

NPP KRŠKO
TO.VZISI



TECHNICAL SPECIFICATION

No. ISI 13/24

for

Inservice Inspection Services
During Outage 2025

(EBS IN 8242 164)

Revision 0

Safety Related

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1.0 ACTIVITY

This document defines requirements related to the scope, performance, and schedule of the ultrasonic (UT) examination during NPP Krško Outage 2025 for safety related class 1 and 2 piping and component welds and reactor vessel closure head studs.

NPP Krško is a pressurized water reactor two-loop plant of Westinghouse design. It is in commercial operation since 1983 and currently is running fifth inspection interval based on ASME Section XI, 2017 Edition that started in July 2022 and will end in July 2032. NPP Krško applies Risk Informed Inservice Inspection Program (RI-ISI) for class 1 and 2 piping welds. The program was originally developed based on Electric Power Research Institute (EPRI) Topical Report TR-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure". The RI-ISI application was also conducted in a manner consistent with ASME Code Case N-578-1 "Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B," and ASME Section XI Nonmandatory Appendix R, "Risk-Informed Inspection Requirements for Piping".

UT examination of the piping welds and reactor vessel closure head studs is required to be performed by qualified examiners using procedures qualified in accordance with Appendix VIII of ASME Section XI or as modified by Electric Power Research Institute Performance Demonstrated Initiative (EPRI PDI) Program. All other welds in vessel components shall be performed in accordance with Vendor's procedures.

2.0 SCOPE OF SERVICE

UT scope of examinations on class 1 and 2 welds and studs is listed in the Appendix 14.1 of this specification. Manual UT examinations of piping welds and studs (designation "PDI") shall be performed in accordance with EPRI PDI generic procedures for piping welds as follows:

- PDI Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds, PDI-UT-1
- PDI Generic Procedure for the Ultrasonic Examination of Austenitic Pipe Welds, PDI-UT-2
- PDI Generic Procedure for Ultrasonic Through Wall Sizing in Pipe Welds, PDI-UT-3
- PDI Generic Procedure for the Ultrasonic Examination of Bolts and Studs, PDI-UT-5, and
- PDI Generic Procedure for Ultrasonic Examination of Weld Overlaid Similar and Dissimilar Metal Welds, PDI-UT-8.

Appendix 14.1 lists total of 37 items to be examined. It is the option of the NPP Krško to add 6 (PDI-UT-2; 4-inch NPS) additional items to be examined. For these locations the radiation dose is estimated up to 5 mSv/h in average.

In addition to the above procedures, vendor is required to perform examination of two 2-inch alternative spay line socket welds (Items 35 and 36) and adjacent base pipe material using EPRI Procedure for Encoded Phased Array Ultrasonic Examination of Small-Bore Socket Fillet Welds: EPRI-SW-PA-1 Revision 3 or own procedure that

demonstrates detection of imperfections in socket welds. Following positions: Nozzle-to-Vessel Weld, Longitudinal Weld and Circumferential Weld on pressurizer (Items 2, 3 and 4), as well as Tubesheet-to-Shell Weld, Nozzle-to-Shell Weld, Shell Circum. Weld and Head Circum. Welds on steam generator (Items 23, 24, 25 and 26) shall be examined in accordance with Vendor's procedures. These procedures shall be prepared in accordance with ASME Sec. V, Article 4 and Sec. XI, Mandatory Appendix III, edition 2017 and approved by NPP Krško UT Level III.

3.0 SAFETY CLASSIFICATION

In-service Inspection is considered as Safety Related (SR) activity.

4.0 TYPE OF SERVICE

According to internal NPP Krško classification, In-service Inspection is considered as activity which includes inspection performance based on fixed price and in compliance with Vendor's quality assurance (QA) program approved by NPP Krško.

5.0 APPLICABLE CODES, STANDARDS AND PROCEDURES

- Code of Federal Regulations 10 CFR 50.55a; 10 CFR 50 Appendix B, 10 CFR Part 21
- ASME B&PV Code Section XI, 2017 Edition
- ASME B&PV Code Section V, 2017 Edition
- ANSI/ASNT CP-189, 2006 Edition
- EPRI PDI UT piping generic procedures listed in chapter 2.0, latest revisions
- TD-2E/5; Inservice Inspection Program for the Fifth Inspection Interval
- Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines (MRP-146)

6.0 IDENTIFICATION OF EQUIPMENT AND COMPONENTS

There are total of 37 items specified for UT examination identified in Appendix 14.1 to this specification. Items requested to be examined in accordance with ASME Sec. XI, Appendix VIII in the Appendix 14.1 are designated as "PDI".

7.0 TECHNICAL REQUIREMENTS

Based on NPP Krško experience, for this scope, components radiation levels and daily dose limits, Vendor shall deliver a team of at least 6 UT examiners (one examiner shall be appointed as a team leader). UT team shall consist of examiners so that their ASME Sec. XI, Appendix VII and EPRI PDI qualifications are covering scope of examination listed in Appendix 14.1. It is required that at least three examiners are qualified for EPRI procedure **PDI-UT-2 with IGSCC (Intergranular Stress Corrosion Cracking)** and at least two examiners are qualified for procedure PDI-UT-3. The number of examiners for each procedure shall be suitable to the radiation dose rate that is estimated about 0.5 mSv/h in average.

NPP Krško UT Level III shall be a project leader and will perform the surveillance during the examination. NPP Krško qualified and certified UT examiners may be involved in sensitive examinations, incorporated in the Vendor's team.

Vendor shall use only UT instruments and search units listed in EPRI PDI tables. Vendor shall deliver at least three sets of operable and functional UT instruments and search units. All necessary equipment and material shall possess valid certificates and statements of conformance as required by referencing code.

For all manual UT examinations of piping welds designated as "PDI" Vendor will be provided with last revisions of EPRI generic procedures that will be handed over by authorized NPP Krško UT Level III individual.

8.0 QUALIFICATION REQUIREMENTS

As a basis UT personnel shall be trained, qualified, and certified by Vendor for at least level II in accordance with ANSI/ASNT CP-189, ASNT Standard for Qualification and Certification of Nondestructive Personnel and ASME Sec. XI, Appendix VII. In addition to that Vendor's team leader shall possess a valid American Society for Nondestructive Testing (ASNT) Level III certificate for UT method.

For examinations of welds designated with "PDI" UT personnel shall be qualified at EPRI for the related procedures and possess certificates for these qualifications. Vendor's team leader (Level III) shall be qualified for at least three EPRI PDI procedures mentioned in Chapter 2.0. Additionally, to prove continuous familiarity with "PDI" procedures and examinations after initial qualification, UT examiners shall possess endorsements issued by EPRI about performing annual "hands on" trainings on samples with real cracks as required by 10 CFR 50.55a. Mandatory, last training must be completed at EPRI no earlier than 6 months prior to NPP Krško Outage 2025.

Finally, after all these prerequisites it is the option that each UT examiner must pass NPP Krško "Site-specific" practical examination on NPP Krško weld samples. This examination will be graded by NPP Krško Principal UT Level III in accordance with ASME Sec. XI, Appendix VIII rules.

9.0 DETAIL SCHEDULE

The examination is scheduled for October 2025. Vendor will be informed about exact start of inspection. For this scope of examination, it is scheduled net 20 days. In addition to this, Vendor shall take at least one day for "check in", "Safety at Work" training and preparation activities, as well as time necessary for preparation of the preliminary report at the end of inspection.

It is the intention to perform examination activities in 10 hours shifts per day. Detail time schedule will be established before start of inspection by NPP Krško ISI personnel together with Vendor.

Because ISI time schedule is depending on actual plant outage schedule some of the inspections may be shifted to the late evening or night shifts.

10.0 VENDOR's RESPONSIBILITIES

Vendor shall provide to NPP Krško:

Documentation included in the bid proposal:

- Written practice (procedure for training, qualification, and certification in accordance with ASME sec. XI and CP 189). This practice shall be approved by NPP Krško Level III project leader
- Quality Assurance (QA) Manual that complies with 10CFR50 Appendix B and 10CFR Part 21
- Vendor's organization chart with names and certificates of potential examiners

Before start of inspection:

- Inspection Plan where NPP Krško and Vendor's team leader will define check points (R, W, H, T)
- trained, qualified and certified examination personnel as required in Section 8.0 with valid licenses to work in radiation area
- instruments and search units as listed on EPRI qualified equipment list, calibration standards like ferritic and austenitic IIW blocks, other material and consumables required for performance of examinations
- certificates about contaminants and safety data sheets for all materials like UT couplant, cleaners etc. shall be provided at least 30 days before inspection

During inspection:

- daily reporting about scope performed and examination findings

After inspection:

- preliminary report (one hard copy and one electronic) of the performed examinations not later than 5 days after completion of full scope of the examination which includes as a minimum:
 - short overview of the examination with results and evaluation of all indications according to acceptance criteria
 - non-conformities with their status
 - qualitative judgment of the work performed
 - Inspection Plan with all checkpoints (R, W, H, T) signed
 - all UT records
- final report (4 hard copies and one electronic) not later than 30 days from the completed scope of work which includes as a minimum:
 - overview of the examination scope with results and evaluations
 - non-conformities with their statuses
 - list of all applied examination and control procedures
 - list of all personnel and their certificates
 - equipment and material list including consumables with all calibration evidences and certificates
 - results of the examinations and evaluations
 - Inspection Plan with all QA/QC reports

11.0 NPP KRSKO RESPONSIBILITIES

NPP Krško shall provide the following:

- all necessary ISI Program documents
- on-site transportation and lifting
- supply of electric power
- Reference UT calibration blocks for items listed in Appendix 14.1
- HP coverage
- support for decontamination
- scaffolding and insulation removal.

12.0 SPECIAL REQUIREMENTS

Vendor shall incorporate into inspection team at least 2/3 of UT examiners with references of at least five in-service inspections as UT examiners qualified by EPRI in accordance with PDI implementation of ASME Sec. XI, Appendix VIII.

Each company bidding for this job shall deliver a copy of the current Written Practice in accordance with CP-189 and ASME XI, the list of NPP Krško Outage 2025 potential UT examiners with CP-189 and ASME Sec. XI, App. VII UT certificates, personnel certificates of qualified EPRI PDI generic procedures, EPRI endorsements of PDI annual "hands on" trainings (or statement that "hands on" will be performed before NPP

Krsko Outage), and the list of references of the PDI examinations performed in nuclear plants. Each bidding company shall send all these documents in bidding documentation.

13.0 QA REQUIREMENTS

Vendor's QA Program

The Vendor shall provide a Quality Assurance (QA) Manual that complies with 10 CFR 50 Appendix B and 10CFR Part 21 and satisfies the requirements of the NPP Krško specification QS 610 Rev. 2 - »Generic Quality Assurance Program Requirements«.

QA Program review and acceptance by the NPP Krško shall be a prerequisite for selection of a Bidder as a Vendor. The Vendor 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 NPP Krško prior to implementation.

The Vendor shall pass the requirements of this specification to its subcontractor(s) and retain full responsibility for their performance in accordance with the requirements of this specification.

Applicable Codes and Standards:

- 10 CFR 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
- 10 CFR 21, Reporting of Defects and Noncompliance
- ANSI/ASME NQA-1-2008, Addenda 2009/2011, Quality Assurance Requirements for Nuclear Facility Applications

During performance of the activity, it is a duty of the Vendor's Lead examiner to continuously monitor the inspection team, to refer in writing and verbally about work progress, as well as about deviations from prescribed requirements.

14.0 APPENDICES

14.1 Scope of UT examinations – ISI Program Plan UT - 2025

Appendix 14.1 Scope of UT examinations – ISI Program Plan UT – 2025

No.	Component Id.	Class	System	ISI Fig.	Line Ident.	Component Description	Exam. C/Item	Vol.	Notes Comments	History	NPS	Restriction
1	1-011-RCPCRV-STUDS	1	RC	011	RCPCRV	Closure Head Studs	B-G-1	B6.20	UT	RE-18	52.70" x 6"	N/A
2	1-018-RCPCPR-01-BW-10	1	RC	018	RCPCPR-01	Nozzle-to-Vessel Weld	B-D	B3.110	UT	RE-18	31" x 3"	N/A
3	1-018-RCPCPR-01-BW-2	1	RC	018	RCPCPR-01	Longitudinal Weld	B-B	B2.12	UT	RE-16	12" x 3.9"	N/A
4	1-018-RCPCPR-01-BW-5	1	RC	018	RCPCPR-01	Circumferential Weld	B-B	B2.11	UT	RE-16	92.3" x 3.9"	N/A
5	1-018-RCPCPR-01-SWOL-1	1	RC	018	RCPCPR-01	Structural Weld Overlay	N-770-5	C-1	UT	RE-18	19" x 2.64"	N/A
6	1-035-SL-BW-4	1	RC	035	SURGE LINE	Butt Weld	R-A	R1.11	UT	PDI: IE		BW to elbow
7	1-038-RC-11-BW-15	1	RC	038	RC-11	Butt Weld	R-A	R1.11	UT	PDI: IE	12" SCH 160	BW to VLV
8	1-047-CS-16-BW-5	1	CS	047	CS-16	Butt Weld	R-A	R1.20	UT	PDI: IE	3" SCH 160	BW to elbow
9	1-048-CS-19-BW-4	1	CS	048	CS-19	Butt Weld	R-A	R1.20	UT	PDI: IE	3" SCH 160	BW to VLV
10	1-049-CS-84-BW-4	1	CS	049	CS-84	Butt Weld	R-A	R1.11	UT	PDI: IE	3" SCH 160	BW to VLV
11	1-049-CS-84-BW-6	1	CS	049	CS-84	Butt Weld	R-A	R1.11	UT	Weld added as selection during I4P3 Update; PDI: IE	3" SCH 160	BW to VLV
12	1-049-RC-03-BW-1	1	RC	049	RC-03	Butt Weld	R-A	R1.20	UT	PDI: IE	3" SCH 160	BW to branch connection
13	1-049-RC-03-BW-2	1	RC	049	RC-03	Butt Weld	R-A	R1.20	UT	PDI: IE	3" SCH 160	BW to T
14	1-055-RH-06-BW-1	1	RH	055	RH-06	Butt Weld	R-A	R1.20	UT	Ref. 1.2.12, PDI	8" SCH 160	BW to branch connection
15	1-055-RH-06-BW-8	1	RH	055	RH-06	Butt Weld	R-A	R1.20	UT	PDI: IE	8" SCH 160	BW to elbow
16	1-056-RH-07-BW-7	1	RH	056	RH-07	Butt Weld	R-A	R1.20	UT	PDI: IE	8" SCH 160	BW to elbow
17	1-056-RH-07-BW-8	1	RH	056	RH-07	Butt Weld	R-A	R1.20	UT	PDI: IE	8" SCH 160	BW to elbow
18	1-072-SI-55-BW-21	1	SI	072	SI-55	Butt Weld	R-A	R1.20	UT	PDI: IE	6" SCH 160	BW to branch connection
19	1-073-SI-54-BW-18	1	SI	073	SI-54	Butt Weld	R-A	R1.20	UT	PDI: IE	6" SCH 160	BW to branch connection
20	1-075-SI-50-BW-14	1	SI	075	SI-50	Butt Weld	R-A	R1.20	UT	Ref. 1.2.12, PDI: IE	12" SCH 140	BW to elbow
21	1-077-SI-51-BW-11	1	SI	077	SI-51	Butt Weld	R-A	R1.20	UT	PDI: IE	12" SCH 140	BW to VLV
22	1-077-SI-51-BW-3	1	SI	077	SI-51	Butt Weld	R-A	R1.20	UT	Ref. 1.2.12, PDI	12" SCH 140	BW to T
23	2-013-SGN2-BW-2R	2	RC	013	RCPCSGN2	Tube-sheet-to-Shell Weld	C-A	C1.30	UT	RE-18	96.5" x 2.91"	N/A
24	2-013-SGN2-BW-7R	2	RC	013	RCPCSGN2	Nozzle-to-Shell Weld	C-B	C2.21	UT	RE-16	32" x 4.33"	N/A
25	2-019-CSATVC-01-BW-1	2	CS	019	CSATVC-01	Shell Circum. Weld	C-A	C1.10	UT	RE-16	90" x 0.25"	N/A
26	2-026-CSAHEL-01-BW-1	2	CS	026	CSAHEL-01	Head Circum. Weld	C-A	C1.20	UT	RE-16	9.5" x 0.75"	N/A
27	2-059-SI-28-BW-20	2	SI	059	SI-28	Butt Weld	R-A	R1.20	UT	PDI: IE		BW to elbow
28	2-059-SI-30-BW-26	2	SI	059	SI-30	Butt Weld	R-A	R1.20	UT	PDI: IE	12" SCH 40	BW to elbow
29	2-060-SI-26-BW-13	2	SI	060	SI-26	Butt Weld	R-A	R1.20	UT	PDI: IE	12" SCH 40	BW to T
30	2-077-SI-51-BW-7	2	SI	077	SI-51	Butt Weld	R-A	R1.20	UT	Ref. 1.2.12, PDI	12" SCH 40	BW to elbow
31	2-092-FW-01-BW-5	2	FW	092	FW-01	Butt Weld	R-A	R1.20	UT	Ref. 1.2.9, PDI	16" SCH 80	BW to elbow
32	2-092-FW-01-BW-7	2	FW	092	FW-01	Butt Weld	R-A	R1.20	UT	Ref. 1.2.9, PDI	16" SCH 80	BW to elbow
33	2-094-FW-02-BW-6	2	FW	094	FW-02	Butt Weld	R-A	R1.20	UT	Ref. 1.2.9, PDI	16" SCH 80	N/A
34	2-094-FW-02-BW-8	2	FW	094	FW-02	Butt Weld	R-A	R1.20	UT	Ref. 1.2.9, PDI	16" SCH 80	BW to elbow
35	1-052-CS2-116-SW-12	1	CS	052	CS2-116	Socket Weld	R-A	R1.20	UT	OTI RE25, MRP-146	2" SCH 160	SW to VLV
36	1-052-CS2-116-SW-13	1	CS	052	CS2-116	Socket Weld	R-A	R1.20	UT	OTI RE25, MRP-146	2" SCH 160	SW to T
37	2-093-FW-14-BW-11R	2	FW	093	FW-14	Butt Weld	R-A	R1.20	UT	PDI: OTI RE25	16" SCH 80	BW to branch connection