NUKLEARNA ELEKTRARNA KRŠKO
TO.VZ

TECHNICAL SPECIFICATION
TS ISI - 03/19

For

ECT inspection of BOP HEX CY (3A) & (3B) and TC in Outage 2019

(EBS IN_____)

Rev. 0

AQ – AUGMENTED QUALITY

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1. ACTIVITY

Technical Specification defines requirements related to performance and scope of the BOP HEX on secondary side of the plant 3A & 3B: **CY104HEX-001 (3A) & CY104HEX-002 (3B)** and **TC100HEX-001.** Potential supplier (bidder) is expected to submit proposal for the service during refueling outage 2019.

2. SCOPE

Scope of ECT bobbin inspection **100% tubes** in 3A & 3B; i.e. **1288 U-tubes** in each heat exchanger. Both together (3A + 3B) **1288 x 2 = 2576.** Time available in chapter 9. Scope of ECT inspection in TC100HEX-001 is also **100%** i.e. = **3247 straight tubes.**

NPP Krško will provide calibration blocks (TO.VZISI). Supplier shall provide all necessary personnel, equipment and consumables required for inspection. One (1) month before the outage all necessary documentation shall be hand over to NEK:

- An organization chart including functions of individuals
- QA / QC Quality/Inspection Plan with the possibility of entering the required presence / information for NPP Krško QA and authorized organizations representatives,
- List of procedures to be used in the service,
- Certificates of inspection personnel,
- Personnel performance record / work experience on ECT heat exchangers,
- Copy of Medical and vision test reports
- List of ECT equipment, techniques and software with appropriate (if applicable) calibration records and certificates,

The fulfillment of technical and formal requirements of ANSI / ASNT CP-189 will be verified by TO.VZISI. Selected supplier will get documentation of past ECT inspection results and corrective actions (plugging). NPP Krško will provide all necessary ECT calibration blocks.

3. SAFETY CLASIFICATION

ECT inspection of **CY104HEX-001 (3A), CY104HEX-002 (3B) and TC100HEX-001** in the plant secondary side is classified as ″**Augmented Quality**″ activity.

4. TYPE OF SERVICE

SG ET Inspection is considered as type of service with fixed price for defined activity and scope according to supplier's procedures which will be reviewed and accepted by NEK and includes supplier's QA/QC.

5. APPLICABLE CODES; STANDARDS AND PROCEDURES

5.1 ASME B&PV Code Section XI, Edition 2007 with the Addenda 2008
5.2 ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Non-destructive Testing Personnel
5.3 EPRI / TR-108009; Balance-of-Plant Heat Exchanger Condition Assessment and Inspection Guide, Final Report Dec. 1999
5.4 EPRI / TR-103824; Steam Generator Reference Bcok, Dec 1994
5.5 EPRI / Eddy Current Guide For Engineers; Training course materials, 2001

6. IDENTIFICATION OF EQUIPMENT AND COMPONENTS

These are CY HEX **CY104HEX-001 (3A) & CY104HEX-002 (3B) and TC100HEX-001** with technical details in 14. **Attachments**.

7. TECHNICAL REQUIREMENTS

Supplier shall perform ECT of 3A, 3B and TC multi-frequency bobbin inspection. The collected ECT data must allow analysis in differential and absolute mode (with additional use of MIX channels if necessary) in order to enable reliable analysis and interpretation of data. The analysis must be capable of detecting degradation-mechanisms such as OD & ID SCC (Stress Corrosion Cracking), PITTING, as well as service-induced mechanical damage to the pipe: FRETTING, FATIGUE cracking, IMPINGMENT, WEAR, DENTING and PLP (loose parts) (appropriate explanations of individual degradation mechanisms are given in Ref. 5.3 and 5.4). In the data analysis report, the identified indications shall be nominated according to their type, origin, or cause of origin, using the appropriate abbreviations. The equipment for data collection and analysis must be calibrated and properly labeled

8. QUALIFICATION REQUIREMENTS

Data acquisition personnel shall be qualified & certified for at least level I or II in accordance with reference 5.1 in 5.2 and for data analysis level II. Leading analyst shall have level III certificate.

Very different mechanisms of degradation processes have been detected on NEKs heat exchangers so far. Supplier is expected to provide experienced data acquisition and

analysis staff. Tubes are often very difficult to inspect - RESTRICTED pipes, DENTs on the pipes, making the acquisition process very difficult.

It is also desirable that staff who will perform ECT data analysis have many years of experience in analyzing ECT data of Steam Generators and appropriate qualifications there (QDA). This experience is necessary because due to different degradation processes on the exchangers and due to the fact that the final assessment of detected indications will only be done on the basis of bobbin data (No MRPC technique), which requires extensive experience of ECT analysts.

9. DETAILE TIME SCHEDULE

ECT inspection of 3A, 3B and TC HEX NKE will be performed in accordance with the valid NEK outage plan, which can still be changed. The expected available time for the overview of 3A and 3B exchangers at the time of writing of this specification is as follows:

- CY104HEX-001 (3A): 08/10/2019 - 13/10/2019
- CY104HEX-002 (3B): 11/10/2019 - 16/10/2019
- TC100HEX-001: 12/10/2019 – 15/10/2019

The supplier is expected to be able to take into account flexible start of activity. The notice of the exact start of the activity will be given to the supplier at least 14 days before start of the outage, which is now planned for 1th of October 2019.

10. SUPLIER RESPONSABILITIES

- Prepare and submit implementation procedures
- Prepare QA/QC Quality/Inspection Plan with the possibility of entering the required witness / hold points for QA NEK and authorized representatives
- Provide qualified NDE staff with qualifications and general experience as defined in paragraph 8.
- Perform evaluation of detected indications in accordance with the implementation procedures and prepare a proposal of plugging list. Acceptance criteria will be determined together with Plant representative (TO.VZISI) depending on the extent and type of the degradation mechanism.
- Plugging list shall be part of preliminary report two (2) days after the inspection. Final report shall be hand over 30 days after the inspection.
- Cooperate with NEK TO.VZISI staff, which will be actively involved in data analysis results. TO.VZISI will also coordinate the entire activity (changes to the plan, daily reports, etc.).
- The staff must have valid medical examinations and a Site Specific Training course. In addition to that at least two (2) individuals must passed training course for NEK Work Shift Leader in order to provide 24 hours/day shifts. These courses are available in Slovenian or Croatian language only.

11. NEK RESPONSIBILITIES

- Submit all necessary documentation, as-built drawings and previous ECT reports.
- Assure access to the components.
- Coordination of all activities and informing supplier about eventual changes in the plant-Outage Plan.
- Review of Preliminary and Final report of ECT inspection carried out.
- Organize NEK Site Specific Course for supplier personnel participants.
- Organize NEK Shift Leader course for 2 individuals (in SLO or CRO language).
- Organize internal transportation (forklift, etc.)
- Provide ECT calibration blocks

12. SPECIAL REQUIREMENTS

Supplier must submit a preliminary report at a closing meeting in one (1) copy of the performed activities, which must include the following:
- Name, title and contract number of the report
- Name and surname of the person, as well as the signature of the person who prepared the report
- Date of preliminary report hand-ower
- Scope of work completed, restricted tubes, re-works and eventual additional scope
- ECT inspection results.
- List of NCR reports with status
- Proposal of plugging list for each heat exchanger
- Organization chart, a list of personnel and their certificates
- List of equipment with associated documentation and calibration certificates,
- Completed QA / QC control plan

Supplier must submit a Final report in three (3) copies 30 days after inspection completed which shall contain the following:

- Company name, title, contract number, report title, number and date
- Names, signatures and date of Final report issued.
- Approved document list (prepared/reviewed/approved) of applicable procedures
- List of test and inspection equipment
- List of inspection equipment certificates
- List of NDT personnel certificates
- Scope of work completed
- ECT results shall contain also:
    - List of tubes inspected
    - Plugging list
    - No. of indications/tube
    - No. of DNT/tube (dented)
    - No. of RES/tubes (restricted)
    - No. of WEAR/tube

- »lay-out« Tube Sheet with plugged tubes for each BOP HEX
- List of NCR reports with status
- Report of Scope completed, additional scope (if any), degradation mechanisms detected, QA assessment with comments and recommendations for improvements in next operating cycle.

13. QA - REQUIREMENTS

The contractor shall ensure that contractual quality-related requirements are fulfilled by using their own Quality Management System, which complies with the ISO 9001 standard or a comparable standard, and with the relevant requirements from the QA specification NEK QS 610, rev. 1, Generic Quality Assurance Program Requirements, accepted by NEK. Any changes to this document during the validity of the obligations under this contract must be accepted beforehand by NEK.

Bidding documentation must include a valid Quality Management System Manual under which the works will be performed. The adequacy and effectiveness of the contractor's Quality Management System shall be verified and confirmed by NEK.

Activities shall be performed in accordance with the contractor's Quality Management System and a previously approved Quality / Inspection Plan, and internal technological and control procedures.

Activities shall be performed under the surveillance of the responsible contractor's site manager and qualified QA/QC personnel. The contractor shall assure compliance with quality requirements, to fulfil commercial and technical requirements and to meet the schedules, including responsibility for all their potential subcontractors.

Handover documentation shall include all quality records, as defined in the contract, and shall be provided to the purchaser in the form of a final report after the completion of all works.
Handover documentation and final report shall be reviewed and approved, by mutual agreement, by the responsible representatives of the contractor and the purchaser.

Contractual works shall be performed in compliance with legal requirements, required standards and technical regulations in such a manner as to comply with the requirements of environmental management system as per ISO 14001 and occupational health and safety at work system as per BS OHSAS 18001.

14. ATTACHEMENTS:

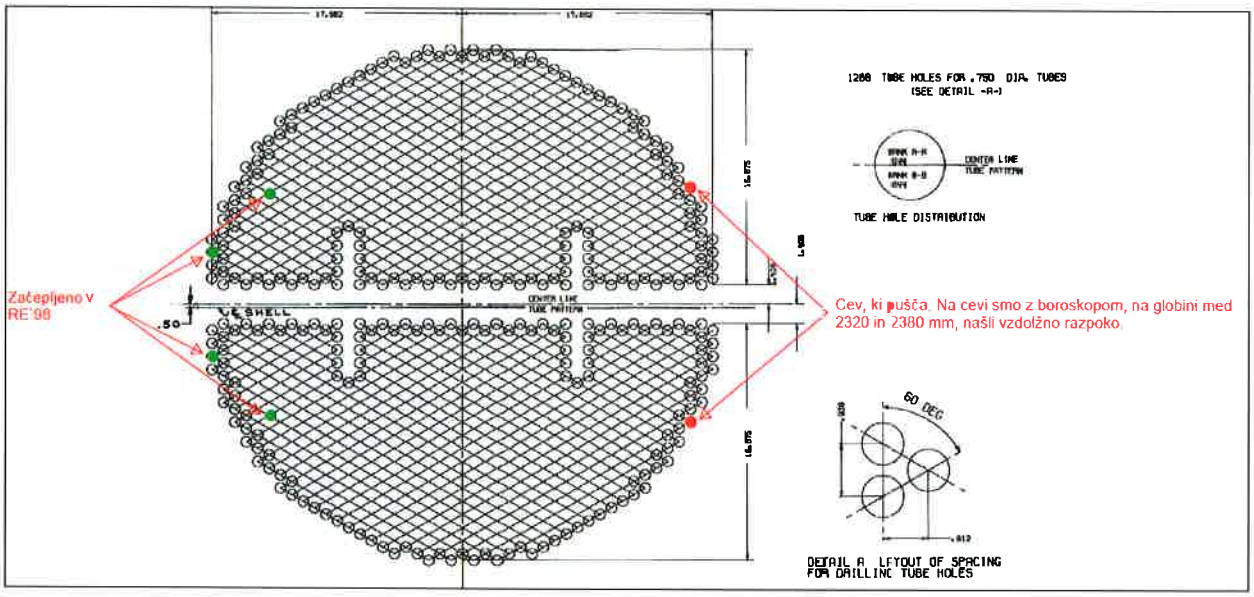
14.1 Details & drawings of CY Heat Exchangers 3A & 3B:
14.2 Technical details & drawings of TC
14.3 QS 610, rev. 1, Generic Quality Assurance Program Requirements

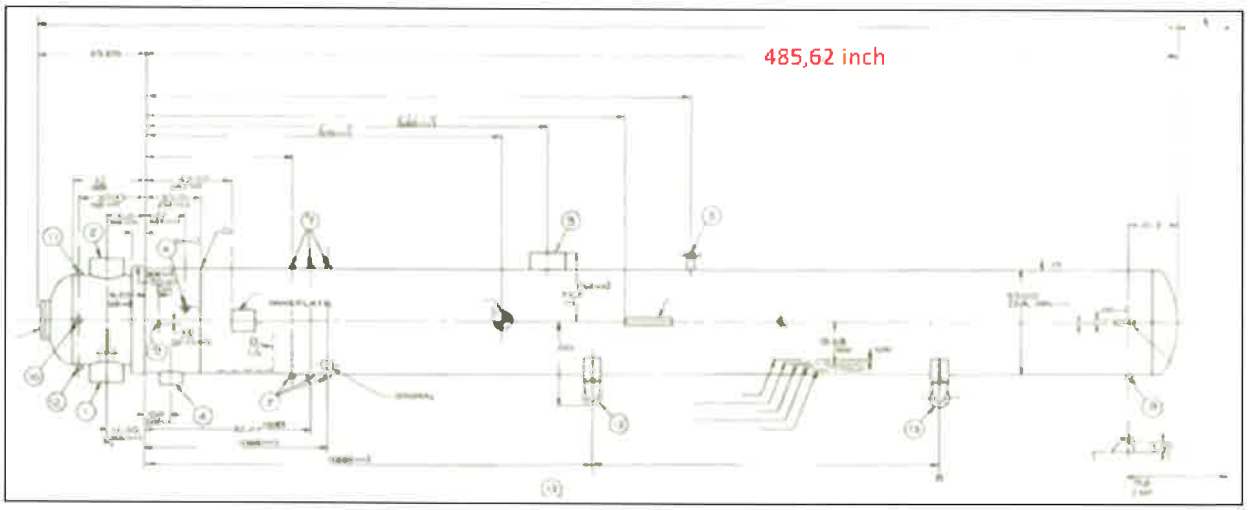
All other technical details and drawings are available on the site of NPP Krško.

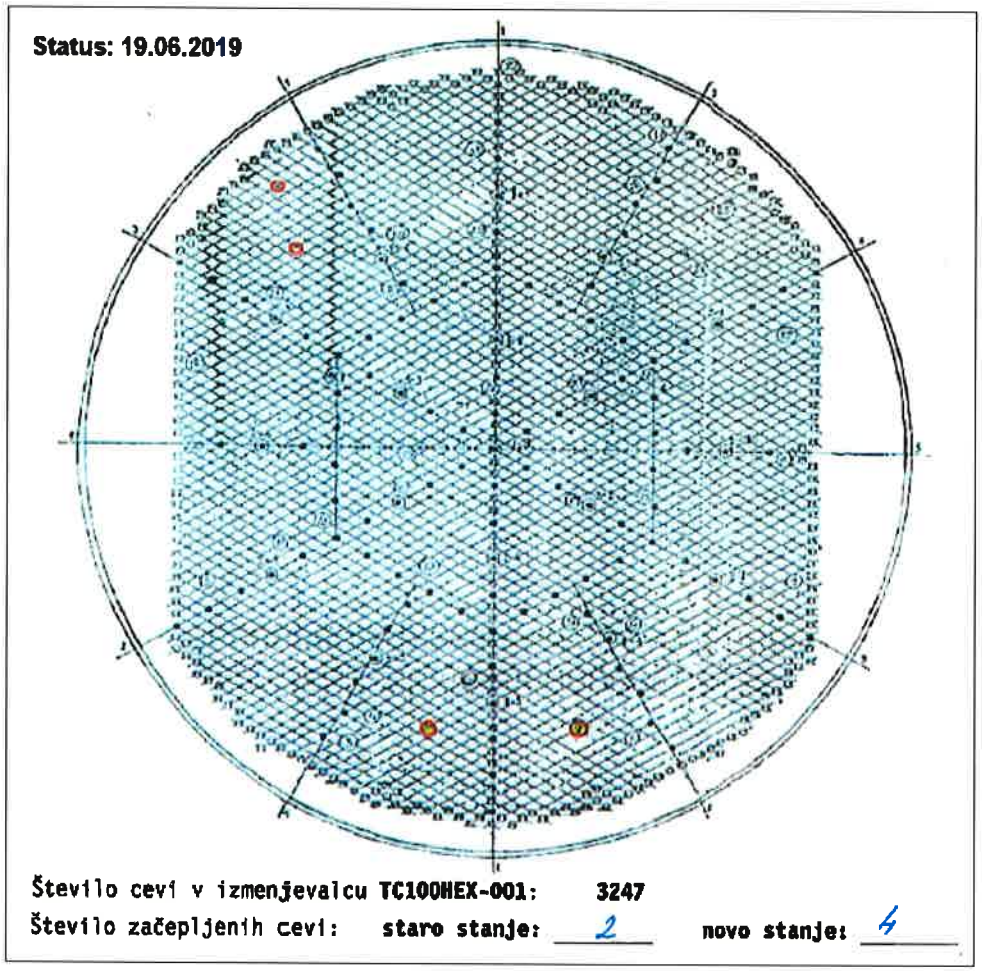
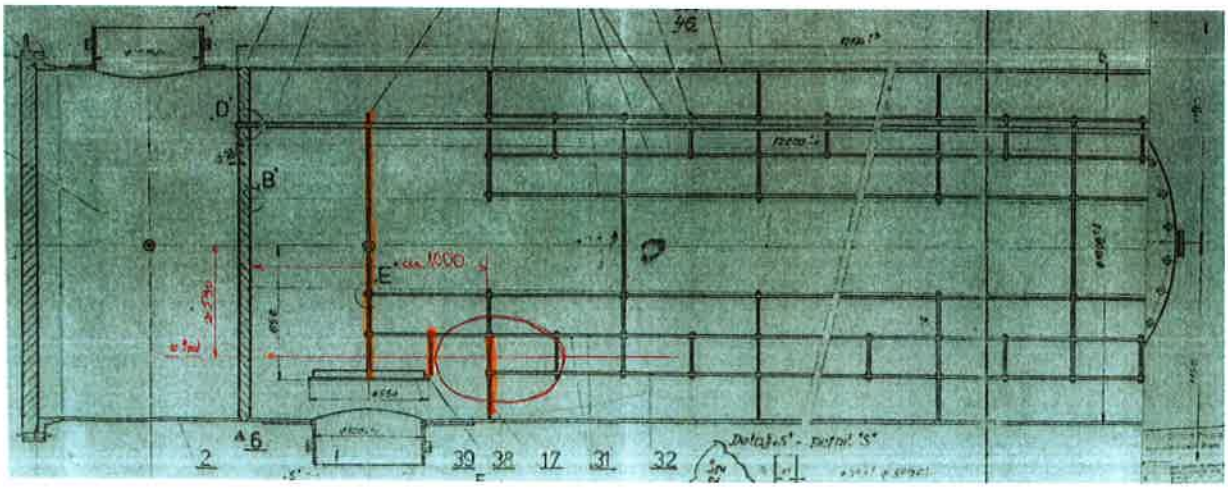
ATTACHEMENT 14.1 Details & drawings of CY Heat Exchangers 3A & 3B:

CY104HEX-001 (3A), Ser. No.: 18A4119-1
CY104HEX-002 (3B), Ser. No.: 18A4119-2

Tube diameter:	0.75″ O.D. x 20BWG
Tube material:	Stainless Steel Type 304
Tube length:	max 485 in. / U-bend
No. of tubes:	1288 (3A + 3B = 1288 x 2 = 2576 tubes)
ECT Scope:	100%
Time schedule:	Paragraph 9.





ATTACHEMENT 14.2 Details & drawings of TC100HEX-001

Tube diameter:	¾" O.D. x 18 BWG
Tube material:	ASTM B111/CDA 443
Tube length:	12,194 m / straight tubes
No. of tubes:	3247 tubes
ECT Scope:	100%
Time schedule:	Paragraph 9.