

APPROVED
AB ORLEN Lietuva
Deputy General Director
for Operations
Order No.1(1.2-1)-2026-0195

**OPERATING INSTRUCTION BM-1
FOR TUBE HEATERS, INCINERATORS, PREHEATERS, AND COMBUSTION CHAMBERS**

I. PURPOSE

1. Operating Instruction BM-1 for Tube Heaters, Incinerators, Preheaters and Combustion Chambers (hereinafter – the Instruction) defines the requirements for the operation, reconstruction and installation (hereinafter – the use) of tube heaters, incinerators, pre-heaters and combustion chambers (hereinafter – the heaters) at AB ORLEN Lietuva (hereinafter – the Company).

II. APPLICATION

2. The requirements of this Instruction are mandatory for all employees of the Company's organizational units and contractor organizations (where stipulated in the relevant contracts) whose activities are related to the use of all heaters operated by the Company.

III. REFERENCES

3. This Instruction shall apply in conjunction with the following legislation (as amended to date):

3.1. General Regulations on the Use of Working Equipment approved by the Minister of Social Security and Labor of the Republic of Lithuania;

3.2. Technical Regulation of Pressure Equipment (2016) approved by the Minister of Economy of the Republic of Lithuania;

3.3. Safety Rules for Operation of Heating Equipment approved by the Minister of Energy of the Republic of Lithuania;

3.4. Rules for Operation of Crude Processing Facilities approved by the Minister of Economy of the Republic of Lithuania.

IV. ABBREVIATIONS, TERMS AND DEFINITIONS

4. Terms and definitions:

Test pressure, P_b – pressure at which combustion chambers, preheaters and heater tube coils are tested.

Operating pressure, P_d – the maximum pressure at which a heater or a tube coil is operated. The operating pressure can be equal to or lower than design pressure P_s ;

Burner – a device that supplies fuel gas or liquid fuel to a combustion chamber at a specified flow rate, turbulence, and concentration in order to create and maintain the conditions necessary for ignition and combustion. The burner is intended for firing gaseous and liquid fuels, either separately or simultaneously, in any proportion, with liquid fuel being atomized together with steam.

Combustion gas (flue gas) – the products of combustion of fuel gas or fuel oil, including excess air.

Combustion chamber – a horizontal cylindrical refractory-lined vessel equipped with a front-mounted burner, intended for high-temperature conversion of hydrogen sulphide gas into sulphur (used in the Elemental Sulphur Production Unit);

Fuel gas duct (or flue gas piping) – a system intended for the removal of air or combustion gases by natural or forced draft;

Fittings – devices that facilitate monitoring of heater operation, maintenance, and cleaning (explosion relief openings, inspection windows, dampers, etc.);

Tube coil hydraulic test (HT) – verification of tube coil strength and tightness by applying test pressure.

Lining (refractory) – an internal monolithic structure of the heater / flue gas duct made of fire resistant concrete or fireclay brickwork, as well as mineral or rock wool, intended to reduce temperature impact on the heater / flue gas duct shell and to protect it against the corrosive effects of flue gases and acidic condensates;

Header – a chamber intended for collecting incoming/outgoing product or distributing it to a multi-pass tube coil.

Convection section – the part of a heater in which heat is transferred to the tube coil mainly by convection.

Heater operation – activities related to process control of heaters, start-up and shutdown, maintenance, repair, modification, measurements, testing, commissioning, adjustment, and cleaning.

Heater steel framework – the main load-bearing structure consisting of interconnected structural frames with welded steel plates, designed to support the loads of the refractory lining, tube coils, fittings, connection piping, and access platforms.

Heater reconstruction – all works performed on a heater that result in changes to the initial parameters specified in the tube coil passport, process characteristics, or the material properties of the heater steel framework, tube coils, or their supports.

Heater repair – restoration of the heater's serviceability by replacing worn components or, without replacement, by performing other operations (welding, cutting, grinding) necessary to ensure safe operation.

Heater technical documentation – the heater certificate of conformity, heater passport, drawings, maintenance records, and other documentation provided by the manufacturer specifying the heater's purpose, design, parameters, mandatory safety requirements, and operating procedures.

Technical maintenance – a set of preventive and other measures intended to ensure that the heater and its elements comply with their intended purpose and condition throughout an economically and technically justified service life, ensuring safe operation.

Technical inspection – mandatory visual inspections and other actions needed to verify heater compliance with safety requirements performed in accordance with the procedure and time limits defined in applicable heater operation and maintenance regulations, manufacturer's technical documents and/or owner's documents.

Process control – a set of technical and organizational measures ensuring reliable, economical, and safe heater startup/commissioning, maintenance of the specified operating mode, shutdown, localization of malfunctions and emergencies, and restoration of normal operation.

Heater – equipment designed for high temperature heating of crude oil and petroleum products, preheating or burning of process gas, depending on the technological process. Heaters include tube heaters, preheaters, combustion chambers and incinerators.

Routine technical maintenance – regular testing, inspection, repairs and other actions mandatory for heaters in continuous service established in the applicable operation and maintenance regulations and manufacturer's technical documents.

Preheater – a horizontal cylindrical refractory-lined vessel with a front-mounted burner designed for process gas mixing and pre-heating (used in the Elemental Sulphur Production Unit).

Recognized standards – national and international standards applicable to heater calculation, design, and operation (LST EN, ISO, DIN, API, GOST, etc.).

Design service life – the guaranteed operating time of tube coils, expressed in hours, and the operating life of preheaters, incinerators, and combustion chambers, expressed in years / cycles, during which the manufacturer guarantees reliable operation provided that the operating parameters and modes specified in the manufacturer's instruction manual are complied with.

Radiant section – a part of a heater in which fuel gas or fuel oil is fired and heat is transferred primarily to the tube coil by thermal radiation.

Tube support plate, hanger, support – supporting components of a tube coil.

Design (allowable) pressure P_s – the maximum pressure for which the equipment is designed, as specified by the manufacturer.

Pressure – pressure relative to atmospheric pressure, i.e. gauge pressure. Vacuum is considered negative pressure.

Incinerator – a horizontal or vertical cylindrical refractory-lined vessel equipped with a burner and intended to neutralize or burn residual process gases. Residual process gases (flue gas) are discharged to the atmosphere through a stack (used in the Elemental Sulphur Production Unit).

Medium – gases, liquids, vapors, or their mixtures, with or without impurities, contained in a heater or heater tube coil. The medium may contain suspended solid particles.

Process unit – (hereinafter – process unit, unit, block, or object) – a set of crude refining facilities consisting of equipment, apparatuses, vessels, systems, instruments, etc., installed at a specific location and interconnected / separated by pipelines.

Damper – a device intended to stop or regulate the flow of combustion gases (flue gases) or air and to control draft or pressure in the combustion chamber.

Heater tube coil (hereinafter – tube coil) – a structure consisting of straight tubes interconnected by elbows, through which heated petroleum products circulate and on the surface of which heat transfer takes place.

Inspection of an operating heater (hereinafter – OHI) – monitoring of process parameters and external visual inspection to assess the heater's technical condition and system performance.

Internal and external inspection (hereinafter – IEI) – assessment of the technical condition of heaters (tube coils, radiant and convection sections, supports, and other components) by means of internal and external visual inspections, measurements, and tests.

V. RESPONSIBILITIES

5. Employees of the subdivision operating the heaters – Senior Process Unit Operator and Process Unit Operators (hereinafter – the Operators) shall be responsible for routine technical maintenance of operating heaters, including shift-based visual inspections as well as proper and safe process control of heaters.

6. Heads of process units in which heaters are installed, or other employees of appropriate qualification appointed by an order of the Company's General Director (hereinafter – the Person responsible for Process Control), shall be responsible for routine technical maintenance of heaters, including ensuring proper and safe process control of heaters and organization of such process control.

7. Mechanical Engineers – Engineers Experts / Senior Mechanical Engineers / Engineers of the Mechanical Department (hereinafter – the Mechanical Engineers) shall be responsible for routine technical maintenance of heaters, including preparation of heaters for technical inspections and organization of repair works, within the subdivisions assigned to them by order of the Deputy Director of Maintenance.

8. Engineers Experts / Senior Engineers / Engineers of the Technical Supervision and Materials Analysis Group of the Mechanical Department (hereinafter – the TSG Engineers), appointed by an order of the Equipment Technical Supervision and Materials Analysis Group Manager, shall be responsible for routine technical maintenance of heaters (tube coils, headers, combustion chambers, preheaters, and supports), including technical condition inspection and evaluation, acceptance of completed repair, reconstruction, and installation works, proper preparation of technical documentation, and preparation of the annual operating heater inspection schedule.

9. Engineers Experts / Senior Civil Engineers / Civil Engineers of the Civil Construction Technical Supervision and Maintenance Group of the Mechanical Department (hereinafter – the Civil Engineers), appointed by an order of the Chief Mechanical Engineer, shall be responsible for routine technical maintenance of heaters, including liners, fire-proof materials, steel frameworks, flue gas ducts, and fittings, as well as for technical condition inspections and acceptance of repair, reconstruction, and installation works.

10. Engineers Experts / Senior Engineers / Engineers of the Energy Engineering Group of the Energy Department (hereinafter – the Engineers), to whom these duties have been assigned, shall be responsible for monitoring of heater technological parameters (including burner firing control), review of technological operating limits, and participation in technical inspections of heaters.

11. Engineers experts / Senior Electrical and Automation Engineers / Engineers of the Maintenance Department (hereinafter – the Electrical and Automation Engineers) shall be responsible for routine technical maintenance and organization of repairs of electrical and automation equipment of heaters within subdivisions assigned to them by a decree of the Deputy Director of Maintenance.

12. Persons who violate the requirements of this Instruction shall be held liable in accordance with the laws and other legal acts of the Republic of Lithuania and in accordance with the procedure established by the Company.

VI. DESCRIPTION OF ACTIONS

General requirements

13. The requirements of this Instruction apply to the following heater components:

13.1. Tube coils;

13.2. Fittings (explosion relief openings, inspection windows, dampers);

13.3. Headers;

13.4. Heater steel framework;

13.5. Flue gas ducts (or flue gas duct piping);

13.6. Lining (or refractory);

13.7. Burners;

13.8. Air preheaters;

13.9. Control and automation instruments.

14. Process control of heaters shall be performed in accordance with the process regulations and other recognized standards defining safe operating conditions for the technological process.

15. For each heater tube coil, a set of technical documentation in the form established by the Company shall be compiled – a heater tube coil passport (Annex 1). When manufacturing (installing or reconstructing) tube coils, their passports shall be prepared by the manufacturer (installer) in accordance with the form provided by the Company.

16. The heater tube coil passport shall contain the following information:

16.1. Location of installation of the heater tube coil; owner (the Company and its address); manufacturer (manufacturer's name and address);

16.2. Main parameters of the heater tube coil: process fluid, temperatures (T_d , T_s , T_{max} of the tube wall), pressures (P_d , P_s , P_{HB});

16.3. Documents confirming conformity assessment of the heater tube coil (declarations of conformity, certificates, and drawings);

16.4. Heater tube coil welding conformity documents, indicating the welding method, the type and grade of welding materials, the names of welders and their identification marks, and the methods and results of weld testing, demonstrating suitability for service, where required to substantiate conformity;

16.5. A heater tube coil connection diagram approved by the Company's Director of Production (a schematic drawing indicating the pressure source, process fluid, parameters – temperatures (T_d , T_s), pressures (P_d , P_s , P_{HB}) – fittings, control and measuring instruments, alarm and automation control systems, safety devices, interlocks.

Routine technical maintenance of operating heaters

17. Routine technical maintenance of operating heaters includes:

17.1. **Shift-based** (heater visual inspection) – performed each shift by the relevant shift operators operating the heaters;

17.2. **Periodic** (operating heater inspection – OHI) – performed once a year by a commission composed of an Engineer of the Energy Engineering Group of the Energy Department; a TSG Engineer of the Mechanical Department; a Civil Engineer of the Civil Structures Technical Supervision and Maintenance Group of the Mechanical Department; Electrical and Automation Engineers of the Maintenance Department; persons responsible for process control; Mechanical Engineers of the Maintenance Department within the subdivisions assigned to them. OHI shall be carried out in accordance with a schedule prepared by the TSG engineer of the Mechanical Department (Annex 2), coordinated with the Director of Maintenance, the Deputy Director of Maintenance, the Chief Mechanical Engineer, the Heads of Production Subdivisions No. 1, No. 2, and No. 3, and approved by the Deputy General Director for Production Operations;

17.3. **Extraordinary** (OHI) – carried out after repair or reconstruction works and after placing the heater back into operation. Persons responsible for process control of the process units in which heaters are installed shall notify the TSG Engineer by email of the need to perform an extraordinary OHI. Extraordinary inspections shall be carried out by a commission of the same composition as for the periodic inspection.

18. Shift-based routine technical maintenance includes:

18.1. Monitoring compliance of process parameters with the process regulations during operation and maintaining them within specified limits;

18.2. Ensuring correct operation of burners. Contact between burner flames and tube coils is not permitted. The flame shall be stable, non-pulsating, and free of smoke;

18.3. Inspecting heater tube coils, grates, hangers, and guiding supports through inspection windows, with particular attention to bent and/or bulged coil tubes, stains and/or burn-throughs on tubes, and any structural deformation or damage to supports, hangers, or tube support plates.

18.4. Shutting down the heater upon detection of tube coil burn-throughs and/or bulging;

18.5. Inspecting the condition of the lining (refractory), paying particular attention to expansion joints and the condition of burner embrasures;

18.6. Inspecting the condition of measuring and control instruments, as well as alarm and protection systems; they shall be in proper condition and operational;

18.7. Inspecting the heater steel framework, supporting and load-bearing structures, access platforms, walkways, and stairs;

18.8. Assessing the serviceability of lighting equipment and fire-fighting equipment.

18.9. Recording the results of shift-based OHI in the shift logbook.

19. Periodic technical maintenance includes:

19.1. All activities specified in Item 18.

19.2. Verification of key process parameters, both current (at the time of inspection) and, where applicable, historical parameters from the preceding operating period, with particular attention to combustion gas temperatures at transition / bridgewall zones, product temperature at the heater outlet, surface temperature of tube coil walls, ensuring that these values do not exceed limits specified in the process regulations;

19.3. Analysis of thermographic inspection results of heater tube coils (thermographic inspections shall be performed in accordance with the annual OHI schedule prepared by the TSG Engineer, coordinated with the Equipment Technical Supervision and Material Analysis Group Manager, Heads of Operations Subdivisions No. 1, No. 2, and No. 3, the Chief Mechanical Engineer,

the Director of Maintenance, and approved by the Deputy General Director for Production Operations, Annex 2);

19.4. Analysis of thermographic inspection results of the heater steel framework (thermographic inspections shall be carried out once per year in accordance with the annual schedule prepared by the Rotating Equipment Technical Supervision and Maintenance Group Engineer, coordinated with the TSG Engineer and the Rotating Equipment Technical Supervision and Maintenance Group Manager, Annex 3).

20. Upon completion of a periodic or extraordinary operating heater inspection (OHI), and taking into account comments on identified deficiencies received by email from commission members, the TSG Engineer shall prepare a heater technical inspection report (Annex 4). The report shall be signed by commission members participating in the inspection, coordinated with the Equipment Technical Supervision and Material Analysis Manager, and approved by the Chief Mechanical Engineer.

21. Based on observations specified in the technical inspection report, Mechanical Engineers shall prepare a corrective action plan for elimination of identified defects and/or non-conformities (Annex 5). The plan shall be approved by the Deputy Director of Maintenance and formally communicated, against signature, to the relevant Maintenance Managers and Heads of Operations Subdivisions.

22. The approved technical inspection report and the plan for elimination of defects/nonconformities indicated in technical inspection report are returned to TSG engineer for scanning and uploading into the TP.Shell.XAP program. Original technical inspection reports and corrective action plans shall be stored at the Mechanical Department, Equipment Technical Supervision and Material Analysis Group. The TSG Engineer shall be responsible for proper storage of these documents.

23. Operation of heater tube coils that have reached or exceeded their design service life, or have been in service for more than 20 years, is permitted only after completion of a technical condition assessment and determination of the remaining allowable service life.

Technical maintenance of heaters during their shutdowns

24. Technical maintenance during heater shutdown includes:

24.1. **Scheduled** (technical condition inspection) – performed during planned heater shutdown for repair.

24.2. **Unscheduled** (technical condition inspection) – performed during emergency heater shutdowns.

25. Scheduled and unscheduled technical inspections include:

25.1. Preparation of heater components for inspection;

25.2. Corrosion protection of tube coils made of austenitic steels against cracking caused by polythionic acids and chlorides;

25.3. Visual inspection and non-destructive testing (NDT) of components listed in Item 13.

25.4. Organization of repair and/or reconstruction works.

25.5. Verification of the quality of repair and/or reconstruction.

25.6. Hydraulic testing of heater tube coils and headers (hereinafter – HT);

25.7. Preparation of the technical inspection report.

26. Heater tube coils, headers and tube support plate shall be prepared for technical inspection in accordance with an inspection plan (hereinafter – IP) (Annex 6) prepared for each heater by the TSG engineer. The inspection plan shall be coordinated with the Equipment Technical Supervision and Materials Analysis Manager and Maintenance Manager of the relevant operations subdivision, and approved by Chief Mechanical Engineer.

27. Heater steel frameworks, shells, flue gas ducts, and dampers shall be prepared for technical inspection based on a diagram indicating NDT locations. The diagram for each heater shall be prepared by a Civil Engineer.

28. The following requirements shall be observed when protecting austenitic steel tube coils against the formation and effects of polythionic acids and chlorides:

28.1. If high-sulphur fuel is being fired and the heater will not be opened or depressurized, the internal temperature of the heater shall be maintained between 150–230°C by keeping the burners in operation;

28.2. For heaters firing clean gas fuel ($H_2 S \leq 0.01\%$ by volume), no additional protection of the external tube coil surface is required. In cases where heaters have been continuously operated on a combination of gas ($H_2 S > 0.01\%$ vol.) and fuel oil, and are subsequently switched to gas firing only, without removal of deposits from the tube coils, additional protection is required. In such cases, an alkaline wash using a 5% sodium carbonate ($NaCO_3$) solution shall be carried out to form a protective layer against acid attack. The washing shall be performed before atmospheric moisture begins to condense on the surfaces of the tube coil elements. As an alternative to forming a protective layer by alkaline washing, sandblasting or mechanical removal of deposits from the tube coils may be used.

29. Technical inspection of heater tube coils and headers includes:

29.1. Visual inspection (hereinafter – VI) of all tube coil elements in the radiant section and in accessible parts of the convection section. During VI, all unacceptable surface defects that may reduce the strength of the elements shall be identified and assessed, with particular attention to surface corrosion, burn-throughs, cracks, fissures, bulging, defects in welded joints. If there is any doubt regarding the condition of elements or welded joints, additional examination shall be carried out using other non-destructive testing methods.

29.2. Measurement of the outside diameter of all tubes in the radiant section and accessible parts of the convection section, using a fork (U-shaped) gauge or other instruments with an accuracy of ± 0.5 mm, in order to detect unacceptable dimensional changes. The outside diameter of heater tubes shall not exceed the nominal value by more than 5 mm.

29.3. Measurement of wall thickness shall be carried out for all elements of the radiant section tube coils, headers, and accessible tubes and bends in the convection section. Measurement locations shall be selected based on operating experience and indicated in the diagrams attached to the inspection plan (IP). If the corrosion rate of tube coil elements is less than 0.2 mm/year (confirmed by at least two measurements taken at different times), thickness measurements may be performed at selected locations across different temperature zones. If the measured wall thickness of at least one selected element is below the retirement thickness, thickness measurements shall be extended to all elements of the same type. Wall thickness measurements may be performed using ultrasonic testing (UT_{Th}), or radiographic testing (RP), or other diagnostic methods used in tube-coil inspection practice. Tube coil elements may be operated only until the retirement thickness specified in Annex 7 is reached.

29.4. During scheduled technical inspections of heaters in Production Subdivisions No. 1, 2, and 3, where wall thickness measurement is provided for in the inspection plan, it shall be ensured that, wherever technically possible, wall thickness measurements are carried out on the lower rows of convection tubes located inside the heater.

30. The remaining service life of heater tube coils shall be calculated using the following formula:

$$H = \frac{S - S_{br.}}{KG}, \text{ years;} \quad (1)$$

Where:

S – wall thickness of the heater tube coil element measured during the latest inspection, mm;

$S_{br.}$ – retirement thickness of the heater tube coil element, mm;

KG – corrosion rate of the heater tube coil element, mm/year;

31. The corrosion rate may be calculated as follows:

31.1. Where previous measurements are available, the corrosion rate shall be calculated using the following formula:

$$KG = \frac{S_{t1} - S_{t2}}{\Delta T_1}, \text{ mm/year;} \quad (2)$$

Where:

S_{t1} – wall thickness of the heater tube coil element measured during the previous inspection, or the initial wall thickness after installation if no earlier measurements are available, mm;

S_{t2} – wall thickness of the heater tube coil element measured during the most recent inspection, mm;

ΔT_1 – time interval between the previous and most recent thickness measurements, years;

31.2. Where no previous measurements are available (i.e. thickness measurement is performed for the first time), the corrosion rate shall be calculated using the following formula:

$$KG = \frac{S_{nom.} - S_{t2}}{\Delta T_2}, \text{ mm/year} \quad (3)$$

Where:

$S_{nom.}$ – nominal wall thickness of the heater tube coil element (as specified in manufacturer quality documentation), mm;

S_{t2} – wall thickness of the heater tube coil element measured during the most recent inspection, mm;

ΔT_2 – time interval between commissioning of the element and the most recent thickness measurement, years.

32. Hardness testing (hereinafter – HT) shall be performed, on a selective basis, for convection and radiant tube coil elements as well as headers made of steels susceptible to hardening (1X2M1, 15XM, 15X5M, 15X5M-Y, X9M, P22, P5, P9, P91, etc.). Hardness shall be measured for the base metal, the heat-affected zone of welded joints and the weld metal at locations specified in the diagrams attached to the inspection plan (IP), distributed across different temperature zones. If, for any tested element (base metal, heat-affected zone, or weld metal), at least one hardness value falls outside the allowable limits, hardness testing shall be doubled for all elements of the same type. Hardness values shall comply with the limits specified in recognized standards.

33. Penetrant testing (hereinafter – PT) or magnetic particle testing (hereinafter – MT) shall be performed in weld zone or base metal areas identified by the TSG engineer based on the results of visual inspection (VI).

34. Metallographic examination (by cutting out a specimen or using a portable microscope) shall be performed on heater tube coils made of austenitic steels (08X18H10T, 12X18H10T, W1.4541, TP 321/321H, TP 347, etc.). The locations and methods of metallographic examination shall be selected based on the operating history of the heater and specified in the diagrams attached to the IP.

35. Additional non-destructive testing (NDT) methods may be applied as required, depending on the technical condition of the heater and the results obtained from inspections specified in Items 29–34.

36. Requirements for hydraulic testing (HT):

36.1. The purpose of hydraulic testing (HT) is to verify the strength of tube coil elements and the tightness of their joints. HT shall be carried out during technical inspection of tube coils or after replacement of tube coil elements.

36.2. HT shall be performed using water or other non-aggressive liquids with a temperature between 5°C and 40°C, unless otherwise specified by the heater manufacturer. Air shall be completely removed from the tube coil during filling. During testing, the tube coil walls shall not show condensation caused by temperature differences between the test fluid and ambient air. When testing tube coils made of austenitic steels, the chloride content in the test water or liquid shall not exceed 50 ppm.

36.3. HT shall be monitored using two calibrated pressure gauges (manometers) of the same type, range, accuracy class, and scale, one installed at the lowest point and the other at the highest point of the system.

36.4. The test pressure for strength shall comply with the requirements specified in the design documentation or in the manufacturer's passport. If the manufacturer does not specify the test pressure, tube coils manufactured in accordance with ПД 26- 02- 80 or OCT 26 291 shall be tested at a pressure calculated as:

$$P_b = 1,25 \times P_s \frac{[\sigma]_{20}}{[\sigma]_t}, \quad (4)$$

Tube coils manufactured in accordance with API 560 shall be tested at:

$$P_b = 1.5 \times P_s \frac{[\sigma]_{38}}{[\sigma]_t}, \quad (5)$$

Where:

P_b – test pressure (bar);

P_s – design (allowable) pressure (bar);

$[\sigma]_{20}$ or $[\sigma]_{38}$ – allowable stress of the coil material at 20°C or 38°C;

$[\sigma]_t$ – allowable stress at design temperature.

36.5. Pressure during HT shall be increased and decreased gradually, in accordance with manufacturer recommendations or, if not specified, at a rate not exceeding 2 bar per minute. The use of air or other gases to increase pressure is not permitted.

36.6. The holding time during HT shall comply with the requirements specified in the design or in the manufacturer's passport. If not specified, for tube coils manufactured according to РД 26-02-80 or OCT 26 291 standards – not more than 10 minutes and for API 560 tube coils – not less than 1 hour.

36.7. After applying the test pressure, it shall be reduced to the maximum allowable pressure, and the tightness of the tube coil shall be checked by thorough inspection of its surface, as well as all detachable and welded joints.

36.8. During HT, the stresses in the tube coil walls shall not exceed 90% of the material yield strength at test (ambient) temperature.

36.9. The tube coil shall be considered to have successfully passed the hydraulic test if no visible pressure drop occurs; no residual deformations or cracks are observed; no leakage or sweating is detected through welded joints, detachable joints, or base metal.

36.10. After completion of HT, the test liquid shall be drained from all parts of the tube coil. When drying tube coils made of austenitic steel, they shall be purged with nitrogen.

36.11. For combined heaters with two or more tube coil packages (e.g. convection coils and steam super-heaters) designed for different pressures, each coil package shall be hydraulically tested at the pressure for which it is designed.

37. For heaters where hydraulic testing of tube coils is impractical (e.g. heaters with non-detachable headers internally lined with refractory, or coils from which water cannot be effectively removed and where the process does not allow the presence of water), pneumatic testing may be used instead. Pneumatic testing shall be performed using compressed air or inert gas in accordance with the manufacturer's instructions, or a test procedure prepared by the testing contractor and approved by the Company's Occupational Safety Manager, specifying all necessary safety measures.

38. Assessment of the technical condition of heater tube coil elements (unless otherwise specified in the tube coil passport) shall be carried out in accordance with:

38.1. СТО–СА-03-004-2009 '*Трубчатые печи, резервуары, сосуды и аппараты нефтеперерабатывающих и нефтехимических производств. Требования к техническому надзору ревизии и отбраковке*' for heaters manufactured in accordance with РД 26-02-80-88 '*Змеевики сварные для трубчатых печей. Требования к проектированию, изготовлению и поставке*';

38.2. API RP 573 'Inspection of Fired Boilers and Heaters' for heaters manufactured in accordance with API STD 560 / ISO 13705 'Fired Heaters for General Refinery Service', 4th Edition.

38.3. After completion of the heater technical inspection, the TSG Engineer shall prepare a technical inspection report in the TP.Shell.XAF system (Annex 8). Report approval and subsequent actions shall be carried out in accordance with the TP.Shell.XAF user instruction.

39. If, during technical inspection, wall thickness reduction of heater tube coil elements down to or below the retirement thickness (specified in Annex 7) is identified, such elements may continue to be operated provided that the established service life of the tube coil (in operating hours) has not been exceeded; and strength calculations confirm that the remaining wall thickness will be sufficient to withstand operating loads until the next scheduled shutdown (or for the specified operating period). If defects or deficiencies are identified in heater components not subjected to pressure, such components may continue to be operated provided that safe operation is ensured, as confirmed by appropriate engineering calculations and/or sound engineering practice. The results of calculations and any recommendations shall be included in the heater technical inspection report.

Reconstruction and repair of heaters, installation of new heaters

40. In order to assess the possibility of operating a heater under technical parameters different from those specified in the heater technical documentation, recognized standards shall be applied. The requirements of these standards shall not be less stringent than those applied in the manufacture of the heater or its components.

41. The Company installs and operates heaters in accordance with the conditions specified by the designer (manufacturer), their technical documentation, recognized standards, and the requirements of this Instruction.

42. The tube coil battery limits are defined as the first process medium inlet/outlet flange, provided that the flange is located no more than 2 m from the heater, or alternatively the first welded joint outside the heater boundary.

43. After repair (reconstruction), or when accepting a new heater or its individual assemblies and components for operation, the requirements of the detailed design, the normative documents provided by the manufacturer, and this Instruction shall be followed.

44. Modification of the heater structure, changes to materials or dimensions of its elements, as well as changes to process parameters or capacity increase, may only be carried out based on a design supported by calculations and/or other analyses confirming that such changes will not adversely affect the safe operation of the heater.

45. Reconstruction of heaters shall be carried out in accordance with an approved design, in compliance with the Company's change management procedures for modifications related to refinery processes. Repairs shall be performed without a design, based on an approved repair procedure (see Item 49).

46. The reconstruction design shall specify the technical requirements applicable to heater reconstruction, including the type and scope of inspection of welded joints, as well as the quality acceptance criteria for welds and heater elements. The requirements of these technical standards shall not be less stringent than those applied during the manufacture and/or installation of the heater. If this condition is not met, the differences in requirements shall be justified by appropriate calculations and/or sound engineering practice.

47. Mandatory occupational safety and health requirements applicable to any equipment used by organizations performing installation, reconstruction, or repair works, including requirements for the manufacture of individual work equipment or groups of equipment and their conformity assessment procedures, are established by technical regulations and other occupational safety and health legislation. Only technically sound work equipment that complies with occupational safety and health requirements may be used. Employees of the contractor performing the works shall use work equipment safely. Requirements for the safe use of specific work equipment shall be defined in the equipment documentation and instructions provided by the manufacturer together with the equipment. The contractor performing the works shall ensure that such instructions are available.

48. The scope of heater repair shall be determined based on the heater technical inspection report and the corrective action plan for elimination of identified defects and/or non-conformities.

49. Prior to performing heater repair or reconstruction works, the contractor shall prepare a repair / installation / reconstruction procedure (a work method statement) and a quality control plan in accordance with the template provided in Annex 9. When a tube coil spool or another element is cut out during repair or reconstruction, the open ends shall be sealed to prevent ingress of foreign objects that could obstruct the flow of the process medium. The contractor performing welding and installation works on the tube coil shall be responsible for sealing.

50. Materials and technologies used for heater repair shall be equivalent to those used during manufacturing, or alternatively shall be selected in accordance with applicable standards and repair procedures.

51. All materials used for repairs shall have quality compliance certificates. Materials made of austenitic steels shall be tested for resistance to inter-granular corrosion in accordance with ASTM A-262 Practice E. In the absence of certificates, such materials may only be used after appropriate analysis, testing (including identification), and confirmation of compliance through positive test results.

52. Where it is necessary to connect heater tube coil elements located outside the heater that were manufactured in accordance with different standards (GOST, ASME, etc.), special adapters shall be used to prevent reduction in wall thickness at the connection points.

53. Heater repair and reconstruction works may be performed only by legal entities holding a certificate issued by the National Energy Regulatory Council (VERT) authorizing operation of oil and

petroleum product equipment and the performance of repair and reconstruction works on petroleum refining installations.

54. During welding works carried out as part of heater repair or reconstruction:

54.1. The contractor's welding coordinator shall hold at least one of the following qualifications:

54.1.1. Welding Engineer EWE/IWE, LST EN ISO 14731;

54.1.2. Welding Technologist EWE/IWE, LST EN ISO 14731;

54.1.3. Welding Specialist EWS/IWS, LST EN ISO 14731;

54.1.4. Welding Inspector EWII/IWI, LST EN ISO 14731;

54.2. Welder qualification shall comply with the requirements of LST EN 287 or LST EN ISO 9606-1, unless otherwise specified in the design documentation.

55. In addition to the requirements specified in Items 45, 49, and 53, the contractor shall prepare the following documentation prior to commencing repair or reconstruction works:

55.1. Welding procedure qualification records (WPQR) and a list thereof for all welding methods and weld types to be applied during the works;

55.2. Welding procedure specifications (WPS) for all welding methods and weld types to be used, coordinated with the Equipment Technical Supervision and Material Analysis Manager of the Mechanical Department;

55.3. A list of certified welders who have passed qualification tests (as specified in Item 55), together with copies of their certificates;

55.4. A list of personnel trained in assembly of flanged joints (where applicable);

55.5. Regardless of the validity of welder qualification certificates, all welders shall additionally pass a qualification test in accordance with the procedures established by the Company.

56. Upon completion of heater repair or reconstruction, and prior to internal/external inspection (IEI) or hydraulic testing (HT) (if applicable), the contractor shall submit the following documentation to the TSG Engineer:

56.1. Reconstruction design documentation;

56.2. Repair / installation / reconstruction procedure (work method statement) and quality control plan;

56.3. Welding procedure specifications (WPS);

56.4. List of welders and heat treatment operators, including copies of their certificates;

56.5. As-built (repair/reconstruction) drawings, prepared in electronic format and provided both as hard copy and in Microsoft Visio format;

56.6. Specification of materials used;

56.7. Quality certificates or material identification certificates for all materials used;

56.8. HT diagram (if performed);

- 56.9. Non-destructive testing (NDT) reports for welded joints;
- 56.10. Positive material identification (PMI) reports for elements and welded joints (for alloy steels);
- 56.11. Heat treatment records (log) and charts;
- 56.12. Welding log;
- 56.13. Reports on actual wall thickness measurements of newly installed elements;
- 56.14. Tube coil flushing and purging report;
- 56.15. Certificate of the installed tube coil ball test (if applicable). The ball diameter shall be calculated as $0,75 \times D_{int}$, where D_{int} – the internal diameter of the tube;
- 56.16. Laboratory analysis report of water used for hydraulic testing of austenitic steel coils (indicating chloride content);
- 56.17. Hydraulic test report;
- 57. Upon completion of repair or reconstruction works, the contractor shall additionally submit the following documents to the TSG Engineer:
 - 57.1. Heater repair / reconstruction quality certificate;
 - 57.2. Flanged joint closure report (if applicable);
 - 57.3. Certificate issued by the National Energy Regulatory Council (VERT);
 - 57.4. Other documentation agreed with the Owner;
 - 57.5. Report on visual inspection of tube coil open ends Annex 10);
 - 57.6. Permit to close the heater (Annex 11).
- 58. Installation of new heaters shall be carried out in accordance with the approved detailed engineering design.
- 59. The scope of documentation and quality requirements applicable to newly installed heaters shall be the same as for heater reconstruction, with the following additional requirements:
 - 59.1. Safe operation instruction;
 - 59.2. Declaration of conformity (CE).
- 60. Upon installation of a new heater tube coil, the contractor shall prepare a heater tube coil passport (Annex 1).
- 61. After completion of repair, reconstruction, or installation of a new heater, the TSG Engineer shall perform a technical inspection to verify compliance with the design documentation, the repair / installation / reconstruction procedure (work method statement) and applicable regulatory requirements. If non-conformities are identified during the inspection, corrective actions shall be taken in accordance with Item 38.3.

VII DOCUMENTS AND RECORDS

- 62. Implementation of this Instruction results in the creation of the records specified in Table 1.

Table 1

Record/document	Storage location	Responsible person	Retention period
Heater passport	Equipment Technical Supervision and Materials Analysis Group	Equipment Technical Supervision and Materials Analysis Manager	Throughout the service life of the tube coil
Heater tube coil technical inspection report	Equipment Technical Supervision and Materials Analysis Group	Equipment Technical Supervision and Materials Analysis Manager	Throughout the service life of the tube coil
Repair (reconstruction) documentation	Equipment Technical Supervision and Materials Analysis Group	Equipment Technical Supervision and Materials Analysis Manager	Throughout the service life of the tube coil

VIII. FINAL PROVISIONS

63. This Instruction shall be controlled and distributed in accordance with procedure described in the 'Preparation and Control of Management System Documents'.

64. The Equipment Technical Supervision and Materials Analysis Manager shall be responsible for the periodic review of this Instruction and its update, where necessary.

IX. ANNEXES

Annex 1 – Tube Coil Passport Template.

Annex 2 – Template for Thermographic Inspection Schedule of Heater Tube Coils During Operation.

Annex 3 – Template for Thermographic Inspection Schedule of Heater Steel Framework during Operation.

Annex 4 – Template for Heater Visual Inspection Report during Operation.

Annex 5 – Template for Corrective Action Plan for Elimination of Defects / Non- Conformities Identified in Technical Inspection Report No. ____

Annex 6 – Heater Inspection Plan Template

Annex 7 – Retirement Thickness Values for Tube Coil Elements.

Annex 8 – Heater Technical Inspection Report Template.

Annex 9 – Template for Equipment Repair / Installation / Reconstruction Procedure and Quality Control Plan

Annex 10 – Visual Inspection Report for Open Ends of Tube Coils.

Annex 11 – Heater Closure Permit Template.

Instruction prepared by:	Equipment Technical Supervision and Materials Analysis Group Senior Engineer		Rimantas Skarulis
--------------------------	--	--	-------------------

Agreed with:	Deputy Director of Maintenance		Gražvidas Šakys
	Director of Production		Rimantas Kontrimas
	Chief Mechanical Engineer		
	Technical Inspection and Analysis Manager		Evaldas Lungys
	Occupational Health and Safety Manager		Rolandas Rupšys
	Equipment Technical Supervision and Materials Analysis Manager		Kęstutis Ševeliovas
	Position	Signature	Name, surname

Annex 1

TECHNINIO ĮRENGINIO PASAS
(Technical Equipment Passport)

(Įrenginys, baras)
(Process Unit, Section)

VAMZDINIO GYVATUKO PASAS
(Tube Coil Passport)

Registracijos Nr.
(Registration No.)

20..... m. mėn. d.
(..... 200...)

Inv. Nr.
(Inventory No.)

Annex 1

Paso turinys (Table of contents)
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Dokumento pavadinimas	Lapų numeris	
(Name of document)	(Page No.)	(Remarks)

1. Techninės charakteristikos (Technical characteristics)	3	
2. Bendri duomenys (General data)	4	
3. Informacija apie montavimo-suvirinimo darbus (Installation and welding information)	5	
4. Gyvatuko konstrukcijos metalas (Coil structural materials)	6÷8	
5. Suvirtų sujungimų kontrolė (Inspection of welded joints)	9÷10	
6. Kiti bandymai ir tyrimai (Other tests and examinations)	11	
7. Išvada (Conclusion)	12	
8. Registracija (Registration)	13	
9. Žinios apie vamzdinės krosnies priežiūros meistrą (Information on maintenance supervisor (foreman))	14	
10. Žinios apie pakeitimą, remontą (Modification and repair data)	15÷20	
11. Patikrinimo rezultatų įrašymas (Inspection results)	21÷26	
12. Attachments (Attachments)	27÷29	

Annex 1

1. Techninės charakteristikos
(Technical characteristics)

Parametrai <i>(Parameters)</i>			Radiacinis gyvatukas <i>(Radiant coil)</i>	Konvekcinis gyvatukas <i>(Convection coil)</i>
Slėgis, barg. <i>(Pressure bar)</i>	Darbinis (įėjimas/išėjimas) <i>(Operating)</i>	Įėjime <i>(Inlet)</i>		
		Išėjime <i>(Outlet)</i>		
	Skaičiuojamasis <i>(Design)</i>			
	Bandomasis <i>(Test)</i>			
Temperatūra, °C <i>(Temperature °C)</i>	Produkto <i>(Product)</i>	Įėjime <i>(Inlet)</i>		
		Išėjime <i>(Outlet)</i>		
	Maksimali sienelės <i>(Maximum wall temperature)</i>			
	Skaičiuotina <i>(Design)</i>			
Process medium <i>(Process medium)</i>	Krosnies kameroje <i>(Heater chamber)</i>			
	Vamzdiniame gyvatuke <i>(Tube coil)</i>			
Srautų skaičius <i>(Number of streams)</i>				
Gyvatoکو matmenys, mm. <i>(Tube coil dimensions)</i>	Vamzdžių ilgis <i>(Tube length)</i>			
	Vamzdžių išorinis skersmuo x storis <i>(Tube outside diameter x thickness)</i>			
	Alkūnių išorinis skersmuo x storis <i>(Elbows outside diameter x thickness)</i>			
Plieno markė <i>(Steel grade)</i>	Vamzdžių <i>(Tubes)</i>			
	Alkūnių <i>(Elbows)</i>			

Annex 1

2. Bendri duomenys (General data)

Technologinis Nr. (Tag No.)	
Projektuotojas ir jo adresas (Designer and address)	
Projekto numeris, P&ID (Project number / P& ID)	
Gamintojas ir jo adresas (Manufacturer and address)	
Montavimo organizacijos pavadinimas (Installation contractor)	
Iškloją sumontavusios organizacijos pavadinimas (Refractory installation contractor)	
Savininkas ir jo adresas (Owner and address)	
Sumontavimo data (Date of installation)	
Projektinis darbo laikas (metais, val.) (jei projekte nenurodyta – rašoma Nenurodyta) (Design service life (years, hours), If not specified – enter 'Not specified')	
Forma ir konstrukciniai matmenys pagal projektą (Design geometry and dimensions)	Ilgis (length) – Plotis (width)– Aukštis (height) –
Vamzdinio gyvatuko atitikties deklaracija (Declaration of Conformity, PED)	Nr. (nereikalaujama (optional))

Annex 1

**3. Informacija apie montavimo-
suvirinimo darbus**
(Installation and welding information)

Vamzdinis gyvatukas suprojektuotas ir sumontuotas pagal reikalavimus <i>(The tube coil has been designed and installed in accordance with applicable requirements)</i>	
Vamzdinio gyvatuko plieno markė <i>(Tube coil material grade)</i>	
Terminio apdirbimo informacija <i>(Heat treatment information)</i>	
Suvirinimo siūlių neardomoji kontrolė, % <i>(NDT extent, %)</i>	VT - PT- RT- UT- MT-
Metalo cheminė sudėtis <i>(Chemical composition, PMI)</i>	
Žinios apie kamuoliuko testo atlikimą <i>(Ball test)</i>	
Hidraulinio ar pneumatinio bandymo slėgis, bar <i>(Hydraulic or pneumatic test pressure, bar)</i>	

[illegible]

5. Gyvatuko konstrukcijos metalas

[illegible]

[illegible]

7. Išvada*(Conclusion)***1. Krosnis (detalės) pagamintos pagal šiuos norminius aktus***The heater (components) have been manufactured in accordance with the following legal documents)***(taisyklių, techninių sąlygų ir kt. pavadinimai)***(Title of regulation, technical requirements, etc.)***2. Krosnis (detalės) apžiūrėtos ir hidrauliškai išbandytos bandomuoju slėgiu bar***(The heater (components) have been visually inspected and tested at the pressure of Mpa (bar))*

- a. Radiacinis gyvatukas Bar (*radiant coil*)
- b. Konvekcinis gyvatukas..... Bar (*convection coil*)
- c. Garo perkaitintojas..... Bar (*steam superheater*)

Krosnis (detalės) pripažintos tinkama eksploatuoti pase nurodytais parametrais.**(The heater (components) are considered suitable for operation under the conditions specified in this passport)****Pasą sudarė:**
(Passport prepared by)**Vardas, pavardė, parašas**
(Name, surname, signature)**Data**
(Date)

8. Registracija
(Registration)Vamzdinė krosnis užregistruota
(Heater is registered)(registruojančios įstaigos pavadinimas)
(Registered by (authority))Numeris _____
(No.)____ m. ____ mėn. ____ d.
(Year) (month) (day)Irišta _____ lapai(-ų)
(Bound) (sheets)(_____) lapai(-ų)
(Sheets)A.V.
(Stamp)Registruojančio asmens
(Registration performed by)Pareigos
(Position)Pavardė
(Surname)Signature
(Signature)

(Information on maintenance supervisor (foreman))

[illegible]

10. Žinios apie pakeitimą, remontą

[illegible]

[illegible]

12. Priedų sąrašas*(Attachments)*

Eil. Nr.	Dokumento pavadinimas	Lapų numeris
1	2	3
12.1	Valstybinės energetikos inspekcijos atestato eksploatuoti (remontuoti) naftos ir naftos produktų įrenginius kopija / <i>A copy of certificate issued by the State Energy Inspectorate for operation / maintenance of crude oil and petroleum product facilities.</i>	
12.2	Projekto kopija / <i>Copy of design documentation</i>	
12.3	Remonto technologija / <i>Repair method statement</i>	
12.4	Kokybės kontrolės planas / <i>Quality control plan</i>	
12.5	Suvirinimo procedūros, WPAR / <i>Welding procedures, WPAR)</i>	
12.6	Vykdomoji (remonto) schema / <i>Repair diagram</i>	
12.7	Panaudotų medžiagų specifikacija/ <i>Material specifications</i>	
12.8	Suvirinimo darbų žurnalas / <i>Welding log</i>	
12.9	Suvirintojų ir termistų sąrašas / <i>A list of welders</i>	
12.10	Suvirintojų pažymėjimų kopijos / <i>Copies of welder qualification certificates</i>	
12.11	Pažyma apie suvirintojų patikrinimą AB „ORLEN Lietuva“ / <i>Notice on welder testing by AB ORLEN Lietuva</i>	
12.12	Terminio apdirbimo žurnalas ir diagramos / <i>Heat treatment log and charts</i>	
12.13	Elementų ir suvirinimo siūlių cheminės sudėties nustatymo, po sumontavimo, protokolas (legiruotiems plienams) / <i>PMI for alloy steels</i>	
12.14	Neardomosios kontrolės išvados / <i>NDT conclusions</i>	
12.15	Naujų atvamzdžių, vamzdžių, alkūnių ir t.t. faktinių sienelės storio matavimo rezultatai / <i>Wall thickness measurement reports for new nozzles, tubes, elbows, etc.</i>	
12.16	Sumontuotos krosnies kamuoliuko testo pažyma / <i>Heater ball test certificate</i>	
12.17	Hidraulinio bandymo aktas su schema / <i>Hydraulic test report with diagram</i>	
12.18	Įrenginiui iš austenitinio plieno hidraulinio bandymo atlikimui naudojamo vandens analizės pažyma (chloridų kiekis) / <i>Water analysis report (chloride content) for hydraulic testing of equipment made of austenitic steel</i>	

[illegible]

APPROVED BY
 AB ORLEN Lietuva
 Deputy General Director for
 Operations
 _____ 20__

VISUAL INSPECTION SCHEDULE FOR HEATERS DURING OPERATION (YEAR 20__)

Process unit	Number of heaters	Month / day											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
OS-1 LK-1	11												
OS-1 LK-2 (S-100)	2												
OS-1 LK-2 (S-200, S-300)	10												
OS-3	18												
OS-2 (S-800)	1												
OS-2 (KT-1/1)	7												

ARGEED WITH:

Director of Maintenance
 Deputy Director of Maintenance
 Head of Operations Subdivision No.1
 Head of Operations Subdivision No. 2
 Head of Operations Subdivision No. 3
 Equipment Technical Supervision and Materials Analysis Manager

Prepared by:
 Equipment Technical Supervision and Materials Analysis Group Engineer

APPROVED BY
 AB ORLEN Lietuva
 Deputy Director of Maintenance

THERMOGRAPHIC INSPECTION SCHEDULE OF HEATER STEEL FRAMEWORK DURING OPERATION

PROCESS UNIT	Month / day											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
OS-1 LK-1												
OS-1 LK-2 (S-100)												
OS-1 LK-2 (S-200, S-300)												
OS-3												
OS-2 (S-800)												
OS-2 (KT-1/1)												

ARGUED WITH:

Rotation Equipment Technical Supervision and Maintenance Manager

Equipment Technical Supervision and Materials Analysis Group Engineer

Prepared by:
 Rotation Equipment Technical Supervision and Maintenance Group Engineer

APPROVED
AB ORLEN Lietuva
Chief Mechanical Engineer
_____ 20 ____

HEATER TECHNICAL INSPECTION REPORT NO. ____
(Visual inspection of heater in operation)

COMMISSION MEMBERS:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Carried out a visual inspection of heaters in operation _____ on
_____ 20 ____.

Inspection results:

- 1.1.
- 2.1.

Attachments:

- 1.
- 2.

Agreed with: Chief Specialist for Equipment Technical Supervision.....

Signatures:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

APPROVED BY
Deputy Director of Maintenance

_____ 20 ____.

Corrective Action Plan for Elimination of Defects / Non-Conformities

Identified in Technical Inspection Report No. _____

Heater: _____

Identified defects / failures:

Item No. (from inspectio n report)	Defect No.	Description of defect	Planned actions	Scheduled repair date	Target completi on date

Acknowledged by:

Operations Subdivision No. _____

Maintenance Manager _____
(Name, surname, signature, date)

Head of Operations _____
(Name, surname, signature, date)

Approved by:
Chief Mechanical Engineer
_____ 20____

Heater Inspection Plan No. _____

Date: _____

1. General information on the inspected equipment

1.1. Location of operation _____

(Operations subdivision, Complex, Unit No.)

1.2. Equipment _____

(Pipeline, pressure vessel, tank, heater, boiler)

1.3. Tag and registration number _____

1.4. Material _____

(Convection coil / radiant coil)

1.5. Tube coil operating time (service hours) _____

2. Technical parameters of the equipment

2.1. Process medium _____

2.2. Operating (design) pressure, bar _____

(Convection coil / radiant coil)

2.3. Operating (design) temperature, °C _____

(Convection coil / radiant coil)

3. Description of inspection methods**VT** – Visual Testing**RT** – Radiographic Testing**RP** – Radiographic Profile Testing**MT** – Magnetic Particle Testing**RT** – Ultrasonic Testing**PT** – Penetrant Testing**PMI** – Positive Material Identification**UT_(TH)** – Ultrasonic Thickness Testing**LT** – Leak Testing**XX** – Oil and Chalk Method**HB** – Hydraulic Testing**PB** – Pneumatic Testing**HT** – Hardness Testing**EC** – Eddy Current Method**SM** – Outside Diameter Measurement**ST** – Structural Material Testing

4. Requirements for preparatory work

RT^[1] – cleaning of welds and base metal to metallic brightness within at least 20 mm on both sides of the weld;
UT – surface roughness $Ra < 6.3 \mu m$; the cleaned area shall include base metal extending at least 150 mm on both sides of the weld.

UT_(Tn)^[2] – surface roughness $Ra < 6.3 \mu m$; cleaned area $30 \times 30 \text{ mm}$;

PT – surface roughness $Ra < 6.3 \mu m$; surface depression between weld beads shall not exceed 1 mm; the cleaned area shall include the weld and at least 20 mm on both sides of the weld.

MT – surface roughness $Ra < 2.5 \mu m$; cleaned area shall include the weld and at least 80 mm on both sides.

HT – surface roughness $Ra < 2.5 \mu m$; cleaned area $20 \times 20 \text{ mm}$.

VT – external surfaces of components shall be cleaned of dirt and combustion product residues; weld seams and base metal shall be cleaned to metallic brightness within at least 20 mm on both sides of the weld.

PMI – surface roughness $Ra < 2.5 \mu m$; cleaned area $30 \times 30 \text{ mm}$.

LT – cleaning of the weld seam and base metal to metallic brightness within at least 50 mm on both sides of the weld.

XX – cleaning of the weld seam and base metal to metallic brightness within at least 20 mm on both sides of the weld.

SM – external surfaces of components shall be free of dirt.

^[1] - In the presence of a corrosion protection coating, the necessity and scope of preparatory work shall be determined by responsible personnel.

NOTES:

1. If insulation prevents the inspections listed below, openings (windows) shall be made in the insulation to allow preparatory work and the required inspections to be carried out;
2. For internal visual inspection or other inspections, illumination inside the equipment shall be $> 300 \text{ lx}$;
3. If the diameter or height exceeds 2.5 m, scaffolding shall be provided for inspection of inaccessible areas.

5. Inspection Plan

Table 1

Item No.	Inspection object/method	Material ^[2]	Inspection method	Scope	Comments

^[2] – indicate only the material abbreviation: **CS** – carbon steel; **Cr-Mo** – chromium- molybdenum steel; **SS** – stainless steel.

NOTE: The inspection scope and methods may be adjusted depending on the results of inspection and internal examination.

1. Attachments:

PREPARED BY: Equipment Technical Supervision
and Materials Analysis Group Engineer _____

(Position, name, surname, signature, date)

ARGEED WITH: Equipment Technical Supervision and Materials Analysis Manager

(Position, name, surname, signature, date)

ARGEED WITH: Maintenance Manager of Operations Subdivision

(Position, name, surname, signature, date)

AGREED WITH*: Authorized Body Expert

(Position, name, surname, signature, date)

Retirement Thickness Values for Tube Coil Elements

LK-1 tube heaters									
Tag No.		Parameters (passport)				Steel Tube diameter x wall thickness/ elbow diameter x wall thickness	Corro sion allowa nce (mm)	Minimum allowable thickness (mm)	
		Pressure		Temperat ure (°C)				Tube	Elbow
<i>P_{oper.}</i>	<i>P_{desig n}</i>	<i>T_{oper.}</i>	<i>T_{desi gn}</i>						
KR-102	Convection	-	33.0 kg/cm²	-	270	15X5M Ø152x8 / Ø152x8÷10	2	3.5	5.0
	Radiant	30.0 kg/cm²	34.2 kg/cm²	230	300	15X5M Ø152x8 / Ø152x8÷10	2	4.0	5.5
KR-201	Convection	30.4 barg	30.4 barg	356	356	Gr.P5 6"xNB Sch40 (Ø168.3)x7.11 / 6"x0.394 (Ø168.3x10)	3	4.0	4.5
	Radiant	30.4 barg	30.4 barg	422	422	Gr.P9 ASME A335 8"x STD (Ø219.1x8.18) / 8"x Sch60 (Ø219.1x10.31)	3	3.5	5.0
KR-202	Convection	11.0 barg	24.2 barg	195	355	15X5M-Y Ø152x8 / WP5 Ø152x10	3	3.5	5.0
	Radiant	9.0 barg	24.2 barg	270	445	P5 Ø152x8 / WP5 Ø152x10	3	3.5	5.0
KR-203	Convection	26.0 barg	44.0 barg	530	533	P22 6.625"x0.432" (Ø168.3x11) / WP22CL1 6"x0.532" (Ø168.3x13.5)	2	7.6	8.0
KR-203/I	Radiant	26.0 barg	44.0 barg	530	588	P22 4.252"x0.394" (Ø108x10 / Ø108x11.48)	2	7.9	9.2
KR-203/II	Radiant	24.08 barg	44.0 barg	530	588	P22 4.252"x0.394" (Ø108x10 / Ø108x11.48)	2	7.9	9.2
KR-203/III	Radiant	22.38 barg	44.0 barg	530	606	P22 4.252"x0.394" (Ø108x10 / Ø108x11.48)	2	7.9	9.2
KR-204	Convection	22.5 barg	22.5 barg	225	290	A106 Gr.B Ø152x8/ Ø152x8	2	3.5	5.0
	Radiant	22.5 kg/cm²	22.5 kg/cm²	252	296	A106 Gr.B Ø152.4x6.3 / Ø152.4x8	2	3.5	5.0
KR-205	Radiant	6.0 kg/cm²	6.6 kg/cm²	320	400	15X5M Ø108x8 / Ø108x6	2	3.0	4.0
KR-301/1	Convection	62.8 barg	62.8 bar.	305	433	TP 321H Ø168.3x7.11 / 6"x0.475" (Ø168.3x12.1)	1	6.0	6.5
	Radiant	62.8 barg	62.8 bar.	400	521	TP 321H 8"Sch XS (Ø219.1x12.7)/ 8"x0.625" (Ø219.1x15.9)	1	8.5	11.5
KR-301/2	Convection	62.8 barg	62.8 barg	305	433	TP 321H 6"Sch40S (Ø168.3x7.11) / 6"x0.475" (Ø168.3x12.1)	1	6.0	6.5
	Radiant	62.8 barg	62.8 barg	400	521	TP 321H 8"Sch XS Ø219.1x12.7 / Ø219.1x15.9	1	8.5	11.5
KR-302	Convection	49 kg/cm²	49 kg/cm²	300÷ 390	380	08X18H10T Ø152x8 / Ø152x10	1	5.0	7.0
	Radiant	49 kg/cm²	49 kg/cm²	340÷ 420	440	08X18H10T Ø152x8 / Ø152x8÷10	1	5.5	7.0
KR-303	Convection	13 kg/cm²	15 kg/cm²	100÷ 320	585	W1.7386 (X9M) (Ø108x10)	1	4.0	5.0
	Radiant	13 kg/cm²	15 kg/cm²	278÷ 510	585	W1.7386 (X9M) (Ø108x10)	1	4.0	5.0

LK-2 tube heaters									
Tag No.		Parameters (passport)				Steel Tube diameter x wall thickness/ elbow diameter x wall thickness	Corrosion allowance (mm)	Minimum allowable thickness (mm)	
		Pressure		Temperature (°C)				Tube	Elbow
		P _{oper.}	P _{design}	T _{oper.}	T _{design}				
KR-101	Convection	22.0 barg	22.0 barg	235÷281.6	485	P5 A335 Ø168.3x7.11 / Ø168.3x7.11	3	4.0	4.5
	Radiant	22.0 barg	22.0 barg	281.6÷395	485	P5 A335 Ø168.3x7.11 / Ø168.3x7.11	3	4.0	5.0
KR-101/1	Convection	22.0 barg	22.0 barg	235÷274.5	482	P5 A335 Ø168.3x7.11 / Ø168.3x7.11	3	4.0	4.5
	Radiant	22.0 barg	22.0 barg	274.5÷395	482	P5 A335 Ø168.3x7.11 / Ø168.3x7.11	3	4.0	5.0
	Steam superheater	13.0 barg	13.0 barg	183÷383	505	P11 A335 Ø168.3x7.11 / Ø168.3x7.11	3	4.0	5.0
KR-102	Convection	22.0 kg/cm²	24.2 kg/cm²	240	340	15X5M Ø152x8 / Ø152x8÷10	2	3.5	5.0
	Radiant	22.0 kg/cm²	24.2 kg/cm²	380	430	15X5M Ø152x8 / Ø152x8÷10	2	4.0	5.5
KR-201	Convection	29.0 barg	29.0 barg	225	356	P5 6.625"x0.315" (Ø168.3x8) / 6"x0.394" (Ø168.3x10)	2	4.1	5.8
	Radiant	29.0 barg	29.0 barg	325	422	TP321H 8.625"x0.315" (Ø219.1x8) / TP321H 8"x0.394" (Ø219.1x10)	1	5.0	5.8
KR-202	Convection	22.0 barg	22.0 barg	245	297	A106 Gr.B Ø152x8 / Ø152x8	2	3.5	5.0
	Radiant	22.0 barg	22.0 barg	252	297	A106 Gr.B Ø152x8 / Ø152x8	2	3.5	5.0
KR-203	Convection	20.9 barg	32.0 barg	520	530	P9 A335 Ø141.3x9.52 / Ø141.3x9.52	3	5.5	6.0
KR-203/1	Radiant	20.9 barg	32.0 barg	520	530	P9 A335 Ø114.3x8 / Ø114.3x8	3	4.5	5.0
KR-203/2	Radiant	19.7 barg	32.0 barg	520	530	P9 A335 Ø114.3x8 / Ø114.3x8	3	4.5	5.0
KR-203/3	Radiant	18.6 barg	32.0 barg	520	530	P9 A335 Ø114.3x8 / Ø114.3x8	3	4.5	5.0
KR-204	Convection	22.5 bar	22.5 bar	225	290	15X5M Ø152x8 / Ø152x10	2	3.5	5.0
	Radiant	22.5 bar	22.5 bar	252	296	15X5M Ø152x8 / Ø152x8÷10	2	3.5	5.0
KR-205	Radiant	6.0 kg/cm²	6.0 kg/cm²	30÷320	400	W1.7362 Ø108x4 / Ø108x6	2	3.0	4.0
KR-301/1	Convection	62.8 barg	62.8 barg	305	433	08X18H10T Ø152x7 / Ø152x10	1	5.5	6.5
	Radiant	62.8 barg	62.8 barg	400	521	TP321H (08X18H10T) Ø219.1x12.7 / Ø219.1x16	1	8.5	11.5
KR-301/2	Convection	62.8 barg	62.8 barg	305	433	08X18H10T Ø152x7 / Ø152x10	1	5.5	8.5
	Radiant	62.8 barg	62.8 barg	400	521	TP321H (08X18H10T) Ø219.1x12.7 / Ø219.1x16	1	8.5	11.5
KR-302	Convection	49.0 barg	49.0 barg	255	380	08X18H10T Ø152x8÷9 / Ø152x10	1	5.0	7.0
	Radiant	49.0 barg	49.0 barg	255÷380	620/470	A312 TP321H (08X18H10T) Ø152.4x8 / Ø152x10	1	6.0	7.0

KT-1/1 tube heaters									
Tag No.		Parameters (passport)				Steel Tube diameter x wall thickness/ elbow diameter x wall thickness	Corrosion allowance (mm)	Minimum allowable thickness (mm)	
		Pressure		Temperature (°C)				Tube	Elbo w
P _{oper.}	P _{design}	T _{oper.}	T _{design}						
KR-101	Convection	60.0 kg/cm ²	60.0 kg/cm ²	240	523	08X18H10T Ø159x8÷12 / Ø159x10÷12	1	5.5	6.0
	Radiant	55.0 kg/cm ²	60.0 kg/cm ²	420	523	08X18H10T Ø219x10 / Ø219x11÷12	1	7.0	10.0
KR-102	Convection	7.1 barg	18.0 barg	385	550	TP347 Ø168.3x7.11 / Ø168.3x7.11	3	4.5	5.0
	Radiant	7.1 barg	18.0 barg	385	550	TP347 Ø168.3x7.11 / Ø168.3x7.11	3	4.5	5.0
	Steam superheater	12.0 barg	16.0 barg	360	510	P5 Ø88,9,3x5.49 / Ø88,9,3x5.49 Header P11 Ø168.3x7.11	3	5.0	5.0
KR-501	Convection	20.5 barg	26.6 barg	287	411	TP321 6.625"Sch.40 (Ø168.3x7.11) / Ø168.3x7.11	3	5.3	6.0
	Radiant	19.7 barg	26.6 barg	340	411	TP321 6.625"Sch.40 (Ø168.3x7.11) / Ø168.3x7.11	3	5.3	6.0
KR-601/1	Convection	2.36 barg	6.0 barg	275	580	A335 P5 Sch.40 (Ø168.3x7.11) / (Ø168.3x7.11)	3	4.0	4.0
	Radiant	0.3 barg	6.0 barg	406	580	A335 P5 12"Sch.40 (Ø323.8x10.31) 10"Sch.40 (Ø273.3x9.27) / (Ø273.3x9.27) 8"Sch.40 (Ø219.1x8.18) / (Ø219,1,3x8.18) 6"Sch.40 (Ø16.3x7.11) / (Ø168.3x7.11)	3	5.0	5.0
	Steam superheater	12.9 barg	16.0 barg	381	403	A335 P5 6" Sch.40 (Ø168.3x7.11) / (Ø168.3x7.11)	3	4.5	5.0
KR-601/2	Convection	2.36 barg	6.0 barg	275	580	A335 P5 Sch.40 (Ø168.3x7.11) / (Ø168.3x7.11)	3	4.0	4.0
	Radiant	0.3 barg	6.0 barg	406	580	A335 P5 12"Sch.40 (Ø323.8x10.31) 10"Sch.40 (Ø273.3x9.27) / (Ø273.3x9.27) 8"Sch.40 (Ø219.1x8.18) / (Ø219,1,3x8.18) 6" Sch.40 (Ø168.3x7.11) / (Ø168.3x7.11)	3	5.0	5.0
	Steam superheater	12.9 barg	16.0 barg	381	403	A335 P5 6" Sch.40 (Ø168.3x7.11) / (Ø168.3x7.11)	3	4.5	5.0
KR-701/1	Convection	23.0 barg	23.0 barg	360	460	P5 4" Sch.40 (Ø114.3x11.13) / X11CrMo5 Ø114.3x11	3	4.0	5.0
	Crossover	23.0 barg	15.5 barg	480	636.9	P9 5"xXS (Ø141.3x9.53) / Ø152x15.88 - Ø141.3x10.15	3	5.0	7.5
	Radiant	15.5 barg	15.5 barg	480	636.9	P9 5"xXS(Ø141.3x9.53) – P91 Ø152x13.8 / Ø152x15.88 - Ø141.3x10.15	Tube.2 Elbow.6.5	6.8	10.5
	Steam superheater	12.0	23.0	450	460	15X5M Ø89x6 / 15X5M-Y Ø89x6	3	4.0	5.0
KR-701/2	Convection	23.0 barg	23.0 barg	360	460	P5 4" Sch.40 (Ø114.3x11.13) / X11CrMo5 Ø114.3x11	3	4.0	5.0
	Crossover	23.0 barg	15.5 barg	480	636.9	P9 5"xXS (Ø141.3x9.53) / Ø152x15.88 - Ø141.3x10.15	3	5.0	7.5
	Radiant	15.5 barg	15.5 barg	480	636.9	P9 5"xXS(Ø141.3x9.53) – P91 Ø152x13.8 / Ø152x15.88 - Ø141.3x10.15	Tube.2 Elbow.6.5	6.8	10.5
	Steam superheater	12.0	23.0	450	460	15X5M Ø89x6 / 15X5M-Y Ø89x6	3	4.0	5.0

HPU tube heaters								
Tag No.		Parameters (passport)				Steel Tube diameter x thickness/ elbow diameter x thickness	Corrosion allowance (mm)	Minimum allowable thickness (mm)
		Pressure		Temperature (°C)				
		P _{oper.}	P _{design}	T _{oper.}	T _{design}			
KR-801	Reaction tube	33.0 barg	33.0 barg	515	941	H39WM (25Cr.35Ni Nb) Ø134x12	0	11.6
	Outlet pipes (pigtails)	33.0 barg	33.0 bag	860	880	ASTM B407 UNS NO8811 Ø44.5x8	0	6.0
	Reaction tube outlet header	33.0 barg	33.0 barg	860	880	CR32W (20Cr35NiNb) Ø202x25	0	24.0

OS-3 VVF Unit									
Tag No.		Parameters (passport)				Steel Tube diameter x wall thickness/ elbow diameter x wall thickness	Corrosio n allowanc e (mm)	Minimum allowable thickness (mm)	
		Pressure (bar)		Temperatu re (°C)				Tube	Elbow
		P _{oper.}	P _{desig n}	T _{oper .}	T _{desi gn}				
KR-1	Convection	7.0 bar	12.0 bar	270	450	A335 P91 Ø141.3x6.55 / Ø141.3x6.55	4	4.4	4.4
	Radiant	7.0 bar	12.0 bar	393	630	A335 P91 Ø219.1x8.18 / Ø219.1x8.11	4	5.1	5.1
						A335 P91 Ø168.3x7.11 / Ø168.3x7.11	4	4.9	4.9
						A335 P91 Ø141.3x6.55 / Ø141.3x6.55	4	4.7	4.7
	Steam superheater	9.6 bar	10.0 bar	375	590	A335 P22 Ø141.3x6.55 / Ø141.3x6.55	2	4.5	4.5



Mechanikos skyriaus techninės priežiūros grupė

TVIRTINU:

Vyriausiasis mechanikas

(Pareigos, Vardas, Pavardė, Parašas)

20 _____ m. _____ mėn. _____ d.

Krosnies techninio patikrinimo aktas

Nr.

Techn. Nr.:		Vieta (padalinys, sekcija...):	Techn. Patikr. data:	
PPI kodas/Reg.Nr.			Akto išrašymo data:	
Techninis patikrinimas:		Patikrinimo priežastys:		

Patikrinimo rezultatai

Nr.	Tikrinamas objektas	Patikrinimo rezultatai	Rekomendacijos
1	Atitiktis techninei dokumentacijai		
2	Pamatai, tvirtinimas		
3	Korpusas ir garnitūra (aptarnavimo aikštelės, apžiūros langeliai, sproginio angos, atramos, pakabos, rietinės, užkaišos, repertai)		
4	Dūmtakiai ir jų elementai		
5	Futeruotė		
6	Armatūra		
7	Flanšiniai ir kiti išardomi sujungimai		
8	Kontrolės – matavimo prietaisai		
9	Garso perkaitintuvas; Vamzdinio gyvatuko suvirintieji sujungimai		
10	Garso perkaitintuvas; Išorinė vamzdinio gyvatuko elementų būklė		
11	Garso perkaitintuvas; Vidinė vamzdinio gyvatuko elementų būklė		
12	Konvekcijos gyvatukas; Vamzdinio gyvatuko suvirintieji sujungimai		
13	Konvekcijos gyvatukas; Išorinė vamzdinio gyvatuko elementų būklė		
14	Konvekcijos gyvatukas; Vidinė vamzdinio gyvatuko elementų būklė		
15	Ekraninis gyvatukas; Vamzdinio gyvatuko suvirintieji sujungimai		
16	Ekraninis gyvatukas; Išorinė vamzdinio gyvatuko elementų būklė		
17	Ekraninis gyvatukas; Vidinė vamzdinio gyvatuko elementų būklė		
18	Radiacijos gyvatukas; Vamzdinio gyvatuko suvirintieji sujungimai		

19	Radiacijos gyvatukas; Išorinė vamzdinio gyvatuko elementų būklė		
20	Radiacijos gyvatukas; Vidinė vamzdinio gyvatuko elementų būklė		
21	Kolektoriai; Suvirtieji sujungimai		
22	Kolektoriai; Išorinė kolektorių elementų būklė		
23	Kolektoriai; Vidinė kolektorių elementų būklė		
24	Kiti tyrimai; Išėjimo kolektoriaus atvamzdžių sienelės storio matavimai		

Kito patikrinimo terminai:

Papildomas patikrinimas:

Techninį patikrinimą atliko:

Inžinierius

(Vardas, pavardė, parašas, data)

Suderinta:

Įrengimų techninės priežiūros
vyriausiasis specialistas

(Vardas, pavardė, parašas, data)

Susipažino:

Gamybos padalinio įrengimų priežiūros ir remonto
skyriaus mechanikos inžinierius

(Vardas, pavardė, parašas, data)

Įrenginio viršininkas

(Vardas, pavardė, parašas, data)

Papildomos pastabos:

Nuotraukos prie techninio patikrinimo akto punkto Nr.

Equipment Repair / Installation / Reconstruction Procedure and Quality Control PlanWork Executor _____ Contract No. _____
(Company name, State Energy Inspectorate certificate No.)Work Executor's Subcontractor _____
(Company name, State Energy Inspectorate certificate No.)Equipment location _____
(Operations Subdivision, Complex, Shop/Section)

Equipment name and tag No. _____

Technical parameters of the equipment:	
Process fluid	
Maximum allowable pressure (Ps), bar	
Maximum allowable temperature (Ts), °C	
Equipment group, category and classification document	
Brief description of equipment repair / installation / reconstruction activities	
Justification of equipment repair / installation / reconstruction activities	
Equipment repair / installation / reconstruction standard:	

Sequence of work execution

The sequence of work activities for each equipment element being repaired, installed, or reconstructed shall be specified, indicating the methods and tools to be used. Any additional measures applied (such as preheating, structural reinforcement, additional supports, etc.) shall be specified. The work description shall include references to the applicable Welding Procedure Specifications (WPS). Where heat treatment is performed, the heat treatment method shall be described, including heat treatment modes, tools used, heating area, thermal insulation areas and locations, temperature control method, temperature measurement points. The sequence of assembly of flanged joints shall be specified, indicating the tools used and the tightening torque for each flanged joint, as well as the method of tightening control.

Information on new and existing materials

Information on all new and existing materials used (pipes, sheets, fittings, welding consumables, studs, nuts, gaskets, etc.) shall be provided. It shall be specified for which equipment element or flanged joint each material is used, including the name and dimensions of the element or item, the material standard and grade, and the applicable standard.

Work execution diagrams and drawings

All work locations, welds, and flanged joints shall be shown and numbered in the work diagrams. Dimensions of work locations and elements shall be indicated, as well as distances from the work location to a defined reference point of the equipment (e.g., a weld, support, nozzle, or other existing element whose position is defined in the equipment drawings). If additional temporary reinforcement elements are used, they shall be shown in the work diagrams or drawings.

Attachments

1. *Work execution diagrams and drawings*
2. *Technical project*
3. *Welding procedure specifications (WPS)*

Kokybės kontrolės planas / Quality Control Plan							
Eil. Nr. Item No.	Kontrolės objektas (Inspection object)	Brėžinio ar schemos Nr. (Drawing or diagram No.)	Suvirinimo procedūrų aprašo (SPA) Nr. Welding Procedure Specification (WPS) No.	Kontrolės metodas Inspection method	Kontrolės apimtis Inspection scope	Kontrolės atlikėjas Inspector	Kontrolę patvirtinantis dokumentas Inspection record
	Nurodomas kontroliuojamo įrenginio elemento pavadinimas ar Nr., suvirintų jungčių tipas ir/ar Nr. (Name or number of the equipment element to be inspected; type and/or number of welded joints)		Nurodomas SPA Nr., jei kontrolė atliekama suvirinimo jungčiai (WPS number, where inspection applies to welded joints)	Nurodomas kontrolės ar bandymo metodas (VT, RT ar kitas metodas) (Inspection or testing method (e.g., VT, RT, etc.))	Nurodomi procentai, vienetai, plotai, zonos ir kt. (percentage, number of items, areas, zones, etc.)	Nurodoma kas turi atlikti kontrolę: rangovas, užsakovas ar trečioji šalis. Jei žinoma, papildomai nurodyti organizacijos pavadinimą. (Party responsible for inspection (contractor, owner, or third party); include organization name if known).	Nurodomas kontrolės dokumentas (išvados, protokolai, ataskaita ir kt.) (Inspection document (conclusions, records, reports, etc.))

Notes:

1. Before performing inspection of welded joints, the joints to be inspected shall be agreed with the Technical Supervision Group Engineer of the Mechanical Department.

Acronyms and abbreviations used:

VT – Visual Testing; **Inspection** – LST EN ISO 17637:2017; **Evaluation** – LST EN ISO 5817:2014, Level B
 RT – Radiographic Testing; **Inspection** – LST EN ISO 17636-1&2:2013; **Evaluation** – LST EN ISO 10675-1:2017, Level 1
 MT – Magnetic Particle Testing; **Inspection** – LST EN ISO 17638:2017; **Evaluation** – LST EN ISO 23278:2015, Level 2
 UT – Ultrasonic Testing; **Inspection** – LST EN ISO 17640:2011; **Evaluation** – LST EN ISO 11666:2011, Level 2
 PT – Penetrant Testing; **Inspection** – LST EN ISO 3452-1:2013; **Evaluation** – LST EN ISO 23277:2015, Level 2
 PMI – Positive material identification;
 HT – Hardness testing;
 UT_(Th) – Ultrasonic thickness Testing; **Inspection** – compliance with certificate
 HT – Hydraulic Testing;
 PB – Pneumatic Testing.

Prepared by:

Organizacijos pavadinimas, pareigos, vardas, pavardė, parašas, data, (name of organization, job title, name, surname, signature, date)

Approved by:

Work executor's manager

Organizacijos pavadinimas, pareigos, vardas, pavardė, parašas, data (name of organization, job title, name, surname, signature, date)

Agreed with:

Equipment Technical Supervision and Materials Analysis Group
Manager

Vardas, pavardė, pareigos, parašas, data (name, surname, job title, signature, date)

Equipment Technical Supervision and Materials Analysis Group
Engineer

Vardas, pavardė, pareigos, parašas, data (name, surname, job title, signature, date)

VISUAL INSPECTION REPORT FOR OPEN ENDS OF TUBE COILS

____ 20____

OWNER: **AB ORLEN Lietuva**OBJECT: **OS-**____, **Complex -** _____, **/Section -** _____HEATER: **KR-**_____

We, the undersigned, hereby confirm that during the repair works of the pipeline _____, the open ends of the heater KR-_____ (connected to the above-mentioned pipeline) were left exposed. During the repair works, _____ (company name), while performing its scope of work, properly covered the open coil ends in order to prevent the ingress of foreign object into the coil.

Prior to connecting the pipeline _____ to the heater KR-_____ coils, a visual inspection (to the extent accessible) of the internal surface of the tube coil was carried out. No foreign objects that could obstruct the flow of the process medium were observed.

Representatives of the Installation Company _____
(Company name, position, name, surname)

Owner's representative: _____
(Company name, position, name, surname)

LEIDIMAS KROSNIES UŽDARYMUI HEATER CLOSURE PERMIT

Kompleksas / įrenginys <i>Complex/Unit:</i>	Krosnies technologinis numeris <i>Tag number:</i>
Uždarymo data <i>Closure date:</i>	

Kiekvienas specialistas privalo patvirtinti parašu, kad jis patikrino savo kuriojamą dalį ir duoda leidimą krosnį uždaryti. Bet kokie aptikti neatitikimai turi būti surašyti šioje formoje, pasirašant atitinkamam specialistui. Jei specialistas sutinka leisti uždaryti krosnį su neatitikimais, tai šis specialistas turi tai patvirtinti savo parašu skiltyje „Asmuo atsakingas už krosnies technologinį valdymą“, kartu su asmens atsakingo už krosnies technologinį valgymą parašu. Parašai renkami lentelėje Nr.1 nurodytu eiliškumu.

Each specialist shall confirm by signature that they have inspected the part under their responsibility and grant permission to close the heater. Any identified non-conformities shall be recorded in this form and signed by the respective specialist. If a specialist agrees to the closing of the heater with identified non-conformities, this shall be confirmed by their signature in the column 'Person responsible for heater process control', together with the signature of the person responsible for heater process control. Signatures shall be collected in the order specified in Table 1.

Table 1

	Specialistas Specialist	Data Date	Pastabos, vardas ir pavardė, parašas Comments, name, surname, signature
1	Rangovas (užrašyti pavadinimą) Contractor (indicate the name) Patvirtinu, kad yra užbaigti šios krosnies visi darbų apimties punktai, krosnies gyvatukas ir jos vidus yra švarus ir jokių pašalinių daiktų joje neaptikta. <i>I confirm that all SOW items for this heater have been completed, and that the heater coil and its interior are clean and free of foreign objects.</i>		
2	Techninės priežiūros grupės inžinierius: Patvirtinu, kad šios krosnies vamzdinio gyvatuko elementai konstrukciniu požiūriu yra tvarkingi ir gali būti saugiai eksploatuojami nustatytais slėgio ir temperatūros sąlygomis. <i>Technical Supervision Group Engineer I confirm that the elements of the heater tube coil are structurally sound and can be safely operated under the specified pressure and temperature conditions.</i>		
3	Inžinierius statybininkas: Patvirtinu, kad krosnies metalinis karkasas, garnitūras, iškloja konstrukciniu požiūriu yra tvarkingi, vamzdinis gyvatukas švarus. Civil Engineer: <i>I confirm that the heater steel framework, fittings, and refractory lining are structurally sound, and that the tube coil is clean.</i>		
4	Automatikos inžinierius: Patvirtinu, kad šios krosnies temperatūros matavimo prietaisai konstrukciniu požiūriu yra tvarkingi. Automation Engineer: <i>I confirm that the temperature measuring instruments of this heater are in proper technical condition.</i>		
5	Mechanikos inžinierius: Patvirtinu, kad yra užbaigti šios krosnies visi patikrinimai bei darbai, nurodyti darbų apimtyje. Mechanical Engineer: <i>I confirm that all inspections and work specified in the SOW for this heater have been completed.</i>		
6	Trečioji šalis (konsultantas): Patvirtinu, kad ši krosnis funkcionuos taip, kaip numatyta projekte. Third Party (Consultant): <i>I confirm that this heater will operate as designed.</i>		
7	Asmuo atsakingas už krosnies technologinį valdymą: Patvirtinu, kad krosnis buvo patikrinta aukščiau minėtų specialistų ir kad aparatas prieš jį uždarant buvo švarus. Duodu leidimą uždaryti šį aparatą. Person Responsible for Heater Process Control: <i>I confirm that the heater was inspected by the above-mentioned specialists and that it was clean prior to closing. I hereby grant permission to close this heater.</i>		

