



**NEK**

Nuklearna elektrarna Krško  
Vrbina 12  
8270 Krško

## Technical Specification

### DELIVERY AND INSTALLATION OF DOORS FOR OSC BUILDING

Mod.No. 1056-NA-L

**SP-ES1307**

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### KRŠKO NUCLEAR POWER PLANT AUGMENTED QUALITY

D. Vukas

Date: 7.4.2017

Prepared by

J. Kerin

Date: 10.4.2017

Review by

I. Horvat

Date: 13.04.2017

Review by

B. Kežman

Date: 24.05.2017

Review by

R. Dolovčak

Date: 29.5.2017

QA

J. Cerjak

Date: 29/05/2017

Superintendent

B. Krajnc

Date: 9/6/17

Dir. ING

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## 1.0 BACKGROUND AND DESCRIPTION OF THE PROJECT

Based on Slovenian nuclear regulations (Rules on radiation and nuclear safety factors, JV-5) related to Plant Life Extension as well as the consequences of the Fukushima accident in Japan, Slovenian Nuclear Safety Administration (SNSA) issued a request to NEK (Krško Nuclear Power Plant) in September 2011 to reassess the Severe Accident Management strategy existing measures. NEK shall then implement necessary safety improvements for the prevention of severe accidents and mitigation of their consequences. In January 2012 NEK presented the analysis/reassessment and the action plan that was reviewed and approved by the SNSA in February 2012. Proposed and approved modernization of safety measures will address so called Design Extension Conditions (DEC). These measures will include best available technological solutions and will follow best international nuclear industry practices. New structures, systems and components will be designed to withstand DEC such as extreme natural events (tornado, large earthquakes, flooding, etc.) resulting in the failure of all existing safety measures and accidents.

The shelter at the NEK also serves as Operational Support Centre (OSC). The main entrance to the shelter is in the basement of the administrative building; the shelter has an emergency exit to the lawn. It is kept in good condition, regularly inspected and holds a licence to operate. However, the building designed for SSE with PGA of 0.1g is not structurally sound enough to withstand a larger earthquake. The main entrance to the shelter and OSC is at the height of 3.5 m ASL and therefore not floodsafe.

The Safety Upgrade Program includes a new project (see Ref. 1.2 NEK Safety Upgrade – Design Inputs and Interfaces). The existing emergency exit to the north-east side of the shelter will be removed. A new two-level entrance, 24 m by 16 m, will be built instead to house the equipment which is needed for uninterrupted operation of both, the shelter and OSC. The existing shelter will be retrofitted to be protected from flood.

The existing shelter is planned to be reconstructed by building a new entrance and associated objects on the lawn, in front of the plant's health care, surrounded by a restaurant, road and walkway to ADM III.

- The existing shelter with OSC is planned to be upgraded to ensure flood safety up to height 157.53 m.a.s.l.;
- ensure seismic safety to accommodate a new design condition seismic value of PGA equal to 0.6g;
- consider extreme weather conditions (-33 °C to +45°C);
- ensure safety and 7-day habitability for on-site support staff in the event of a nuclear accident.

The upgraded object will function as a:

- shelter (offering radiological, biological and chemical protection);
- OSC assuring 7-day operation in the event of a bombing attack and nuclear accident together with flood and earthquake;
- building which will be designed to meet the radiation shielding requirements in the case of a nuclear accident; the radiation shielding efficiency will be supported by radiation protection analysis.

This Technical Specification covers the technical and quality requirements for the design, fabrication, delivery, installation, functional testing and supervision for door installation.

## **2.0 SCOPE OF SUPPLY AND SERVICES**

The Contractor's scope of supply and services for delivery and installation of doors per modification 1056-NA-L for the NEK "Operational Support Centre" project includes:

- preparation of design drawings and analyses;
- qualification and functional testing;
- shop fabrication and delivery;
- preparation of Installation Package (IP);
- installation works including supervision;

- preparation of FDCRs (if required);
- preparation of Final Report.

List of doors to be shop fabricated, delivered and installed per this Technical Specification is provided in Appendix 22.1.

The work will be performed in accordance with NEK procedures and applicable standards defined in this Technical Specification.

The Contractor shall be responsible for compliance with all the detailed requirements of this Technical Specification and its referenced documents.

Revisions requested by NEK, and accepted by the Contractor shall in no way relive the Contractor from his responsibilities. There shall be no deviation from this Technical Specification or its references without prior written authorization by NEK.

The Contractor is responsible for the preparation of specified installation and finalization project activities. All project activities by the Contractor shall be timely scheduled and implemented by the Contractor in order not to jeopardize overall project implementation schedule.

## **2.1 DOOR DESCRIPTION**

Door shall be made from high quality materials as specified in Chapter 4.10 of this Technical Specification.

The Contractor shall define door equipment (handles, panic bars, pull/push handles, etc.) and provide information on design drawings. All equipment mounted to door leaf or frame shall be installed with welds or high grade bolts as specified in referenced Technical Specifications SP-J. Use of self-drilling screws or glues for door equipment mounting is not allowed. All equipment mounted on door shall withstand minimally 10.000 openings of the door without failure of equipment or mounting material. Airtight or watertight levers shall have enough free space between door leaf and lever. Manipulation with levers should be easy with minimum effort.

The contractor shall define spare parts list including quantities required for 10-years maintenance.

The Contractor shall define connection points for earthing on design drawings.

Security equipment shall meet the requirements provided in Chapter 4.1 of this Technical Specification. Connection points for security cabling shall be defined on design drawings.

## **2.2 DESIGN DRAWINGS & ANALYSIS**

The Contractor is responsible to perform NEK site walkdown(s) to confirm the accuracy of items provided in this Technical Specification and “As – Built” drawings before starting design process.

The Contractor shall prepare design drawings. Design drawings shall provide informations and details of door frame and leaf, frame installation details, door equipment, door equipment mounting details, sections, etc. Design drawings shall be approved by NEK prior the start of design analysis.

The Contractor shall prepare design analysis in accordance with NEK procedure ESP-2.605 “Design Analysis and Calculations”. The Contractor shall also review and approve the design analysis in accordance with NEK procedure ESP-2.607 “Design Verification”. After design analysis are verified and approved by Contractor, the analysis shall be send to NEK for final approval.

NEK shall provide to Contractor analysis number, title and analysis forms.

## **2.3 QUALIFICATION & FUNCTIONAL TESTING**

The Contractor’s scope of services shall include all required qualification testing. The qualification testing results shall achieve and meet all the criteria and requirements of this Technical Specification and documentation referenced by it.

The Contractor shall deliver qualification testing reports, which should include laboratory identification, identification of test specimen, test conditions, test inputs and outputs and conclusion.

Qualification testing shall be made in accredited laboratories in accordance with EN ISO 17028.

Functional testing shall be done after installation finish. The Contractor personnel shall be present at functional testing. During testing PDR(s) shall be written and signed at the end of functional testing. All deficiencies found at functional testing shall be eliminated. After all deficiencies are eliminated the functional test shall be repeated.

## **2.4 SHOP FABRICATION & DELIVERY**

Shop fabrication shall be made in accordance with referenced technical specifications SP-J.

Doors shall be shop fabricated and assembled in the shop to the greatest extent possible. Parts not completely assembled in the shop shall be secured by bolts to prevent damage in shipment and handling.

Doors, door equipment, spare parts and installation material and tools shall be delivered to NEK site prior the installation start and shall be stored in NEK warehouse until installation start.

## **2.5 INSTALLATION PACKAGE**

The contractor shall prepare Installation Package(s) in accordance with NEK procedure ESP-2.619 "Preparation of Installation Packages". It is important that the IP(s) documentation shall be provided and approved by NEK QA/QC and RE 5 weeks before any installation works are started by the Contractor.

## **2.6 INSTALLATION**

### **2.6.1 General**

The Contractor's scope of services shall include all required installation works. The installation shall be completed physically and functionally in a way that it will achieve and meet all the criteria and other requirements of this Technical Specification and documentation referenced by it.

Support activities of installation works to be done by the Contractor or its subcontractors.

The Contractor will provide all necessary lifting equipment, material, tools and consumables needed to complete the contracted Scope of Supply and Services. All materials and necessary consumables shall be in accordance with NEK Technical Specifications as prescribed in Item 4. If some missing material or consumables should be identified by the Contractor, the Contractor shall immediately inform NEK RE about the material and consumables status.

Lay down area for equipment and material required for installation works shall be defined by the Contractor in Installation Package documentation.

The Contractor is responsible for performing preparation works including preparation and protection of work areas, providing of lifting and transportation machinery, temporary storage, all required scaffolding, etc.

At the end of installation works the Contractor shall perform a final walkdown together with the NEK RE, QA/QC and TO representatives to confirm all installation works have been successfully finished and system is operational.

All works shall be normally planned from Monday to Saturday from 6 am to 5 pm.

All works shall be done within non – technological area of NEK.



ALARA principles are not predicted to be implemented. All works shall be done outside radiological controlled zone.

The Contractor's work leaders shall be present on site all the time when any of their activities are in progress.

The Contractor's work leaders shall be trained and qualified for work leaders and to provide "fire guard" supervision under the work on site.

The Contractor's installation team shall follow project documentation, and safety plan, which will be developed by civil work company building OSC.

Overall coordination of the installation work is under NEK coordination and responsibility.

The Contractor's site manager responsible for installation activities per this Technical Specification shall closely cooperate and coordinate his activities with other Contractor's representative(s) responsible for mechanical and electrical portions of work. Any dissidence between the different Contractor's representatives shall be resolved and coordinated with the NEK RE.

The Contractor is responsible for assuring adequate and qualified manpower in order to meet the schedule requirements for the scope of work per this Technical Specification.

The Contractor shall be obligated for cleaning of work areas.

The Contractor is responsible for control of special processes like visual concrete inspection, anti-corrosion protection, welding and anchoring in accordance with specifications, criteria and approved Contractor's procedures for such processes.

NEK shall be responsible for supervision. The Contractor's QC department and personnel shall be responsible for overall quality delegated by this Technical

Specification and shall closely cooperate with NEK QA/QC representatives and NEK RE.

The Contractor's responsibility is also to initiate and support the development of the FDCR(s) documentation in accordance with NEK procedure ESP-2.609 "Field Design Change request".

### **2.6.2 Door Replacement Installation Scope**

Replacement of doors in existing shelter (all doors with Z- designation except doors Z-9, Z-15 and Z-17) shall take place in one intervention. Existing door frames shall be demolished completely or partially, and removed from shelter and stored on construction site. Laydown area for demolished existing doors shall be determined by the Contractor in conjunction with civil work company. If required the concrete opening for new doors shall be prepared (including cutting of concrete, drilling of holes for reinforcement, reinforcement placing, paneling and concrete works) by the Contractor. The installation of door frame and leaves shall be done by the Contractor. During the installation of door frames and leaves the Contractor QC person shall be present on site. Connection to the electrical and security installation shall be done by Others. The Contractor shall prepare all connection points to electrical or security system.

### **2.6.3 Door Installation Scope**

Installation of doors in new building (all doors with V- designation including doors Z-9, Z-15 and Z-17) shall take place in one intervention. The installation of door frames shall be done by the Contractor. Door frames shall be installed in second phase concrete. The Contractor shall provide information for recess opening in design drawings. The grouting of door frame shall be done by Others. The Contractor shall provide grout information in design drawings. The installation of door leaves shall be done by the Contractor. During the installation of door frames and leaves the Contractor QC person shall be present on site. Connection to the electrical and security installation shall be done by Others. The Contractor shall prepare all connection points to electrical or security system.

## 2.7 FINAL REPORT

The Contractor shall develop the Final Report in accordance with NEK procedure ESP-2.619 "Preparation of Installation Package".

## 3.0 SAFETY CLASSIFICATION OF CONTRACTED WORK

The classification of contracted work is **Augmented Quality (AQ)**.

NEK QSD shall approve the Contractor's Quality Assurance (QA) Program.

## 4.0 DESIGN INPUTS

Requirements for each door are provided in Appendix 22.1 of this Technical Specification.

### 4.1 SECURITY REQUIREMENTS

Doors listed in Appendix 22.1 of this Technical Specification shall be designed in accordance with SIST EN 50518-1.

The Contractor shall provide technical data for cylinders. NEK shall provide cylinders to the Contractor for installation.

Electrically control exit systems on evacuation routes shall be in accordance with standard EN 13637.

Doors listed in Appendix 22.1 of this Technical Specification should be equipped with BMS system with anti-temper. BMS from manufacturer Cooper CSA S.r.l. item number 1021-N shall be used. BMS shall be mounted on those leafs, which shall have the possibility of separate opening.

Doors listed in Appendix 22.1 of this Technical Specification shall be equipped with electrical lock with bolt switching contact (12VDC).

The connection for BMS and electric lock installation shall be prepared on the top side of the door.

## **4.2 FIRE PROTECTION REQUIREMENTS**

Doors listed in Appendix 22.1 of this Technical Specification should be designed as as EI90 or EI180 minute fire resistant in accordance with EN 13501-2 on opposite hinge side.

## **4.3 WATERTIGHT REQUIREMENTS**

Doors listed in Appendix 22.1 of this Technical Specification should be designed as watertight at 8.0 water column with 1.0 l/hr leakage rate or less. Water pressure is considered as evenly distributed static influence applied perpendicular to the surface on both sides.

## **4.4 AIRTIGHT REQUIREMENTS**

Doors listed in Appendix 22.1 of this Technical Specification should be designed as airtight.

The resistance for invasion of contaminated air is expressed with allowable pressure drop in test chamber on the opposite hinge side. Conditions regarding air tightness are met, if the pressure in the test chamber does not fall more than 100 Pa in 5 minute period. The initial overpressure in the test chamber must be at least 1700 Pa.

## **4.5 RADIATION REQUIREMENTS**

Doors listed in Appendix 22.1 of this Technical Specification should be designed as as radiation resistant.

The resistance for radiation is expressed by the thickness of the material, whose surface density must be equal to the surface density of 800 mm of reinforced concrete.

#### **4.6 SHOCK WAVE REQUIREMENTS**

Doors listed in Appendix 22.1 of this Technical Specification should be designed as shock wave resistant.

Resistance against overpressure from shock wave is determined by the next effects of shock wave:

- 1 on hinge side as an evenly distributed static impact of 300 kPa applied perpendicularly on surface (positive impact);
- 2 on opposite hinge side as 20% of the value of positive impact (negative impact);

Positive and negative impact are not superimposable.

#### **4.7 PRESSURE REQUIREMENTS**

Doors listed in Appendix 22.1 of this Technical Specification should be designed as as 10 kPa pressure resistant.

Pressure of 10 kPa is considered as evenly distributed static influence applied perpendicularly to the surface on both sides.

#### **4.8 WIND REQUIREMENTS**

Doors listed in Appendix 22.1 of this Technical Specification should be designed to withstand maximum wind velocities of 140 km/h, when locked in open position.

#### **4.9 SEISMIC REQUIREMENTS**

Seismic qualification of doors and door equipment shall be done in accordance with the NEK specification SP-S702 and developed FRS curves for OSC.

## 4.10 MATERIAL REQUIREMENTS

All used material should be in accordance with NEK technical specifications SP-J listed in Chapter 5 of this Technical Specification.

All steel parts should be anticorrosion protected. Anticorrosion protection systems must provide high durability (over 15 years in accordance with standard ISO 12944-1) for high atmospheric corrosion category (C4-high in accordance with standard ISO 12944-2). Coating system should not release any toxic substances at temperature 363 K. Prior grit blasting surfaces shall be free of any chemical contamination like fats, oils, salts or other electrolytes. If needed degreasing and/or water cleaning shall be provided to provide proper clean surface prior surface preparation.

Two protective systems which can be used are provided in this Technical Specification. Both are based on epoxy - polyurethane generic type of paint materials. Alternative protective systems must be verified and confirmed by NEK. Used coating materials must be tracked by their respective batch number.

### Epoxy - polyurethane system

- Grit - blasting to near-white metal - Sa 21/2 according to ISO 8501-1;
- 1x epoxy barrier primer (without active pigments);
- 1-2x epoxy intermediate coating with micaceous iron oxide;
- 1x polyurethane topcoat 60-80µm (gloss at least 75%);
- Total nominal thickness of protective system: 280µm.

### Duplex epoxy - polyurethane system

- Hot-dip galvanization in compliance with ISO 1461;
- Sweep blasting of surface in compliance with ASTM D6386;
- 1x epoxy barrier primer/sealer (without active pigments), 30-40µm;
- 1x epoxy intermediate coating with micaceous iron oxide, 60-70µm;
- 1x polyurethane topcoat 60µm (gloss at least 75%);
- Total nominal thickness of paint protective coating system: 160µm.

## 4.11 DESIGN REQUIREMENTS

Steel bearing elements of doors should be designed using ultimate limit state or with allowable stress method in accordance with Eurocode or ANSI applicable standards.

If the ultimate limit state is used, partial safety factor of 1.0 should be used. If the allowable stress method is used, the maximum stress in steel should not exceed 80% of yield strength.

Anchoring shall be designed using ACI 349 standards.

All calculations should be prepared, verified and approved in accordance with NEK procedure ESP-2.605 "Design Analysis and Calculations".

## 5.0 APPLICABLE NEK DESIGN CONTROL PROGRAM

The overall control shall be in accordance with the approved Contractor's QA Manual (in accordance with Item 20) and applicable NEK ADP, QCP, ESP, GMC, QS and FPP procedures and quality program requirements for performing engineering and installation work services.

The procedures primarily applicable to the scope described herein include but are not limited to the following.

### 5.1 NEK TECHNICAL SPECIFICATIONS

The NEK technical specification are primarily applicable to the scope described herein but are not limited to the following:

- |            |   |
|------------|---|
| a. SP-S702 | Seismic Analysis, Testing and Documentation   |
| b. SP-J200 | Reinforced Concrete Including Formwork        |
| c. SP-J201 | Placement of Reinforcing Steel                |
| d. SP-J500 | Fabrication and Delivery of Reinforcing Steel |
| e. SP-J501 | Fabrication and Delivery of Structural Steel  |
| f. SP-J502 | Embedments and Anchor Bolts                   |

g. SP-J503

Miscellaneous Steel

## **5.2 ESP PROCEDURES**

- a. ESP-2.609 Field Design Change Request
- b. ESP-2.619 Preparation of Installation Packages
- c. ESP-2.605 Design Analysis and Calculations
- d. ESP-2.607 Design Verification

## **5.3 QUALITY SYSTEM PROCEDURES**

- a. QS 610 Generic Quality Assurance Program Specification, Revision 1
- b. ISO 9001:2008 Quality management systems – Requirements
- c. ISO 14001:2004 Environmental management systems – Requirements with guidance for use
- d. OHSAS 18001 Occupational Health and Safety Zone

## **5.4 OTHER**

- a. NEK Safety Upgrade Project Design Inputs and Interfaces, Revision 8
- b. The Contractor's procedures related to specified scope of work.
- c. OSC Construction Site Safety Plan

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

The design criteria, regulations, codes and other applicable standards listed in this Technical Specification are applicable and will be considered in the detailed design.

IP document and installation works shall be in compliance with all applicable codes and standards including the following.



## **6.1 EUROCODE STANDARDS**

## **6.2 AMERICAN CONCRETE INSTITUTE (ACI)**

- a. ACI 318-11 Building Code Requirements for Structural Concrete and Commentary
- b. ACI 349-06 Code Requirements for Nuclear Safety – Related Concrete Structures and Commentary

## **6.3 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)**

- a. AISC 303-10 Code of Standard Practice for Steel Buildings and Bridges, April 2010
- b. ANSI/AISC 360-10 Specification for Structural Steel Buildings

## **6.4 AMERICAN WELDING SOCIETY (AWS), D1.1, “STRUCTURAL WELDING CODE”**

## **7.0 AFFECTED SYSTEMS**

All performed scope and supply of work per this Technical Specification affects AB and TZ system.

## **8.0 IDENTIFICATION OF AFFECTED EQUIPMENT**

Next doors shall be replaced per this Technical Specification: Z-1, Z-2, Z-13, Z-14 and Z-16.

Next doors shall be installed per this Technical Specification: V-1, V-7, V-8, V-9, V-10, V-11, V-12, V-16, V-19, V-20, V-21, V-22, V-23, V-24, V-25, V-26, V-27, V-28, V-33, V-34, V-35, Z-9, Z-15 and Z-17.

## 9.0 REVIEW AND VERIFICATION OF THE WORK

All performed scopes of work shall be internally verified and approved by the Contractor. The Contractor shall deliver to NEK verification records.

## 10.0 SCHEDULE REQUIREMENTS

The Contractor shall plan and align installation works with NEK schedule and provide sufficient number of qualified personnel in order to complete all installation works within the time defined below.

Activity	Deadline
Contract signature	$T_0$
Delivery of Project Management Plan and Project Quality Plan	$T_0 + 3$ weeks
Delivery of Design Drawings and Analysis	$T_0 + 8$ weeks
Start of manufacturing process	$T_0 + 10$ weeks
Delivery of Installation Package	18.12.2017
Delivery of doors, spare parts, installation material and tools	12.2.2018
Delivery of Qualification Reports	12.2.2018
Start of installation	19.2.2018
Functional testing	21.5.2018
Final Walk Down	4.6.2018
Delivery of preliminary Final Report	11.6.2018
Exit meeting	15.6.2018
Final Report	16.7.2018

## 11.0 STATUS REPORTING REQUIREMENTS

The Contractor shall on a weekly basis inform and deliver written reports to NEK RE on the status of the work performed on the Project. Information shall contain brief description of the work completed during the previous period, and the estimated position related to the approved schedule. Any impediments to the progress shall be identified and the solution resolving the problem shall be stated. Each report shall indicate the Contractor's commitment in meeting the final installation date feasible.

## **12.0 WORK OR INFORMATION PROVIDED BY NEK**

- a. Designate project RE who will serve as interface with the Contractor
- b. Provide the overall project coordination
- c. Provide access for WD and onsite inspection of all areas where installation works will be performed by the Contractor
- d. Provide access for the Contractor's personnel to NEK
- e. Provide required qualification courses for the Contractor's personnel (expenses to be covered by the Contractor)
- f. Provide all required drawings and procedures required for engineering and installation works implementation of all required works in NEK
- g. Provide temporary storage for equipment and installation material
- h. Prepare work orders and provide prerequisites for the start of installation works
- i. Attendance and supervision of installed works and provision of Field Design Request Change (FDCR) if changes of installation or design documentation are required
- j. Clarification of any technical ambiguities related to the contracted scope of work

## **13.0 CHANGES OF WORK SCOPE**

N/A

## **14.0 DOCUMENTATION TO BE PROVIDED BY THE CONTRACTOR**

### **14.1 GENERAL**

All documents submitted shall be in the form of hard copies and electronic media. Hard copies shall be in the form of two (2) good quality full – size reproducible, and electronic media shall be submitted in pdf format (original paper size).

Documents for submittal shall be formatted in format A4, and drawings shall be format A2 or smaller formats A3 and A4 whenever possible.

All data on documents including structural analysis, calculation, mark ups etc. shall be in SI units (m, kg, s, etc.).

Electronic media shall be in a format fully compatible with the following software:

- |                             |   |
|-----------------------------|---|
| a. Word processing          | Microsoft WORD                            |
| b. Spreadsheets             | Microsoft EXCEL                           |
| c. Computer aided drafting  | AUTOCAD                                   |
| d. Planning and scheduling  | Microsoft MS PROJECT 2003 or<br>PRIMAVERA |
| e. Image documents          | ADOBE ACROBAT READER                      |
| f. Calculation and analysis | ANSYS                                     |

All submittals shall be made electronically during the course of the project submittal and review cycles, with the use of hard copies via international courier kept to the minimum.

The submitted documents shall bear at least the following identification:

- a. The Contractor's name
- b. Date of issue
- c. Document number
- d. Revision number
- e. NEK's order number
- f. NEK's specification number

The Contractor shall submit to NEK for review and approval the following documentation:

## **14.2 TECHNICAL BIDDING DOCUMENTATION**

The technical bidding documentation shall consist of the following chapters:

- a. Technical description including type of door, door equipment and spare parts list
- b. List of standards used
- c. List of material and equipment specifications purchased by the Contractor

- d. Listing of corrosion protection and painting specifications
- e. List of qualification and inspection procedures
- f. Project realization schedule
- g. Project organization chart
- h. Safety at work certification for all personnel
- i. List of envisaged subcontracting companies to be contracted by the Contractor
- j. Quality Manual controlled copy
- k. Reference list of similar projects for last 5 years

The Contractor shall demonstrate in technical description of quotation how the required scope of work will be accomplished within planned and scheduled timeframe of the Project.

#### **14.3 BEFORE INSTALLATION START**

The Contractor shall deliver next documentation before the start of installation works:

- a. Project Management Manual
- b. Project Quality Plan
- c. Delivery of design drawings
- d. Delivery of approved Design Analyses and Calculations
- e. Delivery of approved Installation Package
- f. Qualification Testing Report(s)

#### **14.4 DURING INSTALLATION**

The Contractor shall deliver next documentation during installation:

- a. Certificates of installed material supplied by the Contractor
- b. QC reports
- c. NCR(s) and FDCR(s) if any

## 14.5 AFTER INSTALLATION

After completion of service activities the Contractor shall prepare preliminary final report on completed work. Preliminary report on work performed shall include at least following documentation:

- a. Overview of uncompleted works on the equipment/material in tabular form
- b. Overview and status of unplanned works completion specified in reports in tabular form
- c. Overview of non conformance reports with status open/closed in tabular form
- d. Evaluation of the quality of works completed and recommendations for maintenance/servicing of equipment

Two (2) copies of the preliminary report shall be handed over by the Contractor's RE and QA engineer on the exit meeting.

Final Report shall be delivered to NEK 30 days after service completion and shall include at least following documents:

- a. Introduction
- b. Equipment list
- c. Reports on works completed per equipment
- d. List of working and inspection procedures
- e. List of installation items and materials
- f. List of measuring and test equipment used
- g. List of equipment certificates and material certificates
- h. List of qualified personnel and qualification certificates
- i. List of non-conformances and non-conformance reports
- j. Short description of non-conformance
- k. Short description of corrective action
- l. Has the corrective action been implemented (yes or no)?
- m. Used welding procedures
- n. Welders certificates
- o. Fulfilled QA/QC plans
- p. Certificates of installed material supplied by the Contractor

- q. One complete set of As-Built mark-up drawings and documentation in accordance with NEK ADP and ESP procedures
- r. Qualification and inspection reports as it is required per this Technical Specification
- s. Resolved FDCR's, if any (textual, drawings, sketches, etc.)

## 15.0 RECORDS

The Contractors responsible person shall deliver closed work order with all QC documentation within two (2) days of work completion, when installation works per separate work order are completed.

After the closure of installation works the Contractor shall deliver final report which will include documentation as prescribed in Chapter 14.5 of this Technical Specification.

## 16.0 ORGANIZATIONAL CONTACT

The Contractor shall coordinate all technical, commercial and scheduled matters with the assigned NEK RE.

Technical: Mr. Jože Kerin, Project Manager  
+386 (0)7 4802 138  
[joze.kerin@nek.si](mailto:joze.kerin@nek.si)

Mr. Igor Horvat, Civil works  
+386 (0)7 4802 153  
[igor.horvat@nek.si](mailto:igor.horvat@nek.si)

Mr. Darijan Vukas, Civil works  
+386 (0)7 4802 876  
[darijan.vukas@guest.nek.si](mailto:darijan.vukas@guest.nek.si)

Commercial:

Mrs. Andreja Deržič

+386 (0)7 4802 348

[andreja.derzic@nek.si](mailto:andreja.derzic@nek.si)

## 17.0 CONTRACTOR TECHNICAL APPROACH TO THE WORK

The Contractor's responsibilities are specified in Chapter 2 of this Technical Specification.

The Contractor shall supply a short description "Technical Approach to the Work", which shall include a brief description of the expected installation works and how they will be performed. The description must clearly show how the Contractor understands the requested scope of work and time schedule.

Installation works shall be performed in accordance with the Contractor's QA plan, program and technological and control procedures approved by NEK. Works shall be under supervision and coordination of responsible NEK coordinator and the Contractor's QA/QC personnel. The Contractor shall provide proper number of qualified QA/QC controllers for implementation of proposed scope of work.

Before the start of installation works the Contractor shall provide a list of all personnel to be involved with their qualification and indication of the type of work they will perform. The Contractor shall also provide a list of his responsible personnel with their qualification and indication of the type of work they will perform.

The Contractor's personnel involved in installation works shall complete the following NEK training before the start of activities in NEK:

- a. Basic qualification of personnel
- b. Qualification of installation work responsible personnel

The installation works shall be performed in accordance with the prescribed procedures and instructions with special attention to following but not limited to:

- a. Fulfillment of all prerequisites for start of installation works



- b. Preparation for installation works
- c. Quality of work
- d. Cleanliness of work area before, during and after installation works

## **18.0 ACCESS TO CONTRACTOR FACILITY AND DOCUMENTS**

The Contractor shall provide access to the Contractor's and authorized sub contractor's facilities to NEK personnel who are engaged in the work for purpose of reviewing the quality and the amount of the work being performed.

## **19.0 SUBCONTRACTED WORK**

All sub contractors shall be listed in the proposal. If the selected Bidder after the Contract signature wants to change or select new sub supplier, this is subject to NEK approval.

The Contractor shall impose to its Subcontractors the requirements of this Technical Specification.

The Contractor shall ensure that all Subcontractors meet the requirements of this Technical Specification.

Since the Contractor retains full responsibility for all aspects of Subcontractors performance (including quality and schedule), the Contractor shall ensure that adequate and periodic audit and surveillance of the Subcontractors is maintained. The Contractor shall identify to all Subcontractors all applicable QA and QC requirements imposed by the NEK's specifications on the Contractor and shall ensure compliance thereto. NEK's right of access to the Contractor's Subcontractors facilities for the purpose of inspection or audit shall be imposed by the Contractor's documents.

The Contractor shall not subcontract any portion of the work scope without written approval of the NEK RE.

Subcontractors performing augmented quality service shall need to have either by NEK approved QA Program or work in conjunction with the NEK QA Program as identified in QS-610, revision 1 Requirements.

## **20.0 QA PROGRAM REQUIREMENTS**

All work shall be performed and/or provided in accordance with the Contractor's Quality Assurance Program that has been previously evaluated and accepted by NEK QSD.

### **20.1 CONTRACTOR'S QA PROGRAM**

#### ***20.1.1 QA Program Manual***

Submittal of QA Program in accordance with QS 610, Revision 1 is a prerequisite for selection of a BIDDER as a CONTRACTOR. The Contractor shall implement and maintain this program while carrying out the requirements of this specification. All proposed changes to the program shall be submitted to, and approved by the Purchaser prior to implementation.

#### ***20.1.2 Material Control and Identification***

The Contractor/Supplier shall establish and maintain system for the identification and control of materials, parts, and components. These measures shall ensure that identification of the item is maintained by the part number, serial number or other appropriate means on the item and on the records traceable to the item through fabrication, shipment, and use of the item.

These identification and control measures shall be designed to:

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

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

#### ***20.1.3 Contractor's Responsibility for Subcontractors***

Where applicable, the Contractor shall impose on its subcontractors the requirements of this Technical Specification and shall ensure that they meet applicable requirements of this Technical Specification. The Technical Specification requirements for procedure submittals shall apply to subcontractors for operation or service not performed by the Contractor. The Contractor shall review subcontractors procedures and obtain the Purchaser's approval in writing prior to the start of subcontractors scope of work or services.

The Contractor shall make available to the Purchaser one controlled copy of the main subcontractor's list for the duration of the Contract. The Contractor shall identify, in purchase documents to its suppliers, all applicable quality and QA requirements imposed by the Purchaser's Technical Specification on the Contractor and shall ensure compliance therewith.

#### ***20.1.4 Manufacturing, Erection and Inspection Plans***

The Contractor shall provide the manufacturing, erection and inspection plans for Purchaser's review and approval prior to the start of manufacturing. The manufacturing, erection and inspection plans shall cover at least all relevant inspection requirements and shall outline the manufacturing and production sequence and specific preplanned Contractor inspections required to be performed. The Contractor shall update the manufacturing, erection and inspection plan and submit copies thereof to the Purchaser when changes are approved by the Purchaser.

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

## **21.0 NEK PROPRIETARY DATA**

NEK has a proprietary interest in all of the drawings, designs, specifications, calculations, documents, informations or know-how which may be furnished pursuant contract execution and in know-how improvement, discovery or invention which may be made, developed or conceived in the performance of work hereunder or which may be raise or result there from (hereinafter collectively referred to as the "Information"). All such Information shall be considered to be proprietary of NEK. The right to use of all such Information shall be transmitted to the Contractor only for its personnel use and shall be entirely restricted to the performance of the Contract and subject to the confidentiality provision.

## Appendices

## 22.0 APPENDICES

## 22.1 DESIGN REQUIREMENTS

Number	Door No.	Type (see note 1)	Opening direction & type (see note 2)	Free width opening [in cm]	Free height opening [in cm]	Security requirements	Fire protection requirement EI180	Fire protection requirement EI90	Fire protection EI90-SC	Watertightness requirements	Airtightness requirements	Radiology requirements	Shock wave requirements	Pressure requirements	Seismic requirements	Wind requirements	Electric control for evacuation routes (EN 13637)	Monitoring and alarm receiving center requirements (SIST EN 50818-1)	Balanced magnetic switch (see note 3)	Electrical lock (see note 4)	Lock mechanism in door open position
1	Z-1	1	R	100	180		x			x	x	x	x	x	x						
2	Z-2	1	L	100	180		x				x			x	x						
3	Z-9	1	R	70	205						x			x	x						
4	Z-13	1	L	65	80			x	x		x			x	x						
5	Z-14	1	L	65	80		x			x				x	x						
6	Z-15	1	L	110	205		x			x				x	x						
7	Z-16	1	L	65	80		x			x				x	x						
8	Z-17	1	R	110	205									x	x						
9	V-1	1	L	110	205					x	x			x	x						
10	V-7	1	R	110	205	x			x						x		x	x			
11	V-8	1	R	80	205						x				x						
12	V-9	1	R	70	165					x	x				x						
13	V-10	1	R	70	205		x			x		x	x	x	x						
14	V-11	1	L	100	205	x									x		x	x			
15	V-12	1	R	100	205	x			x						x		x	x			

Number	Door No.	Type (see note 1)	Opening direction & type (see note 2)	Free width opening [in cm]	Free height opening [in cm]	Security requirements	Fire protection requirement EI180	Fire protection requirement EI90	Fire protection requirement EI90-SC	Watertightness requirements	Airtightness requirements	Radiology requirements	Shock wave requirements	Pressure requirements	Seismic requirements	Wind requirements	Electric control for evacuation routes (EN 13637)	Monitoring and alarm receiving center requirements (SIST EN 50818-1)	Balanced magnetic switch (see note 3)	Electrical lock (see note 4)	Lock mechanism in door open position
16	V-16	1	L	100	205				X						X						
17	V-19	1	L	80	160				X						X						
18	V-20	1	L	80	160				X						X						
19	V-21	1	L	110	160				X						X						
20	V-22	1	R	80	160				X						X						
21	V-23	1	R	110	205						X			X	X		X				
22	V-24	1	R	115	205		X			X	X	X		X	X						X
23	V-25	1	R	100	205										X						
24	V-26	1	L	110	205				X						X						
25	V-27	1	R	110	205						X			X	X		X				
26	V-28	1	R	115	205		X			X	X	X		X	X						
27	V-33	1	L	62.5	80						X			X	X						
28	V-34	1	L	62.5	80		X				X	X		X	X						
29	V-35	1	L	70	205										X		X				

Note 1:

1 – leaf door

Note 2:

R – right opening

L – left opening

Note 3 &amp; 4:

Information about BMS and electrical lock

shall be determined later in project.