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Revision 1

TECHNICAL SPECIFICATION  
NUCLEAR SAFETY CLASS VALVES  
KRŠKO NUCLEAR POWER PLANT

SP-G508A-536633-00026

Revision 1

SAFETY RELATED

prepared for

NUKLEARNA ELEKTRARNA KRŠKO

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### ATTACHMENTS

Table I, "Design Load Combinations and Stress Limitations."

Table II, "Pmax vs Pr."

Design Specifications:

Exhibit A, "Nuclear Safety Class Valves - ASME III Class 1, 2 or 3"

Valve Specification Sheets:

Equipment Specification Exceptions form (1 page)

Equipment Data forms (2 pages)

Specifications:

SP-S701-044687-000, "Safety Related Electric Motor-Driven Valve Operators"

SP-S702-044687-000, "Seismic Analysis, Testing, and Documentation"

Drawing D-301-001, Weld Preparation

## 1.0 SCOPE

### 1.1 Scope of Work

1.1.1 This Specification establishes the criteria for design, fabrication, testing, and inspection required for Nuclear Safety Class Valves, Classes 1, 2, and 3, for the KRk.0 Nuclear Power Plant.

1.1.2 The VENDOR shall be responsible for compliance with all of the detailed requirements presented in this Specification. The VENDOR is responsible for performing, in addition to the requirements of this Specification, such analyses, tests, inspections, and other activities which the VENDOR considers necessary to insure that the design, material, and workmanship are satisfactory for the service intended, or as may be required by common usage or good practice.

### 1.2 Equipment, Material, and Services to be Furnished by the VENDOR

The equipment and services to be furnished, with the materials and accessories pertaining thereto, shall include, but not necessarily be restricted to, the following:

- a. Valves of the types and sizes as designated in the Valve Specification Sheets included in the NEK procurement document.
- b. Any special tools necessary for installation and maintenance of valves.
- c. Manufacturer's stress report calculations for valves and accessories.
- d. All code reports of materials, testing, and qualifications specified herein.
- e. The furnishing of reproducible drawings and information as specified herein.

### 1.3 Equipment, Material, and Services to be Furnished by Others

The following equipment and services will be furnished by others:

- a. Unloading, storage, erection, and installation of valve assemblies.
- b. Supplying and connecting all external wiring to the valves and their accessories.
- c. All connecting piping, supports, gaskets, and flange bolts.

### 1.4 Information Required with the Proposal

The VENDOR shall submit with the Proposal complete data for the equipment offered. The following information shall be submitted:

- a. Reproducible outline and sectional drawings for each valve. Include: overall dimensions, valve type, pressure class, ASME Code Section III class(es), manufacturer's figure number, connection size, weight, center of gravity, and material specification of all pressure-retaining and structural (valve and actuator) parts,



including identification of hardfaced areas. Accessories may be covered on separate drawings providing a convenient cross-reference is furnished.

- b. Standard catalog information covering valves and accessories offered.
- c. Completion and return of the attached Equipment Data forms.
- d. Information required under items 3.1.2, 3.1.4 subitem b., 3.1.8 subitem c.
- e. Deviations or exceptions to this Specification as listed on the attached Equipment Specification Exceptions Form. Unless specifically stated otherwise, the VENDOR is assumed to propose furnishing services and materials in exact accordance with this Specification, and any modifications to the services and materials necessary to comply with this Specification.

#### 1.5 Documentation Requirements Following Order Placement

The following documentation shall be submitted to NEK by the VENDOR:

- a. Seismic/operability reports as required by Items 3.1.8 and 4.2.
- b. Drawings as required by Item 2.3.
- c. "Installation, Operation & Maintenance Instruction Manual" Item 2.4.
- d. Certified Hydrostatic Test Reports, and any Change Reports per Item 7.4.
- e. Certified Material Test Reports for pressure retaining materials and Certificates of Compliance for other materials.
- f. Report Performance Test 4.1. (Power Operated Valve only)
- g. All reports required by the ASME III Code valves.
- h. List of fabrication procedures per Item 6.1.
- i. List of welding procedures per Item 6.3.
- j. Inspection and NDE Reports, and any Modification or Change Reports per Item 7.2.
- k. List of Testing and Inspection procedures per Item 7.1.
- l. Description of preparation for shipping per Item 8.4.4.
- m. Log of component quality control per Item 9.2.
- n. A "Certificate of Conformance" certifying all requirements of this Technical Specification and purchase order have been met.
- o. Environment Qualification Report per Item 3.2 subitem c.

## 2.0 APPLICABLE DOCUMENTS

Any conflicts between this Specification and the applicable documents or between applicable documents or between applicable documents shall be brought to the attention of NEK prior to any action by the VENDOR.

### 2.1 Supplemental Specifications and Information

Items attached, as listed on the contents page, are hereby made a part of this Technical Specification.

### 2.2 Applicable Codes and Standards

All design materials, fabrication, examination, testing, inspection, stamping, certification, and documentation shall conform to applicable portions of the following specifications, standards, and codes, including case rulings, interpretations, and addenda as applicable.

#### a. American National Standards Institute (ANSI)

1. B16.34-1981, "Steel Valves, Flanged and Buttwelded End."
2. B16.10-1992, "Face-to-Face and End-to-End Dimensions of Ferrous Valves."
3. B16.11-1991, "Forged Steel Fittings, Socket-Welding and Threaded."
4. N18.2-1973, "Stationary Pressurized Water Reactor Plants, Nuclear Safety Criteria for the Design of."
5. N45.2-1977, "Quality Assurance Program Requirements for Nuclear Power Plants."
6. N45.2.1-1980, "Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants".
7. N45.2.2-1978, "Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants."

#### b. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (hereinafter referred to as "the ASME Code"), 1971 Edition, with all addenda up to and including Winter, 1972 or a later edition approved for use in the U.S. Code of Federal Regulations 10CFR50.55a. Documentation will clearly document the applicable code date.

1. Section II, "Material Specifications," Part A, "Ferrous Materials."
2. Section III, "Nuclear Power Plant Components."
3. Section V, "Non Destructive Testing."
4. Section IX, "Welding and Brazing Qualifications."

5. Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."
- c. American Society for Testing and Materials (ASTM), current date where applicable. Specified ASTM s herein include:
  1. ASTM-A262, "Detecting Susceptibility to Intergranular Attack in Stainless Steels, Recommended Practices for."
- d. American Welding Society (AWS) Specifications current date where applicable.
- e. Code of Federal Regulations, Part 50, Title 10, Chapter 1, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants", 1973.
- f. Code of Federal Regulations, Part 21, Title 10, "Reporting of Defects and Non-Compliance".
- g. IEEE 344-1975, "IEEE Standard Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations".
- h. IEEE 323-1974, "Qualifying Class 1E Equipment for Nuclear Power Generating Stations".
- i. IEEE 382-1985, "Standard for Qualification for Power Operated Valve Assemblies with Safety Related Functions for Nuclear Power Plants".
- j. Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  1. SP-25-1993, "Standard Marking System for Valves, Fittings, Flanges, and Unions."
  2. SP-45-1992, "Bypass and Drain Connection Standard."
  3. SP-55-1985, "Quality Standard for Steel Castings - Visual Method."
  4. SP-61-1992, "Hydrostatic Testing of Steel Valves."
- k. United States Nuclear Regulatory Commission (USNRC) Regulatory Guides
  1. 1.29-1973, "Seismic Design Classification."
  2. 1.31-1973, "Control of Stainless Steel Welding."
  3. 1.44-1973, "Control of the Use of Sensitized Stainless Steel."
  4. 1.48-1973, "Design Limits and Loading Combinations for Seismic Category I Fluid System Components."
  5. 1.50-1973, "Control of Preheat Temperature for Welding of Low Alloy Steel."
  6. 1.89-1974 "Qualification of Class 1E Equipment for Nuclear Power Plants".

7. 1.100-1976 "Seismic Qualification of Electric Equipment for Nuclear Power Generating Stations".

### 2.3 Drawings

The VENDOR'S reproducible drawings of each type valve assembly shall include the following information:

- a. Valve assembly outline and sectional view showing internal construction, valve end contours, and flange ends with principal dimensions. The actuator, accessories, or both may be shown on separate drawings if a specific cross-reference is established on the drawings.
- b. ASME or ASTM designation of all materials shown, including location and description of hard-surfaced areas.
- c. Overall dimensions, including maintenance clearance and operator open dimensions.
- d. Weights of valves with all accessories to accommodate a motor operator, air operator, motor operators, and gear operators, including the center of gravity of each of the above.
- e. Pressure class, size, safety class, and figure number.
- f. List of nondestructive testing (NDT) examinations (ASME number or Procedure Reference) to be performed.
- g. Identification of all pressure-retaining parts and all parts of active valves required for active function.
- h. Valve  $C_v$  in the wide open position.
- i. Minimum wall thickness, including corrosion allowance of all pressure-retaining parts.
- j. Any limitation regarding installation of the valve. If there is no indication on the Drawing, it shall be assumed that the valve can be installed in any position and function properly.
- k. Valve identification number as defined by the Valve Specification Sheets.

### 2.4 Installation, Operation & Maintenance Instruction Manual

An "Installation, Operation & Maintenance Manual" shall be provided with each valve assembly and include the following:

- a. Valve assembly drawing per Item 2.3.
- b. Spare parts list for consumables identifying size, composition, part number, Supplier, and any special ordering instructions. See Item 3.2.

- c. Packing Replacement per Item 3.3.3 subitem c.
- d. Gagging procedure per Item 3.3.5.e. (Safety & Relief Valves only)
- e. Torquing Requirements per Item 3.3.1 subitem d.

### 3.0 DESIGN REQUIREMENTS

#### 3.1 General Requirements

3.1.1 The equipment furnished shall be suitable for specific conditions normally encountered in nuclear power plant service. Valves and accessories shall be capable of continuous satisfactory operation under their respective design operating conditions with a reasonable operating margin, without undue strain, corrosion, deterioration, leakage, vibration, or other operating deficiencies.

3.1.2 All valve assemblies as furnished with any combination of options and accessories shall be designed to suffer no structural damage when subjected to the maximum steady state, cyclic, and cumulative effects of all conditions specified herein during a 40-year operating life. The VENDOR shall describe in detail in the Proposal the procedures he will employ to prove equipment adequacy with respect to design and loading requirements.

#### 3.1.3 Working Fluids

The applicable working fluid (WF) for each valve is identified on the Valve Specification Sheets and typical properties defined as follows:

- a. Reactor coolant water chemistry (WF-1)
  - 1. pH, normal operation (with LiOH or NH<sub>4</sub> OH or KOH) at 25 C 4.2 to 10.5
  - 2. Hydrogen, cc (STP)kg H<sub>2</sub>O 25 to 35
  - 3. Chlorides, ppm <0.15
  - 4. Fluorides, ppm <0.15
  - 5. Boric acid, ppm boron as H<sub>3</sub>BO<sub>3</sub> to 4,000
  - 6. Suspended solids, ppm maximum 1.0
  - 7. Dissolved oxygen, ppm maximum 0.1
- b. Component cooling water chemistry (WF-2)
  - 1. pH at 25 C 8.0 to 9.0
  - 2. Chloride, ppm <0.15

	3. Fluoride, ppm	<0.15
	4. Corrosion inhibitor	Chromate, $\text{CrO}_4$ 1000 ppm for 1 week, 175 to 225 ppm thereafter
c.	Boric acid solution (WF-3)	12% by weight
d.	Saturated steam (WF-4)	
e.	Demineralized and makeup water (WF-5)	
	1. Oxygen, ppm	<0.10
	2. Chloride, ppm	<0.15
	3. Fluoride, ppm	<0.15
	4. Total solids, ppm	<0.5
	5. Carbon dioxide, ppm	2.0
	6. Particulates, microns	2.5
	7. Silica, ppm	0.2
	8. pH	6.0 to 8.0
f.	No. 2 fuel oil (WF-6)	
g.	Lube oil (WF-7)	
h.	River water chemistry (WF-8)	
	1. Total hardness, ppm $\text{CaCO}_3$	250
	2. Total alkalinity, ppm $\text{CaCO}_3$	195
	3. Chlorides, ppm	11.7
	4. Sulphates, ppm $\text{SO}_4$	48
	5. Nitrates, ppm $\text{NO}_3$	21.7
	6. Total dissolved solids, ppm	425
	7. Total suspended solids, ppm avg/max	179/800
	8. pH	7.4 to 7.7
	9. Residual chlorine, ppm	0.5 to 3.0

i. Filtered and potable water chemistry (WF-9)

1.	Total hardness, ppm $\text{CaCO}_3$	146
2.	Total alkalinity, ppm $\text{CaCO}_3$	32
3.	Chlorides, ppm	14.9
4.	Sulphates, ppm $\text{SO}_4$	95.3
5.	Nitrates, ppm $\text{NO}_3$	22.3
6.	Total dissolved solids, ppm	200
7.	pH	10.2
8.	Residual chlorine (potable water only)	0.2 to 0.5

j. Condensate and feedwater (WF-10) same as WF-5 except

$\text{O}_2$  <5 ppb  
 $\text{H}_2$  5 ppb >0  
pH 8.8 - 9.2

k. Chilled water system - demineralized water (WF-11) with the following:

1.	Corrosion inhibitor	Sodiumtetraborate/sodium nitrate (70/30 ratio, 1500 to 2500 mg/l)
2.	pH range at 25 C	8.0 to 9.0
3.	Chloride, ppm	0.15 max
4.	Fluoride, ppm	0.15 max

### 3.1.4 Design Specifications

- Exhibits A, contain design conditions which provide a complete basis for construction of the valves in accordance with the ASME Code, Section III.
- The VENDOR shall verify that Exhibits A, contain sufficient detail, with exceptions noted, to provide a complete basis for construction of the valve in accordance with the ASME Code, Section III. If the VENDOR requires supplemental information, he shall submit a request for the additional information with the Proposal.

### 3.1.5 Seismic Design Requirements

- The valves specified herein are classified Seismic Category 1 as defined by USNRC Regulatory Guide 1.29.

- b. Valve assemblies shall satisfy the requirements of Item 4.2 of this Specification.
- c. All electrical devices shall be seismically qualified per IEEE-344-A75.

### 3.1.6 Maximum Piping Loads

- a. The maximum anticipated forces and moments imposed by the piping on the valve end connections are as follows:

Forces and Moments	<u>Plant Loading Conditions</u>			
	<u>Normal</u>	<u>Upset</u>	<u>Emergency</u>	<u>Faulted</u>
F-Axial Force (kips)	$\pm .505A_p$	1.2 x Normal	1.8 x Normal	1.8 x Normal
V-Shear Force (kips)	$\pm .361A_p$	1.2 x Normal	1.8 x Normal	1.8 x Normal
M-Resultant Moment (ft-kips)	$\pm .361Z_p$	1.2 x Normal	1.8 x Normal	1.8 x Normal
M <sub>T</sub> -Torsional Moment (ft-kips)	$\pm .361Z_p$	1.2 x Normal	1.8 x Normal	1.8 x Normal

Where:

F = Axial force acting along the pipe centerline at pipe-nozzle interface (kips).

V = Shear force acting along any radial direction of pipe at pipe-nozzle interface (kips).

M = Resultant moment acting at pipe-nozzle interface, obtained by square root of sum of squares method (ft-kips).

Mathematically  $M = \sqrt{M_1^2 + M_2^2}$  where  $M_1$  and  $M_2$  are bending moments acting along two perpendicular axes.

M<sub>T</sub> = Torsional Moment acting at the pipe centerline at the pipe flange interface (ft-kips).

A<sub>p</sub> = Metal area of pipe (in<sup>2</sup>).

Z<sub>p</sub> = Section modulus of pipe (in<sup>3</sup>)



- b. The VENDOR shall certify that the structural integrity of the valve will be maintained and that piping and load stress analysis is not required when the following conditions are satisfied:
1. The minimum section modulus and area of the valve body crotch are equal to or greater than 110% of that of the connecting piping.
  2. The ASME Code allowable stress limits of the valve body material are greater than or equal to that of the connected piping. If the valve body material allowable stress is less than that of the connected piping, the valve section modulus and area as calculated in subitem 1. above shall be multiplied by the ratio  $S_{pipe} / S_{valve}$ .

### 3.1.7 Radiation Doses

Ambient radioactivity level for valves designated for radioactive service in the Valve Specification Sheets is 50 rads/hour gamma radiation. Gaskets, packing, and seat rings, in particular, shall be selected of materials which will not deteriorate between normal replacement intervals.

### 3.1.8 Design Limits and Loading Combinations

- a. All valve assemblies
1. Valve assemblies shall be designed to the pertinent limits defined in Table I.
  2. The maximum pressure ( $P_{max}$ ) resulting from normal, upset, emergency, or faulted conditions shall not exceed the factors listed in Table II.
  3. These rules do not apply to safety relief valves. Safety relief valves shall be designed in accordance with the ASME Code, Section III.
  4. The values for Safe Shutdown Earthquake (SSE) are given in Item 4.2.
  5. The nozzle loads imposed by the attached piping is described in item 3.1.6.
- b. Active valve assemblies
1. In addition to compliance with the design limits specified in item 3.1.8, subitem a., assurance of operability of active equipment under all design loading combinations shall be provided by the VENDOR, as indicated in Note 11 of USNRC Regulatory Guide 1.48. (See Item 4.2.)
  2. The VENDOR shall provide a report demonstrating the operability of active components under all design loading combinations. The report shall include a description of the measures used. Structural interaction of the entire assembly shall be considered. If superposition of test results for other than the combined condition is used, the applicability of such procedure shall be demonstrated.

3. The VENDOR shall warrant that all active valves shall operate under all design loading combinations, based on loads as specified herein, and further warrant that he will provide demonstrability of such operation to the extent required by USAEC Regulatory Guide 1.48.
- c. The VENDOR shall submit with the Proposal a brief description of the procedures he will use to meet requirements of item 3.1.8 subitems a. and b.

### 3.2 Environmental Qualification Requirements

The desired qualified life of the valves is 40 years with routine parts replacement as identified by the VENDOR. The VENDOR shall provide a list of non-metallic replacement parts including the shelf life and the recommended frequency of change-out to maintain the Environmental Qualification. This information shall be provided in the "Installation, Operation & Maintenance Instruction Manual"

- a. Non-metallic materials, such as diaphragms and "O"-rings, shall maintain operability for a 5-year period when exposed to the inside containment environment or service conditions stated in the Design Specification.
- b. Valve and accessories shall be designed to function unattended for a 5-year period between time of inspection and time of maintenance.
- c. Qualification of non-metallic material shall be documented in a test report supplied to NEK by the VENDOR.
- d. Limit switches, Solenoid Valves and Motor Operators shall be qualified to the requirements of IEEE 323-1974 and 344-1975.

### 3.3 Detailed Design Requirements

#### 3.3.1 All valves

- a. End-to-end dimensions for all standard valves shall be in accordance with ANSI B16.10 for welding end valves.
- b. Valves shall be provided with end transitions and weld end preparations in accordance with the Valve Specification Data. Sheets and Drawing D-301-001.
- c. The minimum wall thickness of the pressure-retaining parts of the Safety Class 1 valves shall satisfy the requirements of Paragraph NB-3541 of Section III of the ASME Code. For Safety Class 2 and 3 valves, minimum wall thickness shall be determined in accordance with the requirements of ASME code. In addition to the minimum wall thickness determined above, additional metal for a corrosion allowance during the 40-year plant life shall consist of 0.003 inch (0.076 mm) for stainless steel valves, 0.12 inch (3.05 mm) for carbon steel valves in steam service, and 0.08 inch (2.03 mm) for all other carbon steel valves. A lesser corrosion allowance may be acceptable for some applications, but only when specifically approved by NEK.

- d. Torquing requirements shall not overstress the pressure-retaining bolting. An "Installation, Operation & Maintenance Instruction Manual" shall contain written procedure for tensioning these bolts and bolt torque values is required. Torque values must be substantiated by calculations or measurements. The procedure and applicable verifications shall be submitted to NEK. Torquing requirements for bolting associated with the valve actuator assembly of active valves is also required.
- e. Pressure boundary components of a valve as defined by Section III of the ASME Code include the body, bonnet, disc, and bolting which joins pressure-retaining items. Body-bonnet bolting shall be included as pressure-retaining items.
- f. When indicated on the Specification Data Sheet, valves shall be provided with a bonnet leakoff. The leakoff connections shall consist of a standard fitting which has all of the major, portion of reinforcement integral with the fitting and is full penetration welded to the valve component. Leakoff connections shall be socket weld type in accordance with ANSI B16.11 in the 300-pound rating for valves of 300-pound primary service rating and below, and 600-pound rating for valves above 300-pound primary service rating. The leakoff and underseat drain connections shall be a 6-inch (152.397mm) long pipe stub closed by means of a steel plug or cap welded to the end. Minimum size shall be 3/4 inch (19.05 mm) NPS, and stub piping shall be as follows:
  - 1. Carbon steel stubs - SA-106 Gr, B seamless, Schedule 160.
  - 2. Stainless steel stubs - SA-376 or SA-316, TP 304 seamless, Schedule 80S.
- g. Safety Class 1, 2, and 3 valves shall be designed to facilitate disassembly and shall have a minimum of pressure boundary welds to facilitate inservice inspection in accordance with Section XI of the ASME Code.
- h. Design of the valves shall minimize crevices or retention pockets which could permit accumulation of corrosion products with resultant radioactivity buildup.
- i. All replaceable valve parts shall be replaceable with the valve installed in the line. Adequate clearances shall be provided to service and replace packing without dismantling the assembly.

### 3.3.2 Gate, Globe, and Check Valves

- a. Gate, globe, and check valves shall be either of the bolted body-to-bonnet type or the pressure seal type. Valves requiring seal welding shall not be seal welded by the VENDOR.
- b. Gate, globe, and check valves shall have the bonnet seal weld and backseat in accordance with the following:
  - 1. Stainless steel gate and globe valves shall have a bolted body-to-bonnet joint with a fully trapped controlled compression and spiral wrapped gasket (Flexitallic type) with provisions for seal welding.

2. Stainless steel check valves having ratings of 150 pounds or 300 pounds shall have the body-to-bonnet joint described in item 3.3.2 subitem b.l., except provision for seal welding is not required.
3. Stainless steel check valves having ratings above 300 pounds shall have the body-to-bonnet joint described in item 3.3.2 subitem b.l.
4. Carbon steel valves may have the VENDOR standard body-to-bonnet configuration; however, the requirements of item 3.3.2 subitem b.l. shall apply when the valve is designated for radioactive service per the valve Specification Data Sheets.
5. Pressure seal designs may be substituted for the gasket design described in item 3.3.2 subitem b.l., provided the following conditions are met:
  - (a) The gasket assembly shall not require retightening after field hydrotesting.
  - (b) Provisions for a replaceable canopy seal shall be supplied.
  - (c) No leakoff connections shall be provided between the pressure seal and the canopy seal.

### 3.3.3 Gate and Globe Type Valves

- a. All valves shall be provided with a back seat to prevent leakage into the gland chamber when the valve is in the fully open position.
- b. The direction of rotation of manual handwheel actuators to close the valve shall be indicated on the handwheel. An arrow shall be cast or welded on the valve body to indicate the direction of flow where necessary.
- c. Valves shall have stuffing boxes in conformance with the VENDOR's standard design and as required herein. VENDOR's packing shall be as specified on the specification sheet. The VENDOR's outline drawing shall show the packing type, size, number of rings, and arrangement in each stuffing box. Box bores and stem and sleeve diameters with their tolerances shall also be shown. The VENDOR's "Installation, Operation & Maintenance Instruction Manual" shall clearly give step- by-step procedure for cutting packing rings to size, proper installation in the stuffing box, independent seating of each ring, and takeup of the gland (torque values and packing compression must be specified). The packing shall contain a suitable corrosion inhibitor to prevent stem pitting. The packing shall be suitable for the service as specified on the Specification Sheet. The stuffing box internal surface finish roughness shall be  $60 \pm 10$  microinches. Packing shall contain less than 200 ppm leachable chlorides.
- d. Maximum hardness of stem material is required; however, it is not to be obtained by deviating from material specification. Allowable stem materials are given on the Specification Data Sheets. The stem or sleeve surface finish roughness shall not be greater than 16 microinches.

- e. Gate and globe valves shall be provided with a locking device to lock the stem in position when so indicated on the Specification Data Sheets.
- f. The gate valve discs shall be designed to prevent sticking due to temperature changes and pipeline stresses. The design also shall minimize disc and seat wear. Gate valves shall have an outside screw and yoke and rising stem.
- g. Globe valve seats and discs shall be designed to be relapped in place.
- h. Manual valve actuators shall be sized for opening and closing with a force not exceeding 80 pounds applied at the rim of the handwheel against the pressure corresponding to 100 F (37.8 C), as listed in Pressure Temperature Rating Tables for the respective valve pressure class. Valve actuators shall be equipped with any combination of geared actuator, ball and roller bearing yokes, and impactor handwheels for valves smaller than 8 inches (203.196 mm). Geared actuators shall be furnished on valves 8 inches (203.196 mm) or larger.
- i. Globe valves 2 inches and smaller used for radioactive service shall be packless type valve with zero leakage. (See item 3.3.7.)

#### 3.3.4 Check Valves

- a. All stainless steel check valves shall have no body penetrations other than the inlet and outlet nozzles and the bonnet. The check hinge shall be serviced through the bonnet.
- b. When a check valve requires a stuffing box and packing for accessories, such as an exercising lever or positive closing device, the stuffing box design shall conform to the requirements of item 3.3.3 subitem c.

#### 3.3.5 Safety and Relief Valves

- a. Valves shall be adjusted for set and blowdown pressure at the VENDOR's shop.
- b. The VENDOR shall determine the required orifice size for each valve for the performance requirements listed on the Specification Data Sheets in conformance with applicable codes, standards, and the manufacturer's standard sizing procedures.
- c. The VENDOR may propose a safety relief type valve of proven suitability for liquid relief service.
- d. When required by applicable codes and standards, the valves shall be provided with lifting levers capable of lifting the disc off the seat when the inlet pressure is at least 75% of the valve set pressure. Closed bonnet type valves shall be provided with packed lifting levers.
- e. All valves shall be provided with gags suitable to keep the valve closed during field hydrotesting of the NEK piping systems. The VENDOR shall provide a drawing of the required valve gags and the recommended gagging procedure.

- f. All valves over 1-inch (2.54 cm) nominal inlet size shall be provided with bolted caps. Valves 1 inch (2.54 cm) and under nominal inlet size shall be provided with screwed caps. All caps shall be provided so that it shall not be necessary to remove the cap to gag the valve.
- g. Each valve shall have a totally enclosed bonnet. There shall be no leakage to the atmosphere during normal operation or during popping.
- h. The design back pressure of the backbalancing bellows shall be 1.5 times the specified static back pressure. Design of the bellows containment shall avoid direct impingement of the escaping fluid upon the bellows during the valve discharge.

### 3.3.6 Diaphragm Valves

- a. The stem and bonnet "O" ring seals shall be fully entrapped in the base metal. The seals shall permit the bonnet to be a pressure boundary should the diaphragm rupture.
- b. The bonnet shall have a vent plug for detecting diaphragm rupture. The plug shall meet the requirements of the ASME Code, Section III for pressure-containing parts and the applicable design requirements of ANSI B16.11.
- c. Diaphragms shall be adequately supported by the use of finger plates or cast fingers to prevent diaphragm ballooning on high line pressure or line pressure surge.

### 3.3.7 Packless Metal Seal Type

- a. The metal seal must be able to flex successfully a minimum of 4000 operating cycles under the design conditions without leakage or damage to the metal seal.
- b. Backup packing capable of withstanding the full design pressure without visible leakage shall be provided.

### 3.3.8 Butterfly Valves

- a. Valve shafts shall conform to the following:
  - 1. The valve disc shaft may be of one-piece construction, or it may be comprised of two separate pieces inserted into the valve disc hubs. The VENDOR shall indicate which type is offered.
  - 2. The valve shaft shall be designed for either horizontal or vertical installation.
- b. The valve disc shall be either cast or fabricated type construction, with no external ribs transverse to the flow. In designs having the rubber seat in the body, the disc shall have stainless steel or monel covering the full width of the disc sealing edge. In designs having the rubber seat on the disc, a retaining ring of stainless steel shall be supplied to clamp the seat to the disc, and a stainless steel or monel seat ring

shall be supplied in the body. All seat ring screws shall be stainless steel. Discs shall not be plated or coated.

### 3.3.9 Ball Valves

- a. Valves shall be capable of sealing in either flow direction.
- b. Valves shall be operated from the fully closed to fully opened position by 90° rotation of the ball.
- c. Valves shall be nonlubricated.
- d. Stem packing shall be manually adjustable without removal of the actuator.

### 3.3.10 Needle Valves

- a. A position indicator shall be provided so that a closed valve may be reopened to its exact previous position.
- b. Either packed or packless type valves are acceptable. The packless type valves shall incorporate either a metal diaphragm seal or a bellows type seal as part of the valve design. The metal seal is required to flex successfully a minimum of 4,000 cycles without leakage or damage to the seal. The body-to-bonnet joint for packed valves shall be integral, welded, or threaded with provisions for seal welding.
- c. The valve shall be designed with provisions for locking in any position.
- d. Precise control of the flow rate indicated on the Valve Specification Sheets is required.

### 3.3.11 Valves Located Inside Containment

When specified on the Specification Data Sheets for service inside containment, valves and accessories shall be in accordance with the following:

- a. Valves shall be capable of functioning unattended for a 2-year minimum duration.
- b. The valve bonnet shall have provisions for seal welding to the body. Mechanical fasteners shall provide the structural strength of the joint. The design of the joint shall permit the bonnet to be removed from the valve body, and be rewelded at least three times before body or bonnet replacement becomes necessary.
- c. Valve assemblies shall suffer no adverse effects from the inside containment environmental conditions stated in Section 3.5 of the Design Specification (DSP-G508A).



### 3.3.12 Options

When the following items appear on the Valve Specification Data Sheets they shall comply with the respective listed descriptions:

a . Bypasses

Bypasses shall be installed in conformance with MSS-SP-45 for either series A or series B bypasses as indicated in the Valve Specification Sheets. The bypass shall include a repackable globe valve with backseating, hardfaced disc, hardfaced seat rings, and with valve body and pipe material compatible with the main valve body. Piping and valve connections shall be made with welded joints.

b . Flanged ends

Raised face flanged ends in accordance with ANSI B16.34 shall be furnished in lieu of butt welding ends.

c . Threaded ends

End connections shall be threaded in accordance with ANSI B16.11.

d . Leakoff

The valve shall be provided with a stuffing box suitable for vacuum service. A deep cavity stuffing box containing a full set of packing below and a half set above a lantern ring shall be furnished as a minimum. A full set of packing shall be defined as a depth of packing equal to at least 1-1/2 times stem diameter. The leakoff connection shall be a 1/2-inch, Schedule 80 nipple with squared end approximately 6 inches long, of material compatible with the bonnet material.

e . Limit switches (plunger or cam types)

1. Limit switches, when supplied, shall provide remote indication of valve plug position (fully open, midposition, fully closed). The limit switches shall be snap acting as manufactured by NAMCO Controls, EA 180 Series, or EQUAL. Switches shall be mounted from the valve yoke and shall be cam operated. Switch assemblies shall meet the requirements of IEEE 323-1974 and 344-1975. A minimum of two normally open and two normally closed electrically separate contacts shall be provided in each limit switch assembly.
2. Rotary cam type adjustable electrical position switches shall be supplied where specified. Switch actuation dead band shall not exceed 0.025 inch per inch (0.025 mm per mm) of stem travel and shall have electrical characteristics as specified in subitem e.l. above. Cam design shall be such that any electrical switch within the assembly may be tripped at any valve position. Switches shall be single pole, double throw (SPDT) with electrical terminals wired to barrier type terminal strips which shall be located within the assembly enclosure. Switch enclosure shall be NEMA Type 12



construction with a suitable size conduit connection to assure easy passage of the required wiring.

3. Electrical contacts shall be clearly identified on each switch to facilitate connection of external wiring. Contact rating shall be as follows (in amperes):

	<u>Make</u>	<u>Break</u>	<u>Carry</u>
(a) 118 volts ac	10	6	10
(b) 125 volts dc	6	1	6

- f. Motor actuators shall be in accordance with the following:

1. Specification SP-S701-044687-000 as applies to nuclear safety related actuators.
2. The structural design of the motor actuator shall be independent of the valve so that no part of the actuator is essential to maintaining the valve envelope pressure integrity.
3. Valve stem speeds shall be defined on the Valve Specification Sheets
4. Motor actuators shall be able to be closed manually against 1.1 times the specified maximum differential pressure across the seat. The actuator operated manually shall be capable of transmitting the required thrust to the seat from a force as defined in item 3.3.3 subitem h.

- g. Solenoid valves, where required, shall be indicated on the Valve Specification Sheets. Solenoid valves shall meet the following requirements:

1. Solenoid valves shall be mounted, piped, or tubed on their respective valve actuator. Where the likelihood of damage to the tubing or piping will result because of its installation, such tubing shall be prefitted and shipped securely fastened to the valve assembly. Tubing or piping shall be 3/8 inch or greater to permit valve full stroke (open) within 12.0 seconds or less.
2. Solenoid valve coils shall have a Class H, 180° C temperature class insulation suitable for continuous operation in an ambient temperature of 120 F (49° C).
3. Solenoid valves mounted on valves for safety related application shall be:
  - (a) Solenoid valve assemblies shall meet the requirements of USNRC Regulatory Guide 1.89 and 1.100.
  - (b) ASCO Figure No. 8316, or EQUAL, for quick exhaust and loading speed, 125 volts dc, (105 min - 140 max).

h. Stem position element for power-actuated valves

A stem position element consisting of a 1000-ohm slidewire and any necessary gearing or components for use with a remote position indicator shall be furnished and installed on the valve assembly when required by the valve specification sheet. The remote position indicator will be furnished by Others.

i. Pneumatic actuators

1. Pneumatic actuators include diaphragm, piston, and cylinder type devices with accessories required for proper operation.
2. Valve actuators shall be capable of handling the unbalanced forces occurring under the specified flow conditions as well as the maximum differential pressure specified. Unless otherwise specified, the design will account for a minimum seating force of 50 lb/lineal inch (0.9 kg/lineal mm) of plug seating circumference to assure tight seating. The actuator shall be designed to produce the required stem force with not more than 80 % of available air supply pressure or at least 5 psi (0.35 kg/cm<sup>2</sup>) less than design supply pressure, whichever pressure is less. Diaphragm cases shall have a minimum design rating of 30 psig (2.12 kg/cm<sup>2</sup>) regardless of the application.
3. The valve actuator shall be designed for a 40-year plant life under ambient conditions of 40 F to 120 F (4.4° C to 49° C). Actuators for active valves shall be qualified to IEEE 382-1985.
4. Actuators shall be, preferably, of the diaphragm type.

However, piston actuators may be specified where any of the following four conditions exists:

- (a) The power required to operate the valve is beyond the size limits of the spring and diaphragm actuator.
  - (b) Valve size precludes a large size spring and diaphragm actuator.
  - (c) Fast action is required.
  - (d) Reliable working life of the diaphragm material is not considered to be a satisfactory length to meet the specified application.
5. Diaphragm actuators
- (a) Actuators shall be of the yoke mounted design capable of 360° mounting without restriction of operation, undue wear, or difficulty in changing the diaphragm or other parts. The actuator housing shall be made from cast steel or pressed steel, and shall completely enclose the spring and diaphragm operating parts, and seal them from dirt or other foreign materials. The steam seals shall be "O" ring type, split "V" type, or pulldown packing type, allowing

replacement of seals without disturbing any part of the valve or actuator assemblies.

- (b) Springless diaphragm actuators shall not be supplied.
- (c) Butterfly valve actuators shall have a shaft arm and the connecting link assembly shall be of a design for easy and accurate shaft alignment. For small and medium size valves the linkage shall be adjustable for either 60° or 90° operation and for rotation in either direction with the design to prevent shift in linkage adjustment over the entire range of angular operation. The valve shaft and actuator shall be connected with a shear key designed to protect the shaft and vane in the event that foreign matter impedes the motion of the vane. The shear key shall be replaceable without removing the valve or actuator from the pipeline.
- (d) Actuators shall be supplied with stainless steel metal nameplates inscribed with the full open and closed air pressure requirements, Cv, tag number, and manufacturer's serial numbers. Stem travel indicators shall be clearly visible with stem travel and direction of movement to open. The nameplates shall be mounted on the same side of the valve upon which the positioned is mounted. Where a positioned is not used, the nameplate shall be mounted on the same side of the valve which shows the flow direction arrow. These nameplates shall be secured with self-tapping screws or their equivalent.
- (e) Provisions shall be made for the attachment of positioner, air filter regulator, and limit switches to the valve assembly.
- (f) The air regulator, positioner and other accessories required for the operation of an active valve shall be qualified to IEEE 382-1985.

#### 6. Piston actuators

- (a) Piston actuators shall be supplied where high unbalanced forces mandate high motivating air pressure.
- (b) Piston actuators shall be supplied with a volume tank and all necessary hardware to assure valve failure to a position (open or closed) as specified on the Valve Specification Sheets when required.
- (c) Piston actuators shall be capable of withstanding 125 psig (8.8 kg/cm<sup>2</sup>) air pressure without impairment of performance capability.
- (d) Piston actuators shall be constructed of the following materials:
  - (1) Casing - aluminum or carbon steel.

- (2) Piston - aluminum.
  - (3) Stem - chrome-plated stainless steel.
  - (e) The piston chamber which is normally pressurized to cause piston motion shall not contain any mechanical devices such as rack and gear mechanisms.
  - (f) "O" rings shall not be used to seal moving parts unless the piston is limited to vertical mounting.
  - (g) Pistons shall be lubricated with silicone during assembly.
7. Cylinder actuators
- (a) Applicable items in item 3.2.14 subitem i.6. shall apply to cylinder actuators.
  - (b) Cylinder actuators shall be supplied for on-off service only.
  - (c) Cylinders shall be self-lubricating types.
8. Oil free instrument air will be supplied, where required, at 90 to 100 psig (63 to 7.0 kg/cm<sup>2</sup>) and with a dew point of -40 F (-40° C) at 100 psig (7.03 kg/cm<sup>2</sup>).
9. Air locks
- A trip valve with volume tank shall be provided when it is necessary to move the valve to its open or closed position upon an air supply failure. The tripping pressure shall be adjustable at 75% of the maximum supply pressure. After the unit has tripped, normal operation shall resume automatically upon restoration of the supply pressure. Volume tanks shall be capable of withstanding 150 psi (10.55 kg/cm<sup>2</sup>) internal pressure. Volume tank size shall be determined so that the valve will be fully stroked against all unbalance and seating forces plus a 25% safety margin.
10. Filter and regulator
- Airsets shall consist of a filter regulator with an integral relief valve, drip well with drain cock, outlet-mounted pressure gage, and the following additional requirements, features, or both:
- a. Connections shall be 3/8-inch NPT, as a minimum.
  - b. The reduced pressure range shall be adjustable and as required for the application.

- c. A pressure gage of suitable range shall be located on the reduced pressure outlet at a right angle to the straight through flow line. The scale on the pressure gage shall be in kg/cm<sup>2</sup>.

- j. Motion transmitters

Motion transmitters, where required, shall be provided to transmit the valve position (motion) for remote indication, recording, or control devices. Transmitters shall be pneumatic or electrical transmission type devices and shall be of weatherproof construction. Transmitter accuracy shall be within  $\pm 5\%$  for all applications.

- k. Travel stops for actuated valves

Valve travel stops, which limit travel in either direction when supplied, shall be incorporated in the actuator mechanism as opposed to the driven mechanism.

- l. Handwheels

The Valve Specification Sheets will indicate the requirements for handwheels. Unless otherwise indicated, the handwheels shall conform to the following requirements:

1. When specified, valve actuators shall be equipped with handwheels for emergency or startup operation. In general, a top-mounted handwheel shall be furnished for diaphragm actuators; however, side-mounted handwheels may be required in the following instances:
  - a. The actuator is too large to conveniently apply a top mounted handwheel.
  - b. Pneumatic piston operator is utilized.
  - c. There is anticipated demand for future diaphragm replacement while valve is in service.
2. The VENDOR shall state the force necessary to operate the handwheel offered for the particular actuator.
3. Engagement of the handwheel shall disengage the automatic actuator function.

## 4.0 PERFORMANCE REQUIREMENTS

### 4.1 Performance Tests

A factory cyclic test at ambient temperature shall be performed on all power-operated valves to demonstrate adequate stem thrust (or torque) capability to unseat the closed valve when the specified differential pressure is applied across the seat, and to close the valve against normal operating pressure. The differential pressure shall be the same

pressure used in the disc hydrostatic test for Safety Class 1 valves or the seat leakage test pressure for Safety Class 2 and 3 valves. All lubrication shall be removed from parts exposed to the working fluid prior to the test and only water shall be used to effect the test. The closing force shall be the normal closing force of the power actuator. The action of the actuator alone, when receiving minimum power, shall unseat the power actuated valves. This test also shall demonstrate that no mechanical damage or permanent deformation of the valve components occurs during full stroking of the valve in either the opening or the closing direction. The operating cycle shall be performed three times. During each operation of electric motor-actuated valves, the stroke time in both directions of travel shall be recorded. A description of the test the VENDOR proposes to perform, with the method of measuring applied power, of the power actuator and stroking time shall be submitted.

#### 4.2 Mechanical Loading Qualifications

- 4.2.1 All valve assemblies shall be qualified for the mechanical loading conditions specified herein. All valves to be supplied under this Specification are Seismic Class I and as such shall meet all mechanical loading tests required by this Specification.
- 4.2.2 Each valve (and its actuator, where applicable) shall withstand the inertial load caused by the safe shutdown earthquake (SSE) and the operating basis earthquake (OBE) with stipulations as given below for active and nonactive valves. Designation of the classification of a valve (active or nonactive) will be given in the valve Specification Data Sheet. Proof of the functional operability of active valves during a seismic event shall be provided in accordance with USNRC Regulatory Guide 1.48 requirements as specified in item 4.2.4 and item 4.2.5.
- 4.2.3 When valves are furnished with a chain and chainwheel, the seismic analysis shall consider this device to be part of the actuator. The VENDOR shall suggest a method of stabilizing the chain or may suggest a nonmetallic material for the chain designed to minimize the impact force the chain will have upon surrounding equipment, when subjected to SSE or OBE. The natural frequency of overhanging or extended structures shall be greater than 33 hertz. An analysis, test procedure, or both, and results determining this natural frequency shall be submitted to NEK for review and approval.

##### 4.2.4 Nonactive Valves

Each nonactive valve, including its actuator, and accessories shall withstand the inertial load caused by OBE or SSE without causing movement or failure of any internal part of change in integrity of any pressure-retaining part during or after OBE or SSE. Each valve shall be fully operational following OBE or SSE. The VENDOR shall demonstrate the ability of the valves to meet this requirement by either testing each integrally assembled valve and actuator with accessories, or by a combination of dynamic analysis and testing in accordance with Specification SP-S702-044687-000, with the following exceptions, limitations, or additions:

- a. The acceleration level of x, y, and z component response acceleration shall be taken as 3.0 g in all directions simultaneously for OBE or SSE, whichever produces the most severe requirement. Input accelerations of less than 3.0 g maximum shall not be used unless approved by NEK.

- b. When several valve assemblies having the same size and configuration are to be qualified, only one valve assembly needs to be tested to qualify the entire quantity.
- c. Resultant stresses and pressures in the pressure-retaining parts of the valves shall not exceed the allowables as set forth in Tables I and II.
- d. The allowable stresses (in tension or compression) of the nonpressure-retaining components shall not exceed 90% yield stress under the SSE condition. The shear stress shall be limited to 0.54 yield stress.

#### 4.2.5 Active Valves

- a. Each active valve, its actuator, and accessories shall be analyzed or tested to the requirements in Item 4.2.4 for Nonactive Valves.
- b. In addition to compliance with the design limits specified in subitem a. above, assurance of operability of active valves under all design loading combinations shall be provided by dynamic analysis with the following requirements:
  - 1. The natural frequency of the extended valve actuator structure shall be determined by dynamic analysis. The actuator structure shall be modeled as a multi degree of-freedom, lumped-mass system with mass-free interconnections or other justifiable models. The fundamental frequency of the structure must be proved to be greater than 33 Hz to allow the structure to be analyzed statically. The static analysis of the actuator shall be obtained by multiplying the lumped mass point by the accelerations specified under item 4.2.4.
  - 2. A combined load analysis shall be performed to substantiate actuator structural integrity. Allowable stresses, deformations in the actuator structure, or both shall consider concurrent loadings associated with the normal, upset, emergency, or faulted plant conditions with the vibratory motions indicated under item 4.2.4. The resultant stresses shall not exceed the limits specified under item 4.2.4.
  - 3. The actuator, solenoid valves, limit switches, interconnecting tubing and mounting shall be seismically qualified in accordance with IEEE 382-1985.
- c. The VENDOR shall prepare proposed design bases describing the methods and procedures that are proposed to satisfy the requirements of operability of each valve under all design loading combinations. They shall include a description of any mathematical models, analysis, and test procedures. The proposed design bases shall be brief but with sufficient information to define a design base for each valve with justification that all requirements of USAEC Regulatory Guide 1.48 are satisfied. These proposed design bases shall be submitted with the Proposal.
- d. The VENDOR shall warrant that the equipment will operate under all design loading combinations, based on the design parameters specified herein and to the extent required by USNRC Regulatory Guide 1.48.



#### 4.2.6 Assurance of Acceptability

Acceptance shall be based on final testing and inspection of the complete assembly and approval of the documented construction, testing, and inspection procedures.

- 4.2.7 Design calculations and reports required by Section III of the ASME Code, Subarticle NB-3500 and Appendix C for Safety Class 1 valves, Subarticle NC-3500 for Safety Class 2 valves, and Subarticle ND-3500 for Safety Class 3 valves, to demonstrate structural acceptability of the valve shall be furnished to NEK for approval. The design report for a Safety Class I valve shall contain a statement of certification that the calculations are complete and correct and in full accordance with the requirements of the Design Specification for that valve and the applicable portions of Section III of the ASME Code.

### 5.0 MATERIALS OF CONSTRUCTION

#### 5.1 General

- 5.1.1 The materials shall be as defined on the valve Specification Data Sheets.
- 5.1.2 Materials used in pressure-containing parts Class 1 for valves shall be furnished in accordance with the ASME Code, Section III, Subarticle NB-2300, - 1971 edition with Addenda through Winter 1972. Tests shall be conducted to determine the ductility of SA 105 material at 10 F (-12° C) and all other materials at 0 F (-17.8° C). A certified test report shall be submitted as described in Paragraph NB-2354 of Section III of the ASME Code.
- 5.1.3 The contact faces of the discs, main seats, and back seats shall be hardsurfaced with Stellite 6, Stellite 21, or EQUAL. Cobalt free hard trim materials are desired for seating surfaces in valves used for WF-1 service.
- 5.1.4 Materials not definitely specified but required shall be of the best quality normally used for the purpose in commercial practice and traceable to ASTM standards.
- 5.1.5 The VENDOR shall coat all studs and nuts with standard corrosion inhibitor. The resultant product shall be capable of withstanding a 48-hour salt spray test without having the bolts or nuts exhibit any evidence of corrosion.

#### 5.2 Unacceptable Materials

- 5.2.1 Nitriding treatments on any surface exposed to the working fluid are prohibited.
- 5.2.2 The use of aluminum for valve parts or accessories is prohibited.
- 5.2.3 Plating on any surface exposed to the working fluid is prohibited.
- 5.2.4 Austenitic stainless steel surfaces shall not be exposed to substances containing chloride and fluoride ions that could cause stress corrosion attack.



## 6.0 FABRICATION PROCEDURES

- 6.1 All fabrication procedures and qualifications shall conform to the applicable codes, standards, and requirements stated herein. When not specified herein, the fabrication procedures and qualifications shall be the VENDOR standard and of proven suitability for the requirements. The VENDOR shall submit a list of fabrication procedures to NEK.
- 6.2 The surface finish on steel castings shall meet the requirements of MSS-SP-55 and requirements for radiography, magnetic particle, or liquid penetrant testing.
- 6.3 Welding preparation, heat treatment, and welder qualifications and procedures shall be in accordance with the ASME Code, Sections IX and III, Articles NB-2000 and NB-4000, Articles NC-2000 and NC-4000, or Articles ND-2000 and ND-4000 for all pressure-retaining parts of Safety Class 1, 2, and 3 valves, respectively. Valves denoted for containment isolation service shall, in addition, conform to the requirements of Articles NE-2000 and NE-4000 of Section III of the ASME Code. When welding stainless steel and low alloy steel, the requirements of USNRC Regulatory Guides 1.31 and 1.50, respectively, also shall be met. A list of all welding procedures and the results of qualification tests shall be submitted to NEK.
- 6.4 Examination and repair of pressure-retaining materials shall be in accordance with Subarticle NB-2500, NC-2500, or ND-2500 of Section III of the ASME Code, as applicable.
- 6.5 Procedures for heat treating of stainless steel shall include qualification to USAEC Regulatory Guide 1.44 and ASTM A 262, Practice E.

## 7.0 TESTING, INSPECTION, AND ACCEPTANCE CRITERIA

- 7.1 All testing, inspection, and acceptance criteria shall conform to the applicable codes and standards as specified in Item 2.2. When no code or standard applies, the acceptance criteria shall be the VENDOR standard and of proven suitability for the service. The VENDOR shall submit a list and brief description of all tests, codes, and acceptance criteria as part of the Proposal. A list of all testing and inspection performed, with the results, shall be submitted to NEK.
- 7.2 If a valve assembly fails to pass any test or inspection the modifications or changes to the valve, assembly, or test equipment shall be recorded before retesting. Modification or change reports shall be submitted with the test and inspection reports to NEK.
- 7.3 The VENDOR shall be responsible for conducting all inspection and tests (including recording of results and maintaining records thereof) and shall furnish all materials and equipment (including certifications) required.
- 7.4 Hydrostatic tests shall be as follows:
  - a. All valve parts shall be clean and the surfaces free from foreign material. The completely assembled Safety Class 1, 2, and 3 valves shall be tested in accordance with the requirements of the applicable paragraphs of Articles NB-6000, NC-6000, or ND-6000 of Section III of the ASME Code, respectively. There shall be no indications of permanent deformation of valve parts. All seals, gasket joints,

packing, and shell pressure boundary parts shall show no leakage. Valves shall be maintained in the near open position (not back seated, if such is provided) during hydrostatic testing.

- b. The valve disc of Safety Class 1 valves is defined as part of the pressure-retaining boundary (reference Subparagraph NB-3546.2 of Section III of the ASME Code) and shall be subjected to a hydrostatic test pressure equal to that applied to shell components of the same material and for the same pressure and temperature service. Hydrostatic test pressures shall be applied as follows:
  - 1. Gate valves  
  
Pressure shall be supplied successively on each side of the closed disc with the opposite side open for inspection.
  - 2. Globe and angle valves  
  
Pressure applied in the direction of normal flow (inlet under the seat unless specified otherwise) and the other end open for inspection.
  - 3. Check valves  
  
Pressure applied over the disc and the other side open for inspection.
  - 4. Relief and safety valves  
  
Valves shall be gagged and tested with gag in place.
  - 5. Diaphragm valves  
  
A seat leakage test shall be performed at 110% of the 100 F pressure rating.
- c. For subitems a. and b. of Item 7.4, the test pressure shall be maintained at 15 minutes per inch (2.54 cm) of minimum wall thickness, but for not less than 10 minutes. There shall be no indications of permanent deformation of valve parts as a result of the test. The maximum permissible leakage rate on each valve seat shall be 10 cubic centimeters per hour per inch of nominal valve size.
- d. Seat leakage testing of Safety Class 2 and 3 valves shall be in accordance with the requirements of MSS-SP-61 with the following exceptions:
  - 1. Test duration shall be 10 minutes minimum after valve is fully prepared and under full test pressure.
  - 2. Test pressure shall be applied as given in subitem b. of Item 7.4, except that for globe valves with power actuators the test pressure shall be applied under the seat instead of in the direction of normal flow.
  - 3. The optional air test shall not apply.

- e. All valve back seats (where provided) shall be hydrostatically leak tested using the test pressure as specified for the shell test. The valve shall be in full open and back seated position. The stem packing shall be backed off sufficiently to permit detection of leakage. The duration of the test shall be 5 minutes minimum. The maximum permissible leak rate shall be 10 cubic centimeters per hour per inch of nominal stem diameter.
- f. After completion of hydrostatic testing, the test fluid shall be completely drained. The valve shall be dried and immediately protected from corrosion as specified in Item 8.4. The stem packing shall be removed and new packing installed.
- g. The quality of the water used in the hydrostatic test described above shall conform to the VENDORS normal water quality requirements for testing.

7.5 Examination in accordance with the ASME Code shall be as follows:

- a. The examination of all welds and pressure-retaining parts shall be in accordance with the applicable requirements of Section III of the ASME Code, Articles NB- 2000 and NB-5000 for Safety Class 1 valves, Articles NC-2000 and NC-5000 for Safety Class 2 valves, and Articles ND-2000 and ND-5000 for Safety Class 3 valves, with the following exceptions or particular requirements pertaining to nondestructive examination:

1 . General

Forged Safety Class 2 valve pressure boundary items without supplementary requirements for nondestructive examination shall be either magnetic particle (MT) or liquid penetrant (PT) examined on all accessible surfaces. Butt weld ends of all valves shall be either MT or PT examined. Procedure and acceptance standards for magnetic particle and liquid penetrant examination shall be the same as required for the particular product form under Article NB-5000 for Safety Class I valves.

2 . Radiography

- (a) For those castings and casting repair areas where relatively uniform thicknesses occur, the minimum film density shall be 2.0 for single viewing and 2.6 for composite viewing of multiple film exposures; each film of a composite se shall have a minimum density of 1.0. The maximum density permitted shall be 4.0.
- (b) For those castings and casting repair areas where the thickness varies sufficiently to cause difficulty in meeting the density requirements as specified in subitem a.2.(a) of this item with one penetrometer, two penetrometers shall be used representing the thinnest and the thickest sections in the area to be interpreted. Densities at or between the densities on the penetrometers shall be considered acceptable except that the minimum density of the penetrometer image shall be 2.0 for single film viewing and 2.6 for

composite film viewing of multiple film exposures. Each film of a composite set shall have a minimum density of 1.3.

3 . Magnetic particle

- (a) Except as permitted by subitem a. 3. (b) below, all magnetic particle examinations shall be by the prod, coil, or direct contact method using dc or rectified ac current.
- (b) The yoke method may be used only for supplementary surface examinations.
- (c) All cast surfaces shall be examined by dry particle methods.

4 . Liquid penetrant

- (a) All liquid penetrant examination for machined and welded surfaces shall be by the solvent removable method.
- (b) Liquid penetrant examination for cast and unfinished surfaces may be by the water washable method.

- b. Other parts, welds, and fabrication not covered by Section III of the ASME Code shall be examined and inspected with the VENDOR's standard procedures and criteria which shall be submitted with the Proposal.
- c. All NDT examinations performed for acceptance by the VENDOR's shall be performed by personnel qualified in accordance with the requirements of Section III of the ASME Code, Subarticle NB-5500.

7.6 Minimum dimensional requirements shall be as follows:

- a. The VENDOR'S shall measure and record the thickness of pressure boundary castings, forgings , and fabricated parts in accordance with an approved procedure.
- b. The procedure shall require that measurements taken and recorded represent the thicknesses of the component "as shipped."

8.0 PREPARATION FOR SHIPMENT

8.1 Identification

- 8.1.1 Each valve shall be marked in accordance with Subsection NB, NC, or ND (as applicable) of Section III of the ASME Code.
- 8.1.2 Each valve shall have a second securely attached nameplate which shall include the valve identification number, valve unique number, and purchase order number.

## 8.2 Cleaning

Cleaning shall be performed in accordance with ANSI N45.2.1, Level B for Class 1 valves and Level C for other class valves.

## 8.3 Painting

8.3.1 Metal parts shall be clean and free of rust and mill scale prior to painting and shipment.

8.3.2 Unless specified otherwise herein, exterior non-machined carbon steel surfaces shall be given one coat of the VENDOR'S standard primer. Minimum dry thickness shall be 2 mils. Stainless steel surfaces shall not be painted.

8.3.3 Machined surfaces, including shafts, bearings, and couplings, shall be adequately protected against corrosion and damage during shipment and storage prior to installation in the plant. Openings shall be suitably capped with metal covers where possible.

## 8.4 Packaging and Storage

8.4.1 Packaging shall be performed in accordance with ANSI N45.2.2, Level C. Shipping containers for the valves shall indicate the valve identification numbers of the valves contained.

8.4.2 A desiccant shall be placed within the body of all carbon steel valves. A metal tag shall be wired to the outside of the valve stating the type and location of the holder, the number of bags of each, the trade name of the desiccant used, and a warning to remove the desiccant and holders prior to valve operation.

8.4.3 A tag shall be attached to each valve clearly enumerating the location and quantity of blocking or locking devices, shipping gaskets, packing, desiccant, and lubricant to be removed prior to installation of the valve assembly.

8.4.4 The detailed description of how the valves are to be prepared for shipment shall be submitted to NEK.

## 9.0 QUALITY ASSURANCE REQUIREMENTS

9.1 The VENDOR shall establish and maintain a Quality Program that complies with 10CFR50 Appendix B or ANSI N45.2 and which shall assure that all materials, manufacturing practices and examinations and testing conform to the requirements of this specification and the Code. The VENDOR shall submit his Quality Assurance program for NEK'S review prior to commencement of any work on the design and manufacture of the component.

9.2 The valve manufacturer shall maintain a log of valve component quality control during the valve fabrication and final acceptance test periods. The format of log shall be subjected to NEK'S approval.

The log shall summarize all data including mill test reports, non-destructive tests and major weld repair work performed on valve pressure retaining components.

The log together with copies of supplementary certificates shall be submitted to NEK at the time valves are released for shipment. All documents submitted shall be complete, legible and suitable for microfilming.

- 9.3 NEK shall have the authority to stop work at any phase of fabrication, in the event the specification requirements have not been fulfilled, including those for documentation specified herein.
- 9.4 NEK'S Inspector shall be given free access to the VENDOR's and his subcontractors manufacturing facilities to inspect and report on the work, in all phases of design, manufacture and test. The VENDOR shall give NEK'S representative at least five days prior notice of all tests, and other check points in the manufacturing program specifically requested by NEK.

#### 10.0 NON-CONFORMANCE

- 10.1 Non-conformance to the purchase order requirements, NEK approved documents involving violation of technical or material requirements shall be submitted to NEK along with the recommended disposition and technical justification.
- 10.2 The materials and/or services are subject to 10CFR21. NEK shall be concurrently notified of any reports made to the NRC pursuant to 10CFR21.

Deviation requests are to be submitted to NEK for review and approval. A copy of the deviation request and NEK'S reply are to be included in the documentation package for the affected item.

TABLE I - DESIGN LOAD COMBINATIONS AND STRESS LIMITATIONS

Condition	Applied Load	Affected Section	Stress Limitations		
			Class 1	Class 2	Class 3
Normal	Pressure	Pressure Retaining Boundary	NB-3500	NC-3500	ND-3500
	Thermal		$P_m \leq S_m$	Item 3.1.6	Item 3.1.6
	Deadweight		$(P_m \text{ or } P_1) +$		
	Nozzle loads		$P_b \leq 1.5S_m$		
Upset	Pressure	Pressure Retaining Boundary	NB-3500	$P_m \leq 1.1S$	$P_m \leq 1.1S$
	Thermal		$P_m \leq S_m$	$(P_m \text{ or } P_1) +$	$(P_m \text{ or } P_1) +$
	Deadweight		$(P_m \text{ or } P_1) +$	$P_b \leq 1.65S$	$P_b \leq 1.65S$
	Nozzle loads		$P_b \leq 1.5S_m$		
	OBE				
	Pressure	Extended Structures	NB-3500	$P_m \leq 1.1S$	$P_m \leq 1.1S$
	Deadweight		$P_m \leq S_m$	$(P_m \text{ or } P_1) +$	$(P_m \text{ or } P_1) +$
	OBE	Bolts	$(P_m \text{ or } P_1) +$	$P_b \leq 2S$	$P_b \leq 2S$
			$P_b \leq 2S_m$		
Emergency	Pressure	Pressure Retaining Boundary	$P_m \leq 1.2S_m$	$P_m \leq 1.5S_m$	$P_m \leq 1.5S_m$
	Thermal		$(P_m \text{ or } P_1) +$	$(P_m \text{ or } P_1) +$	$(P_m \text{ or } P_1) +$
	Deadweight		$P_b \leq 1.8S_m$	$P_b \leq 1.8S$	$P_b \leq 1.8S$
	Nozzle loads				
Faulted	Pressure	Pressure Retaining Boundary	Note 1	$P_m \leq 2.0S$	$P_m \leq 2.0S$
	Thermal			$(P_m \text{ or } P_1) +$	$(P_m \text{ or } P_1) +$
	Deadweight			$P_b \leq 2.4S$	$P_b \leq 2.4S$
	Nozzle loads				
	SSE				
	Pressure	Extended Structures	Note 1	$P_m \leq 2.0S$	$P_m \leq 2.0S$
	Deadweight		$(P_m \text{ or } P_1) +$	$(P_m \text{ or } P_1) +$	$(P_m \text{ or } P_1) +$
	SSE		$P_b \leq 1.5S_m$	$P_b \leq 2.4S$	$P_b \leq 2.4S$
		Bolts			
			$P_m \leq 2S_m$	$P_m \leq 2S_m$	$P_m \leq 2S_m$



Notes for Table I

NOTE 1: Class 1 faulted condition criteria

## Active

Calculate  $P_m$  from para.  
NB3545.1 with Internal  
Pressure  $P_s = 1.25P_s$   
 $P_m < 1.5S_m$

Calculate  $S_n$  from para.  
NB3545.2 with  
 $C_p = 3.0$   
 $P_s = 1.25P_s$   
 $Q_{t2} = 0$   
 $P_{ed} = 1.3X$  value of  $P_{ed}$   
from equations of 3545.2(b)(1)  
 $S_n \leq 3S_m$

## Inactive

Calculate  $P_m$  from para.  
NB3545.1 with Internal  
Pressure  $P_s = 1.50P_s$   
 $P_m < 2.4 S_m$  or  $0.7S_u$

Calculate  $S_n$  from para.  
NB3545.2 with  
 $C_p = 3.0$   
 $P_s = 1.50P_s$   
 $Q_{t2} = 0$   
 $P_{ed} = 1.3X$  value of  $P_{ed}$   
from equations of NB3545.2(b)(1)  
 $S_n \leq 3S_m$

$P_{ed}$  includes the maximum end loads transmitted by the attached piping due to thermal expansion, deadweight, and SSE and nozzle loads.

NOTE 2:  $P_s$ ,  $C_p$ ,  $Q_{t2}$ ,  $S_n$ ,  $S_m$ ,  $P_m$ ,  $P_l$ ,  $P_b$ ,  $P_{ed}$ ,  $S$  are defined by the ASME Code, Section III, 1971 Edition with Addenda through Winter 1972.



TABLE II - P<sub>max</sub> vs P<sub>r</sub>

Condition	Active Class 1, 2 and 3	Inactive Class 1	Inactive Class 2 and 3
Normal	1.0 P <sub>r</sub>	1.0 P <sub>r</sub>	1.0 P <sub>r</sub>
Upset	1.0 P <sub>r</sub>	1.1 P <sub>r</sub>	1.1 P <sub>r</sub>
Emergency	1.0 P <sub>r</sub>	1.2 P <sub>r</sub>	1.1 P <sub>r</sub>
Faulted	1.0 P <sub>r</sub>	1.5 P <sub>r</sub>	1.2 P <sub>r</sub>

The maximum pressure, P<sub>max</sub>, resulting from a given condition, shall not exceed the above listed factors.

P<sub>r</sub> is the primary pressure rating of the valve as defined by the ASME Code Section III, 1971 edition with Addenda through Winter 1972.

EXHIBIT A

DESIGN SPECIFICATION

NUCLEAR SAFETY CLASS VALVES

ASME III Class 1, 2 or 3

KRSKO NUCLEAR POWER PLANT

DSP-G508A-536633-00026

Originator: B. Fung  
Reviewer: A. Beil  
Approver: C. Rickert

Date 4/26/17  
Date 4/26/17  
Date 4/26/2017

Certification: This document, consisting of 4 pages, complies with the requirements of Sub-subarticle NA-3250, ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," and is correct and complete with respect to functions and operating conditions to provide a complete basis for design, construction, and certified inspection in accordance with the aforementioned code.

Certified C. Rickert, P.E.

Date: 4/26/2017  
Reg. No. 035836-E  
State: PA

P.E. Stamp



WorleyParsons  
2675 Morgantown Road  
Reading, Pennsylvania 19607

## 1.0 SCOPE

This Design Specification, with referenced documents, contains information necessary to manufacture, test, inspect, certify, and stamp valve assemblies and components in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Class 1, 2 and 3. Certain technical requirements and administrative details are contained in Specification SP-G508A, hereinafter referred to as the Technical Specification. If any conflict arises between this Design Specification and the Technical Specification, requests for clarification shall be obtained in writing from NEK.

## 2.0 DEFINITIONS

### 2.1 Normal Operating Condition (LEVEL A SERVICE LIMITS)

Those conditions existing for the majority of the component design life, including commonly experienced transients. (Reference Subparagraph NB-3113.1.)

### 2.2 Upset Condition (LEVEL B SERVICE LIMITS)

Deviations from normal conditions expected to occur often enough that the design must include a compatibility to withstand the condition without operational impairment. Examples are pump shutoff heads and conditions resulting from turbine or reactor trips. (Reference Subparagraph NB-3113.2.)

### 2.3 Emergency Condition (LEVEL C SERVICE LIMITS)

Deviations from normal conditions which require shutdown for corrective action or repair of damage. (Reference Subparagraph NB-3113.3.)

### 2.4 Faulted Conditions (LEVEL D SERVICE LIMITS)

Extremely low probability postulated events where the health and safety of the public are involved, such as loss of coolant accidents. (Reference Subparagraph NB-3113.4.)

### 2.5 Seismic Effects

Earthquake design considerations are contained in the Technical Specification.

## 3.0 DESIGN INFORMATION

### 3.1 General

This Section provides information to the designer, as required by the ASME Code, Section III, Paragraph NA-3252. The format is in general agreement with the requirements of the ASME Code, Section III, Appendix B, "Owner's Design Specifications."

The valve(s) will be installed in a piping system that is designed using the 1971 Edition of ASME III and Addenda thru winter 1972 as the code or record.

The applicable ASME Code Edition to be used for valve manufacture is given in section 2.2b of the Technical Specification.

### 3.2 Component

Valve(s) covered by this Design Specification.

### 3.3 Component Identification

Components are identified by identification number(s) defined on the Valve Specification Sheets.

### 3.4 Function

3.4.1 The function of the component is to contain or convey fluid as defined on the Valve Specification Sheets.

3.4.2 Component dimensions, if critical to proper functional performance of the equipment, are specified in the Technical Specification.

### 3.5 Environmental Conditions

#### 3.5.1 Components Located Inside Reactor Containment

##### a. Ambient temperature

1. Maximum 120 F (48.9 C)

2. Minimum 50 F (10.0 C)

b. Ambient pressure 8 psia to 15 psia (0.562 kg/cm<sup>2</sup> to 1.055 kg/cm<sup>2</sup>)

c. Relative humidity 100% maximum

d. Cumulative radiation level  $5 \times 10^7$  rads

##### e. Remarks

1. Design basis accident (DBA) condition

Environmental conditions will change to 290 F (143.3 C), 60 psig (4.213 kg/cm<sup>2</sup>), and 100% saturated steam conditions within 10 seconds, remain for 30 minutes, then slowly return to ambient after a DBA. Also following the DBA, equipment will be subjected to a maximum of  $5 \times 10^7$  rads radiation and a sodium hydroxide spray for 65 minutes, consisting of 40 to 120 F (4.44 to 48.9 C) demineralized water containing 1950 to 4000 ppm boron in the form of boric acid, sodium hydroxide 0.6% by weight, at a pH of 9.5, then for 6 hours at 240 F (115.6 C), and 24 hours at 190 F (87.8 C) demineralized water containing 1720 to 3500 ppm boron in the form of boric acid, sodium hydroxide 0.23% by weight, at a pH of 8.7.



2. Leakage test condition

Environmental conditions, except for pressure, will be as indicated herein during a periodic leakage test. The external pressure will slowly increase to 51.5 psig (3.63 kg/cm<sup>2</sup>) and return to normal atmospheric.

3. Components Located Outside Reactor Containment

a. Ambient temperature

1. Normal 36 F (2 C) to 125 F (52 C)
2. Upset, emergency, faulted 220 F (107 C) max

b. Ambient pressure - atmospheric

c. Relative humidity 100% maximum

d. Cumulative radiation level  $3 \times 10^6$  rads

3.6 Component Boundaries

Component boundaries are defined as the points at which connections are made to other components which are outside the scope of the Technical Specification.

3.7 External Forces

The yield stress of connected piping limits forces and moments to values normally accommodated by valves designed in accordance with Subarticle NB, NC, ND-3500, as stated in item 3.1.6 of the Technical Specification.

3.8 Structures and Supports

3.8.1 Component is supported by attached piping.

3.8.2 Support is under jurisdiction of the ASME Code, Section III.

3.9 Materials

Materials shall be as specified in the Technical Specification. Impact testing requirements for Class 1 valves are specified in the Technical Specification.

3.10 Design Loadings

3.10.1 ASME Class 1 Valves

Design loadings are within the applicable pressure/temperature ratings of the ASME Code, Section III, Sub-subarticle NB-3530. The Standard Design Rules defined by Subparagraph NB-3512.1 and Normal Duty Application defined by Paragraph NB-3522 shall apply.

### 3.10.2 ASME Class 2 and 3 Valves

Design loadings are within the applicable pressure/temperature ratings in accordance with ANSI 16.34 for 150, 300, 600, 900, 1500 and 2500 psi pressure class valves as specified on the Valve Specification Sheets.

### 3.11 Operating Conditions

#### 3.11.1 Cyclic Operation - Pressure

7000 design cycles from 0 prig to design pressure.

#### 3.11.2 Cyclic Operation - Temperature

7000 design cycles from 70 F (21.1 C) to design temperature at a maximum rate of 100 F/hr (37.8 C/hr).

#### 3.11.3 Thermal shock is not a design factor for these valves.

### 3.12 Radiation Exposure

The total integrated dose over the 40-year design life of the plant is estimated to be  $5 \times 10^7$  rads.

### 3.13 Overpressure Protection Report

Valves covered by this Design Specification will not be subjected to overpressure due to the system design.

### 3.14 Operability

Operability requirements for active valves are specified in the Technical Specifications.

### 3.15 Stress Reports

Stress reports shall be prepared by the VENDOR in accordance with the ASME Code, Section III, and with item 4.2.7 of the Technical Specification.

## 4.0 Valve Closure Testing

Valve closure members or actuating devices that would be subject to damage at a high differential pressure may be tested at a reduced pressure during the valve closure test in accordance with the applicable requirements of Section III of the ASME Code Article NC-3531.4(a). Article NC-3531.4(a) shall not be invoked without the consent of NEK. Consent should be documented on the specification data sheet as a note or on an attachment.

**EQUIPMENT SPECIFICATION  
EXCEPTIONS**

**KRSKO NUCLEAR POWER PLANT  
SP-508A**

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

\_\_\_\_\_  
(VENDOR'S NAME)

\_\_\_\_\_  
(MANUFACTURER'S NAME)

\_\_\_\_\_  
(QUOTATION NUMBER)

**Attest:**

\_\_\_\_\_  
(SIGNATURE)

\_\_\_\_\_  
(TITLE)

EQUIPMENT DATA

KRSKO NUCLEAR POWER PLANT  
SP-508A

NUKLEARNA ELEKTRARNA KRSKO

SAFETY CLASS VALVES

Each VENDOR shall return one copy of  
this form with all blanks filled in.

\_\_\_\_\_  
(VENDOR'S)

\_\_\_\_\_  
(MANUFACTURER'S NAME)

\_\_\_\_\_  
(QUOTATION NUMBER)

\_\_\_\_\_  
(VALVE SPECIFICATION SHEET NO.)

1. Valve description

a. Model number(s)/size range

\_\_\_\_\_ / \_\_\_\_\_

b. Bidder's data required to complete  
Valve Specification Sheets.

\_\_\_\_\_

Bonnet Seal Type

\_\_\_\_\_

Plug Material

\_\_\_\_\_

Seat Material

\_\_\_\_\_

Cv Full open @ max flow

\_\_\_\_\_

Max Flow @  $\Delta P$

\_\_\_\_\_

Mfg. Figure No.

\_\_\_\_\_

Assembly Dwg. No.

\_\_\_\_\_

Outline Dwg. No.

\_\_\_\_\_

Pneumatic Spring and Diaphragm

\_\_\_\_\_

Full Stroke at (psi)

\_\_\_\_\_

Size (sq. in.)

\_\_\_\_\_

Full stroke (in.)

\_\_\_\_\_

Operating Supply (psi)

\_\_\_\_\_

Stroke time to open (sec.)

\_\_\_\_\_



**EQUIPMENT DATA**  
**KRSKO NUCLEAR POWER PLANT**  
**SP-508A**

NUKLEARNA ELEKTRARNA KRSKO

SAFETY CLASS VALVES

(VENDOR'S)

**2. Packing/Shaft Seal**

- a. Manufacturers
- b. Temperature limitations
- c. Material
- d. Other

**3. Paint**

- a. Manufacturer and description
- b. Parts coated

**4. Deliver date at site**

# KRSKO NUCLEAR POWER PLANT

## SPECIFICATION DATA SHEET

ORIGINATOR: \_\_\_\_\_ SPECIFICATION NO: **SP-G508A**

REVIEWED BY: \_\_\_\_\_ SPEC. SHEET NO.: \_\_\_\_\_

DATE: \_\_\_\_\_

<u>TAG NUMBER</u>			<u>VALVE IDENTIFICATION NUMBER</u>			
<u>BODY</u>			<u>SERVICE CONDITIONS</u>			
1	NOMINAL SIZE	in.	32	FLUID	RADIOACTIVITY	WF -
2	FORM		33	TEMP. MAX. °F		
3	END CONNECTIONS - SCH		34	PRESSURE MAX. PSIG		
4	BONNET SEAL TYPE	per G508A	35	L/D FULL OPEN @ MAX. FLOW (or Cv)		
5	STEM PACKING MATERIAL		36	ANSI PRESSURE RATING		
6	BODY & BONNET MATERIAL		37	ASME CODE CLASS		
7	STEM MATERIAL		38	WEIGHT (Max.) LBS.		
8			39	SEAT LEAKAGE @ MAX. PRESSURE		
	<u>TRIM</u>		40			
10	PLUG FORM	**		<u>MOTOR OPERATOR (only)</u>		
11	MATERIAL: PLUG / DISC		41	POWER: VOLTS/PHASE/CYCLES		3 50
12	SEAT MATERIAL	**	43	STROKE TIME OPEN (MAX)		
13	DIAPHRAGM MATERIAL	**	44	STROKE TIME CLOSE (MAX)		
14	BONNET MATERIAL		45	MAX. ΔP VALVE TO OPEN AGAINST PSI		
15	PORT MATERIAL		46	MAX. ΔP VALVE TO CLOSE AGAINST PSI		
16	BIDIRECTIONAL SEALING	NO YES	47	<u>AIR OPERATED (only)</u>		
	<u>RELIEF VALVE (only)</u>			- OPERATING PRESSURE MAX. PSI		
17	GUIDE & RING MATERIAL			- FILTER & REGULATOR		
18	SPRING MATERIAL		48			
	<u>ACCESSORIES</u>			<u>RELIEF VALVE (only)</u>		
19	OPERATOR		49	FLUID	STATE	
20	BONNET TAP	**	50	MIN. REQUIRED CAPACITY GPM		
21	BONNET O-RING STEM SEAL		51	MOL WT OR SP.GR @ FT		
22	POSITION LOCKING DEVICE		52	VISCOSITY @ FT		
23	RELIEF VALVES (only)		53	PRESSURE, PSIG	NORMAL \ RELIEF	\
	- TEST GAG		54	TEMPERATURE °F	NORMAL \ RELIEF	\
	- BALANCED BELLOWS		55	CONSTANT BACK PRESSURE, PSIG		
	- LEVER PLAIN / PACKED		56	SPRING SET PRESSURE, PSIG		
24	LEAKOFF		57	DEVELOPED BACK PRESSURE, PSIG		
25	BACKSEAT		58	OVERPRESSURE, %		
26	MANUAL OVERRIDE		59			
27	LIMIT SWITCHES		<b>SPECIAL REQUIREMENTS:</b> Valve drawing, back-up stem packing, welding procedure, instruction manual require previous agreement and approval of NE Krsko			
28	POSITION INDICATOR					
29	POSITION STOP					
30						
31						

\*The Bidder shall calculate and quote. \*\* Data furnished with quotation

**Nuclear Safety Class Valve Specification**

**SP-G508A-536633-00026**

Nuclear Safety Class Valve Specification SP-G508A, is a revised edition of the original valve specification, reference 3. The specification format, the valve numbering system, the Design Specification, and the Specification Data Sheet are consistent with reference 3 and existing plant documentation.

Since SP-508A is a general specification that may be used to purchase a variety of safety class valve, some paragraphs will not apply when specifying any one particular valve configuration.

Attachment 1, Summary of Design Requirements, is provided as a reference guide to assist in identifying applicable paragraphs in the specification that are relevant to defining the design requirements for any one individual valve. The paragraphs identified in the guide, in addition to the information provide on the Specifications Data Sheet, constitute the valve design input which is necessary for the vendor to complete the design.

When purchasing a safety class valve for the KRSKO Plant, either it is postulated that a replacement valve or a valve for a new application is needed. To maintain consistent documentation it is assumed that the following sequence will be followed:

1. Replacement Valves: (Nuclear Safety Class)
  - a. Identify the valve identification number (tag no.) and obtain the Specification Sheet that describes the valve.
  - b. Review the Specification Sheet to assure the design criteria remains valid.
  - c. Prepare a new Specification Sheet per G508A.
  - d. Assemble the Valve Specification, the Valve Design Specification (attached to G and the new Specification Sheet.)
  - e. Upon completion of valve purchase and installation, revise the MECL, to include the current specification information.

I. Valve not in Plant (Nuclear Safety Class):

- a. Establish the design parameters of the valve.
- b. Assign a valve location number using the MECL as a guide to assure that the location number is not already assigned.
- c. Assign a valve tag numbers to the valve per established plant procedures.
- d. Using the tag number, review the existing specification sheets to identify applicable criteria.
- e. Prepare a new specification sheet using the blank forms attached to G-508A.
- f. Assemble the Valve Specification (G-508A), the Valve Design Spec. (attached to G-508A), and the new Specification Sheet.
- g. Upon completion of valve purchase and installation, revise the plane equipment list to include the current specification information.

To assist in obtaining Vendor documentation for valve during the purchasing cycle, Attachment 2, List of Required Submittals, is provided. This attachment is a comprehensive list of document submittals required from the Vendor during both the proposal evaluation and the contract phase of the valve purchase. It should be noted that the ASME Safety Class of the valve and the body configuration may eliminate certain requirements.

REFERENCE:

1. Valve list, DES-004 (GAI)
2. Westinghouse Equipment Spec. 677473, Rev. 3
3. G508, Spec. for Nuclear Safety Class Valves, including Design Specification and Valve Specification Sheets.

REFERENCE GUIDE  
 SUMMARY OF DESIGN REQUIREMENTS  
 IN VALVE SPECIFICATION SP-508A-536633-00026

GENERAL INFORMATION		BODY TYPE		OPERATOR		OPTIONS	
1. FOR ALL VALVES	3.1	1. GATE	3.3.2, 3	1. MOTOR	3.3.12.f	1. FLANGE ENDS	3.3.12.b
	3.2	2. GLOBE	3.3.2, 3	2. SOLENOID	3.3.12.g	2. THREADED	3.3.12.c
	3.3.1	3. DIAPHRAGM	3.3.6	3. PNEUMATIC	3.3.12.i	3. LEAKOFF	3.3.12.d
	5.0	4. CHECK	3.3.2, 4	3.1 DIAPHRAGM	3.3.12.i	4. AIR LOCK	3.3.12.i
		5. BUTTERFLY	3.3.8	3.2 CYLINDER	3.3.12.i	5. FILTER/REG.	3.3.12.i
		6. BALL	3.3.9	3.3 PISTON	3.3.12.i	6. MOTION TRANS.	3.3.12.j
		7. NEEDLE	3.3.10	4. HANDWHEEL	3.3.12.l	7. TRAVEL STOP	3.3.12.k
		8. SAFETY/RELIEF	3.3.5			8. PACKLESS	3.3.7
						9. BYPASS	3.3.12.a
						11. ACTIVE	4.2.5
						12. NON-ACTIVE	4.2.4
						13. LIMIT SWITCH	3.3.12.e
						14. POSITION ELEMENT	3.3.12.h



REFERENCE GUIDE  
**LIST OF REQUIRED SUBMITTALS**  
 for  
**NUCLEAR VALVE SPECIFICATION**

ITEM		PROPOSAL	CONTRACT
1.	DRAWING:	X	X
2.	LIST OF PROCEDURES:		
	a. Fabrication/Welding		X
	b. Testing		X
	c. Inspection		X
	d. Hydrostatic Test		X
	e. Cleaning, Painting		X
	f. Shipping		X
3.	TESTING RESULTS:		
	a. Material/Welding		X
	b. Hydrostatic		X
	c. NDE Report		X
	d. Performance (power operated only)		X
	e. Seat Leakage/Backseat		X
4.	Q.A. LOG:		X
5.	ASME III CODE:		
	a. Data Report		X
	b. Code Stamp		X
	c. Stress Report		X
6.	Installation, Operation & Maintenance Instruction Manual:		X
	a. Drawing		X
	b. Spare Parts List/Shelf Life		X
	c. Standard Catalog Information	X	X
	d. Torque Requirements		X
	e. Packing Replacement Procedure		X
	f. Environment Qualification Report		X
7.	"CERTIFICATE OF CONFORMANCE":		X
8.	EQUIPMENT DATA FORM	X	
9.	SPECIFICATION EXCEPTION FORM	X	

## KRSKO NUCLEAR POWER PLANT

## SPECIFICATION DATA SHEET

ORIGINATOR: Matjaž PleteršekSPECIFICATION NO: SP-G508AREVIEWED BY: Anton PreskarSPEC. SHEET NO.: C36-10DATE: 10.9.2024

	TAG NUMBER	1)		VALVE IDENTIFICATION NUMBER	1 1/2-S36
	BODY			SERVICE CONDITIONS	
1	NOMINAL SIZE	1-1/2 in.	32	FLUID	RADIOACTIVITY
2	FORM	CHECK	33	TEMP. MAX. °F	AIR NO
3	END CONNECTIONS - SCH	BW - Sch.40S	34	PRESSURE MAX. PSIG	150
4	BONNET SEAL TYPE	per G508A	35	L/D FULL OPEN @ MAX. FLOW (or Cv)	*
5	STEM PACKING MATERIAL		36	ANSI PRESSURE RATING	600
6	BODY & BONNET MATERIAL	CS	37	ASME CODE CLASS	3
7	STEM MATERIAL		38	WEIGHT (Max.) LBS.	**
8			39	SEAT LEAKAGE @ MAX. PRESSURE	2) Zero Leakage
	TRIM		40	N STAMP	YES
10	PLUG FORM	**		MOTOR OPERATOR (only)	
11	MATERIAL: PLUG / DISC	**	41	POWER: VOLTS/PHASE/CYCLES	
12	SEAT MATERIAL	SOFT SEAT	43	STROKE TIME OPEN (MAX)	
13	DIAPHRAGM MATERIAL	**	44	STROKE TIME CLOSE (MAX)	
14	BONNET MATERIAL	CS	45	MAX. ΔP VALVE TO OPEN AGAINST PSI	
15	PORT MATERIAL		46	MAX. ΔP VALVE TO CLOSE AGAINST PSI	
16	BIDIRECTIONAL SEALING	NO	47	AIR OPERATED (only)	
	RELIEF VALVE (only)			- OPERATING PRESSURE MAX. PSI	
17	GUIDE & RING MATERIAL			- FILTER & REGULATOR	
18	SPRING MATERIAL		48		
	ACCESSORIES			RELIEF VALVE (only)	
19	OPERATOR		49	FLUID	STATE
20	BONNET TAP	**	50	MIN. REQUIRED CAPACITY GPM	
21	BONNET O-RING STEM SEAL		51	MOL WT OR SP.GR @ FT	
22	POSITION LOCKING DEVICE		52	VISCOSITY @ FT	
23	RELIEF VALVES (only)		53	PRESSURE, PSIG	NORMAL \ RELIEF
	- TEST GAG		54	TEMPERATURE °F	NORMAL \ RELIEF
	- BALANCED BELLOWS		55	CONSTANT BACK PRESSURE, PSIG	
	- LEVER PLAIN / PACKED		56	SPRING SET PRESSURE, PSIG	
24	LEAKOFF	NO	57	DEVELOPED BACK PRESSURE, PSIG	
25	BACKSEAT	NO	58	OVERPRESSURE, %	
26	MANUAL OVERRIDE	NO	59		
27	LIMIT SWITCHES		<b>SPECIAL REQUIREMENTS:</b> 1) 14854, 14855, 14862, 14863, 14842, 14843, 14844, 14845, 14846, 14847, 14848, 14849, 14850, 14851, 14852, 14853, 14858, 14859, 14860, 14861 2) CLASS VI, ANSI FCI 70-2		
28	POSITION INDICATOR	NO			
29	POSITION STOP	NO			
30					
31					
*The Bidder shall calculate and quote. ** Data furnished with quotation					