



## Technical specification

### Electric Fire Protection, Diesel driven Fire Protection Pumps replacement and Automatic Pre-action Sprinkler System replacement

KRŠKO NUCLEAR POWER PLANT

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## **1 BACKGROUND AND SYSTEM DESCRIPTION**

### **1.1 Background**

Nuklearna elektrarna Krško - NEK (Nuclear Power Plant Krško - NPP) is Westinghouse designed two loops pressurized water reactor plant, built in late 1970's and is in commercial operation since 1983. Beginning with 2024, NPP Krško started extended plant lifetime operation.

Over the 40 years of use, even with regular preventive maintenance, the electric Fire Protection and Diesel driven Fire Protection Pump no longer meet the operational requirements of the Technical Specification for the Fire Protection System at the NEK. The fire protection system is designed to provide adequate fire protection from all known fire hazards. A diesel and electric fire pumps are key to achieving a reliable water supply to the firefighting systems. Both pumps have a supply and withdrawal of fire water from the Sava River, which is the main design source of fire water. The pumps are located in the Essential Service Water (ESW) building for emergency water supply, which is of extreme importance for the safety point of view of the NPP.

Due to 40 years of operation, it is also necessary to replace four sets of pre-action sprinkler systems, which ensure proper triggering of the extinguishing of extremely important equipment. It is planned to replace four sets of Deluge valves for extinguishing diesel generator A, diesel generator B, all three feed pumps (FW), and turbine and generator bearings. The valve sets planned for replacement are outdated, which, due to the difficult availability of spare parts, represents a demanding maintenance of the equipment.

### **1.2 Purpose**

NPP Krško, hereafter referred to as "NEK" intends to replace electrical Fire Protection and Diesel driven Fire Protection Pumps. Part of the fire protection system upgrade is also replacement of the Automatic Pre-action Sprinkler System for Diesel Generator DG1, Automatic Pre-action Sprinkler System for Diesel Generator DG2, Automatic Pre-action Sprinkler System for Feedwater Pumps and Automatic Pre-action Sprinkler System for Turbine and Generator Bearings extinguishing. Modification is planned for plant online operation in 2026 and 2027. The Fire Detection and Protection System provides the facilities for detecting and extinguishing fires in the plant, in order to limit the damage caused by a single fire.

As part of the investment, the selection of an appropriate new diesel and electric FP pump is essential for the continued provision of fire safety at the NEK. The supply and installation of a new fire protection pumps must be carried out in accordance with the NFPA standards for the installation of fixed fire protection pumps. All fire protection equipment and systems in NEK will be subjected to a complete inspection and acceptance test in accordance with the NFPA National Fire Codes after installation was completed. With the plant in operation, periodic inspections and tests are conducted in accordance with NFPA standards and Slovenian requirements. The selected new pump must have sufficient reserves to meet the criteria for the minimum level of the Sava River.

The diesel and electric fire pump equipment is outdated and the supply of spare parts is also difficult. In addition, the aforementioned pumps no longer achieve sufficient capacity at low levels of the Sava River as defined in the technical specifications. for the purchase of equipment that was prepared during the construction of the Krško Nuclear Power Plant. In order to ensure adequate capacities of the fire pumps, several corrective interventions were carried out, which did not

significantly contribute to improvements. Despite repeated repairs and maintenance interventions, the fire pumps no longer meet the required acceptance criteria when operating at the minimum level of the Sava River.

This specification provides information of existing electrical Fire Protection and Diesel driven Fire Protection Pumps and together with attachment SP-B310-044687-000 [1] defines scope and inputs for Fire protection Pumps and accessories. Fire Protection Pumps specification SP-B310-044687-000 is a complete fire protection pumps specification hereby it should include additional operating margin also at the low level of Sava River. Therefore it should be read as applicable for the scope.

### **1.3 Description of existing electrical and diesel fire protection pumps**

The primary fire protection water supply is provided by an electric motor driven fire protection pump, and the secondary supply is provided by a diesel driven fire protection pump. Fire pumps are located in the Essential Service Building and take suction from the Sava River. The fire protection water distribution system includes a complete exterior underground piping and yard fire hydrant loops as well as interior fire protection distribution and standpipe system within the plant buildings.

The distribution piping (including both the underground yard loop and the piping within the building) is provided with sectionalizing control valves that are adequate to allow major maintenance to be performed on a portion of the fire protection water distribution system without distributing the supply of water to the entire system (Ref. Flow diagrams of the FP system).

The electric motor driven fire protection pump is controlled with controller mounted on the local panel, which is located near the pump. The controller will automatically start the pump upon a drop in the fire protection distribution system pressure (low-low fire water pressure from pressure transmitter) to a point, which is successively lower than the pressure normally maintained by the jockey pump and the flushing pump (Ref. to NEK drawings series 208). This excessive drop in the system pressure is usually indicative of fire condition. In addition, push buttons, located on the operator interface at local panel, are provided for manually start or stop the pump. The electric motor fire protection pump can also be started manually from the main control room on the ventilation control board.

The diesel driven fire protection pump is controlled from the local control panel. The pump automatically starts, with 10 seconds time delay, upon an excessive sustained drop in the fire protection distribution system pressure, with main selector switch in the main control room in AUTO position (Ref. to NEK drawings series 208). This pressure drop would be indication of the failure of the electric motor fire protection pump to perform satisfactorily. The pump can be manually started with pushbutton, located on control panel and with selector switch in manual position. In that case, it necessary to select the battery, with battery selector switch. In addition, a push button switch, located in the Main control Room (MCR) on the ventilation board, the pump's speed can be automatically maintained on 2035 rpm by speed controller. The pump's speed can be also over-ride manually with declutching knob. The manual override should be used when there is no power applied to actuator. When power is restored, the actuator will automatically resume normal operation.

#### **1.4 Description of existing spray systems – automatic pre-action sprinkler system**

An automatic pre-action sprinkler system is part of fixed fire extinguishing Systems, which are provided for several specific fire hazards. Local control panels associated with fixed extinguishing are equipped with monitor devices in order to supervise the status of system.

An automatic pre-action sprinkler systems which are part of the scope is provided for each of the following areas:

1. Emergency Diesel Generator (Train A) Room
2. Emergency Diesel Generator (Train B) Room

Each of the above systems includes heat detectors (electric type) and fusible sprinklers at ceiling level, a shutoff gate valve, an automatic electrically operated deluge valve, a rubber seated check valve, piping pressure switches and indicators, and a local control panel. Fusible sprinklers are rated at 212°F (100°C). Integrity of pipes downstream deluge valves is supervised with air under pressure. If the integrity of the sprinkler piping is compromised, the pressure will be reduced activating a supervisory pressure switch that transmits the signal to the control panel.

A fire condition sensed by a heat detector will cause the respective system control valve to open allowing water to be discharged from only those sprinklers that have been heated above their rated temperature. The opening of the deluge valve causes the sprinkler piping to fill with water. The heat generated by the fire would also cause one or more fusible sprinklers to open. Water is discharged on the fire from only those sprinklers that have had their fusible links melted.

The pre-action sprinkler system requires both, an electric heat detector and fusible sprinkler, to operate before any water is discharged. This prevents the accidental discharge of water in the event sprinkler piping or the sprinklers themselves are broken or otherwise mechanically damaged. A small amount of air pressure is maintained in the system piping normally in order to supervise the system and detect any piping breaks, small leaks of open sprinklers. The air is obtained from the Station Service Air System (CA System). Local Panel EE106PNLH849 controls the Diesel Generator 1 building (Train A room), sprinkler system Local Panel EE106PNLH866 controls the Diesel Generator 2 building (Train B room).

The electrical control panels actuate the deluge valve upon a signal from the heat-actuated detector circuits of corresponding system and audibly and visually indicate a fire condition on the control panel upon heat detector indication or waterflow detection; supervise detection circuits, alarm circuits, power circuits, and deluge valve operating circuits and in a case that any of the valve and in the case of any attempt to shut the controlling valve, the trouble signal will be generated; provide a trouble alarm when a low air condition is detected and transmit fire and trouble signals to the MCB (PC100CME007) as a common alarm "Fire Protection System Alarm", Fire Alarm Central FP001OWS, Fire Brigade Area Workstation FP002OWS and on PIS. The alarm "sprinkler system activation" is also annunciated on the PC100CME007 for the corresponding affected area. Manual break-glass station is provided for each deluge valve to allow emergency manual actuation of each area.

Piping which is not part of the automatic pre-action spray skid is not part of the scope. Also replacement of the heat detectors, fusible directional water spray nozzles and control panels EE106PNLH849 and EE106PNLH866 are not part of this scope.

Automatic water spray pre-action sprinkler systems, with closed, fusible nozzles, which are part of the scope are provided for the following equipment:

1. Main turbine-generator bearings and associated lubricating oil piping, in the Turbine Building (one water spray system)
2. Three feedwater pumps-drivers and associated lubricating oil piping, in the Turbine Building (one water spray system)

Each of the above systems includes a shutoff gate valve, an automatically operated deluge valve, heat detectors (electric type), piping, fusible directional water spray nozzles and control panel. Local panel EE106PNLG846 controls the water spray system for the main turbine generator bearings, and panel EE106PNLG845 controls the water spray system for the feedwater pumps. Piping which is not part of the automatic pre-action spray skid is not part of the scope. Also replacement of the heat detectors, fusible directional water spray nozzles and control panels EE106PNLG846 and EE106PNLG845 are not part of this scope.

A fire condition in any of the protected areas is detected by the heat detectors, which then cause the automatically open the respective electrically opened deluge valve and cause a fire alarm to be annunciated on respective local panels, at the Main Control Room (Fire Protection Cabinet) on the PC100CME007. The fire alarm is also provided on the FP Workstations FP001OWS and FP002OWS and on the PIS. The heat generated by the fire also causes one or more fusible directional nozzles to open. Water is only discharged from the nozzles that have their fusible links melted. The requirement for both these actions to occur, before water is discharged, prevents the accidental discharge of water in the event the nozzles or piping are accidentally damaged.

As an additional feature, the system piping is supervised with air pressure. This feature includes a trouble alarm in the event that air pressure decreases rapidly, even though no fire condition occurs. This will give continuous assurance that the piping network and fusible directional nozzles are intact. The same type of system is used to protect the area of the turbine-generator bearings in the event of a fire condition.

## **2 ABBREVIATIONS AND DEFINITIONS**

### **2.1 Abbreviations**

ADP	Administrative Procedure
ANSI	American National Standards Institute
BOM	Bill of Material
CFR	Code of Federal Regulations
CFPP	Cold Filter Plugging Point
CoC	Certificate of Conformity
DCM	Document Control Module
DMP	Design Modification Package
ESD	Engineering Service Division
FAT	Factory Acceptance Test

FDCR	Field Design Change Request
FME	Foreign Material Exclusion
FP	Fire Protection System
FSAR	Final Safety Analyze Report
HOP	Hand-Over Protocol
H&S	Health and Safety
ID	Identification Number
IP	Installation Package
MECL	Master Equipment Component List
M&IP	Manufacturing and Inspection Plan
NEK	Nuklearna Elektrarna Krško (NPP Krško)
NCR	Non-Conformance Reports
NFPA	National Fire Protection Association Codes
NSR	Non-Safety Related
NPP	Nuclear Power Plant
OBE	Operating Basis Earthquake
QA	Quality Assurance
PMM	Project Management Manual
RG	Regulatory Guide
SNSA	Slovenian Nuclear Safety Administration
SAT	Site Acceptance Test
SSC	System, Structures and Components
TOP	Turn-Over Package
TS	NEK Technical Specification
URSJV	Uprava Republike Slovenije za jedrsko varnost (Slovenian Nuclear Safety Administration)
USAR	Currently valid NEK Updated Safety Analysis Report
USNRC	United States Nuclear Regulatory Commission
WSIP	Work Sequence Inspection Plan

## **2.2 Definitions**

2.2.1 Equipment – means all equipment, materials, components and parts to be furnished by the Supplier to the NEK to fulfill requirements of this specification.

2.2.2 Service – means all activities performed to fulfill requirements of this specification.

2.2.3 Project shall mean modification 1334–FP-L, *Electric Fire Protection and Diesel driven Fire Protection Pumps replacement and Automatic Pre-action sprinkler Systems replacement*

2.2.4 Specification shall mean SP-ES1484, *Electric Fire Protection and Diesel driven Fire Protection Pumps replacement and Automatic Pre-action Sprinkler systems replacement* document together with all attached (including SP-B310-044687-000 and SP-B309 "Fixed fire extinguishing system) and not attached references and listed codes and standards in chapter 7 or documents referenced elsewhere in this specification.

2.2.5 Bidder shall mean organization, who meet requirements of and replied to Request for Quotation with submittal of Bid in accordance with Bid instructions provided within RFQ.

2.2.6 NEK shall mean Nuklearna Elektrarna Krško, Nuclear Power Plant Krško or Purchaser

2.2.7 Supplier as used in this specification shall mean the party with whom Contract for the supply of equipment for the project has been signed.

### **3 SCOPE OF SERVICES AND DELIVERY**

Following equipment and services shall be provided by Supplier.

#### **3.1 Equipment delivery**

Scope of equipment delivery is:

- one (1) electric motor driven fire protection pump skid (electric motor, pump),
- one (1) diesel driven fire protection pump skid (diesel motor - pump skid, and control cabinet skid),
- one (1) Automatic Pre-action Sprinkler System skid for Diesel Generator DG1,
- one (1) Automatic Pre-action Sprinkler System skid for Diesel Generator DG2,
- one (1) Automatic Pre-action Sprinkler System skid for Feedwater Pumps,
- one (1) Automatic Pre-action Sprinkler System skid for Turbine and Generator Bearings extinguishing.
- Delivery and replacement of valves, indicators, transmitters, ... (MECL Numbers: 29494, 29484, 29493, 28507, 28506, 28508, 29481, FPEJ-002, PI7302, PIT7302, PUI7302, 28519, 29483, 28522, 28523, 29480, FPEJ-001, PI7306, PIT7306, PUI7306) [See Att. 10 ; Flow Diagram D-302-401]
- Additional equipment for monitoring (indicators, transmitters), which are affecting the control should be also delivered and installed as part of this specification, regarding detailed scope and requirements provided in equipment specification SP-B310-044687-000 [1] and SP-B309 "Fixed fire extinguishing system [2]. Contractor must supply all needed equipment, tools, material, manpower, testing, inspection and other services necessary for the realization and competition of Scope of Work.
- All newly installed equipment must be compatible with the equipment already installed in the NPP (same well-known manufacturers,...), to avoid problems with suppliers and equipment maintenance itself.
- All instrumentation must be mounted in a way that it will be possible to perform calibration (test connections and isolation valves). Pulse lines zero connections must be in imperial units of measurement.



**Note:** Any hardware or service not specifically included in this specification shall be deemed to be included in Contractor's undertaking to make Scope of Work physically complete.

### **3.2 Engineering and Design work**

- 1) Overall project management
  - a) Management of interfaces between NEK, equipment Suppliers, and other sub-Suppliers for the project completion. This involves assistance to assure the flow of information is timely to support schedule requirements.
  - b) Management of schedule, all resources, risks, budget...
  - c) Coordination of all other activities under the scope of this supply & service.
- 2) Quality Control & Quality Assurance in accordance with chapter 43
- 3) Walkdown in September 2025
  - a) Detail site walk-down and evaluation of current as-built conditions in support of the detail engineering and design effort. Any concerns relating to the findings must be reported to the NEK.
  - b) Documentation of walkdown findings within walkdown report. Walkdown report should specify all equipment and its properties which is installed in existing systems. Existing equipment will be reference for delivering appropriate new equipment (same well-known manufacturers), as referenced in chapter 3.1 of this specification.
- 4) Design per ESP-2.602; Plant Design Modification – preparation of DMP.
  - a) Technical overview of design and review of engineering documents for consistency with the project documents requirements.
  - b) All the necessary design calculations necessary to develop the detail design modification package.
  - c) Detailed mechanical, electrical and I&C drawings and explicit demolition work per NEK ESP-2.613.
  - d) AC Load study for electric driven Fire Protection pump replacement – part of the DMP.
  - e) AC Load study for diesel driven Fire Protection Pump replacement – part of the DMP.
  - f) Calculations of loads and stresses on the Fire Protection System (piping loads, foundations, floor slab, flow calculations, seismic calculation, thermal calculation for diesel fuel (low temperature resistance at -28°C) will be responsibility of Supplier.
  - g) Existing Diesel Fuel Reservoir and piping line for diesel driven Fire Protection Pump, shall be modified to ensure using the commercial grade diesel fuel, at minimum outside temperature of minus 28 °C (-28°C) - cold filter plugging point (CFPP).
- 5) Equipment Qualification (including EMC qualification certificate), Equipment Survivability and Seismic Qualifications.
- 6) Licensing support (10CFR50.59)
- 7) Equipment manufacturing, inspections, purchasing, assembly, set up, packing, handling and shipment.
- 8) Material, equipment, parts procurement.

- a) Preparation of equipment specification for the procurement of all required new equipment.
  - b) Preparation and transfer of manufactures documentation to NEK
  - c) Inform Purchaser of factory Acceptance Tests
  - d) Witness of Factory Acceptance Tests
  - e) Verification that contract test requirements are met, and tests demonstrate equipment& component capabilities performance requirements.
  - f) Ensuring that suppliers compile properly the required reports and manufacturing certificates.
- 9) Factory acceptance testing.
- 10) Complete installation work – demolition of existing and installation of new equipment, supervision of transportation of new and removed equipment in NEK and disassembly (including cutting) of disposed parts to reduce necessary storage space.
- 11) Preparation and processing of potential FDCR per NEK ESP-2.609 as applicable for the necessary changes identified during installation and testing requiring additions to existing design or corrections of DMP and execution of all necessary fieldwork related to these changes.
- 12) Site acceptance testing (SAT). The contractor shall develop the Site Acceptance Test procedure with acceptance criteria. Contractor shall demonstrate by testing that system performance met design requirements per these technical specifications.
- 13) Complete DCM and MECL update of new or by modification affected equipment and documents.
- 14) Report for installed equipment which must include all installed equipment with all vendor drawings, Operational and Maintenance Manuals, records.
- 15) Supply of all recommended spare parts for ten years operation.

All activities shall be supported by documentation required and listed in chapter 11. Engineering and Design include all the activities required for preparation of necessary project documentation following NEK ESP Procedures, QS 610, USAR and Codes and Standards specified by the NEK or proposed by the Supplier and approved for use by NEK. The codes and standards are specified under chapter 7 in this specification.

### **3.3 General Notes**

The Supplier shall be responsible for compliance with all the detailed requirements of this Specification and its referenced documents. There shall be no deviation from this specification or its references without prior written approval by the NEK. Review and approval of any drawings, and/or specifications, and/or tests by the NEK shall in no way relieve the Supplier from these responsibilities. The Supplier shall perform the necessary reviews to assure that the supplied items will comply with the existing plant systems, as mentioned in this Specification.

All potential technical solutions required for a safe, reliable and efficient operation of fire protection pumps and pre-action sprinkler systems shall be considered and optimum design proposed and provided.

Prior to the preparation of DMP document, detailed walk-down shall be performed by Supplier. The main purpose of the detailed walk-down is to finalize design inputs and to confirm that the as-built status in the plant is same as it is shown in provided NEK documentation (DCM items). If during

that walk-down or during the DMP development any discrepancies are found between actual status in the field and the existing NEK documentation or if appropriate as-built documentation does not exist at all, it is the Supplier's obligation to prepare inputs for documentation for known purposes. As a consequence of walk-down process and possible discrepancies found, Supplier is requested to report found discrepancies to NEK, but they are not requested to correct NEK DCM documents and drawings. All findings shall be reported in the walk-down report issued. Formal walk-down report should be submitted to the NEK for review and approval.

The Supplier shall ensure that the installation and start-up is implemented on schedule while meeting quality and safety targets. Nothing shall relieve the Supplier of the responsibility to perform, in addition to the established scope, analyses, tests, inspections and other activities that through the process become necessary to ensure that the design and materials, as well as the product quality, shall be satisfactory for the intended service, or as may be required by common usage or good practice.

All engineering, design work, purchasing, manufacturing, installation and start-up work and planning shall be scheduled in accordance with the overall Project Schedule (see chapter 34), as adjusted and agreed by both parties before contract award.

## **4 SAFETY CLASSIFICATION OF CONTRACTED WORK**

Fire protection Pumps and Pre-action Sprinkler Systems are classified as Non-Safety Related. Activities related to Electric, Diesel driven Fire Protection Pump replacement and Pre-action Sprinkler Systems replacement are classified as Augmented Quality due to the importance of components providing adequate fire protection from all known fire hazards, requirements with regards to design control, seismic strength, cyber security, cleanness, and other requirements as specified in following sections.

## **5 DESIGN INPUTS**

### **5.1 General Notes**

All original design documents available at NEK along with the information provided or referenced in this specification will be put at Suppliers disposal for review and use with respect to the proprietary policy.

Preliminary design inputs are prepared by NEK and attached to this specification [6]. The development of the final design inputs is within the scope of Suppliers work. The design input document shall be prepared in accordance with NEK procedure ESP-2.604. As a prerequisite for DMPs development a Design Input document shall be reviewed and approved by Supplier and by NEK.

Design Inputs shall be checked and verified by Supplier vs. equipment specifications SP-B310-044687-000 [1], SP-B309 "Fixed fire extinguishing system and following revision of design inputs.

The standards referenced in chapter 7 of this specification shall provide the basis for the design and construction.

The design of the modified system (equipment) shall ensure maximum reliability and performance for operation and the shortest and most effective maintenance with engagement minimum maintenance crew.

## **5.2 Design Life**

The design life new electric FP pump, Diesel driven FP Pump, and pre-action sprinkler systems delivered to this specification shall be forty (40) years with scheduled parts replacement. Design life is defined as the expected length of time that listed new FP components will provide compliance with its specified functional requirements.

Design life pertains only to metal parts. For non-metallic parts, Supplier shall identify the service and replacement life based on meeting the functional requirements identified in this specification. Supplier shall identify the replacement interval for these parts in the qualification documentation and Instruction Manual.

## **5.3 Verification of existing equipment with calculations**

Verification with calculations of loads and stresses on the Fire Protection System (piping loads, foundations, floor slab, flow calculations, seismic calculation, thermal calculation for diesel fuel (low temperature resistance at -28°C) will be responsibility of Supplier. Extent of verification is dependent on magnitude of change in loads. Technical approach towards the resolution of qualification of existing equipment and structures shall be described within a Bid.

## **6 APPLICABLE NEK-SUPPLIER DESIGN CONTROL PROGRAM**

Design of new Electric Fire Protection and Diesel driven Fire Protection Pumps and new Automatic wet pipe sprinkler systems shall be executed and controlled in accordance with NFPA Standatds for Fire Protection system and QS 610, Rev.2; QA Specification, Generic Quality Assurance Program Requirements..

Design of Electric Fire Protection and Diesel driven Fire Protection Pumps and new Automatic wet pipe sprinkler systems shall include study and revision of applicable design inputs and equipment specification SP-310-044687-000. Both shall be subject of NEK review and approval.

Important design milestone between Supplier and NEK will be after completed conceptual design, upon which Supplier shall provide to NEK assembly drawings, functional drawings, plant interface drawings and BOM's. At that time Supplier shall organize design review meeting accompanying Suppliers experts and NEK operators and maintenance staff.

After preliminary design will be approved, Supplier shall proceed to DMP development.

Design review shall be performed in accordance with NEK ESP-2.607.

## **7 APPLICABLE CODES, STANDARDS AND DESIGN CRITERIA FOR THE WORK**

The design criteria, regulations, codes and standards listed below are to be considered during the course of this project.

A later version of some of the dated documents may be mandatory under regulations that have jurisdiction. If this occurs, Supplier shall inform NEK about it and obtain NEK approval. If there is a conflict between this Specification and a referenced document, the Supplier shall refer the matter in writing to the NEK to inform him of the conflict and to provide a proposal to resolve the conflict for NEK's approval.

The Supplier, unless otherwise stated by the NEK, shall use the appropriate codes and standards listed in this chapter in effect at the time of Contract signed.

Supplier will review listed codes and standards during the project initiation phase. Any conflicts or contradictions between them will be addressed with proposed resolution by the Supplier to NEK.

## **7.1 Applicable Slovenian Legislation**

1. Rules on the use of radiation sources and on activities involving radiation (JV2/SV2), Ur.l. RS, No. 27/2006
2. “Pravilnik o dejavnikih sevalne in jedrske varnosti” (JV5), (Rules on radiation and nuclear safety factors (JV5), Ur.l. RS, No. 92/2009 and 9/2010)
3. “Pravilnik o zagotavljanju varnosti po začetku obratovanja sevalnih ali jedrskih objektov” (JV9), Ur.l. RS 85/09, 9/10, 87/11 (Rules on the safety of radiation and nuclear facilities)
4. Zakon o varstvu pred ionizirajočimi sevanji in jedrski varnosti (ZVISJV), (Ionising Radiation Protection And Nuclear Safety Act, Official Gazette of the Republic of Slovenia (ZVISJV), Ur.l. RS, No. 102/2004-UPB2, 70/2008-ZVO-1B, 60/2011 and ZVISJV-D,74/15)
5. Pravilnik o fizičnem varovanju jedrskih snovi, jedrskih objektov in sevalnih objektov, Ur.l. RS 31/05 (Rules on physical protection of nuclear materials, nuclear facilities and radiation facilities)
6. Uredba o zagotavljanju varnosti in zdravja pri delu na začasnih in premičnih gradbiščih, Ur- l. RS 83/05 (Decree on safety and health at work at temporary or mobile construction sites)
7. Zakon o varnosti in zdravju pri delu (ZVZD-1), Ur. l. RS 43/11 (Law on Safety and Health at Work)
8. Odredba o varnosti strojev (Ur. l. RS št. 52/00 in 57/00, Decree on machinery safety)
9. Konvencija o jedrski varnosti, UL RS-MP, št. 16/1996 (Nuclear Safety Convention)

## **7.2 Applicable US Legislation**

1. 10 CFR 50, Appendix A, General Design Criteria
2. 10 CFR 50, Appendix A, General Design Criteria (GDC) 3, Fire Protection
3. 10 CFR 50, Appendix R, Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979
4. 10 CFR 73.54, Physical Protection of Plants and Materials
5. 10 CFR 50.48 Fire Protection
6. RG 1.205, Risk-informed, Performance-Based Fire Protection for existing Light-Water Nuclear Power Plants, September 2004
7. RG 1.29, Revision 1, Seismic Design Classification
8. RG 1.38, Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Water Cooled Nuclear Power Plants
9. RG 1.100, Revision 3, Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants
10. RG 1.116, Quality Assurance Requirements for Installation, Inspection and Testing of Mechanical Equipment and Systems (endorses N45.2.8)
11. RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems

12. RG 5.71, Cyber Security Programs for Nuclear Facilities
13. NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, January 1980
14. NUREG-0700, Human-System Interface Design Review Guidelines, July 2020
15. NUREG/BR-0522, Fire Protection for Operating Nuclear Power Plants and Decommissioning Reactors, December 2022

### **7.3 Applicable EU and US Codes and Standards**

1. NFPA standard: National Fire Protection Association Codes
2. RG 1.189, rev.3; Regulatory Guide – Fire Protection for Nuclear Power Plants
3. ISO 45001:2018, Occupational health & safety management system
4. EN 61000 series - Electromagnetic compatibility (EMC)
5. ISO 9001:2000 Requirements for a Quality Management System
6. ANSI/ASNT CP-189, ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel, 1995
7. ASME/ANSI B18.2.2-1987, Square and Hex Nuts
8. ASME Y14.5M, Geometric Dimensioning & Tolerance
9. ASTM A 36-70a - Standard Specification for Structural Steel
10. AISC ASD – 13th Edition, American Institute of Steel construction, Allowable Stress Design
11. PA1:2016, Shop, Field, and Maintenance Painting of Steel – (SSPC) Society for Protective Coatings
12. PA2:2018, Procedure for Determining Conformance to Dry Coating thickness requirements – (SSPC) Society for Protective Coatings
13. AWS D1.1:2020, Structural welding code – Steel
14. AWS D1.6:2017, Structural welding code – Stainless steel
15. AWS QCI: 2016, Standard for AWS Certification of Welding inspectors
16. EPRI TR-102323 R5, Guidelines for Electromagnetic Interference Testing in Power plants
17. EPRI, Cyber Security Technical Assessment Methodology: Vulnerability Identification and Mitigation, 3002008023, Final Report, October 2016
18. MIL 461E Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment (Used within the Guidelines of EPRI TR-102323, Rev. 1)
19. IEEE-344, Recommended practice for seismic qualification of class 1E equipment for nuclear power generating stations
20. IEEE-352:1987, Guide for General Principles of Reliability Analysis of Nuclear Power Generating Station Systems and Other Nuclear Facilities
21. IEEE-383, 2015, Standard for Qualifying Electric Cables and Splices for Nuclear Facilities
22. IEEE-1050:2004, Guide for Instrumentation and Control Equipment Grounding in Generation Plants
23. IEEE-1059:1993, Guide for Software Verification and Validation Plans
24. IEEE-1074:2006, Software Lifecycle Process

25. National Electric Code ANSI/NFPA 70 - 2017
26. NEI-08-09, Rev. 6, Cyber Security Plan for Nuclear Power Reactors
27. NEI 10-04, Rev. 2, Identifying Systems and Assets Subject to the Cyber Security Rule
28. OSHA 29CFR1910.29(b), Fall protection and falling object protection-criteria and practices
29. OSHA 29CFR1910.269, Electric Power Generation, Transmission, and Distribution
30. To the above listed, alternative EU standards can be used based on justification by Supplier and approval by Purchaser.
31. ANSI B16.1 Standards for Pipes and Fittings
32. ASME B31.1 – 2010, Power Piping
33. ASME B&PV Code (1995 Edition with all addenda up to including Winter 1997):
  - Section VIII, Pressure Vessels
  - Section IX, Welding and Brazing Qualification
34. ANSI B16.5, Steel Pipe Flanged Valves and Fittings
35. ANSI B16.11, Forged Steel Fittings Socket-Welding and Threaded
36. ASTM Material Specification

#### **7.4 NEK Documents**

1. ED-1, Design Modification Control Program
2. ED-2, Document Control Program
3. ED-15, Configuration Control Program
4. ED-19, Electromagnetic Compatibility Program
5. MD-23, Risk Assessment (Celovito upravljanje tveganj)
6. QD-1, Quality Assurance Plan
7. QS-600, Generic Software Quality Assurance Program Requirements
8. QS 610, Generic Quality Assurance Program Requirements
9. SP-S702, Seismic Analysis, Testing, and Documentation
10. EDC-4, Cable Tray, Cable & Conduit Separation Criteria
11. EDC-5, Grounding System Criteria
12. EDC-10, Cable Rating Criteria
13. ADP-1.0.131, Organizacija izvedbe modifikacije (Development of modifications)
14. ADP-1.0.500, Program protipožarne zaščite – Požarni red (Fire protection program)
15. ADP-1.1.033, Varnost in zdravje pri delu v NEK (Health and safety at work at NEK)
16. ADP-1.1.051, Vstop, izstop in gibanje v tehnološkem delu NEK (Entry, exit and move within the technological part of the NPP)
17. ADP-1.2.116, Nadzor dokumentov v NEK
18. ADP -1.101, Preprečitev vnosa tujkov (FME program)

19. ADP-1.1.105, Priročna skladišča in kontrolirano odložena oprema (Temporary storage and controlled deferred Equipment)
20. ADP-1.1.125, Izvedba delovnega naloga (Working order process)
21. ADP-1.2.003, Plant Design Modification and Control Process
22. ADP-1.3.004, Osamitev in označevanje sistemov / naprav (Tagging)
23. ADP-1.4.022, Prevoz, skladiščenje, rokovanje in notranji transport (Storage, handling and internal transport)
24. ADP-1.14.202, Normativi osebnih zaščitnih sredstev (Personal protection norms)
25. ESP-2.111, EAM MECL Data Element Structure/Definition
26. ESP-2.113, EAM MECL equipment numbering system
27. ESP-2.302, Administration of Changes to the USAR
28. ESP-2.303, Authorization of Changes, Tests and Experiments (10CFR50.59)
29. ESP-2.602, Plant Design Modifications
30. ESP-2.604, Design Considerations, Basis and Input
31. ESP-2.605, Design Analysis and Calculations
32. ESP-2.607, Design Verification
33. ESP-2.609, Field design Change Request
34. ESP-2.611, Document Turnover and Closeout
35. ESP-2.613, CAD Drawing Control of Scanning, Conversion or Revision Process
36. ESP-2.617, Material and Equipment Specification
37. ESP-2.618, System Design Description
38. ESP-2.619, Preparation of Installation Packages
39. ESP-2.624, Design Impact Evaluation
40. ESP-2.631, EMC Program in Design Modification Process
41. ESP-2.912, Documentation of New Applications for Process Computer Systems
42. ESP-2.913, Rules for Process Computer Systems Human Machine Interface
43. ESP-2.921, Cyber Security Assessment of Critical Digital Assets (CDA) in NEK
44. ESP-2.951, Process Computer Signal Configuration Database Control
45. FPP-3.7.002, Postopanje v primeru požara (Fire response)
46. FPP-3.7.004, Kontrola vnosa gorljivih snovi (Flammable items control)
47. FPP-3.7.005, Naloge požarne straže (Fire watch)
48. FPP-3.7.006, Dovolilnica za dela s toplotnimi učinki (Permission to work with heat generating tools)
49. FPP-3.7.007, Ravnanje z vnetljivimi plini in tekočinami (Flammable gases and liquids)
50. EIP-17.044, Nudenje prve pomoči in prve medicinske pomoči v primeru nezgode v NEK (Medical first aid)
51. GMC-4.004, Gradbeni odri (Scaffolding instructions)



- 52. INSTRUMENT & SP LIST, Instrument and Setpoint List
- 53. SP-G332A, Conventional Valves SP-G375A, TS – Piping Line Specifications Non Safety Class Piping Krško Nuclear Power Plant
- 54. SP-G403, TS – Gate, Globe and Check valves  $\leq 2$  inch”
- 55. SP-J200, TS – Reinforce Concrete Including Formwork
- 56. SP-J201, TS – Placement of Reinforcing Steel
- 57. SP-J500, TS – Reinforcing steel fabrication and delivery
- 58. SP-J501, TS – Fabrication and delivery of structural Steel
- 59. SP-J502, TS – Embedments and anchor bolts
- 60. SP-J503, TS – Miscellaneous steel

## **8 AFFECTED SYSTEM(S)**

Fire Protection System (acronym FP).

## **9 IDENTIFICATION OF AFFECTED EQUIPMENT**

FP100PMP-001	Diesel Driven Fire Protection Pump
FP103PMP-001	Electric Motor Driven Pump
Automatic pre-action sprinkler skid	For Diesel Generator A
Automatic pre-action sprinkler skid	For Diesel Generator B
Automatic pre-action sprinkler skid	For Feedwater Pumps
Automatic pre-action sprinkler skid	For Turbine and Generator Bearings extinguishing

## **10 SUPPLEMENTAL DATA**

Not applicable.

## **11 DOCUMENT SUBMITTAL**

### **11.1 General Notes**

All submitted documents shall bear at least following identification:

- Supplier's Name
- Date of issue
- Document number
- Revision number
- Construction Code
- NEK's Purchase Order (Contract) Number
- NEK's Specification Number

- Supplier name, location and employee responsible for the preparation of the document
- Supplier's order number

All document deliverables shall be submitted in two versions as a minimum: PRELIMINARY for NEK review, and FINAL version to be approved by NEK. All documents for review shall be delivered to NEK in soft copy (pdf files structured with bookmarks and active cross reference links) reviewed and approved by Supplier first. All final documents shall be delivered in addition to pdf files also as one hard copy and one soft (editable) copy:

- Word Processing: Word ©
- Spreadsheet: EXCEL©
- Computer-aided Drafting: AutoCAD©
- Planning & Scheduling: PRIMAVERA© or MS Project

Hard copies shall be good qualities full-size, reproducible, sharp, direct-contact prints of the Supplier's original drawings. They shall be provided together with cover form (DIW) in accordance with NEK procedure ADP-1.2.116.

The documents shall be formatted in files and printed as hardcopies in A4, A3, or A2 sizes only. The exceptions could be related only to the revisions or mark-ups of the existing NEK drawings that could be formatted in different (larger) formats.

Final drawings shall be prepared in a form required by NEK procedure ESP-2.613.

A unique drawing number shall be defined by NEK.

The outline drawings shall provide sufficient outline dimensions to permit arranging space in the plant to accommodate the installation and maintenance of the new equipment. As a minimum, the outline drawings shall provide overall dimensions, sizes, orientation, tolerances, and all other interfaces that will require connecting in the field. These physical outlines must clearly indicate any differences in size and space requirements as compared to the as-installed equipment.

For maintenance purposes, the access for repair and inspection shall be indicated.

Assembly and detailed drawings including manufacturing drawings shall be submitted prior to start of manufacturing or procurement of related items. These drawings shall show all operations to be carried out.

Detail drawings shall contain information as to welding procedures, materials and process specifications, materials ordering and procurement specifications.

Documents will be reviewed by NEK within 10 working days after receipt, with exception of DMP, for which review time will be 20 working days, unless otherwise agreed between Supplier and NEK.

Approval of documents by NEK shall constitute acceptance of general design and interface dimensions only and shall not relieve the Supplier from the entire responsibility for correctness of design details or dimensions.

## **11.2 BID Phase**

The bidding documentation shall consist of the following chapters:

1. Technical Approach describes technical solution and how the scope is understood.
2. Walkdown Report

3. Explanation of technical solution for design, installation, and operation of new Fire protection pumps and Automatic Pre-action Sprinkler System.
4. Related general overview drawings
5. Project Schedule
6. Draft Project Management Manual and Project Quality Plan
7. List of applicable codes and standards
8. QA Manual in acc. with the chapter 43 of this specification
9. Identification of key personnel including project manager, main design engineer(s), main installation engineer(s) and QA representative
10. Identification of major equipment Suppliers (new electric Fire Protection Pump, new diesel driven Fire Protection Pump, new Automatic wet pipe sprinkler systems, ect.)

Specification with attachments shall be studied line by line by Bidder. Bid shall include a list of items that are not in compliance with specification requirements and propose rewording by Bidder.

Detailed instructions about the preparation of the Bid is described in the document “Instructions to Bidders”.

### **11.3 Project Documentation**

Following documentation is to be provided by Supplier:

#### **11.3.1 Project Management Manual (see ESP-2.617, App. 6.13 for guideline)**

11.3.1.1 PDR - Project Deficiency Report form shall be established within Project Management Manual. Project Deficiency Reports will be issued by Supplier or NEK to identify deviation from project requirements and process problem resolution.

11.3.1.2 SPWAR – System Performance/Warranty Action Request serves as a formal form by which NEK request Supplier’s corrective action during warranty period.

11.3.1.3 NCR – Non-Conformance Report form shall be established within Project Management Manual. Non-Conformance Report will be issued by Supplier to identify deviation from the design during the installation of the modification. NCR should be also prerequisite for preparation of the FDCR.

#### **11.3.2 Project Schedule**

#### **11.3.3 Project Organization Chart**

#### **11.3.4 Project Quality Plan**

11.3.4.1 PQP shall generally describe Supplier's QA approach, provide specific information concerning the interfaces between various Supplier departments/facilities and describes application of the Supplier's QA Manual to the activities included in the scope of work (including design and procurement control, control of fabrication, treatment of non-conformance's, reporting of deficiencies, corrective actions implementation, site installation control,...).

11.3.4.2 PQP shall identify subtier documents such as all procedures related to the project, design control documents, manufacturing and inspection plans, documents handling deviations, non-conformance process,...

#### **11.3.5 Design Inputs**

a) The design input document shall be reviewed and amended by Supplier in accordance NEK procedure ESP-2.604 including:

- i. Identifying applicable project standards.
- ii. Identify all design information that will be used during the project and assure that engineering activities are performed with a consistent set of assumptions and data.

b) Equipment specification of Fire Protection Pumps SP-B310-044687-000 shall be revised by Supplier based on updated design inputs.

c) Equipment specification of Deluge Valves with pre- activation SP-B309 "Fixed fire extinguishing shall be revised by Supplier based on updated design inputs.

11.3.6 Design Modification Package (DMP) shall be prepared in accordance with the requirements of ESP-2.602 and all other applicable ESD procedures referenced therein.

11.3.7 Three different DMP documents should be prepared and delivered:

- DMP 1334-FP-L Diesel driven Fire Protection Pump replacement
- DMP 1335-FP-L Deluge valves assemblies with pre-activation replacement
- DMP 1336 Electric driven Fire Protection Pum replacement

11.3.7.1 Calculations / Analysis Reports in accordance with NEK procedure ESP-2.605 or equivalent Supplier procedure.

Supplier shall submit calculations showing that equipment meets requirements of SP-310-044687-000. Calculations shall be submitted showing that stresses in the gripper parts, sheave mountings, rope anchors and any other critical parts involved in lifting the fuel meet requirements of abovementioned reference.

Reports shall be provided in sufficient details, providing all inputs and assumptions, supporting calculations, spreadsheets, data bases, etc. to enable NEK engineers to perform an independent line by line review. In case of missing data, NEK will reject such report and reset review cycle.

11.3.7.2 A list of MECL equipment, new or affected by modification with all attributes as required by ESP-2.111 (in excel table, table structure will be provided by NEK).

11.3.7.3 A list of affected (void, new, revised) documents to be entered into NEK database (DCM) with markups

11.3.7.4 Interim drawings. Supplier shall utilize existing NEK numbering system and structure of all documents. Existing NEK drawings shall be reviewed and revised. NEK series drawings shall be provided in editable form (\*.dwg).

11.3.7.5 Detailed Software Functional Specification (DSFS) shall be prepared for PLC developed software as part of DMP package – section I, where software functionalities, program logic, inputs/outputs to program logics and HMI displays are explain in detail.

11.3.7.6 Basic cyber evaluations and protection for all new digital components (PLC, display computer, In-mast Sipping, cameras...) shall be performed and submitted as part of ESP-2.921, Cyber Security Assessment of Critical Digital Assets (CDA) requirements.

11.3.7.7 Detail software and hardware user and maintenance (including administration) manuals shall be prepared and included into project to provide detail usage instructions and basic maintenance instructions such as load or backup of software in case of failed PLC or HMI display equipment replacement.

#### 11.3.7.8 Software Criticality Analysis

#### 11.3.8 TS and USAR changes (10CFR50.59)

Supplier shall prepare necessary technical documentation according to NEK procedures ESP–2.302, Administration of Changes to the Updated Safety Analysis Report (USAR) and ESP–2.303, Evaluation of changes in NEK to apply for SNSA license.

#### 11.3.9 Detailed Equipment Procurement Specifications (ESP-2.617)

- a) Supplier shall transmit in procurement specifications all the requirements from this specification and equipment specification of Fire Protection Pumps SP-B310-044687-000
- b) Supplier shall transmit in procurement specifications all the requirements from this specification and equipment specification of Deluge Valves with pre- activation SP-B309 "Fixed fire extinguishing
- c) Supplier shall review Sub-Supplier (Vendor) drawings and documents for compliance to these specifications and contract documents requirements. Assure that the appropriate parameters and design information are being used by all the parties.
- d) Price and general terms and conditions may be omitted from transmittal.

11.3.10 Fabrication procedures for activities such as material receipt, manufacturing (welding), assembly, testing, inspection, cleaning, shipment, transportation, coating, ...

11.3.11 Manufacturing and Inspection Plans

11.3.12 Non-Conformance Reports

11.3.13 Waste Handling and Minimization Plan providing drawing and instructions for minimization of waste volume, disposal locations,...

11.3.14 Factory Acceptance Test (FAT) procedure

Supplier shall prepare a Factory Acceptance Test procedure to execute the full scope of equipment functional and performance testing at Supplier's facilities.

11.3.15 End of Manufacturing Report

The documentation about manufacturing shall comprise the following as a minimum:

- Index
- The last revision of the Manufacturing and Inspection plan showing the identification number of all records
- Records of all the manufacturing and inspection operations chronologically scheduled per the Manufacturing and Inspection plan
- All procedures
- Bills of materials
- Certificates of Compliance (CoC)
- Non-Conformance reports
- All certificates required by materials specifications
- All certificates required by filler materials specifications
- Personnel certificates

- Equipment (including measuring) certificates.
- Software certificates
- Welders qualification records (AWS)
- Welders and Inspectors certificates (AWS)
- Welding reports
- Welding procedure qualification records (AWS)
- Heat treatment certificates
- Repair reports
- Seismic Qualification Documentation Package (SQDP). The Supplier shall submit a formal qualification report with seismic design analysis or seismic test results, which will demonstrate the seismic qualification of the equipment.
- Electromagnetic and Radiofrequency Equipment Qualification Documentation Package (EMQDP)
- As-built parts lists
- All NDE records including radiographs (originals)
- Packing Specifications
- Transportation Specifications
- Vendor drawings
- Manufacturing drawings

11.3.16 Site Installation Packages for mechanical, electrical/I&C scope of works in accordance with NEK ESP-2.619, including:

- 11.3.16.1 Schedule and Organization Plan
- 11.3.16.2 Lifting Plans
- 11.3.16.3 Welding travelers, WPS's, PQR's
- 11.3.16.4 Installation Procedures
- 11.3.16.5 Work Sequence and Inspection Plan
- 11.3.16.6 Installation and demolition drawings
- 11.3.16.7 Foreign Material Exclusion Plan
- 11.3.16.8 Safety Plan

11.3.17 The need for expeditious changes of the "Approved for implementation" DMP shall be handled by FDCR (Field Design Change Request) document prepared in accordance with NEK procedure ESP-2.609.

11.3.18 Site Acceptance Test (SAT) procedure

Supplier shall prepare SAT procedures to exercise the scope of functional and performance testing, including power testing, which may not have been possible during FAT. Scope of these procedures shall envelope full scope of FAT already performed at equipment Suppliers facilities with the

differences related to the full project configuration and all equipment manipulation needed to start the system in designed configuration.

11.3.19 Instruction (operation, safety, maintenance) manuals (see chapter 31)

11.3.20 Installation report

The documentation about installation shall comprise the following as a minimum:

- Distribution and revision list
- General description of the work and scope
- Organization chart
- Closed out Inspection Reports
- Personnel with certificates
- List of tools and measurement equipment with certificates
- Bill of materials with certificates
- QC records (NDE, dimensional reports, as build data)
- Mark-up of drawings
- Non-Conformance reports
- List of used documents/procedures
- Other documentation related to the installation (see chapter 11.3.16)

11.3.21 Essential drawings (NEK will identify them) shall be furnished by Supplier to NEK as soon as possible but not later than when the systems are ready for operability declaration.

11.3.22 As Built drawings include all existing affected and new drawings reflecting as built configuration. They shall be provided in \*.dwg format.

11.3.23 System design description document in accordance with ESP-2.618 procedure.

11.3.24 Turn Over Package (TOP)

Maximum 3 months after the installation completion, the Supplier shall prepare TOP according to NEK procedure ESP-2.611, Document Turnover and Closeout.

11.3.25 Status/progress reports

11.3.26 Documentation Index

11.3.27 Daily reports during installation phase

All documentation listed above shall be provided in preliminary version, previously reviewed and approved by Supplier, to NEK for review and approval.

#### **11.4 State of the art tools**

The design calculations for Nuclear Utility Plants require tools, includes complete software and library Verification & Validation in compliance with QS 610, Rev.2; QA Specification, Generic Quality Assurance Program Requirements .

Supplier shall, in its project management manual, in detail describe which software tools will be used for the design and for reproduction of the drawings and how it will maintain NEK equipment numbering system including cable and wire numbering, use of NEK drawings symbols, drawings format (headers) and series (206, 207, 208, 302, 911, 912, etc.). If the Supplier is using its own

software tools, its outputs (calculations, drawings ...) shall be compatible with NEK software and in accordance with NEK requirements for drawings. All software used shall comply with the requirements of QS-600, Generic Software Quality Assurance Program Requirements.

#### 11.4.1 Mechanical design area

Standard tools used by NEK for modification processes:

- a) Classical drafting: AutoCad Map 3D + Raster Design
- b) Modeling of mech. elements: Inventor Professional

#### 11.4.2 State of the Art tools for Electrical and I&C design area

NEK uses PC-CKS software database for conduits, cables and cable trays design. Supplier's chosen software for raceways and cable systems shall enable easy transfer from the new database into the existing PC-CKS database.

## 12 PERFORMANCE REQUIREMENTS

Performance requirements are specified in SP-310-044687-000 and in SP-B309 "Fixed fire extinguishing system.

## 13 MATERIAL REQUIREMENTS

Material requirements are specified in SP-310-044687-000 and in SP-B309 "Fixed fire extinguishing system. In the case of the ASTM material substitution with material according to the EN, NEK procedure ESP-2.615 "Material equivalency/Substitution" shall be implemented.

## 14 FABRICATION AND ASSEMBLY

### 14.1 General

14.1.1 Fabrication of equipment shall start upon approved Manufacturing and Inspection Plans with all related documents (drawings, procedures,...). If fabrication will be started prior to DMP approved by NEK, risks associated with redesign shall be borne by Supplier. Fabrication documents shall be stamped with "approved for fabrication".

14.1.2 Components shall be fabricated and assembled in the shop to the greatest extent possible.

14.1.3 Shearing, flame cutting, and chipping shall be done carefully and accurately, finished surfaces shall be clean and smooth. Rough edges shall be removed.

14.1.4 Burrs and shavings produced by punching and reaming operations shall be removed before assembling.

14.1.5 Parts not completely assembled in the shop shall be secured by bolts, in so far as or wherever practical, to prevent damage in shipment and handling.

14.1.6 Holes shall be provided in members to permit erection and connection of the work of other trades who will furnish necessary templates and information as may be required. Holes shall not be made or enlarged by burning. Holes for bolts shall be punched or drilled.

14.1.7 Tolerances shall be defined in accordance with an ANSI/ASME Y-14.5M.



## **14.2 Bolts**

14.2.1 Unless shown otherwise on the Construction Drawings, shop assembly connections may be bolted or welded. Field connections shall be made with high strength bolts except for the following items which shall be bolted with structural grade bolts, ASTM A 307, Grade A, with hexagonal nuts:

- a) All beams marked "Removable" on the Construction Drawings.
- b) All girts.

14.2.2 Hardened washers shall be installed under the driven bolt element of each high strength bolt.

14.2.3 Unless otherwise noted on the Construction Drawings, all high strength bolted connections shall be designed, detailed, and fabricated as "friction-type" connections, and be tightened by the "turn-of-the-nut" or calibrated-wrench method in accordance with the specification for Research Council on Structural Connections Specification for "Structural Joints Using High-Strength Bolts". Shop painting in areas of high strength bolts shall be blocked out.

14.2.4 Bolted beam connections shall develop a minimum of one bolt value greater than the reaction, as given on the Construction Drawings or the maximum reaction allowable for a uniformly loaded beam of the given size and span. A minimum of two bolts per connection shall be used.

14.2.5 One sided or other type of eccentric connections shall not be permitted, unless indicated on the Construction Drawings.

## **14.3 Welding**

14.3.1 Welding, welding procedures, welders, and welding operator qualifications shall conform to AWS D1.1. Written welding procedures shall be submitted for approval.

14.3.2 Welding shall be performed by the shielded metal-arc welding process, except that automatic welding, semiautomatic, or a combination of automatic, semiautomatic and manual welding may be used subject to the following conditions:

- a) The automatic or semiautomatic welding procedure and the welder or machine operator shall be qualified using the same material, process, and type of equipment intended for the production welding.
- b) Welding starts and stops in continuous welds shall be held to a minimum. Each such stop shall be properly conditioned before continuing the welding. The use of runoff plates, where possible, is recommended.

14.3.3 All flux coated welds shall be chipped and wire brushed.

14.3.4 Welded studs shall be secured with the manufacturer's authorized stud welding equipment and shall be in accordance with AWS D1.1.

14.3.5 Welding shall be performed by welders and welding operators certified in accordance with the provisions of AWS D1.1, Section 4, Part C, for the materials and methods to be employed in the performance of the work. Welder's certification shall be submitted for approval.

14.3.6 Electrodes shall be protected from moisture. Handling, storage, heating, reheating, and duration of exposure shall be in accordance with Section 5 of AWS D1.1 or the manufacturer's instruction whichever is more conservative.

14.3.7 Shielding gases shall be welding grade with dewpoints of  $-68^{\circ}\text{C}$  for inert gases and  $-51^{\circ}\text{C}$  for carbon dioxide and nitrogen.

14.3.8 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 fixing shall be avoided.

## **15 INSPECTIONS AND TESTS**

### **15.1 Scope**

15.1.1 Testing, inspections and related acceptance criteria shall conform to the applicable codes and standards as specified in chapter 7. In the absence of the specific code, the Supplier shall use standards proposed with the Bid.

15.1.2 Inspection of all structural steel welding shall be performed in accordance with the provisions of AWS D1.1, Section 6.

15.1.3 Materials, procedures, or workmanship not conforming to the provisions of this Specification shall be rejected at any time non-conformances are found during the progress of the work. Rejected material and workmanship shall be replaced with acceptable material, workmanship, or both at no additional cost to NEK.

15.1.4 The structural steel welding inspections shall include visual examination of preparations, welding processes, and post welding process (100% VT inspection). Fillet welds shall be examined by magnetic particle or dye penetrant inspection on a representative basis of 10% of the weld length scattered over a random choice of location. Full penetration butt welds or tee welds shall be 100% examined by radiographic or ultrasonic inspection.

15.1.5 Weld repairs necessitated by visual or nondestructive test examinations shall be made in accordance with the procedure used to perform the original weld or a qualified repair procedure, and shall be reinspected by the same method which disclosed the repair defect.

## **16 QUALIFICATION, PARTS CLASSIFICATION & DOCUMENT TRACEABILITY**

### **16.1 Seismic and Dynamic Equipment Qualification**

The new Electric and Diesel Fire Protection Pumps shall be qualified to seismic loading. Qualification requirements shall be also applied to the existing affected equipment and interconnections. Qualification shall be performed in accordance with prescribed methodologies in SP-S702 Technical Specification "Seismic Analysis, Testing and Documentation", Rev.10 and in accordance with ESP-2.631 procedure.

Supplier shall prepare Seismic Qualification Documentation Package (SQDP) for subject equipment. SQDP should provide sufficient level of details supported with test reports, calculations or analyses which confirms equipment seismic qualification for subject seismic load.

### **16.2 Electromagnetic and Radiofrequency Equipment Qualification (EMQ)**

New major electrical and I&C equipment shall be qualified in accordance with RG-1.180 Rev. 2 "Guidelines for Evaluating Electromagnetic and Radiofrequency in Safety-Related Instrumentation and Control Systems" regarding radiofrequency, electromagnetic interfaces and power (voltage) surges where applicable.

Supplier shall perform equipment function and location assessment and based on it define equipment EMQ requirements (applicability or classification) related to RG-1.180.

Supplier shall prepare Electromagnetic and Radiofrequency Equipment Qualification Documentation Package (EMQDP) for subject equipment. EMQDP should provide sufficient level of details supported with test reports, calculations and analyses, which confirms equipment qualification for subject equipment function and EMI/RFI plant environment respecting RG-1.180 generic EMI/RFI plant envelopes.

### 16.3 Cyber Security

In general, the Supplier's security policies should follow guidance provided in NEI 08-09 Rev. 6 and NEI 10-04 Rev. 2 and include the following:

- a) Software is developed in a secure environment where only properly authenticated and authorized personnel are allowed access to the target software and hardware.
- b) Media shall be ensured to be free from any malicious code before being connected to the target hardware. Routine virus scans are performed on applicable equipment/media.
- c) Third-party software integrated into the system products shall be assessed and mitigated for security vulnerabilities.
- d) Software not needed to support system operation, maintenance, troubleshooting or diagnostics shall be removed prior to the FAT.
- e) An assessment shall be performed prior to the FAT to ensure unauthorized software or hardware is not contained in the system.
- f) Password shall be used to access different user/maintenance areas with the application.
- g) No connection to the internet or any other network at any time (air-gap protection).
- h) No unnecessary software is installed.
- i) Unused communication ports are blocked.
- j) Cabinet where OT equipment will be mounted must be locked with key.
- k) Software is developed and used in secure environments both at the factory and at the plant.

The drive freezing software shall be installed on all PC's provided as part of the proposed modifications. For the included drive freezing software, the hard drive is frozen to prevent any viruses or malicious threats from taking control of the operating system, registry, software, Master Boot Record (MBR), and files that are located on the hard drive. If a malicious threat successfully penetrates any barriers, the freezing software reverts to the last frozen secure state negating the effect of the threat(s). This reversion occurs when the computer is powered down and rebooted or upon request by the operator. The system provides immediate immunity from many of the problems that plague similar computers. These include configuration drift, accidental system miss-configuration, malicious activity, and system degradation.

Supplier shall provide NEK with licenses to all software medial and licenses for the software provided with the upgrade. Additionally, all passwords will be provided as applicable, so that NEK can maintain required administrative and management rights for the software. NEK shall be able to perform load of software to PLC in case of its failure without Supplier's physical presence and support. In same manner NEK shall be able to load Human Machine Interface to HMI display computer in case of its failure. NEK does not request rights to perform software or HMI modifications.

The criteria for classifying a digital system as a CS (critical system) in the nuclear power plants are based on 10CFR54.73, Protection of digital computer and communication systems and networks (SSEP) and NRC RG 5.71, Cyber Security Programs for Nuclear Facilities. If it is possible for a DA

(Digital Asset) to rule out a possible impact on the design accident of the treatment (for the frequency of the event or in general), the DA can be treated as non-critical DA.

Implementation of project can potentially affect on outage duration, which can directly increase costs (effect of lower power generation) and outage time. For this reason, all security measurements must be included in the design of the entire system, and the cyber assessment must be performed in accordance with the ESP-2.921 procedure and the EPRI Cyber Security Technical Assessment Methodology: Vulnerability Identification and Mitigation.

The provider must identify which computer subsystems are added or modified within the FP modification. For each computer subsystem, it is necessary to determine whether it is critical to cyber security. We also evaluate the isolated computer subsystem in the same way. For each computer subsystem (regardless of whether it is critical or not), the provider must prepare a cyber security analysis using the NEK ESP-2.921 procedure. With the analysis according to the NEK ESP-2.921 procedure, the security controls that need to be implemented will be selected. A successful analysis (signed by NEK) is a prerequisite for completing the DMP package.

## **17 OTHER REQUIREMENTS**

### **17.1 Suppliers Responsibility**

Should the Supplier propose to purchase from other Suppliers any equipment, material, or service specified herein, the Supplier shall identify to the NEK the sub-Supplier and the specific components they need to provide. If the proposed sub-Supplier will manufacture any of the items covered by the specification completely or perform sufficient fabrication of the items which require presence of the NEK's representative in the sub-Supplier's shop, the Supplier shall identify the sub-Supplier to the NEK.

The Supplier or his agent shall perform inspections and/or witness tests at the sub-Supplier facilities. The presence of NEK representative does not relieve the Supplier of his responsibilities to meet the requirements of this specification.

The Supplier shall be completely responsible for the design, manufacturing and installation of the new system components. The Supplier shall be fully responsible to ensure that his work, and the work of any sub-Supplier, 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 Supplier to be technically incorrect or technically unsuitable, or that conformance would diminish the Suppliers responsibility or the product performance after installation; then the Supplier shall transmit such objections with the Bid or as soon as possible later in the project.

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 Supplier's standard practices when such practices do not conflict with this specification.

### **17.2 Health and Safety**

The Supplier shall manage and be responsible for the performance of the H&S services for all the work performed within the project.

The NEK shall be provided with unrestricted access to the Supplier's facilities and H&S records for the purpose of auditing the Supplier's health and safety program.

All persons employed by the Supplier, agents, sub-Suppliers, or other persons for which the Supplier has responsibility, shall perform work under the direction of the Supplier's H&S program that is in compliance with NEK H&S rules. All persons shall be instructed in and be familiar with H&S rules and regulations applicable to the work being performed.

The Supplier shall have sole responsibility for ensuring that safe work practices are followed.

The Supplier shall designate a qualified H&S representative. The representative shall attend all project safety meetings and participate fully in all activities outlined in Supplier's H&S program. The Supplier's H&S representative shall have stop-work authority for unsafe acts or conditions, shall be considered key person, and shall be on site when work is performed. The Supplier's occupational H&S staff shall be adequate to respond to the administrative aspects any emergency or medical situation resulting from the installation work. The Supplier shall maintain reports of all accidents and injuries. The Supplier, once mobilized, shall hold regularly scheduled meetings to instruct its personnel on safety practices and the requirements of the H&S program. The Supplier shall furnish safety equipment and enforce the use of this equipment by its personnel.

Within Installation Package, the Supplier shall submit the H&S Program to the NEK for approval. Program shall have statement which industrial H&S standards were used in preparation installation activities. Approval of Supplier's Program by the NEK does not relieve the Supplier of any Supplier's H&S responsibilities.

### **17.3 Foreign Material Exclusion**

Old equipment demolition, transportation, storage, and installation of new equipment is highly critical from FME perspective, therefore strict adherence to the respective NEK procedure ADP-1.101 (FME program) is required. FME policy applies already at the design stage, where design solution shall be adopted to prevent or minimize possibilities for FME event during installation, operation and maintenance. Supplier shall consult with NEK applicable FME level based on installation operations. During installation phase at NEK site Supplier shall delegate individual responsible for FME.

### **17.4 Radiological Protection**

N/A

### **17.5 Radwaste Handling & Minimization Plan**

N/A

### **17.6 Loads handling at site**

Hoisting, rigging and transporting of items at Supplier's facilities and at NEK site shall be in accordance with QS 610, Rev.2; QA Specification, Generic Quality Assurance Program Requirements.. For all load lifting operations at NEK site, NEK procedure ADP-1.1.141 shall be respected. This procedure requires special load lifting plans to be prepared in advance of lifting (within Installation Package).

## **18 CLEANING**

Cleaning requirements are specified in SP-B310-044687-000 and in SP-B309 "Fixed fire extinguishing system

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## **19 CORROSION PROTECTION / COATING**

Corrosion protection / coating requirements are specified in SP-B310-044687-000 and in SP-B309 "Fixed fire extinguishing system.

Selection of materials and coatings shall ensure lifetime corrosion protection of all components.

Coatings that are damaged in handling shall be repaired. Coated members shall not be loaded for shipment or shipped until dry. Coated members shall be handled, stacked, and transported in a manner that does not damage the coating.

## **20 MARKING AND IDENTIFICATION**

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

## **21 PACKAGING, HANDLING & STORAGE**

For packaging, handling and storage, requirements of QS 610, Rev.2; QA Specification, Generic Quality Assurance Program Requirements shall be respected. For electronic equipment Level B requirements are mandatory, for other equipment Level C requirements are mandatory. Protective measures level shall be clearly labeled on each package.

The Supplier shall provide, for NEK's review and approval, procedures for packaging, shipping, site receiving, site storage, handling, and cleaning. The packaging procedure shall take into account methods of transportation to be used, as well as the possible storage duration and storage environment.

Supplier is responsible for equipment up to customs area in the vicinity of NEK. Truck unloading will be done by NEK based on Supplier's instructions and supervision.

Transportation from customs into reactor building will be done by NEK. Equipment shall be packed to allow transportation with truck, forklift of capacity 8000 kg and auto crane. Any other special transportation and lifting devices shall be provided by Supplier.

Handling shall be done in a manner to minimize damage to the primer or materials. If necessary, critical equipment shall be shipped with accelerometers. Pieces showing the effect of rough handling or damage shall be rejected.

The Supplier shall verify the site storage and/or specify additional requirements necessary to maintain equipment warranties. Available storage locations are ANSI Level C and ANSI Level B with limited storage capacity.

## **22 SOURCE INSPECTION/SURVEILLANCE NOTIFICATION**

Supplier shall perform source inspections of material/products and services provided by its subSuppliers based on requirements in this Specification.

The Supplier shall officially notify about inspection "hold" and "witness" points according to the manufacturing and inspection plan. Notification time shall be at least 10 calendar days ahead of anticipated occurrence, except if resident NEK representative is present at inspection location. In such cases minimum notification time shall be agreed between parties.

## **23 NONCONFORMING MATERIALS**

Control of non-conforming items shall be based on QS 610, Rev.2; QA Specification, Generic Quality Assurance Program Requirements.. Any deviations or design changes which are not fully in accordance with the technical or quality assurance requirements of the procurement documents shall be reviewed and approved by the NEK. Any such deviation request must be made in writing by means of a Non-Conformance report submitted to the NEK for acceptance prior to continuing work. For better understanding a sketch shall be made or picture taken in order to show non-conformance. Further engineering and/or manufacturing after the detection of non-conformances, prior to NEK's approval, shall be at Supplier's risk.

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

Supplier shall:

- a) Make the Non-Conformance report available to the NEK for review to assure the non-conformance is completely identified and accurately stated, and
- b) Properly disposition and transmit the report to NEK by the most expeditious means. The Supplier shall provide technical justification, if recommended disposition is "Accept-As-Is" or "Repair".
- c) Manage corrective actions in accordance with requirement QS 610, Rev.2; QA Specification, Generic Quality Assurance Program Requirements..

## **24 SPECIAL HANDLING**

See chapter 21.

## **25 SHELF LIFE**

Supplier shall provide shelf life data by expiration date and storage conditions for each spare part and consumable supplied. The new equipment shall be designed for forty (40) years operational life. The Contractor shall not ship any item, which has less than 75% remaining shelf life, or is older than one fiscal year at time of shipment. The Contractor shall provide shelf life data for spare parts by one of the following methods:

- a) Expiration date
- b) Cure data and material composition

If above requirements are not met the material will be shipped back to the Contractor at his expenses.

## **26 10CFR21 REPORTING**

10CFR21 reporting is not applicable for this modification.

## **27 COMMERCIAL GRADE ITEM DEDICATION**

Since there are seismic and EMC requirements, commercial grade dedication is applicable to this modification.

## **28 SUPPLIER DOCUMENTATION REQUIREMENTS**

See chapter 11.

## **29 REPAIR RECORDS**

Major defect repair records that require Non-Conformance reports shall be delivered to the NEK.

## **30 SHIPPING REQUIREMENTS**

The NEK's representative has the right to hold shipment if Specification requirements are not met. Supplier is responsible to get all permissions for transportation of the equipment.

Prior to the shipment, the Supplier shall contact NEK to confirm shipping arrangements. All pieces of equipment, boxes, cartons, etc., shall have a waterproof identification label attached with the following information:

Nuklearna Elektrarna Krško

Vrbina 12, 8270 Krško

SLOVENIA

Fire Protection Pumps Replacement

Attn: Matej Libenšek, ING.MOD

CONTENTS: Packing list identifying each item or assembly shipped.

## **31 VENDOR TECHNICAL MANUAL AND REGISTERED UPDATES**

The Supplier shall furnish two (2) hard-copies and electronic copy of the final technical manual with all necessary information for operation and maintenance, updated specific data and drawings for all equipment. Supplier is responsible to send applicable manual updates to NEK until warranty period expiration.

Manual shall include operation instructions, routine maintenance procedures, spare parts list, complete drawing list and a trouble shooting procedure to aid in rapid location of trouble. Standard instructions and data sheets shall be obtained from Suppliers of purchase components and included in manual. A draft of the manual shall be submitted for approval at least three months prior to shipment. Detailed erection instructions for use of Suppliers field engineers shall be included in manual or provided as separate documents.

Content of manuals shall be per ESP-2.617 Appendix 6.10, Vendor Manual Guideline. The Technical Manual shall be in English.

## **32 TRAINING PROGRAM**

The Supplier is obliged to prepare training for the operation and maintenance of the newly installed equipment and systems. The extent and manner of training should be timely coordinated with NEK.



Basic training shall be performed in Suppliers facilities. All necessary mockups and training simulators shall be included in the scope of supply.

Training shall be comprised of classroom training and physical training. Approximate training duration should be 5 full working days for new diesel driven, electric FP pumps, and Automatic wet pipe sprinkler systems operators and 5 full working days for maintenance. Training could be performed in parallel with FAT.

### 33 REVIEW & VERIFICATION OF WORK

Supplier is required to perform a detailed verification of all phases of work starting from initial walkdown, design and ending with TOP preparation. All documentation shall be reviewed and approved by Supplier before sending to review to NEK. In order to NEK to contribute to quality of documentation, Supplier's proprietary documents that are classified as non-releasable may be made available for consultation by NEK and Slovenian regulatory authorities on a case-by-case basis.

### 34 SCHEDULE REQUIREMENTS

#### 34.1 Project Schedule

To comply with the objective of full implementation of the modification, activities shall be completed as required in following table.

**Table 1: Schedule requirements**

ITEM	DESCRIPTION	DELIVERY SCHEDULE
1	PMM and PQP	T0 + 2 MONTHS
2	Preparation of a basic proposed design with proposed equipment selection and feasibility check, design inputs.	T0 + 3 MONTHS
3	Procurement specifications for major equipment	T0 + 3 MONTHS
4	Manufacturing and Inspection plans ready for fabrication	T0 + 4 MONTHS
5	Final DMP 1336-FP-L (Electric FP pump replacement)	T0 + 8 MONTHS
	Final DMP 1334-FP-L (Diesel FP pump replacement)	T0 + 8 MONTHS
	Final DMP 1335-FP-L (Deluge valves assemblies with pre-activation replacement)	T0 + 8 MONTHS
6	Factory Acceptance Test for Flood valve assemblies with pre-activation approved by PURCHASER	T0 + 8 MONTHS
7	<b>Demolition of old Deluge valve assemblies with pre-activation, installation of new Flood valve assemblies, SAT</b>	T0 + 9 MONTHS
8	Site Installation Package and Instruction Manuals approved by PURCHASER	T0 + 10 MONTHS
9	Factory Acceptance Test for Electric FP Pump approved by PURCHASER	T0 + 10 MONTHS
10	<b>Demolition of old Electric FP Pump, installation of new FP Pump, SAT Approved by PURCHASER</b>	T0 + 11 MONTHS

11	Factory Acceptance Test for Diesel driven FP Pump approved by PURCHASER	T0 + 12 MONTHS
12	<b>Demolition of old Diesel driven FP Pump assembly, installation of new Diesel driven Pump, successfully completed SAT and signing of HOP</b>	T0 + 14 MONTHS
13	<b>TURN OVER PACKAGE APPROVED BY PURCHASER</b>	T0 + 19 MONTHS

T0\* = Effective Date of Contract

### 35 STATUS REPORTING REQUIREMENTS

Following tools shall be used by Supplier for status reporting:

- a) Progress weekly (Teams) meetings with participation of Suppliers and NEK project managers, QA representatives, main design and production engineers and main sub-Suppliers representatives,
- b) Regular project Steering Committee meetings (six months period)
- c) On-line Action Items List, which is managed by Supplier and identifies all activities with ID, description, due date, responsible person and status from all parties involved,
- d) Monthly report that integrates weekly meetings, Action Items List and status of project activities,
- e) Weekly updated Documentation Index that lists all project documents (including all sub tier Suppliers documents) with status (in preparation, in review, approved,...),
- f) Site daily reports delivered to NEK by 7AM each morning containing:
  - i. 24 hours activities progress report,
  - ii. Required support from NEK,
  - iii. Deviations (technical, safety, ...),
  - iv. Schedule updates.

### 36 WORK OR INFORMATION TO BE PROVIDED BY NEK

In addition to documentation provided with this technical specification, NEK will provide to Supplier upon request all NEK specific documents/information needed to perform the scope of work. The usage of this information by the Supplier will be restricted according to specific instructions provided by NEK.

In addition, NEK will:

- a) Revise the specification following the completion of the technical part of the Bid process, if necessary.
- b) Designate a Project Manager, QA responsible engineer and other project team members who will serve as interface with the Supplier.
- c) Perform revision of all affected NEK procedures based on markup provided by Supplier.

- d) Provide licensing interface with SNSA with support of Supplier who will assist and provide required inputs for successful licensing of modification.
- e) Provide all interface information with any other plant activities related to this project.
- f) Provide access for onsite inspection to all the areas where new systems, major equipment and accessories will be located.
- g) Provide an on-site training to all Supplier's and his sub-Supplier's employees as needed to meet requirements for an "unescorted access" to perform the on-site activities.
- h) Provide access to NEK workshops.
- i) Provide office for installation crew with internet connection.
- j) Provide all in processing services for installation personnel.

Whenever NEK approval is required in this specification for submittals, procedures, methodologies, approaches or options, such approval shall be provided in writing or if provided orally shall be confirmed in writing.

### **37 CHANGES OF WORK SCOPE**

The Supplier shall notify the NEK in each case when the change of work or plan will affect the quality of work, schedule or cost of contracted activities. Any such deviation must be made in writing by means of a form submitted to the NEK for approval prior to continuing work.

### **38 RECORDS**

A records system shall be established and maintained by the Supplier to provide documentary evidence of the quality of items and activities affecting quality. Records management shall be in accordance with QS 610, Rev.2; QA Specification, Generic Quality Assurance Program Requirements. The Supplier shall turn all records applicable to this project to NEK.

All records shall have unique identification number with revision and need to be sorted into group and subgroup.

If a record is not legible one of the following methods shall be met:

- a) The illegible area of the record shall be enhanced by tracing or writing the information clearly on the record or by submitting additional information for clarification of the illegible area. The Supplier person authorized to perform this function shall initial and date the area enhanced or clarified.
- b) If the record cannot be enhanced, the records shall be marked "Best Copy Available", and the marked record shall be initialed and dated by the responsible organization's supervisor or designee.

### **39 ORGANIZATIONAL CONTACT**

Supplier shall co-ordinate all technical matters with:

Name: Matej Libenšek  
Phone: 00 386 74 802 600  
E-mail: matej.libensek@nek.si

Supplier shall co-ordinate all commercial matters with:

Name: Andreja Deržič  
Phone: 00 386 74 802 348  
E-mail: andreja.derzic@nek.si

#### **40 SUPPLIER'S TECHNICAL APPROACH to the WORK**

Preliminary Project Management Manual and Project Quality Plan (PQP) provided within the Bid outline how and where the work will be performed and indicate how the Supplier understands his scope of work. The Bid should also indicate similar project applications that have been performed by the Supplier.

The Supplier shall be responsible for:

- a) All labor required to physically perform the work. This labor force shall possess skills to perform the work on the Project.
- b) Supplier's field personnel shall be capable, qualified, and able to perform the duties required to the satisfactory resolution of field problems.

To fulfill requirements of this specification, Supplier shall delegate on this project a team of engineers experienced with pump replacement. Supplier shall get familiar with existing fuel system configuration and operator practices in NEK to adopt optimum solution to a specific need.

The Supplier shall be responsible for the selection and supervision of all personnel within the project organization under the Supplier's control.

As a part of the Bid, Bidder shall identify and describe the organization under which the work will be performed, identify the resources (number and types of personnel with their background and experience on similar projects) available to carry out the work associated with the scope of supply.

The Supplier shall provide technical staff with specifically defined duties, responsibilities, and authorities to support timely resolution of all design and other deficiencies in design documentation identified during installation phase of the project. These personnel shall be defined as key personnel. The key personnel shall be assigned full-time to the work, and their names and titles shall be clearly depicted on organization charts. The Supplier will not change personnel assigned to key positions without the prior approval of the NEK.

The Supplier shall designate Project Manager to act on behalf of the Supplier for all matters related to the Contract, including:

- a) Receiving all communications from the NEK;
- b) Providing all approvals, consents, authorizations, and proposals;
- c) Transmitting all communications to the NEK;
- d) Acting for and committing for Supplier.

#### **41 ACCESS TO SUPPLIER FACILITY AND DOCUMENTS**

The Supplier will provide access to the Supplier's and authorized sub-Supplier's facilities to the NEK personnel (including NEK sub-Contractors alias Representatives) who are engaged in the work for the purpose of reviewing the quality and the progress of the work being performed.

## **42 SUBCONTRACTED WORK**

Based on law of [ZVISJV](#) and based on “Pravilnik o dejavnikih sevalne in jedrske varnosti” ([JV 5](#)) Article 60, (nadzor podizvajalcev in dobaviteljev), NEK is responsible for establishing surveillance on Supplier and its sub-Suppliers to ensure high quality of services and nuclear safety for the public.

Supplier personnel working under Supplier’s direct responsibility are not considered as sub-Suppliers in this context.

All sub-Suppliers shall be listed in the Bid. If after Contract signature, Supplier wants to change or select a new sub-Supplier, this is subject to NEK approval.

The Supplier shall impose to its sub-Suppliers the requirements of this Specification. The Supplier shall ensure that all sub-Suppliers meet the requirements of this Specification.

Since the Supplier retains full responsibility for all aspects of sub-Suppliers performance (including quality and schedule) the Supplier shall ensure that adequate and periodic audit and surveillance of the sub-Supplier is maintained. NEK’s right of access to the Supplier’s sub-Suppliers’ facilities for the purpose of inspection or audit shall be imposed by Supplier’s documents.

All sub-Suppliers need to be qualified by Supplier and have to be included on its Approved Supplier List (ASL). They shall also have experience/references on same or similar work performed on nuclear power plant(s).

The Supplier or his sub-Supplier shall not subcontract any portion of the Work without the written approval of the NEK.

## **43 QUALITY ASSURANCE REQUIREMENTS**

### **43.1 General**

43.1.1 The Supplier shall have an established quality assurance (QA) Program that complies with the requirements of ISO-9001 and the requirements of the enclosed specification QS-610, Rev. 2, Generic Quality Assurance Program Requirements.

43.1.2 All work shall be carried out in compliance with the Supplier's QA Manual and with the approved PQP. In accordance with this specification, the Supplier shall also assume responsibility to require any sub-Suppliers to comply with the quality requirements, technical, commercial requirements, and schedules in accordance with this specification.

43.1.3 The Supplier has the responsibility for QA activities for all work pursuant to this Specification. All technical and quality requirements shall be met.

43.1.4 The contractor’s software development lifecycle shall be described in its Software Quality Assurance Program, which shall be harmonized with NEK QA Specification QS 610 requirements, QS 600 Generic Software Quality Assurance Program Requirements and shall be attached to the Bid. Contractor’s procedures for software development lifecycle activities shall be submitted to NEK for review and acceptance before implementation. Detailed Failure Mode and Effects Analysis shall be performed and delivered.

### **43.2 Quality Manual**

43.2.1 One (1) controlled copy of the Supplier's QA Manual of the latest revision shall be submitted to NEK with the Bid, if not previously submitted to NEK.

43.2.2 The Supplier's Quality Manual and referenced company standards shall apply to all practices employed on the work performed pending review and concurrence by the NEK.

43.2.3 The relevance and effectiveness of the Supplier's QA Manual shall be provided with Bid and reviewed and approved by NEK prior to the Contract award. The same shall apply to any subsequent changes of the manual proposed by the Supplier during the project progress.

### **43.3 Supplier's Responsibilities for Sub-Suppliers**

The Supplier has following responsibilities regarding its sub-Suppliers:

- a) The Specification requirements for documents submittals shall apply to sub-Suppliers for services not performed by the Supplier. The Supplier shall first review sub-Supplier's documents to ensure compliance with the Specification requirements, submit these documents, and obtain the NEK's approval in writing prior to performance of sub-Supplier's work. The Supplier's documents may be used at the sub-Supplier's facilities if necessary.
- b) The Supplier shall ensure that the sub-Supplier is aware of all activities that the sub-Supplier will be required to perform and shall identify activities that require the presence of the NEK Representative. The Supplier shall ensure that NEK Representative has the right of access to sub-Supplier's facilities and documents needed to perform audits, inspections or witness tests.
- c) The Supplier shall retain full responsibility of the sub-Supplier work, supervise quality and documents such facts in the End of Manufacturing Report and Final Installation Report.

### **43.4 Manufacturing and Inspection Plan**

The Supplier shall provide Manufacturing and Inspection Plans (M&IP), final or subsequently updated, for acceptance prior to start of manufacturing. There may be more M&IPs when it is practical to keep control over sub systems or work on different locations.

The Supplier shall send a detailed M&IPs which shall indicate a sequence of design activities, material acquisition, fabrication, installation, operation and testing activities, with identified R (record), W (witness) and H (hold) points, approved by NEK.

NEK will identify Record, Witness and Hold point steps prior to the approval of the M&IP. M&IP shall be approved before proceeding with any affected activity.

The M&IPs shall cover all relevant inspection requirements and shall outline the manufacturing and production sequence and specific preplanned Supplier's inspections that are required to be performed. The Supplier shall update M&IP and submit copies thereof to NEK after changes have been approved by NEK.

For each step in the M&IP, the following shall be specified:

- a) Subject component (i.e. material/part/assembly/complete set);
- b) Type of test, activity and method (e.g. assembling, welding, cutting, forming, cleaning, coating, destructive/non-destructive inspection, visual, liquid dye-penetrant, magnetic particle, X-ray, ultrasonic, probes, analysis for chemical composition, etc.);
- c) Standards and supporting documentation according to which material, equipment, part shall be purchased, or standards/procedure according to which operation, test, measurement, inspection,... shall be performed;
- d) Reference procedure with acceptance criteria according to the applicable standard.

If there is a Witness or Hold point, and the acceptance criteria or testing procedure is established according to the manufacturer's standard, such a standard and reference testing procedure must be made available to NEK for inspection at least ten (10) days before test execution. All provided

documents must be in English. The standard shall be included in the list of all applicable standards with the Bid as specified in chapter 11.2 of this Specification.

### **43.5 Inspections**

NEK inspection and audit visits related to this project are not expected to be limited to specific number. Also, NEK is not expected to cover additional costs due to inspection and audit performance.

### **43.6 Notification Points**

NEK shall have the right to establish notification points (through M&IP and WSP) for which the Supplier shall give prior notification to the NEK. NEK may require that activities performed without proper notification is repeated for NEK Representative observation at the Supplier's expense.

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

### **43.7 STOP/Hold Points**

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

The Supplier's failure to stop at a hold point will be a cause for rejection of those activities for which notification was not provided or which were not held.

When Supplier or NEK Representative has any concern about some non-confirming condition found by the test and inspection specified herein, the Representative shall have the right to call for appropriate supplementary test. Acceptance criteria for any supplementary testing will be defined and agreed prior to performing tests and inspections. Non-acceptable results will be dispositioned and corrected, and the subject test repeated in accordance with Supplier quality program requirements.

## **44 NEK PROPRIETARY DATA**

NEK proprietary policy is defined in the Contract. Refer to General Terms and Conditions proprietary-related paragraph.

## **45 APPENDICES**

1. SP-B310-044687-000; Technical Specification Fire Protection Water Pumps and Accessories
2. SP-B309 "Fixed fire extinguishing system
3. SP-S801-044687-001; Non-Safety Related Fractional Horsepower and Larger Electric Motors to be Supplied with Driven Equipment
4. MECL-ESW-01; Essential Service Water Building ESW
5. FP-67 Diesel Fire Protection Pump Isometric
6. Preliminary Design inputs
7. FP-66 Electric Driven Fire Protection Pump Isometric
8. SP-S702 (short version)

9. QS 610, Rev. 2, Quality Specification QS 610 - Generic Quality Assurance Program Requirements
10. D-302-401, FP Fluid System Diagram Fire Protection System

#### **46 REFERENCES**

1. NEK Technical Specifications (Tech. Spec.), Rev.198,
2. FP100PMP Piping Calculation – Fire Protection Piping From Pump FP100PMP – Design Basis Calculation STR 13-03
3. DCM-SD-054; Fire Detection and Protection Systems – System Design Description
4. NUREG/BR-0522, Fire Protection for Operating Nuclear Power Plants and Decommissioning Reactors, December 2022
5. RG 1.189, rev.3; Regulatory Guide – Fire Protection for Nuclear Power Plants