

Technical Specification

Mobile Heat Exchanger for Spent Fuel Pool  
SF900CNR001

KRŠKO NUCLEAR POWER PLANT

SP – G 3025

Revision 0

Augmented Quality

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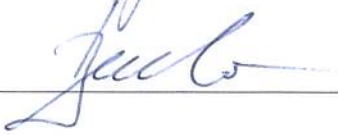


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27.06.2016

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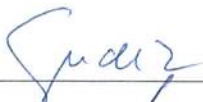


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20/7/16

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# **1 BACKGROUND AND SCOPE OF WORK**

## **1.1 Background**

Nuclear Power Plant Krško has decided to take steps for the upgrade of safety measures to prevent severe accidents, and to improve the means to successfully mitigate their consequences. NPP Krško has prepared Safety Upgrade Program for the modernization. The content of the program for NEK Safety Upgrade is consistent with the nuclear industry response to the Fukushima accident. This includes plant upgrades/design changes to address Design Extension Conditions (DEC A and DEC B). A part of the Safety Upgrade Program is modification 1028 – SF – L (SFP Alternate Cooling) where mobile heat exchanger (MHX) is required.

The SFP alternate cooling with mobile Hx will be designed to remove a heat load from the SFP. It shall be used in the case DEC A with non-availability of all normal cooling systems for the SFP and high temperatures in the SFP. A MHX and a centrifugal pump shall be fitted into a 20 ft container installed on a trailer. The pump shall circulate the SFP water through the MHX. It shall be supplied by a mobile diesel generator. The trailer shall be transportable by truck/tractor and shall be stored in a safe storage building 500 m away from working position. Thus the equipment is protected against seismic events and weather conditions.

For operation of the MHX, the trailer with cooling unit shall be placed in the front of the south wall of the FHB. Area (trailer platform) where the MHX trailer will be located shall be connected with the floor drain system if leakage will occur during the cooling unit operation. Connection with the floor drain system shall be isolated by the valve when the system will not be in function.

The pump and primary side (hot side) of the MHX are to be connected by hoses to the connections on the alternate cooling pipes system at the south wall of the FHB wall. The secondary side (cold side) of the MHX shall be connected through hoses to the cooling water supply. Cooling water supply shall be enabled by mobile pump. A suction hose is to be put into the river and the discharge of the pump is to be connected through hoses to the secondary side MHX. The cooling water shall be pumped from the river Sava through the MHX and back to the river Sava. A strainer in discharge line of the cooling pump provides clean cooling water. The cooling water supply pump and the diesel generator shall be controlled locally – see Attachment 3.

## **1.2 Scope of Supply**

This procurement specification has been prepared generic in nature such that the specific technical requirements with specific equipment for the Non Safety Related (NSR) Augmented Quality related mobile heat exchanger is contained in the Attachment 2

Contractors' scope of work shall include all Specification requirements to allow the Purchaser to receive, install, operate and maintain the alternate cooling of spent fuel pool system. The Contractor shall be responsible for the design, procurement of materials, fabrication, testing, cleaning, shop painting, internal protection, packaging, shipment, and transport per this specification.

The scope of supply per this specification involves:

### **1.2.1 Mobile Heat Exchanger Skid - SF900CNR001**

One mobile heat exchanger skid with cooling capacity for 8,4 MW cooled with water from river Sava shall be designed as specified in Attachment 2 for SFP water cooling with:

- a. Mobile Heat Exchanger SF900HEX-001
- b. Diesel (driven) engine pump on the trailer with fuel tank for 24h MHX operation. Pump required power and capacity shall be verified by MHx supplier.
- c. Two connections for cooling water and two connections for cooled water from SFP. All four connections shall be prepared with coupling for pipe size 8 inch as it is defined in 36.2 Attachment 2 – Data Sheet for SFP MHX.
- d. Temperature, pressure and flow indicators for hot and cold side
- e. Instrument connections for conducting acceptance test, (including those for ASME performance test per latest revision).
- f. Trailer - The mobile heat exchanger shall be shell and tube heat exchanger located in 20 ft container on the standard – 20 ft trailer with sealed floor and common drain connection. Trailer can be moved by tractor from the parking location to the operation location. Parking location will be about 500 m away from the working location. Trailer has to be protected against tip over during seismic event. To protect workers due to radiation streaming, the trailer shall be supplied with supporting structure for lead blanked installation in working position. Lead blankets are not part of the scope of supply.

### 1.2.2 Documentation, special tools and spare parts

- a. Detailed fabrication schedule, written monthly status reports, and a periodic schedule status
- b. Design, fabrication, testing, certification and shipment of one (1) mobile NSR heat exchanger including all necessary quality coverage in accordance with design requirements contained in Purchaser Specification G3025, Rev.0, but not limited to, with the accessories, services, and documentation delineated herein
- c. Special tools for installation and maintenance.
- d. Spare parts
- e. All drawings, certificates and other documents specified in the specification
- f. Installation instructions and precautions
- g. Technical Manual
- h. Assistance of technical adviser(s) and performance testing
- i. Commissioning operations and maintenance manual
- j. Start- up procedure for mobile heat exchangers
- k. The new mobile heat exchanger shall be delivered to KRSKO Nuclear Plant site in Slovenia.

## 2 DEFINITIONS

ADP	Administrative Procedure
ASME	American Society of Mechanical Engineers
ANSI	American National Standard Institute
ARHR	Alternative Residual Heat Removal
AWS	American Welding Society
CE	Comformite Europeene
C/S	Codes and Standards
CMTR	Certified Material Test Report
Contractor	shall mean a company that is fully qualified to conform to requirements of these specification requirements of this specification
CNT	Containment
ddu	delivered duty unpaid
DH	Decay Heat
ESD	Engineering Service Division in NEK
ESP	ESD Internal Procedure
IPP	Inspection Point Plan – Manufacturing and Inspection Plan

MHX	Mobile Heat Exchanger
MECL	Master Equipment Component List
NEK	NPP Krško
NPP	Nuclear Power Plant
NCR	Nonconformance Report
NDE	Nondestructive Examination
NSR	Non Safety Related
PWHT	Post Welding Heat Treatment
PMM	Project Management Manual
PSI	Purchaser's Shop Inspector
PQAR	Purchaser's Quality Assurance Representative
Purchaser	Purchaser shall mean Nuklearna Elektrarna Krško
QA	Quality Assurance
QCP	Quality Control Procedures
RE	Responsible Engineer
RCS	Reactor Coolant System
Rx	Reactor
RFQ	Request for Quotation
SCC	Stress Corrosion Cracking
SFP	Spent Fuel Pool
SSE	Safe Shutdown Earthquake
Work	Shall mean all equipment and services (including all labor, supervision and management) and all other requirements set forth in or necessary to perform the Contract

### 3 CODES, STANDARDS AND REGULATORY REQUIREMENTS

#### 3.1 The contractor shall design MHX in accordance with ASME B&PV Code, Section VIII Div.1.

The MHX shall be designed, fabricated, assembled, tested, cleaned, inspected, packaged, and documented in accordance with the latest revisions of the following codes and standards in effect as of the date of the purchase order, unless specified otherwise. The MHX shall be stamped with the ASME Code stamp, in accordance with the requirements of the ASME Code, Section VIII, Division 1.

Additionally, MHX have to be stamped with the CE stamp (Pressure Equipment Directive 97/23/EC).

It is the Contractor's responsibility to comply with International laws, and local ordinances of the place of installation and properly apply the codes, standards, laws and regulations specified herein, in the design, fabrication and documentation of the MHX. Where a conflict exists between codes, standards and this specification, the Contractor shall bring the conflict to PURCHASER'S attention for resolution.

The following codes and standards apply to the MHX covered by this specification:

**3.2 American Society of Mechanical Engineers ASME Code Sections is applicable as follows:**

- a. ASME Boiler & Pressure Vessel Code Section VIII, Division 1, shall apply for the requirements governing the pressure vessel and the safety relief and relief valves.
- b. ASME Boiler & Pressure Vessel Code Section II, A, B, C, and D, Detailed Specifications for the Materials of Pressure Boundary Construction, shall be applied as allowed by the governing section of the Code.
- c. ASME Boiler & Pressure Vessel Code Section V and referenced standards shall apply to visual and nondestructive examination (NDE) procedures and personnel qualification.

Note: These requirements shall apply to pressure boundary weldments. Non-pressure boundary weldments and other fabrication shall receive a similar level of inspections as those required for the pressure boundary weldments.

- d. ASME Boiler & Pressure Vessel Code Section IX and referenced standards shall apply to welding procedure and welding personnel qualification. These requirements shall also apply to the weldment of non-pressure boundary, internal component seams, and attachments not addressed by the Code, and they shall be maintained current and accepted by the Authorized Inspector for the procedures, materials, progressions, and positions on which they are applied.

**3.3 TEMA (Standards of the Tubular Exchanger Manufacturers Association), Ninth Edition 2007, Class R**



### **3.4 American National Standards Institute**

The following standards, latest edition with addenda (if applicable), shall apply, unless specified otherwise:

- a. ASME B16.5 - Pipe Flanges & Flanged Fittings
- b. ASME B16.9 - Wrought Steel Butt Welding Fittings
- c. ASME B16.11 - Steel Fittings, Socket Weld and Threaded
- d. ASAME B16.25 - Butt Welding Ends
- e. ASME B31.1 - Power Piping

### **3.5 Structural Steel Painting Council**

The standards of the Structural Steel Painting Council (SSPC) shall apply to external surface condition control.

### **3.6 Contractor's Standards**

The Contractor's Quality Control Manual and referenced company standards shall apply to all design, procurement, manufacture, and quality control practices employed on work performed pending review and concurrence by the Purchaser.

### **3.7 Non-Code Configurations**

Non-Code configurations shall be provided to PURCHASER for acceptance and identified on the design drawings.

## **4 SUPPLEMENTAL DATA**

N/A

## **5 DOCUMENT SUBMITTAL**

All document (including drawing, graphs, specifications,...) submitted shall be in the form of hard copies and electronic media. Electronic media shall be in a format fully compatible with following software:

- Word Processing: Word
- Computer-aided Drafting: AutoCAD

All the submitted documents shall bear at least following identification:

- Contractor's Name
- Date of issue
- Document number
- Revision number
- Construction Code
- NEK's Order Number
- NEK'S Spec Number

The Customer shall furnish the following documentation and data for heat exchangers.

### **5.1 Documentation with the Bidder's Quotation**

- a. Heat exchanger and trailer Outline Drawing
- b. Heat exchanger and trailer Arrangement Drawing
- c. As minimum the outline and/or general arrangement drawing shall provide:
  - Overall dimensions and tolerances
  - Nozzle locations, size and orientation
  - Flange dimensions
  - The location and size of piping and instrumentation connections and all other required connections (e.g. vents, drains, etc.)
  - Other interfaces that require connection in the field
  - Dry and flooded weights
  - Hoisting/pulling points and center of gravity
- d. General arrangement/detail drawings to permit review of the design concept
- e. A completed Preliminary Heat exchanger Data Sheet (Appendix 2)
- f. Maximum allowable number of tube plugging for design heat removal
- g. Maximum particle size allowed on the cold/shell side of the HX (Sava river water)
- h. Flow direction and acceptable alternative flow alignments with identical thermal and pressure drop performance of the heat exchanger unit
- i. Copy of ASME B&PV Certificate of Authorization and certified statement by the Bidder that this certificate is current and valid
- j. A list of the Bidder's design, fabrication, testing and inspection facilities

- k. Explanation/description how factory hydrostatic and performance tests in accordance with the ASME Power Test Code will be performed
- l. A reference list of similar products fabricated to ASME Code VIII requirements in last five years
- m. A copy of the Bidder's Quality Assurance Manual
- n. Project Plan

The Bidder' proposal shall include his reasons to every and all section either as general statement or specific comments or either. The Bidder is not hindered to submit any additional documents to ensure completeness of the offer.

## **5.2 Project Management Manual (PMM)**

The contractor shall prepare PMM according to the proposed form in Attachment 36.7 – Project Management Manual. The chapters shall be prepared as applicable for the contract.

## **5.3 Documentation with the MHx supply**

### **5.3.1 Drawings**

The Contractor shall furnish a complete set of following drawings listed below:

#### **5.3.1.1 MHX Assembly Outline drawings**

The outline drawing shall provide sufficient outline dimensions to permit arranging space in the container and on trailer. As minimum the outline drawing shall provide overall dimensions, nozzle sizes, nozzle orientation, nozzle weld end preparation, tolerances, foundation mounting details, including size and orientation of support structure, the location of piping and instrumentation connections and all other connections and all other interfaces that will require connecting in the field.

#### **5.3.1.2 MHX General Arrangement Drawing**

The general arrangement drawing shall be complete enough to permit review of the design concept including arrangement of the tube arrangement, support plates / baffles, tube to tubesheet welding.

#### **5.3.1.3 MHX Assembly As-built Drawings**

"As-built" drawings for MHX shall be supplied. The drawing shall show the measured "as-built" interface dimensions as compared to the dimensions and tolerances indicated on the outline drawing. As minimum, the drawings shall show the following:

- a. Location, size, material and weld preparation dimensions for nozzles, vent and drain connections and other data necessary for installation and maintenance
- b. Location of the support against heat exchanger and required embedment connection
- c. Hoisting/pulling points and center of gravity

#### **5.3.1.4 Assembly & Detailed Drawings**

Assembly and detailed drawings shall be submitted prior to start of manufacturing or procurement of related items. Detail drawings shall contain information as to welding procedures, materials and process specifications, materials ordering.

#### **5.3.2 Design Calculations**

The Contractor shall submit following calculations for approval:

- Thermal / Hydraulic calculation of MHX using inputs from SFP system and Sava River water.
- ASME Code calculation
- Safety / relief valve seizing (Optional)
- Pressure drop calculation across SFP MHX

#### **5.3.3 Manufacturers' Equipment Data Report**

The Contractor shall certify that the equipment furnished conforms to the ASME B&PV Code Section VIII Div.1. The Contractor shall furnish three copies (3) copies of the Final Equipment Data Report.

The Equipment shall be in English and shall cover (at least) following:

- a. Final inspection report
  - Hydraulic test report
  - Quality release
- b. Certificates

- Certificate of Compliance
- Manufacturer data report (form U)
- c. Material
  - Material List
  - Material certificates
- d. Welding
  - Welding book
  - Welders list and performance qualification-welding material certificates
  - Heat treatment
- e. Test
  - Inspection Plan
  - NDE test
  - Other tests
- f. Miscellaneous
  - Nonconformance reports
  - Witnessing report
- g. Drawings

#### **5.3.4 Factory Acceptance Test Report**

Contractor shall submit Factory Acceptance Test Report after successfully completed test at manufacturer testing facility

## **6 DESIGN REQUIREMENTS AND DESIGN INPUTS**

The ASME B&PV Code, PED, TEMA, and other standards as referenced in section 3 of this specification shall provide the basis for the design and construction. Additional design requirements imposed by Purchaser are identified herein. The design of the Mobile Shell and Tube Heat Exchanger shall be subject to Purchaser's approval. The design of the MHX shall ensure maximum reliability and performance for operation and the with engagement minimum maintenance crew.

### **6.1 ASME Code Compliance**

The Heat-exchanger furnished according to this specification shall be in compliance with design, material, fabrication, inspection and testing requirements of the Section VIII, Division 1 of ASME Code. The HTR shall bear the appropriate ASME Code U Stamp, and CE Stamp. The MHX furnished according to this specification shall be in compliance with all design, material, fabrication,

inspection and testing requirements of the applicable Sections of ASME B&PV Code.

## **6.1.1 Hydraulic & Thermal Requirements**

### **6.1.1.1 System and Equipment Design pressure, flow and temperature**

The heat exchanger shall be designed for full design pressure on hot/cold side with atmospheric conditions on the cold/hot side, at design temperature.

### **6.1.1.2 System Parameters**

One mobile heat exchanger shall be designed. One heat exchanger for SFP water with installed pump. Pump shall be defined in accordance with pipe resistance defined in Attachment 5 - Pipe resistance results. Shell and Tube Heat exchanger performance and design shall be in accordance with attached data sheet – see Appendix 2.

### **6.1.1.3 Water Parameters**

#### **6.1.1.3.1 Primary water Parameters**

Primary water which needs to be cooled in mobile heat exchanger has maximal activity of  $1.4e+16$  Bq/m<sup>3</sup>.

#### **6.1.1.3.2 Cooling Water Parameters**

Cooling water is the river Sava water with the parameters defined in App1 – River Sava parameters.

#### **6.1.1.4 Seismic Design**

The trailer shall be protected against seismic event.

## **6.1.2 Design Life**

The mobile heat exchanger shall have a design life of forty (40) years.

## 6.2 General Design Requirements

- Heat exchanger performance and design shall be in accordance with an attached data sheets (Refer to Appendix 2). All performance calculations must include an appropriate allowance for fouling.
- The design of the unit shall not use more than 40% of the allowed pressure drop in the ports and port entry area.
- Pressure drops across each circuit of the shell and tube heat exchanger shall not exceed those noted on the attached data sheet.
- The manufacturer shall indicate on their data sheets the port velocities for each liquid being handled in the shell and tube heat exchanger.

## 6.3 Connections

- Heat exchangers shall be equipped with flanged nozzle connections.
- Pipe Flanged connections shall be prepared with coupling for pipe size 8inch, quick release type and self-locking light tight, NNS, Stainless steel, PN16, DIN 14311, design pressure – 232 PSIG and design temperature – 176 F and blind coupling size 52-C quick release type, NNS, Stainless steel, PN16, DIN14311, design pressure 232 PSIG at design temperature T-115F for pipe 8 inch

## 6.4 Trailer

- Total trailer mass for the transportation shall be 32 t or less.
- The trailer has to have low center of gravity
- It has to be protected against tip over during seismic event (acc. To the procedure SP-S702 Rev. 10 SEISMIC ANALYSIS, TESTING, AND DOCUMENTATION) with manual operated telescopic supports:
  - In parking position
  - In working position with installed shielding blankets
- It has to have at least two axes
- MHx with associated equipment shall be bolted to the trailer platform assuring complete stability under all transportation conditions (uneven off-road terrain, additional loads due to wind, seismic event)
- Trailers shall be equipped with standard equipment such as:
  - direction lights, stop lights brake, approved tails, recessed rear lights
  - transportation tie downs: one with the wheel in front, and two (one on each front side) fixed but movable (up/down) tie downs
  - safety chains with spring loaded hooks
  - standard rotating lunette ring hitch (□ 52mm)

- Trailers shall have axles with surge breaks
- Production test results in accordance with the Supplier's normal testing requirements.
- Equipment drawings and documentation in accordance with section 5.0.
- Trailer must be approved by authority (homologation)
- Trailers will be used with tractor Class 630C (Athlon) – 150 KM

## **6.5 Radiation shielding**

It is expected that the trailer mass with installed MHx, associated equipment and radiation shielding will be much higher than 32 t. To reduce transportation mass the radiological shielding shall be installed on working location as lead blankets hanged on supporting structure. Supporting structure shall be part of the container structure. It must allow hanging lead blankets dimensions 450 x 550 mm with weight of app. 20 kg on the bars. Number of lead blankets shall be defined by contractor. Lead blankets are not part of the scope of supply.

The remote panel with instrumentation shall be located out from the radiation area.

## **7 PERFORMANCE REQUIREMENTS**

- All factory hydrostatic and performance tests in accordance with the ASME Power Test Code will be performed in the presence of a representative(s) of the Contractor.
- Under no circumstances shall the work schedule be compromised due to unavailability of the Contractor's representative. PURCHASER will notify the Contractor a minimum of five (5) working days prior to commencement of testing. The purpose of these tests is to determine whether the heater performance meets the specified minimum characteristics and to ensure operational setpoints and procedures are adequate for normal operation.
- After the hydrostatic and performance test water should be completely drained prior to shipment.



## **8 MATERIAL REQUIREMENTS**

### **8.1 Material Selection**

All pressure boundary and support materials used for construction of the heat exchanger shall conform to specification of Section II of the ASME Code and shall be limited to those that are permitted in ASME VIII in the applicable Part of Subsection C.

All other items shall, as a minimum, be made from materials meeting ASME specifications or justification is provided.

Welding materials used for production shall comply with the requirements of ASME II C, Section VIII Division I, those of Section IX, and the applicable qualified welding procedure specification.

Unless otherwise specified, the recommended minimum quality materials and conditions are specified below. If the Contractor proposes any deviations from these materials, such deviations, with properly detailed justifications, shall be submitted with the proposal clearly marked as deviations from this specification for PURCHASER review and formal concurrence.

All materials to be used in the proposed, heat exchangers, whether pressure boundary or otherwise, shall meet the quality standards of this specification. If the Contractor proposes any deviations from this policy, such deviations, with properly detailed justifications, shall be submitted with the proposal clearly marked as deviations from this specification (see Section 20.0) for PURCHASER review and formal concurrence.

All pressure retaining parts, items welded to pressure retaining parts, and support material shall be fabricated from materials meeting the specification of Section II of the ASME Boiler and Pressure Vessel Code.

## **9 FABRICATION AND ASSEMBLY**

### **9.1 Dimensions and Tolerances**

Dimensions and tolerances referenced on the Contractor's drawing are controlled and shall be maintained. The Purchaser will have the right to verify all dimensions at the Contractor's plant prior to shipment. This dimensional

verification does not relieve the Contractor from his responsibility to meet dimensional requirements within the stated tolerance.

## **9.2 Alignment and Fixturing**

Parts that are to be joined by welding shall be fitted, aligned and retained in position by use of bars, jacks, clamps or other mechanical means, or by welding sequence; the use of temporary attachments for fixturing shall be avoided.

If is necessary to use temporary attachments, they shall be of the same material as the base material to which they are attached, or base metal match-up may be achieved by buttering. The temporary attachments shall be removed by grinding or thermal cutting. If thermal cutting is used, the attachment shall be cut no closer than 1/4 inch from the member and the balance removed by grinding. After removal, the area shall be MT or PT inspected. In all cases, the method or alignment shall not result in deformation of the component.

## **9.3 Welding and PWHT**

Welding, weld procedures, and welder qualifications shall be in accordance with the ASME VIII Div.1 and the requirements of this specification. Weld filler material shall be in accordance with ASME II and the requirements of this specification. WPS and PQR shall be submitted, along with post weld heat treatment (PWHT) procedures, for approval prior to initiating welding. Welders' qualification records shall be retained in the Contractor's shop and made available for Purchaser review upon request. However, a list of welders which were engaged in fabrication with reference data shall be submitted within the final data package. The filler material control, storage, and handling program shall be submitted for approval. Drawings showing fabrication for welding shall indicate the joints, together with joint geometry.

Tack welds to be incorporated into the final weld shall be deposited with contour suitable for fusion with the root pass. The contour may be achieved by grinding if necessary. When tack weld are to become part of finished weld, they shall be performed by a qualified welder and visually examined, and defective welds shall be removed.

All arc strikes shall be removed and the areas ground to a smooth contour. Ground shall not reduce section thickness below required thickness. Nicks, gouges, scratches, punch marks, etc. which do not violate the required minimum thickness of material shall be mechanically faired.

## 10 IDENTIFICATION OF AFFECTED EQUIPMENT

Mobile Heat Exchanger Skid SF900CNR-001

Mobile Heat Exchanger SF900HEX-001

## 11 QUALIFICATION, PARTS CLASSIFICATION AND DOCUMENT TRACEABILITY

Non Safety Related (NSR) Augmented Quality Mobile Heat Exchanger for system accident operating conditions.

## 12 CLEANING

The Contractor shall establish cleanliness program(s) and maintain cleanliness throughout manufacturing, fabrication, assembly, testing and inspection of HEX. The Contractor shall be responsible to ensure that the same requirements for cleanliness are applied by its (potential) subcontractors.

Heat Exchanger shall be cleaned and dried. Contractor's cleaning procedure shall be submitted for approval.

After flushing and hydro testing, the heat exchanger shall be thoroughly dried in a clean warm area for not less than 48 hours. The use of forced filtered warm air is recommended to ensure complete drying. During the first two hours of drying time, the heat exchanger shall be inclined at 5° angle with the tube openings at the lowest point.

### 12.1 Cleanliness Requirements

All materials used shall be thoroughly cleaned of all foreign matter, metal chips, weld spatter, slag, oils, lubricants, preservatives, blasting materials, dirt, scale, excessive oxide, and other foreign materials during the fabrication process. Demineralized water shall be used for final cleaning or rinsing of the heater internals. Demineralized water quality for this specification is defined as follows:

- Conductivity at 25°C (µS/cm) < 3
- pH at 25°C 5.5 to 8
- Chloride, Fluoride, and Sulfide (ppm, each) < 1

- Silica (ppm) < 0.05
- Turbidity (Jackson Turbidity Unit) < 1

All conditions, except for silica and turbidity, are satisfied if the 25°C water conductivity is less than 1 µS/cm.

If any consumable material is left on the surfaces of final cleaned components (creviced and non-creviced), the following contaminant levels shall be met: (Note: for a maximum quantity of one of the elements listed below then other elements shall be less than 1 ppm, e.g., total halogen of 460 ppm will limit the sulfur, nitrite, and nitrate to less than 1 ppm.)

- Total Halogens as Chlorine (maximum) 450 ppm
- Total Sulfur (maximum) 630 ppm
- Total Nitrite (maximum) 10 ppm
- Total Nitrate (maximum) 820 ppm

Preferably there should be no detectable nitrates or nitrites present (<1 ppm), and no glycols shall be present (in the form of dihydric hydrocarbons). If the consumable material is left on the surface there shall be no detectable level of Ag, Zn, Cd, Hg, Ga, In, Pb, Sn, As, Sb, or Bi.

Dye penetrant inspection materials (cleaners, penetrants, and developers) used in the fabrication of the heat exchangers shall meet the requirements of the ASME Boiler and Pressure Vessel Code, Section V, Article 6, Paragraph T-625.

The Contractor shall submit a Material Safety Data Sheets for all lubricants used during fabrication of the heat exchangers. Additional cleanliness requirements are provided in the following sections of the specification – see Attachment 36.4.

The following hot side and cold side cleanliness requirements shall be followed including flushing details during the fabrication process. The Contractor shall submit a cleanliness procedure for PURCHASER review and approval.

## 13 CORROSION PROTECTION/COATING

Exterior steel surfaces, not machined, subject to corrosion shall be cleaned and painted with a heat resistant rust-inhibiting primer. Coatings, paint, etc., shall not be applied to the heat transfer surfaces. Corrosion-resistant material shall not

be painted. The Contractor shall submit with the proposal the coating system to be used.

SSPC-PA1 shall govern minimum standards for painting. SSPC-SP-1, SSPC-SP6 and SSPC-SP10 shall apply specifically to external surface condition control. All protective coatings shall be capable of withstanding temperatures 50°F above the design temperature of the heaters without degradation of the coating properties.

## **14 MARKING AND IDENTIFICATION**

The Contractor shall establish and maintain a system for identification and control of materials, parts and components, including plates. These measures shall ensure that heat number, lot number, part number, serial number or other appropriate identification, either on the item or on records, maintains identification of the item 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. Contents of name plate shall be forwarded to Purchaser for review and approval.

## **15 PACKING, HANDLING AND STORAGE**

The Contractor shall provide, for Purchaser's review and approval, shipment procedures for packaging, shipment, site storage and handling considering ANSI N 45.2.2.

The packaging procedure shall take into account the method of transportation to be used, as well as possible storage duration and storage environment.

Protection of internal cleanliness shall be achieved by sealing all openings with plugs, caps or covers. Covers shall be designed and installed in such manner that their removal can be done without damaging pipe nozzle weld joint preparation area. Internals shall be protected against moisture during shipment and storage by suitable means.

Coated equipment shall be handled in such way to prevent damage to the coating.

## **16 NONCONFORMING MATERIALS**

Non-conformances with specification requirements, approved drawings, and applicable federal, state, and local codes and standards invoked by this specification will not be accepted until approved by NEK.

Non-conformances to be reported for approval by NEK are those non-conformances which cannot be brought within specification requirements by rework or replacement. When such a condition exists, the supplier shall initiate a Nonconformance Notice (NCN) using the suppliers' standard.

Additionally, the supplier shall:

- a) Segregate the non-conforming item to prevent any further processing which may result in a change of the nonconformance as identified,
- b) Make the NCN available to the OSI for review to assure the nonconformance is completely identified and accurately stated, and
- c) properly disposition and transmit the NCN to NEK's Project Manager by the most expeditious means. The NCN may be telecopied, followed by direct transmittal of the original. The supplier shall provide technical justification it recommended disposition is "Accept-As-Is" or "Repair".

The resolution/approval of Deficiency Notices, Nonconformance Notices, Field Change Notices, etc. must be approved in advance by NEK. Further engineering and/or manufacturing after detection of non-conformances, prior to NEK's approval, shall be at supplier's risk.

The NCN shall provide the method by which the supplier shall obtain a documented response and approval from NEK when non-conformances are identified.

## **17 RECORDS**

A record system shall be established and maintained by the Contractor to provide documentary evidence of the quality of items and activities affecting quality. Records shall, as a minimum, identify the Purchaser's name, Purchaser's order number, inspector or data recorder, inspection date, type of observation, procedures used, results, acceptability, and action taken with any deficiencies

noted. Records of inspection shall also include identity of drawings and procedures utilized, along with the revision level. All quality verification records, procedures, and qualifications shall be identifiable to the item or activity involved.

## **18 OTHER REQUIREMENTS**

### **18.1 Contractors Responsibility**

The Contractor shall furnish adequate information for the Purchaser to evaluate the Contractor's proposed design.

Should the Contractor propose to purchase from other Contractors any equipment, material, or service specified herein, the Contractor shall identify to the Purchaser the SubContractor and the specific components they need to provide. If the proposed SubContractor will manufacture any of the items covered by the specification completely or perform sufficient fabrication of the items which require presence of the Purchaser's Shop Inspector in the SubContractors shop, the Contractor shall identify the SubContractor to the Purchaser.

The Contractor or his agent shall perform inspections and/or witness tests at the SubContractor facilities. The presence of PSI does not relieve the Contractor of his responsibilities to meet the requirements of this specification.

The Contractor shall be completely responsible for the design and performance of the MHX. The Contractor shall review all relevant data of existing HTRs, redesign and fabricate any changes required, and guarantee the performance of MHX required by this specification. The Contractor shall be fully responsible to ensure that his work, and the work of any sub-Contractor, is of high quality in every respect of workmanship throughout and fully complies with this specification. If any requirement of this specification is determined by the Contractor to be technically incorrect or technically unsuitable, or that conformance would diminish the Contractors responsibility or the product performance after installation; then the Contractor shall transmit such objections in writing to PURCHASER within forty-eight hours of discovery or with the proposal.

In all respects, equipment supplied in response to this specification shall incorporate normally accepted industry practice of engineering, design, and workmanship. It is not the intent of this specification to specify all details of design and construction. The equipment shall be constructed and equipped with

accessories in accordance with this specification and with Contractor's standard practices when such practices do not conflict with this specification.

The Contractor shall guarantee the performance of the HEX to conform to the values specified by the Contractor and listed in Attachment 2

## **18.2 Purchaser's Responsibilities**

- The Purchaser will evaluate technical part of the offers in conjunction with completeness of the required documents and solutions evident from these documents.
- Following the evaluation, the Purchaser will select the Contractor who best conforms to the Purchaser's requirements. The Purchaser will revise the specification following the completion of the technical part of the bid process and issue specification G-3025 Rev.0 if necessary.
- Purchaser will provide all available design-related inputs necessary to support SELLER's design. Purchaser is responsible for correctness of provided documentation. Available documents may be subject to protection of proprietary information.
- The SELLER may request any available design-related information according to Purchaser document control program and corresponding requirements. Purchaser is responsible for correctness of provided information.
- Purchaser will ensure all internal reviews and approvals required herein.
- Purchaser will provide an on-site training to all SELLER's and his subcontractor's employees as needed to meet requirements for an "unescorted access" to perform the on-site activities.
- All mutually agreed SELLER's interface activities shall be integrated into an overall Purchaser plan. NEK shall be responsible for conducting the plan in a timely manner.

## **18.3 Bidder's Responsibility**

The Bidder shall furnish adequate amount of information to the Purchaser to evaluate the Bidder's proposed design.

Should the Bidder propose to purchase from other Contractors any equipment, material, or service specified herein, the Bidder shall identify to the Purchaser the Sub-contractor and the specific components they need to provide.



If the proposed sub-contractor will manufacture any of the items covered by the specification completely or perform sufficient fabrication of the items which require presence of the NEK Representative in the sub-contractors shop, the Contractor shall identify the Sub-contractor to the Purchaser.

## **19 RIGHT OF ACCESS**

### **19.1 Purchaser's Right of Access**

The Purchaser's Representative shall be allowed access to the areas where design, fabrication and assembly of the MHXs equipment, sub-components will take place, such as shops, working areas and engineering offices of the Contractor and its Sub-contractors at any time for the purpose of auditing.

Such audits will include examination of documentary evidence of activities affecting quality and will be carried out on a regular basis. The Contractor shall at no additional expense provide Purchaser an office at the Contractor's facility for the period of his presence during inspection. A copy machine, computer support and phone (internet, E-mail) connections shall be at Purchaser's disposal.

### **19.2 Availability of Records**

The Contractor shall make available a complete set of all schedules, drawings, specifications, work, inspection and quality control procedures, copies of all contracts and purchase orders, quality assurance records, tests reports, free of charge in his office.

## **20 QA PROGRAM REQUIREMENTS**

### **20.1 Contractor's Quality System**

The Contractor shall have a quality system commensurate to the requirements of the ASME Sec. VIII Division 1 or similar.

Contractor shall have counterfeit program in used.

#### **20.1.1 Quality Manual**

Contractor's have to have Quality program. The Contractor shall implement and maintain this program while carrying out the requirements of this

specification; all proposed changes to the program shall be submitted to, and approved by, the Purchaser prior to implementation.

### **20.1.2 Contractor's Responsibilities for Sub-contractors**

The Contractor shall ensure that all potential Sub-contractors meet the applicable requirements of the specification.

The specification requirements for procedure submittals shall apply to Sub-contractors for operations or services not performed by the Contractor. The Contractor shall first review Sub-contractor's procedures to ensure compliance with specification requirements, submit these procedures, and obtain the Purchaser's approval in writing prior to performance of Sub-contractor's work. The Contractor's procedure may be used at the Sub-contractor's facilities if necessary.

The Contractor shall ensure that the Sub-contractor is aware of all testing that the Sub-contractor will be required to perform, and shall identify activities that require the presence of the NEK Representative. The Contractor shall ensure that the NEK Representative has the right of access to Sub-contractor's facilities and documents needed to perform inspections or witness tests.

The Contractor shall retain full responsibility of the Sub-contractor work, supervise quality, and document such facts in the Final Documentation Package.

### **20.1.3 Preproduction Review Meeting**

Prior to ordering of materials or starting of fabrication, the Contractor shall review the purchase order, specification, other contractual documents, and its Quality Program with the Purchaser's Responsible Engineer and the QA representative. The Contractor shall demonstrate its understanding of the technical and Quality requirements in the specification and present its methods of complying with those requirements.

The Contractor, immediately after award of NEK purchase order, shall perform a complete review of the specification and take timely action to ensure that the necessary procedures and provisions are established in accordance with the CONTRACT DOCUMENTS and applicable codes and standards. Where there are unique requirements which require special equipment, specially trained personnel, procedures for process control, process or personnel qualifications, or other actions to control quality, they shall be provided, documented and planned

as necessary into travelers, process sheets, work instructions and inspection plans (i.e., painting, welding, testing, cleaning, NDE, etc.).

The Contractor shall cooperate with the Purchaser's representatives in scheduling various inspections and tests during manufacture, cleaning, and preparation for shipment. The Purchaser will confirm which tests or inspections the Purchaser's representatives will witness. This meeting will normally be held at the Contractor's facilities.

#### **20.1.4 Manufacturing and Inspection Plan**

The Contractor shall provide manufacturing and inspection plans for review and approval prior to start of manufacturing. The Manufacturing and Inspection Plans shall cover all relevant ASME inspection requirements and other deriving from this specification and by it quoted relevant rules and regulations. It shall outline the manufacturing and production sequence and specific pre-planned Contractor inspections that are required to be performed. Based on the above information, Purchaser will determine his own witness and hold points. The Contractor shall update the Manufacturing and Inspection Plan and submit copies thereof to the Purchaser for final approval. There may be more Manufacturing and Inspection Plans when it is practical to keep control over subitems or work on different locations.

The Purchaser will utilize the plan and requirements of this specification to establish notification or hold points for surveillance or Purchaser's approval, in accordance with Subsections 20.2.1 and 20.2.2.

#### **20.2 Material Control and Identification**

The Contractor shall establish and maintain a system for the identification and control of materials, parts, and components, including tubing and partially fabricated assemblies and availability to recognize counterfeit items. These measures shall ensure that identification of the item is maintained by part number, serial number, or other appropriate means, on the item and on the records traceable to the item through fabrication, shipment, and use of the item. These identification and control measures shall be designed to:

- prevent the use of incorrect, defective material, parts, and components, and
- provide traceability of all parts and components to specific manufacturer, heat number, lot number, material test reports and to the Purchase Order Number.

In the event of defective material, parts and components, records must include the ultimate disposition of the component to ensure incorrect or defective material is destroyed.

## **20.3 Inspections**

### **20.3.1 Notification Points**

The Purchaser shall have the right to establish notification points for which the Contractor shall give prior notification to the Purchaser. In addition, the Purchaser may establish temporary notification points if necessary to ensure resolution of temporary quality problems. Notification points require receipt of notification at least ten (10) working days in advance of the scheduled time of performance. Alternatively, if there is a resident NEK Representative, schedules may be submitted in advance to the NEK Representative identifying the activities which have been designated as notification points in the Manufacturing and Inspection Plan. The Purchaser may require that activities performed without proper notification be repeated for NEK Representative observation at the Contractor's expense.

The NEK Representative will witness the event or will authorize the Contractor to proceed without Purchaser's witnessing of the event.

### **20.3.2 Hold Points**

Mandatory hold points are considered to be those tests, inspections, or operations which require witnessing by the NEK Representative and beyond which operations shall not proceed without written consent of the Purchaser.

The Contractor's failure to stop at a hold point will be a cause for rejection of those items for which notification was not provided or which were not held. Hold points require receipt of notification at least ten (10) working days in advance of the scheduled time of performance.

Alternatively, if the NEK Representative is a resident at the Contractor's manufacturing facility, notification may be by weekly schedules submitted in advance to the NEK Representative and identifying those activities which have been designated hold points in the Manufacturing and Inspection Plan. The Purchaser may require that activities performed without proper notification or the ones not held are repeated for NEK Representative observation at the Contractor's expense.

### **20.3.3 Stop Work Action**

When the Purchaser's Inspector is concerned about some marginal condition found by the tests and inspections specified herein, the Purchaser's Inspector shall have the right to call for an appropriate supplementary nondestructive test. The cost of the test, and the effect if any on the schedule, shall be ascertained in advance. If the test shows the component is in compliance with this specification, the cost of the test will be borne by the Purchaser. If the test shows the component is not in compliance with this specification, the Contractor shall bear the cost of the test, and shall rectify the situation to the satisfaction of the Purchaser's Inspector with no additional cost to the Purchaser.

The Purchaser will orally notify, and confirm in writing, to the Contractor any situation where, in the judgment of the Purchaser, the Contractor or Contractor's sub suppliers are performing work contrary to the conditions and terms of the procurement documents, or where continued operations could cause damage to preclude further inspection of or render remedial action ineffective for any product or service.

If, after this notification by the Purchaser, the Contractor does not commence appropriate corrective action, the Purchaser, by acting through channels previously established, will initiate work stop action on the specified product or services and so notify the Contractor in writing.

Upon receipt of notification to Stop Work from the Purchaser, the Contractor and the Contractor's sub suppliers shall cease operations, including shipments, on any specified product or service to the extent stipulated in the Stop Work notification. Resumption of operations shall not be undertaken until the Contractor has obtained a written authorization from the Purchaser. The written authorization to resume further operations will be granted only after receipt and approval of the Contractor's written commitment to correct those conditions itemized in the notification to Stop Work.

### **20.3.4 Contractor's Responsibility**

It is not intended that the NEK Representative will relieve the Contractor in any way whatsoever of its obligation to maintain an adequate test, inspection, and documentation program, or of any obligation under this specification.

## **20.4 Release for Shipment**

Equipment or material shall NOT be shipped unless a Quality Release (QR) has been issued by the Purchaser's Inspector and affixed thereto or a Waiver of Inspection (WOI) has been issued by Purchaser's designated quality assurance interface. If the requirement for a QR is waived, shipment shall be made with all documents distributed in accordance with the requirements of the specification. A copy of the WOI must become part of the documentation package and accompany the shipment.

Prior to each shipment, the Contractor shall submit to the Purchaser's Inspector the documentation packages as required by the specification consisting of the records applicable to the shipment, which records shall be loose-leaf bound and appropriately identified for reference and use.

The Purchaser's Inspector will review the documentation for completeness, legibility and reproduction quality. If satisfactory, the Purchaser's Inspector will issue either a QR or a WOI to the Contractor. If not satisfactory, the Contractor will be promptly advised that additional documentation is required.

Failure of the Contractor to comply with these requirements may be cause for rejection at the receiving inspection, with the material returned to the factory, and with all additional freight, off-loading, handling, and storage expenses for the Contractor's account.

These requirements also apply to shipments from Contractor's sub suppliers for any items to be shipped directly to the Purchaser.

## **20.5 Procedures and Drawings**

The Contractor shall submit all procedures including with acceptance criteria and drawings to the Purchaser for review and approval.

To the extent that approval of certain drawings or procedures by the Purchaser is required by this specification:

- No production work for which the indicated drawings or procedures are used shall be started until the Purchaser's approval has been obtained.
- All work shall be in accordance with the approved drawings or procedures.

Failure to comply with the requirement for approval may be the cause of rejection of the work by the Purchaser.

## **20.6 Documentation**

### **20.6.1 Certificate of Compliance**

A "Certificate of Compliance" shall be submitted by the Contractor certifying that the equipment is in conformance with the requirements of this specification. The Contractor will not only be required to certify the compliance of his own actions, but those of sub-suppliers he may use.

The Contractor and the possible Contractor's Sub-contractors shall maintain adequate documentation to support the facts certified in the "Certificate of Compliance" for turnover to the Purchaser.

### **20.6.2 Contractor's Documentation**

QA & QC documents are a deliverable item. The Contractor's Quality Control Representative shall approve them, then present them to the Purchaser for review and approval. Documentation to be transmitted with a shipment shall be adequately packaged, protected, and secured to ensure it will arrive undamaged with the shipment.

The Contractor shall be responsible for inspecting the item(s) and checking the applicable records, prior to shipment, to verify compliance with all specification requirements. Acceptance of the completed sets of records by the Purchaser does not relieve the Contractor of responsibility for compliance with specification requirements.

All records required by this specification, applicable regulations, or codes and standards, or generated as a result of the Contractor's QA program shall become part of NPP Krško QA Records. The Purchaser shall be notified in advance if, at any future date, Contractor should plan to destroy any records. At the discretion of the Purchaser, all quality assurance records and documentation related to this specification shall be transferred to the Purchaser.

Certified copies of test reports shall be furnished to the Purchaser's Project Engineer each properly identified and including a description of the test covered and of the materials or equipment tested. Reports shall be submitted on all tests specified.

### **20.6.3 Documentation Checklist - Index**

Prior to the start of fabrication, the Contractor shall prepare and submit to the Purchaser, for review and approval, a preliminary Documentation Index detailing the quality assurance documents which will be required to comply with this specification and referenced codes and standards. This Index shall identify, both by document type (e.g., materials test report or PT report) 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's Inspector.

The Contractor shall organize the Index in a logical and easy-to-follow format, so that for any shipment (whether it be a partial or complete shipment) it will be possible to readily ascertain the completeness of documentation applicable to the shipment. If more than one shipment to NEK site is involved, the index shall be organized by components as shipped, with all documents applicable to each component as shipped separately itemized.

The Documentation Index, when submitted to the Purchaser, will be reviewed for its adequacy. If satisfactory, it will be "Approved" and documentation of its approval will be returned to the Contractor. If not satisfactory, it will be returned with comments noted; the Contractor shall then promptly revise and resubmit the Index for approval.

This specification requires specific documents to be formally submitted to the Purchaser for information or review and approval. If these documents are changed subsequent to submittal, the Contractor shall resubmit the revised document(s) to the Purchaser for information or review and approval consistent with the original requirement. Any document required by this specification which is produced by a sub supplier of the Contractor shall first be reviewed and noted as being approved by the Contractor and then submitted to the Purchaser for review and approval. Contractors and sub suppliers who proceed to use unapproved documents do so at their own risk, and may be required to repeat



activities that were performed if the document used is subsequently rejected by the Purchaser.

#### **20.6.4 Deviation/Change Requests**

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 Contractor desires to accept, must be approved by the Purchaser. Any such deviation request must be made in writing by means of a Deviation/Change Request Form submitted to the Purchaser for approval prior to continuing work.

### **21 SPECIAL HANDLING**

Contractor shall prepare instruction for handling with the MHX.

### **22 SHELF LIFE**

The supplier shall not ship any item, which has less than one year remaining shelf life at time of shipment. The supplier shall provide shelf life data by Expiration date.

### **23 10CFR21 REPORTING**

N/A

### **24 COMMERCIAL GRADE ITEM DEDICATION**

N/A

### **25 SUPPLIER DOCUMENTATION REQUIREMENTS**

The Contractor will provide all documentation specified in this specification especially sections 5, 33 and tables from Attachment 2.

### **26 NEK PROPRIETARY DATA**

NEK has a proprietary interest in all of the drawings, designs, specifications, documents, information or know-how which may be furnished pursuant the

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 NEK. The right to use of all such Information shall be transmitted to the contractor 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 REPORTING**

Pressure- retaining materials shall conform to those listed in Subsection C, Section VIII, Division 1 of the ASME B&PV Code.

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 Contractor desires to accept, must be approved by the Purchaser. Any such deviation request must be made in writing prior to disposition by means of 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. Nonconformance to be reported for approval by the Purchaser are those nonconformance, which cannot be brought within specification requirements by rework or replacement. When such a condition exists, the Contractor shall initiate a Nonconformance Report (NCR) using the Contractor's standard nonconformance document, which identifies the nonconformance and the Contractor's proposed disposition.

The Contractor shall:

1. segregate the nonconforming item to prevent further processing which may result in a change of the nonconformance as identified
2. make the NCR available to the Purchaser's inspector if available for review to ensure the nonconformance is completely identified and accurately stated
3. transmit the NCR with recommended disposition to the Purchaser in an expeditious manner. The Contractor shall provide technical justification to the recommended disposition.
4. Further manufacturing after detection of non-conformances, prior to Purchaser's approval shall be at the Contractor's risk.

**Note:** For better understanding a sketch shall be performed or computerized digital picture attached in order to show Nonconformance.

## **28 REPAIR RECORDS**

A record system shall be establish and maintained by the Contractor 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, monitoring of work performance and material analyses. Records shall as a minimum identify the inspector or data recorder, inspection date, scope of inspection, type of observation, procedures used, results, acceptability, and actions taken with deficiency noted and shall conform to the requirements of item 20.5.3- Contractor's documentation.

All repair records shall be delivered to the Purchaser.

## **29 SOURCE INSPECTION/SURVILLANCE NOTIFICATION**

The Contractor shall officially notify about manufacturing "hold" and "witness" points according to the installation and inspection plan. Notification time shall be 14 calendar days ahead of anticipated occurrence.

## **30 SHIPPING REQUIREMENTS**

The supplier shall provide packaging and shipping methods for protection from the effects of temperature extremes, humidity and in transit shocks. The NEK's authorized source inspector has the right to hold shipment if purchase order requirements are not met. The Contractor is responsible to get all permissions for transportation of the equipment

The packaging procedure shall take into account the method of transportation to be used, as well as possible storage duration and storage environment.

Protection of internal cleanliness shall be achieved by sealing all openings with plugs, caps or covers. Covers shall be designed and installed in such manner that their removal can be done without damaging the BD or pipe nozzle weld joint preparation area. Internals shall be protected against moisture during shipment and storage by suitable means. Coated equipment shall be handled in such way to prevent damage to the coating.

## **30.1 Protection of Internals, preparation for shipment and shipment**

### **30.1.1 Cleanliness**

As required by Sections 6.5.6, 9.3.7, 9.9.1, and 12.1 of this specification, all materials used shall be thoroughly cleaned. These materials shall be cleaned of all foreign matter, metal chips, weld spatter, slag, oils, lubricants, preservatives, blasting materials, dirt, scale, excessive oxide, and other foreign materials throughout the fabrication process to ensure the cleanliness of the heater's internal surfaces.

### **30.1.2 Protection against Damage**

The procedures for protection against corrosion damage of heater internal surfaces and damage due to freezing at any time during shipment and outdoor storage shall be submitted for approval.

All weld end preparations; gasket surfaces, flange faces, and threads shall be thoroughly cleaned and greased or treated with preservative dependent upon the closure used. All weld end preparations shall be protected with a mechanical cover, flange nozzles shall be closed with bolted flanges, and all threaded connections with bull plugs or threaded caps. All threads shall be lubricated prior to installation of the plugs or caps. Any auxiliary threaded connection used for fabrication of the heat exchanger (i.e., shop hydro test connections) shall be closed and seal welded. These auxiliary connections shall be added to the design drawings and labeled accordingly.

### **30.1.3 Corrosion Inhibitors**

Corrosion inhibitors applied in any heater must limit chlorides, fluorides, and sulphur per Section 12.1 in the test or hot dry out water. Petroleum based corrosion inhibitors are not allowed.

### **30.1.4 Temperatures for Vacuums for Dry Out**

The dry out procedure shall be included under 15.1.2 and submitted for PURCHASER approval.

### 30.1.5 Shipment

Prior to shipping, mechanical covers or equivalent alternative shall be installed to replace hydro test caps. The use of welded end caps for storage and shipping is not permitted unless otherwise approved by PURCHASER. Prior to shipment, the Contractor shall contact PURCHASER'S Representative to confirm shipping arrangements. All pieces of equipment, boxes, cartons, etc., shall have a waterproof identification label attached with the following information:

**PURCHASER**

Nuclear Plant Krško

Vrbina 12, 8270 Krško, SLOVENIA

Mobile Heat Exchanger

Attn:

**CONTENTS:** Contents Description (Provide reference to Purchase Order and Heater No.). The Contractor shall include packing list identifying each item or assembly shipped.

## 31 DELIVERY SCHEDULE

- Project Management Manual in one month
- The drawings (Section 5.3.1) and the calculations (Section 5.3.2) required by NEK for approval shall be delivered in 4 months.
- Factory Acceptance test shall be performed in 11 months
- The Contractor shall deliver Scope of Work in accordance with section 1.2 in 12 months
- Site Acceptance Test shall be performed on NEK site within 2 months after the delivery on site
- Hand-over Protocol shall be signed in 14 months

## 32 WITNESS/HOLDPOINTS OR SUBMITTAL OF SUPPLIER DOCUMENTATION

The Contractor shall not start with fabrication prior NEK approval of drawings (section 5.1), calculations (section 5.2) and fabrication & testing procedures and Manufacturing and Inspection Plan.

## **33 VENDOR TECHNICAL MANUAL**

The Supplier shall furnish four (4) copies of the Final Technical Manual. The Technical Manual shall be in English and cover:

### **INTRODUCTION**

- i.1 Purpose and Scope of Manual
- i.2 Definitions

### **SECTION 1 EQUIPMENT DESCRIPTION**

- 1.1 Description and purpose
- 1.2 Specifications

### **SECTION 2 INSTALLATIONS**

- 2.1 Receiving
- 2.2 Handling
- 2.3 Installing
- 2.4 Connections and Grounding
- 2.5 Cleaning and Inspection
- 2.6 On-site testing service

### **SECTION 3 OPERATING INSTRUCTIONS**

- 3.1 General
- 3.2 Safety precautions
- 3.3 Start-up procedure
- 3.4. Instrumentation with interlocks
- 3.5 Operation
- 3.6 Operational Checkout at plant shutdown
- 3.7 Testing at Power
- 3.8 Equipment Setpoints

### **SECTION 4 MAINTENANCE INSTRUCTIONS AND PROCEDURE**

- 4.1 Preventive Maintenance Procedure
- 4.2 Safety Precautions and Interlock Checks
- 4.3 Test Equipment and Tools for Maintenance and Troubleshooting
- 4.4 Dismantling & Reassembly of Assemblies and Subassemblies
- 4.5 Alignment and Adjustment procedures (including Torque Sheet Data)
- 4.6 Operational Performance Test

- 4.7 Leak Detection
- 4.8 Conservation and storage

## **SECTION 5 TROUBLESHOOTING**

- 5.1 Troubleshooting procedure and/or Troubleshooting Chart

## **SECTION 6 REPLACEMENT PART**

- 6.1 Parts List
  - 6.1.1 Introduction
  - 6.1.2 Maintenance Parts List
  - 6.1.3 List of Manufacturers and addresses with ordering instructions
  - 6.1.4 Recommended Spare parts

## **SECTION 7 SPECIAL TOOLS AND INSTRUMENTATION**

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

## **SECTION 8**

DRAWINGS & All document /including drawing, graphs, specifications,...) submitted shall be in the form of hard copies and electronic media.

Vendor technical manual shall contain all sections listed in items above, NEK will update existing onsite documentation. Contractor shall provide all relevant data to supplement MECL database, which are related to the MHX.

## **34 TRAINING**

N/A

## **35 ORGANIZATIONAL CONTACT**

Purchaser contact persons:

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- E-mail: [bojan.volaric@nek.si](mailto:bojan.volaric@nek.si)

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## 36.1 Attachment 1 – River Sava Parameters

Sheet 1 of 2

TABLE 2.6.2-3

### SAVA RIVER WATER ANALYSIS

Location of Sample Collection	Upstream New Bridge Krsko			Nuclear Power Station Krsko		
	Min.	Max.	Average	Min	Max.	Average
Nonfiltrable Residue (Total Susp. Solids) ppm	23	509	137	45	614	179
Filtrable Residue (After Evaporation at 105°C)	151	280	230	157	325	266
Ignition loss	62	108	89	68	170	114
Filtrable Fixed Residue (Ignition Res.)	89	172	141	89	155	152
Silica, SiO <sub>2</sub>	2.4	6.0	3.7	5.6	2.6	3.7
Al <sub>2</sub> O <sub>3</sub> + Fe <sub>2</sub> O <sub>3</sub>	0.2	2.0	1.3	0.0	2.5	1.9
Calcium oxide, CaO	57.7	96.8	80.3	54.9	98.7	83.2
Magnesium oxide, MgO	12.1	29.0	21.4	10.5	29.0	21.1
Chloride, Cl <sup>-</sup>	3.2	10.6	6.8	3.9	11.7	8.2
Sulphate, SO <sub>4</sub> <sup>-</sup>	11.6	48.1	26.7	11.8	48.0	32.1
Nitrate, NO <sub>3</sub> <sup>-</sup>	2.8	6.7	4.5	3.8	8.5	5.2
Ammonia, NH <sub>3</sub>	n.d.	n.d.	n.d.		0.15	
Phosphate, PO <sub>4</sub> <sup>-</sup>	0	0.30		0	0.35	
Sodium, as Na <sub>2</sub> O + K <sub>2</sub> O	0	2.5		2.17	19.5	9.6
Ca-Hardness °dH, Germ. degree/ppm CaCO <sub>3</sub>	5.8/103.8	9.7/173	8.0/143	5.5/98	9.8/175	8.3/148

Page 1/2

NE KRŠKO

SECTION 2.6

REVISION 6

TABLE 2.6.2-3 (Continued)

## SAVA RIVER WATER ANALYSIS

Location of Sample Collection	Upstream New Bridge Krsko				Nuclear Power Station Krsko			
	Min.	Max.	Average		Min	Max.	Average	
Mg-Hardness Germ. dH degree/ppm CaCO <sub>3</sub>	1.7/30.4	4.1/73.3	3.1/55.4		1.5/26.8	4.1/73.4	3.0/53.6	
Total Hardness dH Germ. degree/ppm CaCO <sub>3</sub>	7.5/134	13.8/246	11.1/198		7.0/125	13.9/248	11.3/202	
Carbonate Hardness dH, Germ. degree/ppm CaCO <sub>3</sub>	6.4/114	10.2/183	8.8/157		6.7/120	10.6/189	8.4/150	
Non Carbonate Hardness dH, Germ degree/ppm CaCO <sub>3</sub>	1.1/19.7	3.6/64	2.3/41.2		0.3/5.4	3.3/59	2.9/52	
pH - Value	7.4	8.7	7.9		7.4	7.7	7.5	
p-Alkalinity (Phenolphthaleim Alk.) ml 0.1 N HCl/100 ml of sample	0.0	0.1	0.0		0.0	0.1	0.0	
m-Alkalinity (Methylorange Alk.) ml 0.1 N HCl/100 ml of sample	2.3	3.7	3.2		2.4	3.8	3.3	
Consumption of KMnO <sub>4</sub> ppm	11.6	758	29.4		16.4	270.2	104.9	
Electrical conductivity micro Siemens cm <sup>-1</sup>	287	462	393		263	465	404	
Biological consumption of oxygen after 2 days			4.0					
Biological consumption of oxygen after 5 days			5.9					

NE KRŠKO

SECTION 2.6

REVISION 6

### 36.2 Attachment 2 – Data Sheet for SFP MHX

Prepared by*:	Job No:*		
Customer: NPP Krško	Ref. No:*		
Address: Vrbina 12	Proposal No:*		
Plant Location: 8270 Krško, Slovenia	Date:*	Rev*:	
System Operating Mode: Accident Condition	Item No*:		
Model Number:*	Connected In:           Parallel		
Area Per Unit:*(m <sup>2</sup> )	Shell/Unit:*	Area/Unit:*	m <sup>2</sup>

#### Performance for One Unit

Fluid Allocation:	Hot Side		Cold Side	
Fluid Name:				
SFP Water – Table 6-1 (Hot Side) River Sava – App. 1 (Cold Side)				
	Inlet	Outlet	Inlet	Outlet
Total Fluid Flow: m³/h	240	240	250	250
Non-condensable: m³/h	0	0	0	0
Temperature: °C	80	50	29,1	57,6
Density*: kg/m³				
Specific Heat*: kJ/kg°C				
Thermal Conductivity*: W/m°C				
Viscosity*: mPa s				
Overall Fouling Allowance: % Excess Area	10			
Wall Shear Stress:* kPa/Velocity (mps)	/		/	
Inlet Pressure: kPa	600		600	
Pressure Drop Allowed: kPa	100		100	
Pressure Drop Calculated:* kPa	/		/	
Design/Test Pressure: kPa	1034/1551		1034/1551	
Design/MDMT Temperature: °C	93,3/-35,1		93,3/-35,1	
No. Passes/No. Channels Per Pass:*	/		/	
Total No. of Tubes:*	Tube arrangement:*			
Tube dimension:* mm	Tube arrangement:*		mm	
Heat Exchanged: MW	8,4			
Heat Transfer Area: * m²				
LMTD:* °C	Corrected LMTD:*		°C	
Transfer Rate:* W/m, °C, Clean	Service: (1)			

Materials of Construction				
Shell and Tube sheet: SS 304 Shell flanges: optional CS or SS		Heat transfer tubes: SA-213 or SA-249 TP 304 or 316		
Flange Bolts: SA-193 B7		Gaskets: SS jacketed, non-asbestos filler		
Shroud*:				
Sizes and Weights				
Connections Size, Rating, & Facing		Hot Side		Cold Side
Inlet Size:*		DN200	-	DN200 -
Outlet Size:*		DN200	-	DN200 -
<b>Code Requirements:</b> Shall be designed, fabricated, and tested in accordance with the requirements of Section VIII, Division 1 of ASME Code and PED. Certified with ASME U-Stamp for pressure retaining components and CE Stamp for trailer, pump unit and MHx unit				
Heat Exchanger size*		mm		
Unit Weights*, Dry:		kg		Filled with Water*: kg
<b>Pump:</b>				
Pipe resistance: see Attachment 5 - Pipe resistance results				
Pump P* =		kW		
Pump h* =		m		
Pump F* =		m3/h		

**Remarks:**

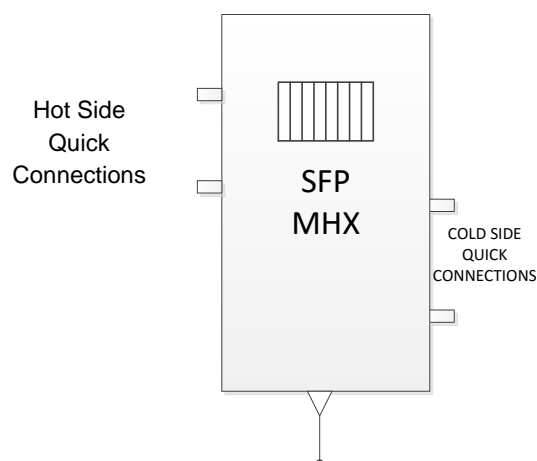
- Pipe Flanged connections shall be prepared with coupling for pipe size 8 inch, quick release type and self-locking light tight, NNS, Stainless steel, PN16, DIN 14311, design pressure – 232 PSIG and design temperature – 176 F and blind coupling m size 52-C quick release type, NNS, Stainless steel, PN16, DIN14311, design pressure 232 PSIG at design temperature T-115F for pipe 8 inch
- Pump powered by diesel (It has to be considered possible temperature in parking position of -33 deg. C)
- Installed PI, DPI, TI and FI (to be shown on flow diagram attached to this unit data sheet) - The remote panel with instrumentation shall be located out from the radiation area.
- Remote control panel which can be allocated to the distance of cca. 10m
- Flange ratings and facings shall comply with ASME B16.5 requirements.
- The MHX shall be fitted with adapters – quick connectors.
- The MHX consists of a container unit mounted on a trailer.
- The container can be transported by truck and shall be stored in the emergency equipment storage facility.
- For the operation of the MHX the container shall be placed to location of the pipe tie-in points.
- The MHX container shall be fitted with quick coupler for connection
- The MHX shall be fitted into a 20 ft standard container
- Radiation shielding according to the requirements in Item 1.3

Nozzle Sketch(es), if appropriate:

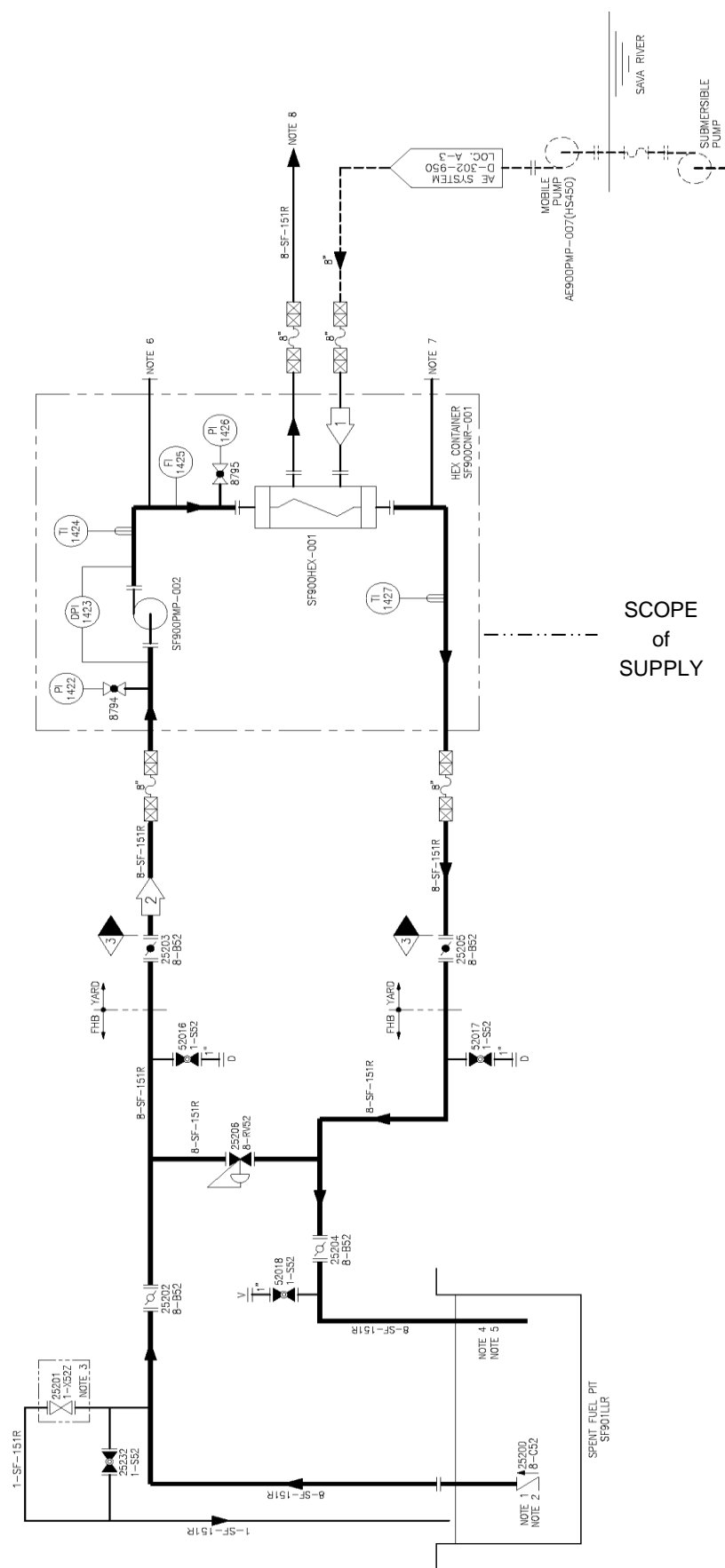
**Note:**

- \* - shall be furnished by the manufacturer

Figure 1: Location of SFP MHX quick connections



### 36.3 Attachment 3 – SF System P&ID with MHX connections

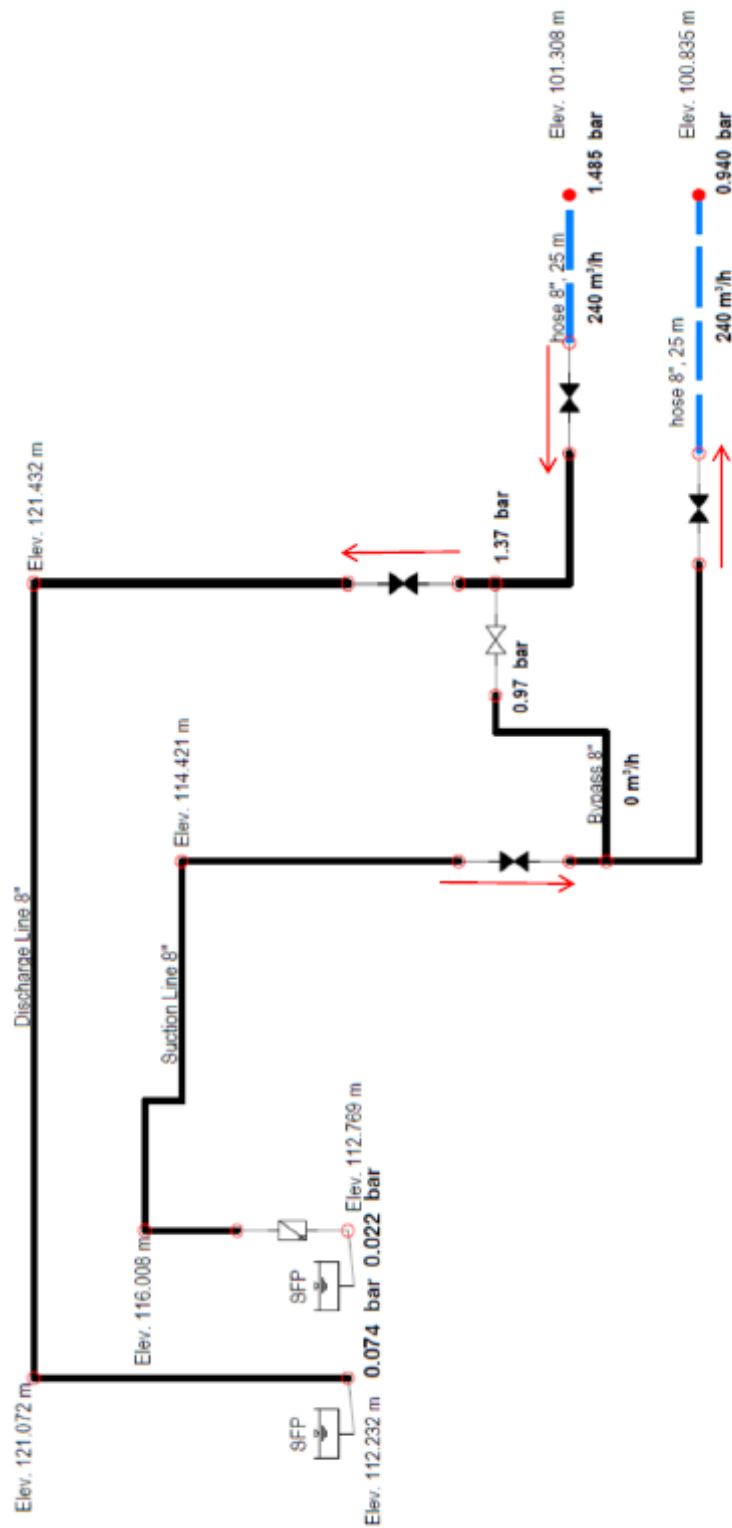


## 36.4 Attachment 4 - Cleanliness Requirements

CLEANLINESS REQUIREMENTS		
Examination Method	Acceptance Criteria	
	Hot side	Cold side
Visual Examination (White Light)	<p>Bare metal shall appear clean and free of organic films and contaminants.</p> <p><u>Corrosion resistant alloys</u> may have scattered areas of rust with an aggregate area less than or equal to two square inches in any one square foot area.</p> <p><u>Carbon steel and low alloy steels</u> may have scattered rust with an aggregate area less than or equal to four square inches in any one square foot area.</p>	<p>Bare metal shall appear clean and free of organic films and contaminants.</p> <p><u>Corrosion resistant alloys</u> may have scattered areas of rust with an aggregate area less than or equal to fifteen square inches in any one square foot area.</p> <p><u>Carbon steel and low alloy steels</u> may have scattered rust with an aggregate area less than or equal to four square inches in any one square foot area. Uniform light rust "bloom" which can be removed by brushing or wiping is acceptable.</p>
	<p>Exceptions:</p> <ol style="list-style-type: none"> <li>1. Temper film and discoloration resulting from welding is acceptable.</li> <li>2. Light deposits of atmospheric dust are acceptable.</li> </ol>	
Visual Examination (Black Light)	<ol style="list-style-type: none"> <li>1. Surface should be free of any hydrocarbon or organic fluorescence.</li> <li>2. Lint or dust visible under ultraviolet light is not acceptable.</li> </ol>	<ol style="list-style-type: none"> <li>1. Same acceptance standards apply as for the tubeside, with exceptions as listed above for white light examination.</li> </ol>
Wipe Tests	The cloth, filter paper or plug should be free of any smudges or marks.	
Cleanliness Verification Flush	<ol style="list-style-type: none"> <li>1. Slight corrosion particle speckling of screen material is acceptable.</li> <li>2. ....Total accumulation of particles shall be less than or equal to the volume of a 1/16 cubic inch per inch of pipe diameter.</li> <li>3. Particle size shall be less than or 1/32-inch thick and 1/16-inch long.</li> <li>4. No evidence of contamination (e.g. oil, discoloration) in effluent of water flushed systems.</li> </ol>	<ol style="list-style-type: none"> <li>1. Considerable particle speckling of screen material is acceptable.</li> <li>2. Considerable rust staining of flush cloth is acceptable.</li> <li>3. Total accumulation of particles shall be less than or equal to the volume of a 1/8 cubic inch per inch of pipe diameter.</li> <li>4. Particle size shall be less than or 1/32-inch thick and 1/16-inch long.</li> <li>5. No evidence of contamination (e.g. oil, discoloration) in effluent of water flushed systems.</li> </ol>

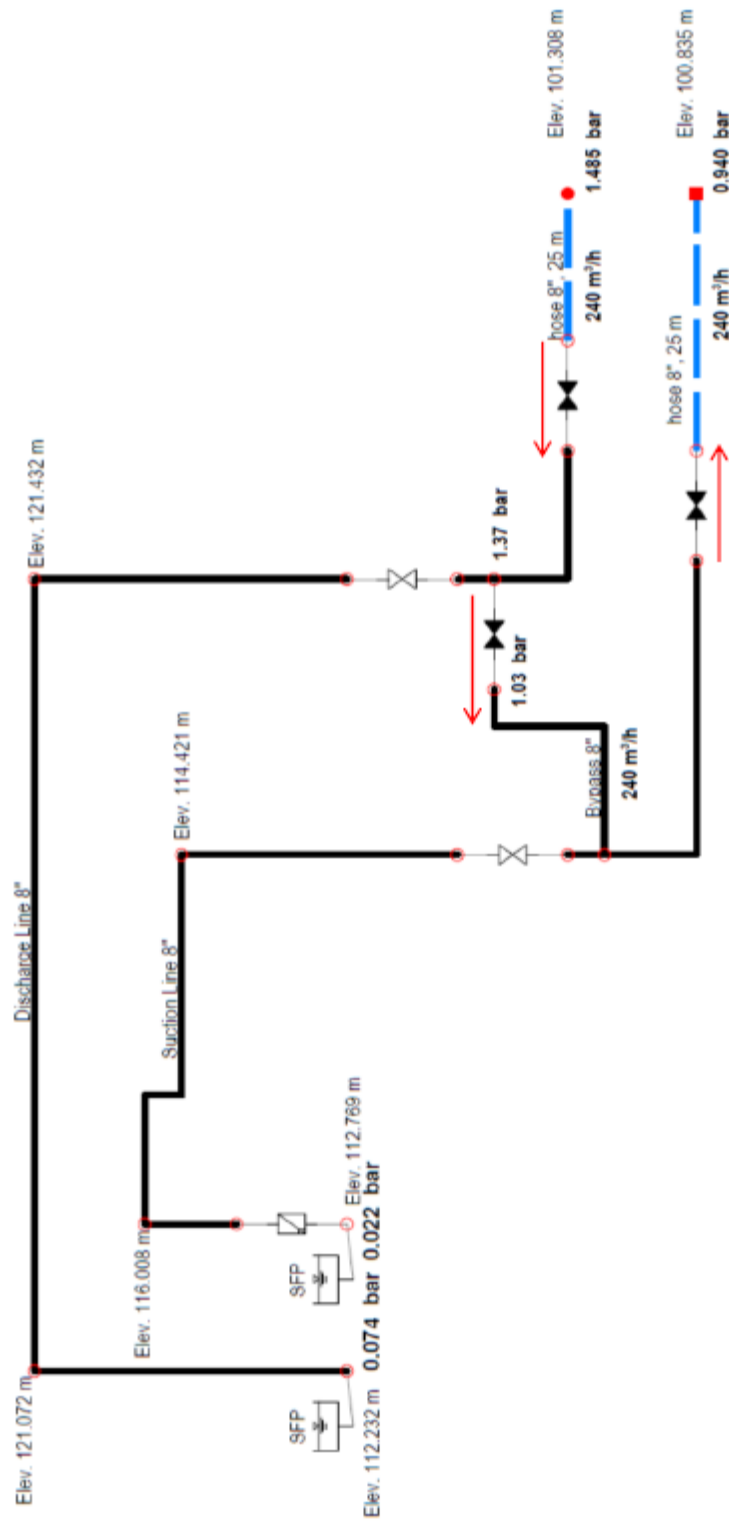
36.5 Attachment 5 - Pipe resistance results

A. Normal Operation





## B. By-pass Operation



## 36.6 Attachment 6 - Project Schedule

ID	Task Name	Start	Finish	Duration	2nd Half	1st Half	2nd Half	1st Half	2nd Half
0	MHx Manufacturing	Mon 2.01.17	Thu 1.03.18	304 days					
1	Contract signed	Mon 2.01.17	Mon 2.01.17	0 days					
2	PMM delivered to NEK	Mon 2.01.17	Tue 31.01.17	22 days					
3	Design	Mon 2.01.17	Fri 7.04.17	70 days					
4	Design Completed	Fri 7.04.17	Fri 7.04.17	0 days					
5	Manufacturing	Mon 10.04.17	Fri 8.12.17	175 days					
6	FAT Start	Fri 8.12.17	Fri 8.12.17	0 days					
7	FAT	Mon 11.12.17	Fri 15.12.17	5 days					
8	Delivery on site	Mon 18.12.17	Fri 29.12.17	10 days					
9	Site Acceptance Test	Mon 1.01.18	Thu 1.03.18	44 days					
10	HOP Signed	Thu 1.03.18	Thu 1.03.18	0 days					

Task	Inactive Task	Inactive Task	Start-only
Split	Inactive Milestone	Inactive Milestone	Finish-only
Milestone	Inactive Summary	Inactive Summary	Deadline
Summary	Manual Task	Manual Task	Progress
Project Summary	Duration-only	Duration-only	Manual Progress
External Tasks	Manual Summary Rollup	Manual Summary Rollup	
External Milestone	Manual Summary	Manual Summary	

Project: MHx Manufacturing  
Date: Thu 22.09.16

### **36.7 Attachment 7 – Project Management Manual**

Sample of proposed Project Management Manual is attached as a separate document

# NUCLEAR POWER PLANT KRŠKO

Project Modification \_\_\_\_\_

*Project Name*

*Contractor Logo*



## PROJECT MANAGEMENT MANUAL (PMM)

Rev 0

	Name	Org. Unit	Signature	Date
Approved by (NEK):	_____	_____	_____	_____
Approved by (Contractor)	_____	_____	_____	_____
Reviewed by:	_____	_____	_____	_____

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## 1. REVISION CONTROL LOG

[illegible]

## 2. CROSS-REFERENCES

- Project Quality Plan for Project \_\_\_\_\_

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#### 4. ABBREVIATIONS, PURPOSE AND APPLICABILITY OF THE DOCUMENT

Abbreviation	Description
AC	Award of Contract
AIL	Action item list (list with major issues which need to be resolved)
Contract PM	Contract Project Manager
CHO	Change order
CPM	Commercial Project Manager
DCM	Document Control Management (by NEK)
DC	Document controller
DMP	Design modification package
DOR	Date of Release
IPS	Integrated Project Schedule
MPR	Monthly Project Report
MS	Microsoft (applicable in respective software products)
mths	months
NEK	Nuklearna Elektrarna Krsko
NPP	Nuclear power plant
OPS	Overall Project Schedule
PDR	Problem / Deficiency Report
PG	Power Generation
PM	Project Manager
PMM	Project Management Manual
PQP	Project Quality Plan
PQST	Project QST
PSC	Project Steering Committee
QA	Quality Assurance
QC	Quality Control
QIR	Quality incident report
QMM	Quality Management Manual
QST	Quality assurance specification turbo generators
SPWAR	System Performance Warranty Action Report
tbd	To be decided
TPM	Technical Project Manager
TTL	Technical Team Lead
wks	weeks



Workflow	predefined sequence of activities within the project-organization
WP	Work-package
PS	Project Scheduler

#### **Enclosure 1: List of abbreviations and definitions**

### **4.1. PURPOSE AND APPLICABILITY**

The PMM serves as guidance for the project implementation from Award of contract until the end of warranty period. It does not limit nor change in any form contractual requirements.

The PMM is worked out in close cooperation between NEK and **Contractor** for ensuring a fertile, effective and efficient cooperation for achieving the projects goals for both parties benefit. The PMM is approved by **Contractor** and NEK Project Managers.

The PMM will be reviewed, which means changed and replenished, during the project course for following exemplary reasons:

- Some data is not yet available (e.g. certain handling procedures, FAT procedure). They will be referred to as soon as available.
- Changes in workflows or organization, especially the design of software which is used during the project for correspondence and filing (share-point-platform) often triggers new revisions because of customization.
- Contract/ scope changes (e.g. optional scope)

### **4.2. RELATION TO OTHER DOCUMENTS**

The three most important guidelines for project implementation are the PMM, the PQP and the IPS.

All overall **Contractor** quality related issues are part of the offer as a QMM 602. The PQP (Project Quality Plan) is more project-specific and shows quality related activity during the entire project course with referenced procedures and standards. The PMM however shows document deliverables which are linked to the PQP. Referenced documents which are necessary for project controlling and implementation, e.g. Problem / deficiency reports, are explained and attached. Processes which are more into the details of non-conforming products are described in the PQP. The PDR and SPWAR can be seen as the main interface between the **Contractor** internal quality processes and NEK processes.

## **5. PROJECT DESCRIPTION**

**To be fulfilled by the Contractor.**

### **5.1. PROJECT SCOPE**

**To be fulfilled by the Contractor.**

---

The Scope of the project is described in SP-EXXXXX in detail.

## 5.2. PHASES OF PROJECT

Single phases of the project are:

1. Design and Engineering
2. Material procurement (if applicable)
3. Manufacturing (if applicable)
4. Transport (if applicable)
5. Assembly at NEK-site (if applicable)
6. Lifting (if applicable)
7. Erection, Commissioning & Testing (if applicable)
8. Trial run (if applicable)
9. Hand-over  
referring to documentation and other details (e.g. spare parts)
10. Warranty period (separately for main contract and CHO)

The project phases are visible in the monthly provided integrated project schedule, taking the above mentioned phases into account.

Category	Aspect	Improvement	Previous situation
Organization	Meetings of Project Steering Committee		
	PSC Members		
	Quality management within the project		
	Communication		
	Personnel, intercultural understanding		
Project management	Project management personnel and location of PMs		
	Requirement management		
	Outage planning		
Quality management	Understanding of quality requirements on both sides		
	Supplier management (control of suppliers)		

## Enclosure 2: Project phases

---

## **6. PROJECT ORGANIZATION**

### **6.1. PROJECT TEAMS**

**Enclosure 3: Project Team NEK**

**Enclosure 4: Project Team Contractor**

**Enclosure 5: Project Organizational - Chart Contractor**

**Enclosure 6: Project Organization - Chart NEK**

#### **6.1.1. SITE TEAM**

During the implementation of the project, the Site Project Manager is the main point of contact for NEKs Project Manager and Site Manager. This revision of the PMM will be amended with details of the site team as well as the site organization as soon as the team is assigned.

### **6.2. PROJECT STEERING COMMITTEE**

#### **6.2.1. PURPOSE AND GOALS**

The Project Steering Committee (PSC) supervises the work of the Project Management. The Project Management reports in regular PSC-meetings on project progress and critical issues if existing. It is comprised of management personnel from NEK and the Contractor as shown in below Enclosure 7: Project Steering Committee.

**Enclosure 7: Project Steering Committee**

#### **6.2.2. PSC-MEETINGS**

Meeting-Period: every 2-3 weeks. Initial meeting to be called by NEK, officially communicated approximately 2 weeks prior to the meeting date (please see Enclosure 8: Project-meetings and characteristics).

Agenda: To be created by NEK and the **Contractor** Project Managers. The proposal has to be sent to all members well in advance (two weeks) of the date for commenting and approval.

Location: The meeting will be hosted alternating by NEK and the **Contractor** on locations of their choice taking travel conditions and requirements for meeting purposes for all members into account.

Minutes of meeting: Minutes will be prepared by hosting PM directly in the meeting for common approval and signature afterwards. They will be signed by NEK and the **Contractor** managers.

### 6.3. PROJECT MEETINGS AND CONFERENCES

Name	Tasks and purposes	Owner	Attendants	Frequency	Invitation due date by owner
PSC meetings	Management review of project				
PM meetings	Regular meetings with <b>Contractor</b> and NEK PMs, held as telephone conferences or personal meetings according to needs. Project Management for Project-controlling and status updating				
Site Readiness Review Meeting	Preparation of outage. Verification that all requirements for successful outage are fulfilled.				
Safety meeting (site)	Safety controlling at site				
Job Mobilization meeting	Preparation of Outage work				
Bi-monthly quality telcon	Vendor quality and production schedule follow up. Coordination of WPs, PDRs and quality proceedings				
Technical Meetings	Discuss and solve technical problems				

#### Enclosure 8: Project-meetings and characteristics

## 6.4. SUB-CONTRACTING

Sub-contractors will be managed by team-members who are responsible for respective scope. A list of current subcontractors with contact and scope information can be found as Attachment 1: List of subcontractors and potential subcontractors, on page I.

Subcontractors are chosen in accordance with respective, applicable quality requirements (please compare PQP). NEK receives copies of technical specifications for subcontractors without commercial information. The **Contractor** intellectual property rights have to be protected and respected.

As per main contract, The **Contractor** shall notify to NEK the names of the subcontractors proposed to perform a part of the Scope of Supply and shall not award any principal part of the Scope of Supply to any subcontractor without prior written approval of NEK. The refusal should be justified by NEK. Full overall responsibility always remains on The **Contractor's** side concerning participation of Slovenian and non-Slovenian companies as The **Contractor's** subcontractors. Approval for hardware subcontractors which are listed in this revision of the PMM are deemed as "approved by NEK".

## 6.5. CORRESPONDENCE AND DOCUMENT TRANSMISSION

### 6.5.1. COMMUNICATION CHANNELS

Item/ topic	Formal transmittal	Medium/ format	Direct Addressee	Copy to
All commercial contractual matters (e.g. Invoices)	yes	Optional: Postal Letter Email with scanned letter		
All requests related to contractual obligations (Change-requests, Change-orders etc.)	yes			
Technical information with direct contractual relevance	yes	optional		
Technical information without direct contractual relevance	normally no	Email		
Results of technical information exchanges (e.g. design input)	yes	Email		
Project specific issues, deficiencies, non-conformances of any type (NCR, PDR, SPWAR) please see chapter 7.4	yes	Email, to be confirmed by receiver		

### Enclosure 9: Correspondence requirements related to topic

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Technical information with direct contractual relevance refers to input-data of high significance e.g. design data as input for calculations which determine design of components. All exchanged design input data or information must display its respective source.

Technical information without direct contractual relevance is related to e.g. explanations for understanding, comments if easily and quickly to implement and without high significance. Quickly to implement provides, that misunderstandings will be discovered quickly without causing damage. Providing the possibility of exchanging technical information without the obligation of formal record has the purpose to facilitating information flow.

All mentioned people might be temporarily replaced. Respective names have to be communicated to the other party according to the correspondence requirements.

Internal project correspondence box

The **Contractor** Share-point portal for the project, which hosts project related documents and information, provides a library for filing all email communication. Outgoing mails from the **Contractor** are copied to the box (cc). Incoming mails to the **Contractor** are forwarded from the account of the PM by using a MS-Outlook forwarding rule. Internal alerts will be implemented. The library and respective procedures ensure a high level of information-availability and security of communication within the project team.

#### 6.5.2. PROJECT CORRESPONDENCE

**Contractor** and NEK use a specific tracking system for the correspondence within this project (i.e. Numbering system). The following basic rules will be followed when assigning letters, email, or file numbers:

**YY**-BBB-CCC-XXX, where:

- a. **YY** stands for project subject
- b. BBB three letters abbreviation for the sender (i.e. NEK)
- c. CCC three letters abbreviation for the receiver, (i.e. for the **Contractor**)
- d. XXX current number of the letter or email.

Formal coding of correspondence is used if content could need to be referenced, because of contractual relevance. To be transmitted formally: Invoicing, Non-conformance reports, PDRs, SPWARs, change-requests, change-orders, minutes of meetings except for informally handled minutes of PM-teleconfs.

Document which have to be provided by the **Contractor** to NEK in hardcopy or (vice versa) e.g. Drawings, Reports, Calculations, Lists etc. will be sent by post accompanied with a formal letter number. The accompanying letter for a transmittal will include the following data: Addresses of sender and receiver, name of sender PM with signature, date, purpose of transmittal (for approval <FA>, for commenting <FC>, for information <FI>). For attached documents: Document no, Document Rev., Document Title, Document Issuer, Document format, Document Type, Transmittal no.

A template can be found as Attachment 7: Transmittal Sheet, page VII.

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In the further course of the project the **Contractor** may be granted access to certain parts of NEK Share-point portal through which documents could be provided during the commenting and review processing.

### 6.5.3. AUTHORIZED PERSONS

Transmittals are normally sent by the Project managers. Other **Contractor** persons entitled are: Technical Project manager, Quality Manager, Documentation Control and others, who are entitled by the PM. Transmittals which contain final contractual deliverables from the **Contractor** to NEK as per contract, are sent by the Local PM or entitled persons from the **Contractor** who is the contract partner of NEK.

### 6.5.4. EXTERNAL SHAREPOINT PAGE

NEK established an external data storage page which the **Contractor** can access. If **Contractor** personnel need access to that page, respective instructions will be provided by NEK engineer. Respective persons will then be enrolled as users and can access the page via user login and Tokencode provided via RSA SECURID.

The page is used to provide files which exceed normal file sizes which can be transmitted via email. The party which provides documents to the other party uses an official transmittal mail (numbered) to inform the other party about the upload and the location where the file is stored (most convenient is sending a link with the transmittal mail).

The URL for the page is:

*To be filled later by NEK.*

## 6.6. IT-TOOLS AND SOFTWARE

Software shown in, Enclosure 10: List of software for project management, will (some optional) be used within the project implementation with regard to project management and communication on technical matters.

*To be filled by the Contractor.*

### Enclosure 10: List of software for project management



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## 7. PROJECT CONTROLLING

### 7.1. PROJECT PLANNING AND SCHEDULING

#### 7.1.1. TYPES OF SCHEDULES

An **overall integrated project schedule** for the complete project from contract signing until end of warranty was developed. The planning unit for this overall schedule is “day”. This schedule refers to the project phases described in section 5.2 Phases of project, p.2.

#### 7.1.2. UPDATING AND FOLLOW-UP

The **overall integrated project schedule** is updated regularly and is provided to NEK each month for project reporting. The contract dates in the original contract schedule are valid throughout the project as per contract. However a **Contractor** baseline is to be communicated to NEK for official approval, showing the current status of the baseline dates. Explanations on deviations shall be included (e.g. reason, background, consequences). An approved schedule gets a formal major revision number. Schedules for each monthly update only get minor revision numbers (separated by a dot behind the major revision number). Details of schedule documentation are determined (within contract range) by the assigned project scheduler, however. Changes in the schedule dates between two monthly reports are outlined. Input-information is retrieved from various partners (internal and external) by adequate tools / programs as digital information or via direct communication, e.g. phone supported by online-conferencing.

#### 7.1.3. PROJECT SCHEDULE FEATURES

The **Contractor** schedule has the following features:

- Critical path logic diagram for all work activities prior to the outage
- Identify the duration of these activities
- Indicate changes in the critical path during the job
- Allocate major resources where they are most needed
- Provide updated progress and activity reports during the project
- Accept, change and update as frequently as monthly (project schedule), to evaluate scope and/or schedule changes as they occur

---

## 7.2. PROJECT REPORTING

The **Contractor** provides written status reports on a monthly basis for the work being performed. These reports will contain brief information but will convey all necessary information to the NEK Project Manager for evaluation the overall status and progress of the project.

The overall status of the work reports include:

1. Overall status of the project
2. Accomplishments from the previous report issued.
3. Technical, quality, management or other concerns, or emerging issues that could impact schedule, costs, or quality of work.
4. Work-arounds, or planned remedial actions and “path-forward” to ensure milestone dates are met.
5. Four (4) week look-ahead, including the dates of measuring, testing and inspections of the equipment per the QST.
6. Overall project management assessment.
7. Project Schedule (overall view of the IPS)

Please see Attachment 2: Content of Project Reports, page I. Monthly Project Reports (MPR) will be provided approximately each 1<sup>st</sup> to 5<sup>th</sup> day of the month and report on the past months issues.

## 7.3. ACTION ITEM HANDLING AND ISSUE TRACKING

An Action Item list is administrated as a living document by the **Contractor** (assigned person). This document is attached to the monthly progress report with its current status. The document will be update for action item tracking in PM-telcons.

Updates can be made available more often to NEK if necessary and if feasible with reasonable effort. Each time an Action item comes up it will be included into the AIL (Action item list). It can be communicated on an informal way (phone, email, direct verbal communication etc.) or formally, if necessary. To ensure proper recording and traceability it will come up in the monthly report next following the first occurrence and be discussed/ tracked in regular progress meetings until being closed which will be declared in mutual agreement.

## 7.4. CONTROLLING OF PROJECT SPECIFIC ISSUES, DEFICIENCIES AND NON-CONFORMANCES

The project specific issue and deficiency controlling is specified for two periods: (a) from project beginning until SAT completion period and (b) after the SAT completion until end of warranty period.

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#### 7.4.1. PROBLEM/ DEFICIENCY REPORT (PDR)

Applicability: The PDR is used for problems/deficiencies or technical issues in the project period from project beginning until SAT completion. Furthermore all deviations from the contractual documents are handled by PDRs, including Technical Specification SP-Exxxx rev.0, if not requiring contract amendments (to be mutually agreed). Both sides, i.e. NEK and Contractor can initiate a PDR for addressing problems/deficiencies, technical issues or deviations to the other party. In the PDR it is shown by whom it was initiated.

If a technical issue and/or problem/deficiency are discovered by Contractor or its subcontractors, Contractor internally uses its standard issue reporting and issue resolution/disposition tools. These are described in the PQP. In case a PDR needs to be issued to NEK, the internal form will not be attached to the PDR but its content will be entered in respective PDR fields and send to NEK officially. Contractor is permitted to hide proprietary/confidential information.

In case that NEK detects a technical issue or problem/deficiency, it is reported to Contractor using the same PDR form with the only difference that it will be identified in the document head that it is initiated by NEK. Respectively NEK is author of included comments. For tracking purposes, the PDR form will have its unique PDR number and priority assignment. Numbering will be consecutively regardless by whom it was initiated. The basic workflow outlined as shown below applies.

Basic workflow for PDR, e.g. initiated by NEK:

- Detection of problem/deficiency or technical issue or other deviation
- Rating (priority, A,B,C or D)
- Communicating to Contractor responsible
- Confirmation of reception to be sent to NEK
- Assigning capable personnel for resolving (Contractor)
- Including issue in the “Action item list” with category PDR, due date according to priority (Contractor)
- Workflow for PDR to be followed (share-point workflow: message, confirmation, status reporting). Contacting NEK personnel if necessary for resolution.
- Starting related Contractor internal quality workflows (such as PCM depending on issue, please see PQP)
- Follow up until resolution. Quality –controlled documentation
- Communication in Project reports.

PDR Priority	Required response time	Sender	Receiver at <b>Contractor</b>	Communication (all to be applied)	AIL priority
A	< 2 days	NEK PM	<b>XXXX</b>	Email with high priority Phone-call (reaching one of the receivers personally) Formal letter (sent or handed over)	High
B	< 5 working days			Email with high priority Phone-call (reaching one of the receivers personally) Formal letter (sent or handed over)	High
C	< 2 wks			Email with normal priority Formal letter (sent or handed over)	Normal
D	< 4 wks			Email with normal priority Formal letter (sent or handed over)	Normal

#### Enclosure 11: PDR priorities and handling

The following are the available priority assignments:

**PDR Priority A:** The issue needs urgent (within two days as maximum) response from **Contractor**/NEK technical personnel. System performance is degraded and ongoing (test) activity cannot be completed or the tasks that were planned to follow cannot be executed.

**PDR Priority B:** The issue needs prompt response (within five working days as maximum). Considering some plan adjustments and rescheduling, part of the planned and scheduled work can be continued but not with the full system performance and not with the full system functionality as designed. If the issue is not resolved within the available time, (FAT & SAT) activities will have to be rescheduled for some another time.

**PDR Priority C:** The identified issue has no influence on ongoing activities and no influence on scope of work that is in progress. However, the system demonstrates obvious technical issue or deficiency that has to be resolved. The major part of problems, deviations and/or deficiencies that would belong to this priority group that are issues related to the manufacture and or assembly of the generator and related components. The appropriate time window for resolution of problems / deficiencies from the Priority 3 group is up to two weeks.

**PDR Priority D:** Minor issues that do not affect system functionality and system performance (equipment, cable, materials, inconsistencies in non-essential documentation). Those problems, deviations and/or deficiencies cannot be seen by the NEK operators. The problem resolution should be achieved within 4 weeks.

All PDR's of priority 1 and 2 shall be closed while small number of the lower priority (3 & 4) PDRs (less than twenty) may still be open before taking-over the unit by NEK and starting the warranty period.

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#### 7.4.2. SYSTEM PERFORMANCE / WARRANTY ACTION REQUEST (SPWAR)

The SPWAR is used for all respective issues coming up between SAT completion and end of Warranty period, i.e. project phase-groups E (please see paragraph 7.4.1 Problem/ Deficiency Report (PDR)).

For any technical issues and/or deficiencies in the works subject to warranty service discovered by NEK during the warranty period, NEK uses the form SPWAR provided in Attachment 5: System performance / Warranty Action Request (SPWAR), page I, to capture such findings. For tracking purposes, the SPWAR form will have its unique SPWAR number and priority assignment. The available priority assignments are shown in 7.4.1, (please compare PDR).

SPWAR Priority	Required response time	Sender	Responsible Persons at Contractor	Modalities	AIL priority
A	< 2 days	NEK PM	XXXXXX	Unit performance seriously degraded or system inoperable	High
B	< 5 working days			Unit performance below design requirements and/ or part of the unit unavailable	High
C	no later than next maintenance outage			System performance/ functionality not significantly affected. Minor adjustments required.	Normal
D	< 4 wks			All minor issues that do not affect system functionality/ performance. Not visible for NEK operators / maintenance personnel	Normal

#### Enclosure 12: SPWAR Priorities and modalities

#### 7.4.3. NONCONFORMING PRODUCT

Handling of nonconforming products and related procedures are included or respectively referenced in the PQP.

## 8. PROJECT CHANGE MANAGEMENT

### 8.1. CONTROL OF DESIGN AND DEVELOPMENT CHANGES

All changes of the contractual requirements triggered by NEK are performed according to the Contract Section XXX. For those triggered by Contractor section XXX applies.

No.	Action	Responsibility
SCOPE IDENTIFIED IN ADVANCE OF OUTAGE		
1	Identify scope change which is outside of the existing contract.	NEK + Contractor
2	Agree on scope to be quoted by Contractor and DOR	NEK + Contractor
3	Submit offer for additional scope to be provided	Contractor
4	Review offer and provide feedback to Contractor	NEK
5	Finalize scope, schedule, DOR and final price of additional scope	NEK + Contractor
6	Issue contract modification to Contractor for additional scope	NEK
7	Contractor to provide scope as defined in the contract change modification	Contractor
SCOPE IDENTIFIED DURING OUTAGE		
1	Identify scope change which is outside of the contract scope of supply	NEK + Contractor
2	Agree on scope to be quoted by Contractor and DOR	NEK + Contractor
3	Provide budget estimate for the work to be performed	Contractor
4	NEK to sign authorization for extra work to be performed	NEK
5	Perform work as needed to prevent adverse effects to the outage schedule.	Contractor
6	Provide finalized offer to NEK for work performed	Contractor
7	Issue contract modification to Contractor for additional work performed	NEK

#### Enclosure 13: Division of responsibility on scope changes

No.	Action	Responsibility
SCOPE IDENTIFIED IN ADVANCE OF OUTAGE		
1	Identify scope change which is outside of the existing contract.	NEK + Contractor
2	Agree on scope to be quoted by Contractor and DOR	NEK + Contractor
3	Submit offer for additional scope to be provided	Contractor
4	Review offer and provide feedback to Contractor	NEK
5	Finalize scope, schedule, DOR and final price of additional scope	NEK + Contractor
6	Issue contract modification to Contractor for additional scope	NEK
7	Contractor to provide scope as defined in the contract change modification	Contractor
SCOPE IDENTIFIED DURING OUTAGE		
1	Identify scope change which is outside of the contract scope of supply	NEK + Contractor
2	Agree on scope to be quoted by Contractor and DOR	NEK + Contractor
3	Provide budget estimate for the work to be performed	Contractor
4	NEK to sign authorization for extra work to be performed	NEK
5	Perform work as needed to prevent adverse effects to the outage schedule.	Contractor
6	Provide finalized offer to NEK for work performed	Contractor
7	Issue contract modification to Contractor for additional work performed	NEK

Enclosure 13: Division of responsibility on scope changes shows the workflows for changes on design and development. Workflow starts with the identification of the matter and respective necessity. Different activities have to be performed by NEK or/and Contractor to reach the final contractual fixed change as outlined in above show table.

## 9. QUALITY ASSURANCE

The QA and QC approach is described according to applicable sections in SP-Exxxx and applicable sections in QS 610 from NEK in the separate PQP (Project Quality Plan) for the project. The Project Quality Plan is briefly described in 4.2, p. 6. In some areas property rights from Contractor have to be regarded, especially for some detailed technical procedures which will be addressed in the PQP. Contractor standard procedures will not be changed. To ensure project specific implementation, work packages which are basis for processing activities related to procedures may be changed.

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There are three major QSTs for the project which are applicable on: (a) Phases 1,2,3,4, i.e. from design and manufacturing until end of transport (b) for Assembly at site (Krsko NPP) and lifting, which are Phase 5 and 6 and (c) for Installation and commissioning.

The part of the PQP for installation and commissioning requires detailed work-packages and work-plans which are to be developed according to document delivery schedule (please see section 11, page 21). Therefore this part of the PQP is only crucially covered at the project start. A list of testing procedures from **Contractor** is being administrated and updated during the project. To each procedure, its number, title, revision and owner are displayed.

## **10. SITE WORK**

### **10.1. PLANNING**

For planning of site work work-packages, work-plans and a respective outage are issued according to the document delivery schedule.

### **10.2. LOGISTICS**

The amount of new equipment, materials and personnel, as well as old equipment handling during the project, requires close cooperation between **Contractor's** site management/logistics personnel with NEK security and receiving personnel.

Logistics coordination entails:

- receipt of equipment (forms, data, security issues etc.)
- development of the laydown plan
- pre-job set-up
- inspection and staging of material (tagging, protocols etc.)

Detailed workflows and interfaces will be identified in respective procedures. Since content of procedures is mostly confidential and intellectual property, contractual agreements on this matter apply. Confidential procedures could be looked at. Copies cannot be provided.

## **11. DOCUMENT DELIVERABLES AND TRANSMITTAL SCHEDULE**

### **11.1. DRAWING AND DOCUMENT NUMBERING SYSTEM**

Drawings and documents which are included in the DMP use the NEK DCM numbering system. Documents will also show **Contractor** document numbers in respective fields for document control and designation.



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## 11.2. DOCUMENT STATUS (*Contractor*)

- Preliminary release  
Documents which are provided to NEK for review will have the status “preliminary release”. This means that responsible *Contractor* personnel have approved the preliminary release to NEK.
- Final release  
As soon as comments by NEK have been regarded and all issues are clarified/ solved, the documents will be sent to NEK for approval in the status of “final release”. The highest status for documents which were commented and the very comments replied by *Contractor*, is final release.
- Approved for construction  
After having received written approval, all applicable documents will get the status approved for construction. This applies for NEK and *Contractor* documents. Approval of documents is to be made visible by stamping the hardcopy of the document.

## 11.3. DOCUMENT REVIEW BY NEK

### 11.3.1. PROCESS

*Contractor* will provide documents for review in electronic form to NEK. With the goal to make review effective and efficient NEK accepts marked up drafts, which should however be self-explaining and adequate.

Documents which are provided to NEK by *Contractor* for review in the status of preliminary release should be returned to *Contractor* redlined, red-circled or anyhow highlighted with accompanying comments explaining the matter of concern and change request. NEK returns the transmittal sheet (please see) with respective remarks and assigns the NEK approval status to the document. NEK provides comments to *Contractor* documents in pdf files with the “commenting” function (“note” or “text box”).

*Contractor* replies to comments using the “reply to” function directly assigned to the comment of NEK.

After a document was rejected, *Contractor* provides the next higher revision with NEK comments applied as well as the commented file with replies to the comments. The respective file shall be added a “\_c” after NEK incorporated comments and an additional “-r\_” when being replied by *Contractor*. Respective letters are added each time when commenting / replying is performed.

### 11.3.2. NEK APPROVAL STATUS

- Approval status “rejected”  
This status constitutes that the provided document does not meet the contractual requirements as per NEK perspective.

- 
- Approval status “approved with comments”

If NEK has comments on provided documents, they can be “approved” with comments if the significance of the comments is low, i.e. not affecting **Contractor** procurement specifications negatively with regard to fulfillment of final contract requirements or in general not affecting schedule, costs and technical solution.

Respective comments shall be corrected by **Contractor** as soon as feasible and reasonable, but for sure well before issuing of the final DMP so that any aspects of the comments will be regarded. This document status constitutes that the content of the document is in compliance with the contractual requirement and justifies invoicing if an installment is associated with.

- Approval status “approved”

The final status constitutes that the document is in full compliance with contractual requirements. No further changes are needed on the document itself (however the document might have to be adopted during further processing within the DMP/ instruction book incorporation).

#### **11.4. DOCUMENT TRANSMITTAL SCHEDULE**

The applicable document transmittal schedule for the **Name of the project** is shown in SP-Exxxx, as Attachment x, page xx.

### **12. PROVISIONAL ACCEPTANCE PARAMETERS**

Respective parameters are provided in SAT procedure.

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## 13. ATTACHMENTS

### Attachment 1: List of subcontractors and potential subcontractors

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## Attachment 2: Content of Project Reports

### **Table of Contents**

1	Overall status of the project.....	3
2	Outlook .....	3
3	Accomplishments since last Report.....	3
4	Potential negative impacts (technical, quality, management).....	3
5	Outlook and mitigation measures if required .....	3
6	Attachments .....	4
6.1	Action Item List .....	4
6.2	PDR status .....	6

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### **Attachment 3: Project Schedule**

## Attachment 4: Problem/ Deficiency Report (PDR)

NUCLEAR POWER PLANT KRŠKO PROJECT **Project Number**  
**Project Name**



### PDR – Problem/Deficiency Report

**Contactor**  
**Logo**

PDR Number (nm):	Priority (A-D):	Date of PDR Issue (dd/mm/yy):		

Initiated by NEK ☐ / **Contactor** ☐

<b>NEK/XXX: PDR Issue</b>	
<b>PROBLEM TITLE:</b>	
Affected Components:	
Reference documents:	

<b>NEK/ <b>Contactor</b>: Scenario Identification</b>
Environment description and order of events that were predecessors to the problem appearance:
Identified by:

<b>NEK/ <b>Contactor</b>: Description of the Problem or Deficiency</b>					
Problem/deficiency existence verified and approved by:	Date (dd/mm/yy):	Problem is repeatable:	YES <input type="checkbox"/>	NO <input type="checkbox"/>	N/A <input type="checkbox"/>

<b><b>Contactor</b>: Troubleshooting and Problem/Deficiency Root Cause Explanation</b>	
Troubleshooting and Explanation Provided by:	Date (dd/mm/yy):

<b><b>Contactor</b>: Corrective Action Proposal and Corrective Action Tracking Log and Tracking References</b>			
Corrective Action Description:			
Corrective Action Performed by:	Date (dd/mm/yy):		
<b>Contactor</b> Track Changes References:			
Other Applicable Documentation References and Attachments:			

<b>NEK: Resolution and/or Answer Acceptance</b>	
NEK Comments:	
Accepted by:	Date (dd/mm/yy):

## Attachment 5: System performance / Warranty Action Request (SPWAR)

NUCLEAR POWER PLANT KRŠKO PROJECT **Project Number**  
**Project Name**



### SPWAR – System Performance/Warranty Action Request

**CONTRACTOR'S  
LOGO**

SPWAR No. (nmn):	Priority (1-4):	SPWR Issue date (dd/mm/yy):

Form to be issued by NEK as problem reporting and problem resolution tracking tool during the generator warranty period

<b>NEK: SPWAR Issue</b>					
<b>PROBLEM TITLE:</b>					
Affected Components:					
Reference documents:					
<b>NEK: Scenario Identification</b>					
Environment description and order of events that were predecessors to the problem appearance:					
					Identified by:
<b>NEK: Description of the Problem or Deficiency</b>					
Problem/deficiency existence verified and approved by:		Date (dd/mm/yy):	Problem is repeatable:	YES <input type="checkbox"/>	NO <input type="checkbox"/>
				N/A <input type="checkbox"/>	
<b>Contractor: Troubleshooting and Problem/Deficiency Root Cause Explanation</b>					
Troubleshooting and Explanation Provided by:			Date (dd/mm/yy):		
<b>Contractor: Corrective Action Description, Corrective Action Tracking Log and Tracking References</b>					
Corrective Action Description:					
Corrective Action Performed by:			Date (dd/mm/yy):		
<b>Contractor:</b> Track Changes					
References:					
Other Applicable Documentation					
References and Attachments:					
<b>NEK: Resolution and/or Answer Acceptance</b>					
NEK Comments:					
Accepted by:			Date (dd/mm/yy):		

Template file: SPWAR.docx

Page 1 of 2

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## **Attachment 6: Work-package content**

### **WORK PACKAGE CONTENTS**

- Activity Identification Number(s)
- Technical Information
  - Drawings
  - Process specifications
  - Field procedures
  - Availability Information Bulletins (AIB's)
  - Operation and Maintenance Memos (OMM's)
  - Action Items List (AIL) = List of open points (LOP)
- Contingency Plans
- Special Tool Requirements
- Safety Requirements
- QA/QC Checklists - hold/verification points for work in progress
- Data Sheets - recording work performed and inspection findings
- Attachments - including special materials



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**Attachment 7: Transmittal Sheet**

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**Attachment 8: Document-Cover-Sheet**