

PUBLIC COMPANY ORLEN LIETUVA

APPROVED BY
Deputy General Director for Operations
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Order No TV1(1.2-1)-

**PRESSURE VESSELS OPERATION MANUAL
BM-2**

1. PURPOSE

- 1.1. The Operation Manual establishes the manner of installation and operation of pressure vessels owned by Public Company ORLEN Lietuva (hereinafter – the Company).

2. SCOPE OF APPLICATION

- 2.1. This Manual shall apply to all vessels with the volume of more than 25 liters irrespective of the maximum allowable pressure (Ps) in them. It shall be binding upon all the employees of the Company and contracting organizations installing, repairing and operating pressure vessels under respective contracts concluded by the Company.

3. REFERENCES

This Manual has been developed in line with effective revisions of the following documents:

- 3.1. Law on Supervision of Potentially Dangerous Equipment of the Republic of Lithuania approved by the President of the Republic of Lithuania on 2 May 1996, No I-13242;
- 3.2. Regulations of the State Register of Potentially Dangerous Equipment approved by the Prime Minister of the Republic of Lithuania and Minister of Social Security and Labor of the Republic of Lithuania on 9 May 2002, No 645;
- 3.3. General Regulations on Use of Work Equipment approved by the Minister of Social Security and Labor of the Republic of Lithuania on 22 December 1999, No. 102;
- 3.4. Technical Regulation for Pressure Equipment approved by the Minister of Economy of the Republic of Lithuania on 6 October 2000, No 349;
- 3.5. Technical Regulation for Simple Pressure Vessels approved by the Minister of Economy of the Republic of Lithuania on 27 December 1999, No 431;
- 3.6. Rules for Operation of Pressure Vessels approved by the Minister of Economy of the Republic of Lithuania on 15 November 2002, No 403;
- 3.7. Rules on Operating Crude Oil Processing Facilities approved by the Minister of Economy of the Republic of Lithuania on 28 January 2008, No 4-27.

4. TERMS, DEFINITIONS AND ABBREVIATIONS

- 4.1. The terms used herein shall be defined as follows:

Potentially dangerous equipment (hereinafter – equipment) – work means (any machine, apparatus, device, tool or equipment used for work), also other facilities which, due to energy accumulated and processes taking place in such while in operation, pose risk (potential threat) to human life, health or environment.

Equipment operation – any activity related to equipment (startup, shutdown, use, transportation, repair, upgrade, maintenance, cleaning etc.).

Pressure vessel (hereinafter – vessel) – a tightly closed tank, where chemical, thermal and other processes take place or fluids are stored and carried. A vessel may be composed of more than one chamber. Its boundaries are the inlet and outlet nozzles through to the port for connection to another equipment.

Nozzle – a part (or an element) designed for connection of valves, control and measuring instruments, piping, etc. to a vessel.

Permanent joints – joints that can be demounted by breaking such only (e.g., welded joint).

Flanged connection – a stationary demountable connection made of flanges tightly fitted to each other with a softer material insert between them.

Continuous vessel maintenance – compulsory verifications, technical inspections and maintenance of constantly used vessels, also other indicated activities specified in legislative norms for vessel use and maintenance, as well as manufacturer submitted vessel technical documentation.

Supervisors – persons performing technical inspections of vessels, servicing vessels (vessel maintenance foremen, operators, inspectors, machinery operators, etc.)

Operator – an employee or employees assigned to operate a vessel.

Certification – testing if an employee's knowledge meets the established requirements.

Accredited body for inspection of technical condition of potentially dangerous equipment (hereinafter – the Accredited Body) – a legal entity established in the Republic of Lithuania, a legal entity or another organization established in another member state of the European Union or the European Economic Area, or a branch thereof established in the Republic of Lithuania or another member state recognized by accreditation bodies as competent to inspect the technical condition of potentially dangerous equipment.

Expert – a representative of the Accredited Body for inspection of technical condition of potentially dangerous equipment authorized to inspect technical condition of vessels.

Certificate of conformity – a declaration issued by the vessel manufacturer to confirm that before the vessel was launched onto the market, following the conditions established in Article 5 of the Technical Regulation for Pressure Vessels, one of the conformity evaluation procedures described in Annex 3 of the Regulation was performed and the vessel is safe to use.

EC certificate – a statement issued in compliance with certification policies (EC type investigation, EC project investigation or EC conformity), based on which a granted (notified) agency validates complete conformity of a pressure vessel or a unit after performing required investigations and identifying vessel confirming type, or determining the design conformity with the essential requirements in the Technical Regulation for Pressure Vessels or harmonized standards following the technical documentation analysis, or verifying technical documentation evaluating materials used for operations, procedures and qualifications, performing final verification as specified in technical documentation.

CE mark – a mark whereby the manufacturer proves that the pressure equipment or unit meets the applicable harmonization legislation of the European Union on the marking.

Recognized standards – national and international standards (LST, EN, ISO, BS, DIN, ANSI, GOST, etc.) for vessel calculation, design and use.

Cylinder – a vessel with one or two sockets for insertion of vents, flanges or nozzles designed for carriage, storage and use of compressed, liquefied or solute gases.

Tank – a mobile vessel installed on a railroad car underframe, on truck (trailer) chassis or on any other vehicles designed for carrying of fluids.

Maximum or minimum allowable temperature, T_s – maximum or minimum temperature for which the vessel has been designed, as specified by the manufacturer.

Pressure – excess pressure determined in relation to atmospheric pressure. For this purpose, vacuum is considered to be a negative value. Pressure is measured at the top of a vessel.

Maximum allowable pressure, P_s – the maximum pressure for which the vessel has been designed, as specified by the manufacturer.

Operating pressure, P_o – maximum pressure at which the vessel is used. Maximum operating pressure may be equal to or lower than the maximum allowable pressure, P_s .

Testing pressure, P_t – pressure at which a vessel is tested.

Volume, V – internal volume of a section and nozzles through to the first joint or weld (determined on the basis of the dimensions specified in the vessel drawings) excluding the volume of permanent internal components.

Fluids – gases, liquids and vapours in pure form as well as mixtures thereof. Fluids may contain suspended solids.

Medium – a fluid, which a vessel is filled up with.

Safety devices – devices safeguarding vessels against exceeding their maximum or minimum operating parameters.

Devices for direct pressure limitation – safety valves, safety devices with bursting (rupture) discs, etc.

Limiters – devices which either activate regulating instruments or provide for shutdowns or shutdown and lockout (pressure switches, fluid level switches, etc.) of a vessel.

Inspection of vessel technical condition:

- **Inspection of a vessel in operation** – inspection of an operating vessel in order to determine the functioning of its safety and regulating devices, controlling and measuring instruments, general technical condition of the vessel, its valves, coating and insulation, also documentation, compliance with its operation manual, and other issues pertaining to its operation;

- **Internal and external inspection** – inspection of internal and external surfaces of a vessel in order to evaluate its technical condition; performed after a vessel has been shut down and cleaned;

- **Hydraulic test, HT** – testing of a vessel for strength and tightness by building test pressure inside the vessel.

Repair – restoration of a vessel's operability.

Technical documents of equipment (hereinafter – technical documents) – equipment conformity declaration, equipment certificate, equipment passport, drawings and servicing documents (including regulations on equipment installation and testing prior to operation, servicing, repair and dismantling procedures, instructions), also other accompanying manufacturer's documents specifying the equipment designation, design, parameters, mandatory safety requirements and operation procedure.

4.2. Any other terms used in the present Manual have the meaning defined in the Law on Supervision of Potentially Dangerous Equipment of the Republic of Lithuania.

5. RESPONSIBILITIES

5.1. Equipment maintenance – a set of technical services, legal and organizational measures provided in relevant legal norms for operation and maintenance of equipment, as well as technical specifications presented by the manufacturer in order to ensure the equipment in operation is safe and non-hazardous to people, property and environment; maintenance of vessels is mandatory and is divided into inspection of technical condition and routine maintenance of equipment.

5.2. Routine maintenance, proper and safe operation of vessels shall be the responsibility of the head of the organizational unit operating the vessel, or any other qualified engineer/technician assigned by a decree of a Head of Operations Subdivision or Shop. The person responsible for routine maintenance, sound and safe operation of a vessel shall:

5.2.1. Make sure the persons responsible for process control of vessels are trained and certified under the program for pressure vessel operators or pressure vessel maintenance foremen;

5.2.2. Ensure routine maintenance of vessels, control over formalization (recording) of daily and periodic inspection findings in accordance with the established procedure;

5.2.3. Operate vessels in accordance with the operation and maintenance requirements in the manufacturer's technical documentation (installation and pre-commissioning test, maintenance, repair and dismantling rules, mandatory safety requirements and procedures);

5.2.4. Develop a connection diagram for newly installed vessels, and give timely notification to Equipment Technical Supervision and Materials Analysis Group Engineer of any changes in the process diagram of the vessel connection, as well as change such;

5.2.5. In case of breach of the present Operation Manual, as well as vessel failures that could result in an accident or emergency, immediately eliminate such breach/failure and, if necessary, disconnect the vessel from the process flow diagram.

5.3. Maintenance and technical inspection of vessels, also evaluation of the quality as well as acceptance of the repair, upgrade and installation works shall be the responsibility of Mechanical Department Equipment Technical Supervision and Materials Analysis Group Engineer. The person appointed to service vessels with a decree of Equipment Technical Supervision and Materials Analysis Manager shall:

5.3.1. Develop an annual schedule for technical inspection of vessels (hereinafter – the schedule). The schedule shall be agreed with Equipment Technical Supervision and Materials Analysis Manager, head of the organizational unit operating the vessels, Chief Mechanical Engineer, Deputy Director of Maintenance, Director of Maintenance, and approved by Deputy General Director for Operations;

5.3.2. Submit technical documents of subject-to-registration vessels for registration with the institution administrating the State Register of Potentially Dangerous Equipment (PDE);

5.3.3. Register the vessels that are not subject to registration with the State Register of PDE with Equipment Technical Supervision and Materials Analysis Group;

5.3.4. Carry out technical inspections of vessels registered with Equipment Technical Supervision and Materials Analysis Group;

5.3.5. Organize technical inspections of vessels registered with the State Register;

5.3.6. Duly issue and store technical passports of vessels;

5.3.7. Make timely entries on performed repairs and technical inspections of vessels;

5.3.8. Make plans for inspections of technical condition of vessels;

5.3.9. Perform risk assessment for vessels.

5.4. Maintenances of vessels, i.e. preparation for evaluation of technical condition and arrangement of repairs, shall be the responsibility of Maintenance Department Mechanical Engineer (hereinafter – Mechanical Engineer) acting within the assigned organizational units. Mechanical Engineer shall:

5.4.1. Based on the inspection plans, prepare vessels for inspection of their technical condition in a timely and qualitative manner;

5.4.2. Control activities related to repairs, revamp and maintenance including cleaning.

5.5. Organization of maintenance and repair of vessels anticorrosion coating, refractory lining, and concrete foundations shall be the responsibility of Mechanical Department Civil Construction Technical Supervision and Maintenance Group Civil Engineer acting within the assigned organizational units.

5.6. Organization of maintenance and repair of electrical equipment of vessels shall be the responsibility of Maintenance Department Electrical Engineer acting within the assigned organizational units.

5.7. Organization of maintenance and repair of automation instruments of vessels shall be the responsibility of Maintenance Department Automation Engineer acting within the assigned organizational units.

5.8. Persons breaching the requirements laid down herein shall be liable in accordance with the laws of the Republic of Lithuania and procedures established by the Company.

6. ACTIONS

- 6.1. Pressure vessels owned by the Company shall be installed and operated in compliance with the Rule for Operation of Pressure Vessels DT 12– 02, other operation and supervision legislation, technical documents developed and conditions specified by the designer (manufacturer), as well as following recognized standards and requirements herein.
- 6.2. Newly purchased pressure vessels shall meet the requirements in the Technical Regulation for Pressure Vessels. Manufacturer or its authorized representative shall be responsible for the suitability of vessel design, its strength calculation, material selection, for workmanship and compliance with conformity assessment procedures consistent with the valid technical regulations and requirements in harmonized standards.
- 6.3. Newly purchased pressure vessels shall be enclosed with operation manuals in the Lithuanian language providing for all the necessary safety data. Manuals shall be accompanied by technical documents, drawings and diagrams making it easier to understand the instructions in the manual.
- 6.4. When necessary to recalculate vessel parameters according to parameters other than those in the technical documents in order to determine vessel operability, recognized standards shall be followed; requirements in such shall not be inferior to the requirements observed when manufacturing particular pressure vessels. As for previously used pressure vessels which do not comply with the requirements set in normative documents applicable to new vessels, it is recommended to follow the normative documents and other engineering practices developed by contemporary organizations specializing in the field and meant for determining of technical deviations and effects thereof on vessel strength.
- 6.5. Pressure vessels are grouped into two categories based on the hazard level of fluids stored in them.
- 6.6. Vessels designed for group 1 fluids are attributed to the first category. Vessels designed for group 2 fluids comprise the second category.
- 6.7. Fluids fall into two groups:
- 6.7.1. Group 1 is comprised of hazardous fluids (according to Item 24, Article 3 of LR Law on Chemical Substances and Preparations), which are:
- 6.7.1.1. Explosive;
 - 6.7.1.2. Extremely flammable;
 - 6.7.1.3. Highly flammable;
 - 6.7.1.4. Flammable (where the maximum allowable temperature is above flashpoint);
 - 6.7.1.5. Highly toxic;
 - 6.7.1.6. Toxic;
 - 6.7.1.7. Oxidizing;
 - 6.7.1.8. Destructing (corrosive);
 - 6.7.1.9. Irritating (sensitizing).
- 6.8. Group 2 incorporates any other fluids, which are not attributable to hazardous fluids.
- 6.9. If a vessel is composed of a number of sections (chambers), it shall belong to the first category in case one of the chambers is designed to be filled up with group 1 fluids. If a vessel chamber contains several fluids attributed to different groups, categorization of the vessel shall be based on the fluid with the highest hazard level.
- 6.10. Pressure vessels of the Company are divided into those subject to registration with the institution administering the State Register of Potentially Dangerous Equipment and those not subject to the registration (hereinafter – subject to registration or not subject to registration).
- 6.11. The following are the vessels that have to be registered with the State Register of Potentially Dangerous Equipment:
- 6.11.1. higher than 0.5 bar pressure, bigger than 25 liter capacity vessels and their equipment designed for group 1 fluids with P_s times V exceeding 500 bar·l, with the exception of smaller than 250 l capacity cylinders and their equipment designed for natural gas, liquefied petroleum gas and other process gases;
 - 6.11.2. higher than 0.5 bar pressure, bigger than 1000 liter capacity vessels and their equipment designed for group 2 fluids with P_s times V exceeding 10'000 bar·l.
- 6.12. Vessels that do not correspond to the requirements indicated in Item 6.11 above shall be registered with Equipment Technical Supervision and Materials Analysis Group of Mechanical Department. The registration shall be done by Equipment Technical Supervision and Materials Analysis Group Engineer.
- 6.13. A technical data file (vessel passport) of the form established by the Company shall be started for each vessel, see Annex 1.
- 6.14. A vessel passport shall provide the following data:
- 6.14.1. Vessel location, owner (company address shall be specified too);

- 6.14.2. Manufacturer (the address shall be specified too);
 - 6.14.3. Vessel purpose and main parameters;
 - 6.14.4. Documents certifying assessment of the vessel conformity (conformity declarations, certificates and drawings);
 - 6.14.5. Vessel erection and installation conformity documents regarding welded joints; if necessary to validate the conformity, welding method, electrode type and brand, surnames of welders and their identity certifications, welding control methods and testing results certifying usability shall be indicated;
 - 6.14.6. Vessel connection diagram approved by the Head of the Operations Subdivision operating the vessel (diagram indicating pressure sources, parameters, operating medium, fittings, control and measurement instruments, alarms, automated control devices, safety and ESD trip appliances);
 - 6.14.7. Number of safety devices/appliances, their throughput and performance characteristics. The latter have to be based on calculations and conformity documents.
- 6.15. An appropriate number of persons responsible for routine maintenance, proper and safe process control of vessels shall be appointed by a decree of Head of Operations Subdivision or Shop. These persons shall be certified in accordance with the procedure effective at the Company and have the qualification of a pressure vessel maintenance operator or pressure vessel maintenance foreman.
- 6.16. Vessel operation shall immediately be discontinued in the manner specified in the relevant Operation Manual or Process Regulation if:
- 6.16.1. Pressure in the vessel has exceeded the permissible limit, and it is impossible to reduce such immediately;
 - 6.16.2. At least one of the devices directly limiting pressure in the vessel has failed;
 - 6.16.3. Vessel fractures, blisters, leaks have been detected, and the defects cannot be eliminated;
 - 6.16.4. All pressure and/or temperature meters/gauges have failed, and the failure cannot be eliminated immediately;
 - 6.16.5. The level of medium contained at fire-heated vessels has reduced below the minimum allowable level, and increase of the level up to the allowable one is impossible;
 - 6.16.6. All liquid level meters have failed;
 - 6.16.7. Fire has started and is disturbing normal operation of the vessel;
 - 6.16.8. Another hazard is faced, in case of which the manufacturer recommends to shut the vessel down.
- 6.17. Reasons for emergency shutdown shall be determined and documented in accordance with the Company's Incident Investigation Regulations.
- 6.18. Vessel fittings (valves, gates, vent valves flow rate regulating devices), level gauges, pressure and temperature meters, safety devices, emergency alarm mechanisms have to conform to the operating parameters of a vessel and be maintained as well as and checked according to the procedure established at the Company.
- 6.19. All fittings, controlling and measuring instruments, safety devices have to be easy to access for service and repair. Valve opening and closing directions have to be marked.
- 6.20. Vessel outlet valves or other discharge equipment has to be controlled so that the released medium would not create shock volume. Fluid discharge shall be safe.
- 6.21. Direct-acting level gauges shall have the top and bottom limits of fluid level marked on them.
- 6.22. Sight glasses (ports) of liquid level gauges and of process tracking devices, in case such break, have to be protected against external damage or injury of supervising personnel.
- 6.23. Unless otherwise specified by the manufacturer, the accuracy class of a pressure gauge indicating vessel pressure has to be 2.5 at up to 25 bar pressure, and 1.5 at higher pressure. The diameter of a pressure gauge shell has to be at least 100 mm if installed at the height of up to 2 m over observation platform, and 160 mm if installed higher.
- 6.24. The selected pressure gauge shall have the scale with the measurable limit of operating pressure in the second third of the scale.
- 6.25. The value of operating pressure (P_o) of a vessel has to be marked on the pressure measuring device scale or as a special mark on the exterior of the device, but not on the glass.
- 6.26. Vessels, pressure in which can exceed the maximum allowable pressure, P_s , have to be installed with safety devices preventing exceeding of the maximum allowable pressure, P_s . The pressure activating safety devices may be equal to P_s pressure only if, at the peak activation of the safety device, short-term pressure increase in the pressure vessel does not exceed P_s more than 10%. The number, throughput and performance of such safety devices shall be based on calculations and conformity documents.
- 6.27. Safety devices shall not be used for adjustment/control purposes.
- Activation of safety devices shall be avoided as much as possible, by maintaining sufficient difference between the operating pressure of a vessel and its maximum allowable pressure. Pressure limiting and/or adjusting devices shall be used for this purpose. If increase of pressure inside a vessel is caused by the medium temperature, temperature limiting and/or adjusting devices shall be used.

- 6.28. Installation of valves on the line between a safety device and a vessel as well as on the line discharging the medium from a safety device shall be prohibited. Valves may be installed upstream or downstream a safety device if redundant safety devices and ESD trip, which prevents switching of both safety devices off at the same time, have been installed and at least one safety device of sufficient diameter remains connected to the vessel at all times. Also if the design approved by the authorized institution indicates to install lockable open-type valves, the control of which is assigned to the maintenance foreman according to the owner's instructions ensuring constant control of pressure inside the vessel;
- 6.29. For equipment in operation, safety devices can be disconnected and verified only in compliance with the Pressure Safety Valve Operating Procedure BM-19.
- 6.30. Pressure safety device functions are performed by:
- 6.30.1. Safety valves;
 - 6.30.2. Rupture membranes;
 - 6.30.3. Hydraulic seals;
 - 6.30.4. Safety studs.
- 6.31. Pressure safety devices can be connected:
- 6.31.1. Directly to a vessel shell;
 - 6.31.2. To a source of pressure;
 - 6.31.3. To a pipeline supplying pressure generating medium to a vessel or several vessels.
- 6.32. Pipelines used for removing medium out of safety devices shall not impact operation of these devices. Possible pressure build-ups in a medium discharge pipeline shall be taken into account, and condensate shall be removed from the lowest possible point of its accumulation.
- 6.33. Vessel medium shall not have any negative effect on the structure and functioning of safety devices, pressure and temperature measuring instruments.
- 6.34. When vessels contain aggressive, sticky, dusty or other kinds of media use of direct-acting safety devices in which is impossible or inexpedient, such safety devices can be replaced with protections or alarms operating together with pressure reducing devices preventing pressure in a vessel to exceed P_s pressure, where other measures applied, including disconnection of pressure generating media supply, cannot guarantee prevention of such pressure increase.
- 6.35. In case operating pressure starts increasing, alarms have to give a timely visible and audible signal to the supervising personnel.
- 6.36. Examples of alarms (signaling equipment) include:
- 6.36.1. Pressure metering instruments with signal contacts connected directly to a vessel;
 - 6.36.2. Instruments with signal contacts determining temperature of medium in a vessel.
- 6.37. Vessels designed for storage of highly toxic or flammable gases, which (vessels) operate without constant control of supervising personnel and in which pressure can exceed the maximum allowable pressure P_s , have to be installed with protective pressure limiters that do not allow pressure to exceed P_s . Protective pressure limiters have to switch off and block the supply of pressure and/or heat carrying medium. If pressure inside a vessel can increase only due to increased temperature of the medium in it, such protective pressure limiters can be replaced with protective temperature limiters.
- 6.38. Vessels shall be erected and installed according to the design developed in compliance with the established procedure, in the areas where no people gatherings and presence of unauthorized persons are expected, where vessels are protected against accidental mechanical damage, freezing and high temperature impact.
- 6.39. Vessels and related equipment shall be erected in the manner enabling easy and convenient maintenance, cleaning, repair and inspecting of technical condition thereof.
- 6.40. The media drained and discharged out of safety devices shall be safely routed away, without causing danger to people and the environment.
- 6.41. Only legal entities holding the certificate issued by the National Energy Regulatory Council for operation (repair) of crude oil and petroleum product facilities shall be entitled to repair the vessels. Personnel coordinating welding works must have one of the following qualifications (as per LST EN ISO 14731):
- 6.41.1. Welding Engineer EWE/IWE;
 - 6.41.2. Welding Technologist EWT/IWT;
 - 6.41.3. Welding Specialist EWS/IWS;
 - 6.41.4. Welding Work Quality Engineer EWI/IWI.
- 6.42. Vessels shall be repaired (revamped) based on a pre-developed design and/or repair (revamp) method statement, quality control plan. The documents shall be developed using the form presented in Annex 2.
- 6.43. Only the materials and elements specified in a vessel repair design and/or repair method statement and having conformity certificates shall be used for repairs.
- 6.44. Vessels shall be installed, revamped or repaired in a way ensuring the safety and health of employees performing the works. Any equipment used by an organization performing works shall be

subject to the mandatory occupational health and safety requirements for production of individual working aids or their groups, and their conformity assessment procedures established in technical regulations or other occupational safety and health normative legal acts. Only working aids in good technical condition and meeting the requirements prescribed by occupational safety and health normative legal acts shall be used. Contractor employees must use the working aids in a safe manner. The requirements for safe use of particular working aids (equipment) is laid down in the documents and instructions which the manufacturer must enclose in the supplied equipment. The work performing entity must have such instructions available.

6.45. After repair (revamp) of a vessel, repair (revamp) quality certificate (see Annex 3) and other documents specified in Annex 4 have to be presented.

6.46. After opening flange connections of a vessel, the contractor performing internal inspection, repair and reconstruction works shall, before closing the vessel, obtain a permit for closing such (see Annex 5) coordinated with the specialists indicated in Annex 5. Once assembled, all flanged connections shall be appropriately labeled, i.e. every assembled connection must have a metal tag with an imprinted name of the contractor, the individual flanged connection number of the worker having assembled the connection, and the code of sealing material (G – graphite, M – metal, Z – ARMKO ring, S – spiral), also the tightening torque for the flanged connection studs (Nm, Newton meters).

6.47. Equipment Technical Supervision and Materials Analysis Group Engineer shall enter the data on repairs done to a vessel into the passport of the vessel. Vessel repair documents shall be stored with Equipment Technical Supervision and Materials Analysis Group together with the technical documents (passport) of the vessel throughout its service life.

6.48. Based on the requirements set in the Rules for Operation of Pressure Vessels DT 12– 02 (hereinafter – Operation Rules DT 12-02), pressure vessels are subject to the following periodical technical inspections:

- 6.48.1. Operating vessel inspection (OVI);
- 6.48.2. Internal and external inspection (II);
- 6.48.3. Hydraulic testing (HT).

6.49. Technical condition of vessels subject to registration with the State Register of PDE shall be inspected by an expert from the Accredited Body. Vessels not subject to registration shall be inspected by Equipment Technical Supervision and Materials Analysis Group Engineer. When necessary, specialists from concerned departments of the Company and/or expert organizations may be invited to inspect the technical condition.

6.50. The purpose of vessel technical condition inspection is to determine if vessels can operate reliably through to the next inspection under the same operating conditions, considering their corrosive and mechanical depreciation level, the number of operating hours (cycles), as well as determine the dates for the next inspection.

6.51. Vessel technical condition is inspected:

- 6.51.1. Before a newly installed vessel is put into operation – internal and external inspection, hydraulic testing and, afterwards, operating vessel inspection. Technical condition of newly installed vessels is inspected prior to their registration with the institution administrating the State Register of Potentially Dangerous Equipment. In the cases where the manufacturer has performed the required conformity evaluation procedures, declared the vessel's conformity and marked it with CE mark, also where, based on the submitted technical documents, it can be determined that the vessel complies with the requirements of the applicable Technical Regulation for Pressure Equipment, internal and external inspection of the vessel, also hydraulic testing shall not be performed prior to putting the vessel into operation provided that its construction, insulation and coatings feature no damage, and manufacturer-provided regulations related to storage terms & conditions have not been violated. In this case, an expert from the Accredited Body or an Engineer from Equipment Technical Supervision and Materials Analysis Group, after he/she analyzes a vessel installation design, technical documents (passport) and inspects the vessel in operation, shall determine the date for the next technical inspection of the vessel;
- 6.51.2. When moved to and installed on a new site – internal and external inspection, hydraulic testing and operating vessel inspection;
- 6.51.3. Periodically, based on the terms established in the Operation Rules DT 12– 02:
 - 6.51.3.1. inspection of a vessel in operation,
 - 6.51.3.2. performing of internal and external inspection;

6.52. Additionally, non-routinely – after accidents, revamp as well as repairs that involved welding, long-term (more than 12 months) or other unusual downtimes – internal and external inspection, hydraulic testing and operating vessel inspection.

6.53. Periodic inspections of technical condition of vessels subject to registration with the State Register of PDE shall be performed following the terms established by the manufacturer of the vessels or the terms indicated in Table 1 below.

Table 1

Vessel class	Maximum allowable pressure times volume, bar x l	Volume, l	Periodic inspection of technical condition of vessels	
			Operating vessel inspection	Internal and external inspection
Class 1	$P(s) \times V > 500$	$V > 25$	every 2 years	every 4 years
Class 2	$P(s) \times V > 10000$	$V > 1000$	every 2 years	every 8 years

6.54. Based on the experience in vessel operation, performed analyses or any other evidence of the fact that corrosion, erosion or mechanical depreciation of vessels is impossible, the interval between internal and external inspections can be determined according to the calculated service life remaining for the vessel. Calculated vessel service life is determined on the basis of the thickness measurements for vessel elements, considering the corrosion rate and vessel strength calculation results. When determining the service life remaining for individual vessels which, when in operation, are exposed to cyclical charges, high temperature, hydrogen medium, etc., the number of cycles, the period in operation as well as the medium impact shall be considered. The interval between technical condition inspections should not be more than a half of the calculated vessel service life, but minimum once in 10 years. This shall be recorded in a common document issued by the Accredited Body and Equipment Technical Supervision and Materials Analysis Group.

The above mentioned evidence could be obtained by using the pressure equipment technical condition assessment and inspection planning methodology according to API 580 and API 581 standards – Risk Based Inspection (RBI) by applying Equity Engineering Group INC software *Plant Manager*.

6.55. Periodic inspections of technical condition of vessels registered with Equipment Technical Supervision and Materials Analysis Group shall be performed by Equipment Technical Supervision and Materials Analysis Group Engineer at the intervals established by the vessel manufacturer, as in Table 2 below.

Table 2

Vessel class	Maximum allowable pressure, Ps, bar	Maximum allowable pressure times volume, bar x l	Volume, l	Periodic inspection of technical condition of vessels	
				Operating vessel inspection	Internal and external inspection
Class 1	$P_s > 0.5$	$P_s \times V \leq 500$	$V > 25$	every 2 years	every 4 years
Class 1	$-1.0 \leq P_s < 0$ (vacuum)	unlimited	$V > 25$	every 2 years	every 4 years
Class 2	$P_s > 0.5$	$P_s \times V \leq 10000$	$25 < V < 1000$	every 2 years	every 8 years

6.56. For vessels, with the maximum allowable pressure $0 < P_s \leq 0.5$ bar and volume $V > 25$ l, the interval between periodic inspections of their technical condition is determined with respect to the manufacturer's recommendations, actual state of the vessel and actual corrosion rate of the vessel components. The interval between technical condition inspections should not be more than $\frac{3}{4}$ of the calculated service life remaining for the vessel, but minimum once in 10 years.

6.57. If vessel construction does not allow performing its internal and external inspection, technical documents of the vessel have to indicate adequate technical inspection methods. If no such instructions are given, the inspection method shall be determined by an Engineer from Equipment Technical Supervision and Materials Analysis Group in cooperation with an expert from the Accredited Body following the experience in operation of such vessels and, if necessary, technical calculations and analyses performed.

6.58. Vessels which have been assembled from separate sections (elements) on-site, shall be recognized as fit for use in the procedure analogous to that applied to vessels produced at manufacturer's workshop.

6.59. Further operation and extension of service life of vessels with their number of operating cycles or service time specified by the manufacturer expired, as well as vessels with non-allowable defects and defects that have emerged during the operation, consequences of which are difficult to evaluate without additional analyses, shall be decided upon by the Accredited Body in cooperation with an Engineer from Equipment Technical Supervision and Materials Analyses Group based on the analyses, calculations and tests performed.

6.60. The following shall be assured when inspecting a vessel in operation:

- 6.60.1. If vessels are supervised by persons with sufficient qualification, and the instructions for vessel operation are observed;
- 6.60.2. If the defects identified during previous inspections have been eliminated;
- 6.60.3. If repair documents have been filled out in a proper manner (in case any repairs were performed);
- 6.60.4. If pressure limiting, regulating, also safety devices operate reliably;
- 6.60.5. If flanged connections, fastening parts and supports are in proper condition;
- 6.60.6. If valves, alarms, controlling and measuring instruments are in proper condition;
- 6.60.7. If insulation, coating and general vessel condition is appropriate.
- 6.61. All non-allowable defects reducing vessel strength shall be determined during internal and external inspection of a vessel. Special attention shall be paid to the following potential defects:
 - 6.61.1. Surface of vessel – splits, cracks, wall corrosion (especially at bends and cut-outs), blisters, bulges (usually in vessels with a hood and fire- or electricity-heated vessels), cavities (in moulded vessels);
 - 6.61.2. Welds – welding defects, fractures, corrosion damage;
 - 6.61.3. Vessels with their surfaces protected against corrosion – liner decomposition, leaky tile layers, rubber-covered, lead-based or other coating fractures/cracks, enamel curling, cracks and blistering of metal inserts, vessel wall metal defects within damaged areas of protective coating.
- 6.62. Vessels to be covered with protective coating or insulation layer have to be inspected prior to coating or insulating.
- 6.63. If determined that internal and external surfaces of vessels underneath insulation, protective coating or a layer of corrosion resistant material feature no damage at all, such coating or material may not be subject to removal/destruction.
- 6.64. If during a vessel inspection signs certifying that metal defects are likely under the layer of insulation or liner (wet insulation layer, liner cracks, liner blistering, etc.) are detected, such protective layers shall be removed, walls shall be closely inspected, thickness thereof shall be checked, and then the insulation and lining shall be re-installed and re-inspected.
- 6.65. Hydraulic testing of vessels shall be performed only in case the findings of its internal and external inspection are positive. Hydraulic testing shall be performed after a vessel has been shut down, freed from the product, and disconnected from the process flow diagram.
- 6.66. Hydraulic testing of vessels (except for cryogenic ones) shall be performed at the testing pressure indicated by the manufacturer. If the manufacturer did not indicate any testing pressure or upon P_s reduced, testing shall be performed at the following pressure:

$$P_b = 1.25 P_s \frac{[\sigma]_{20}}{[\sigma]_t};$$

where:

P_s – maximum allowable pressure in bars,

$[\sigma]_{20}$ – allowable tension (stress) upon a vessel material at 20 °C,

$[\sigma]_t$ – allowable tension (stress) upon a vessel material at design temperature.

- 6.67. Hydraulic testing of moulded vessels (their parts) shall be performed at the following testing pressure:

$$P_b = 1.5 P_s \frac{[\sigma]_{20}}{[\sigma]_t}$$

- 6.68. Hydraulic testing of cryogenic vessels with vacuum insulation shall be performed at the testing [3.6] pressure as follows:

$$P_b = 1.25 P_s - 1.0 \text{ bar}$$

- 6.69. Hydraulic testing of composite vessels with two or more operating sections designed for different pressures shall be performed individually for each section at the pressure the section has been calculated (designed) for.

- 6.70. Water of not lower than 5 °C and not higher than 40 °C temperature or other non-aggressive liquids shall be used for hydraulic testing if not otherwise stated by the vessel manufacturer. During the test, vessel walls shall not get dewy due to the difference between test fluid and air temperature.

- 6.71. All air has to be removed from a vessel before filling it up with a test fluid.

- 6.72. During the test, the pressure has to be controlled with two duly verified pressure gauges of the same type, same measuring limits, same accuracy class and same scale.

- 6.73. Testing pressure shall be increased gradually based on the pressure increase rate recommended by the manufacturer or, in case such recommendations are absent, pressure increase/decrease rate shall not exceed 2 bars per minute. Use of air or other gases for pressure increase is not allowed.
- 6.74. The vessel shall be pressure tested for five minutes if not otherwise stated by the manufacturer.
- 6.75. After testing vessels at the testing pressure, the pressure shall be reduced down to the maximum allowable pressure, and the vessel surface, all dismountable as well as welded joints thereof shall be thoroughly inspected. During the test, pounding on a vessel walls as well as their joints shall be prohibited.
- 6.76. A vessel shall be deemed to have passed a hydraulic test if no deformations, leaks, cracks or formation of dew is observed or detected on its welds and base metal after the test.
- 6.77. After the defects of vessels and elements thereof noticed during the test have been eliminated, the vessels and elements shall undergo repeated hydro-testing.
- 6.78. A hydraulic test may be skipped if welding works with other than all-the-way-through (up to 50 % thickness) fusion of vessel shell elements were performed when repairing the vessel (welding of internals, repair of cladding, elimination of non-through defects of welds, etc.). Such repairs shall be followed by non-destructive testing (hardness measuring, magnetic flaw detection, dye-penetration, etc.) of the fused area and heat-exposed zone.
- 6.79. Hydraulic testing can be replaced with pneumatic testing or acoustic emission testing. Pneumatic test shall be performed with compressed air or inert gas under the testing procedure, which specifies the required safety measures prepared by the test executor and approved by a Safety Manager.
- 6.80. Installation and functioning of all devices that prevent closable/openable (loadable/unloadable) vessels from opening under pressure and activation thereof without reliably closing such shall be checked. Operation manuals of such vessels shall specify allowable pressure and temperature fluctuations.
- 6.81. In case of need to postpone the dates of internal and external inspections of vessels listed in the schedule, the person responsible for continuous maintenance of a vessel, sound and safe use thereof shall address Equipment Technical Supervision and Materials Analysis Manager with a reasoned request. The request shall be coordinated with the head of the organizational unit operating the vessels, Chief Mechanical Engineer, Director of Maintenance or Deputy Director of Maintenance, Deputy General Director for Operations. For vessels registered with the State Register of PDE, Equipment Technical Supervision and Materials Analysis Manager or his assigned Technical Supervision and Materials Analysis Engineer with an expert from the Accredited Body shall evaluate technical condition of a vessel in operation and determine the date for next inspection thereof. The condition of vessels registered with Equipment Technical Supervision and Materials Analysis Group shall be evaluated by the Technical Supervision and Materials Analysis Group Engineer responsible for their supervision. Inspections of technical condition of vessels can be postponed for up to 12 months depending on their technical condition.
- 6.82. Inspection of a vessel in operation shall be performed with the vessel connected to the process flow diagram and with the regular technological process going on in it.
- 6.83. Internal and external inspection of a vessel shall be performed with the vessel disconnected from the process flow diagram, with the product removed from it, with dirt, petroleum product residue cleaned off the inner surface of metal and internal element surfaces of the vessel; weld seams and main metal shall be cleaned down to metallic appearance 20 mm both sides away from a weld.
- 6.84. Homogenous sediments formed on vessel surfaces as a result of technological process, which have no negative effect on the vessel walls, may be kept (not removed). In such case, certain sediment-covered surfaces shall be uncovered and the effect thereof shall be analyzed to determine if the sediment layer has any impact on the vessel strength.
- 6.85. Entry of a vessel is possible only in accordance with the Occupational Health and Safety Procedure BDS 6/2 *Work in Confined Space*, which regulates working in confined spaces.
- 6.86. During internal or another inspection inside a vessel, lighting used for inspection shall be greater than 300lx.
- 6.87. Removable internals of a vessel (all or some of them) which impede performance of internal inspection shall be removed.
- 6.88. Prior to inspecting higher than 2 meter vessels, the method and means of vessel inspection have to be determined and agreed with an Engineer from Equipment Technical Supervision and Materials Analysis Group.
- 6.89. Corrosion (thickness) of vessel walls shall be monitored together with internal inspection of the vessel. Wall thickness of all pressure affected elements and cladding (if available) shall be measured as indicated in the diagram of vessel corrosion monitoring card. The diagram shall be drawn and presented by Equipment Technical Supervision and Materials Analysis Group Engineer. Wall thickness may be additionally controlled at the points most affected by corrosion, as detected during internal inspection. Where strength calculation is needed for a vessel, at the intervals established for technical inspection or

when necessary, vessel wall thickness shall be measured as indicated in the diagram of vessel corrosion monitoring card and at the following additional points:

- 6.89.1. At implied points of decomposition of medium phases, and at places where an aggressive medium contacts a wall;
- 6.89.2. In vessels containing homogenous medium phase – at the bottom part of a shell;
- 6.89.3. At the shell points subject to the largest stress (tension):
 - 6.89.3.1. At nozzle reinforcement zone;
 - 6.89.3.2. At the zone above supports;
 - 6.89.3.3. At the zone of the largest bottom bend;
 - 6.89.3.4. On the middle band – for horizontal vessels.

6.90. Based on thickness measurement results for every element, corrosion rate and service life of every element is determined taking only corrosion related thinning of elements into consideration. Wall thickness measurement results together with a points arrangement diagram shall be documented in the form of a corrosion card and stored together with technical documents (passport) of a vessel throughout its service life.

6.91. Findings of technical inspection performed for a vessel subject to registration with the State Register of PDE by an expert from the Accredited Body shall be discussed with an Engineer from Equipment Technical Supervision and Materials Analysis Group and documented in the form (report) established by the Accredited Body. Findings of inspection (internal and external) of technical condition of a vessel registered with Equipment Technical Supervision and Materials Analysis Group shall be documented by an Engineer from Equipment Technical Supervision and Materials Analysis Group by issuing a vessel technical inspection report (see Annex 7). During technical inspection of a vessel in operation, an Engineer from Equipment Technical Supervision and Materials Analysis Group shall record any noticed deficiencies in a technical inspection report; in case no deficiencies are detected, the report shall not be issued, the conclusion stating that the vessel is fit for operation shall be recorded in the passport of the vessel, specifying allowable parameters, operation conditions and the date for the next inspection. In case a vessel is not fit for use, a record thereon shall be made in the passport of the vessel. Original copies of the Accredited Body issued reports providing technical inspection findings shall be stored together with the vessel's technical documents (passport) throughout the entire service life of the vessel. Copies of the reports, also technical inspection reports shall be stored in the Maintenance Department data management system TP Shell.

6.92. Where vessels have been recognized fit for use, the following shall be visibly specified on each vessel:

- 6.92.1. Identification code / technological number;
- 6.92.2. Maximum allowable pressure;
- 6.92.3. Year and month of the next external and internal inspection of the vessel in operation;
- 6.92.4. Marking specified by the Accredited Body (for registered vessels).

6.93. When operating pressure vessels and when supervising them, normative legal acts valid in the Republic of Lithuania and regulating the use of potentially dangerous equipment shall be observed in addition to the present operation manual.

6.94. The Company employees responsible for providing and transmitting information shall report pressure vessel accidents and malfunctions, as well as related incidents, also damage to the environment and assets to the concerned state institutions, depending on their competence and the nature of incident, or other employees of the Company immediately or within the term established in applicable legal acts following the provisions of Company Procedure CS-7 for Mandatory Notification of Incident, Emergency Event or Emergency.

6.95. Company employees whose work is related to maintenance, inspection of technical condition of or repairs to pressure vessels shall be trained and certified under the present Manual. The personnel shall be certified at the intervals specified in Procedure PR-DS-18.

7. DOCUMENTS AND RECORDS

7.1. Entries (records) indicated in Table 3 below shall be made when acting under the present Manual.

Table 3

Entry	Place of storage	Responsible	Storage period
Pressure vessel passport	Equipment Technical Supervision and Materials Analysis Group	Equipment Technical Supervision and Materials Analysis Manager	All through the vessel service life

Entry	Place of storage	Responsible	Storage period
Vessel Technical Inspection Report	Equipment Technical Supervision and Materials Analysis Group	Equipment Technical Supervision and Materials Analysis Manager	All through the vessel service life
Repair (revamp) documentation	Equipment Technical Supervision and Materials Analysis Group	Equipment Technical Supervision and Materials Analysis Manager	All through the vessel service life

8. FINAL PROVISIONS

8.1. Director of Maintenance shall be responsible for arranging periodic reviews of this Manual and its updates, if necessary.

9. ATTACHMENTS

Annex 1 – Pressure Vessel Passport.

Annex 2 – Repair (Revamp) Method Statement and Quality Control Plan.

Annex 3 – Repair and Installation Quality Certificate.

Annex 4 – List of documents necessary for repair, installation and fabrication of vessels.

Annex 5 – Permit for Vessel Closing.

Annex 6 – Vessel Technical Inspection Report.

Prepared by	Equipment Technical Supervision and Materials Analysis Group Senior Engineer		Viktoras Fuks	
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AGREED WITH				
	Director of Maintenance		Viktor Zapolski	
	Deputy Director of Maintenance		Gražvidas Šakys	
	Chief Mechanical Engineer		Dalijus Vozbutas	
	Occupational and Process Safety Control Manager		Rolandas Rupšys	
	Equipment Technical Supervision and Materials Analysis Manager		Kęstutis Ševeliovas	
	Position	Signature	Full name	Date

SLĖGINIO INDO PASAS
(Pressure Vessel Passport)

Indo pavadinimas ir technologinis numeris
Equipment description and technological number

Identifikavimo kodas / Identification code

Įrenginio pavadinimas, technologinis numeris (Equipment description, technological number)	
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Gamintojas ir jo adresas (Manufacturer, address)	
Tiekėjas ir jo adresas (Supplier, address)	
Savininkas ir jo adresas (Owner, address)	
Projektuotojas ir jo adresas (Designer, address)	

Paso turinys (Passport contents)

Dokumento pavadinimas (Document description)	Skyriaus numeris arba kitos žymės (Chapter number or other notes)	Lapo numeris, skyrius (Page number)
1	2	3
Bendrieji duomenys (General information)	1	
Techninės charakteristikos ir parametrai (Technical characteristics and parameters)	2	
Registracija (Registration)	3	
Duomenys apie indo pastatymą (Information about vessel installation)	4	
Duomenys apie indo priežiūros meistrą (Information about person responsible for vessel maintenance)	5	
Duomenys apie pakeitimą, remontą (Information about replacement, repairs)	6	
Patikrinimo rezultatų įrašymas (Inspection records)	7	
Priedai (Attachments)	8	

1. Bendrieji duomenys (General information)

Pavadinimas ir paskirtis (Description and purpose)	
Tipas / Modelis (Type/Model)	
Pagaminimo metai (Data of fabrication)	
Gamyklinis numeris (Serial number)	
Projektinis darbo laikas, metais (Design service life, in years)	
Pagrindinių elementų plieno markė (Steel grade of main elements)	Korpusas (shell) - Paskirstymo kamera (distribution chamber) - Vamzdinis pluoštas (tube sheet) -
Terminis apdirbimas (Post weld heat treatment)	
Suvirinimo sujungimų kontrolė (Nondestructive weld testing)	
Forma ir konstrukciniai matmenys, brėžinio numeris (Shape and constructional dimensions, drawing number)	

2. Techninės charakteristikos ir parametrai (Technical characteristics and parameters)

Darbinės erdvės pavadinimas (Description of operation conditions)		Korpusas (Shell)	Vamzdeliai (Tubes)
Darbinis slėgis, bar(g) (operation pressure)			
Skačiuojamasis slėgis, bar (g) (Design pressure)			
Bandomasis slėgis, bar (g) (Test pressure)	Hidraulinis (Hydraulic)		
	Pneumatinis (Pneumatic)		
Bandymo terpė ir trukmė, min. (Testing medium and duration, min.)			
Bandymo terpės temperatūra, °C (Temperature of test medium)			
Didžiausia leistina indo sienelių darbinė temperatūra, °C (Max allowed vessel wall operation temperature)			
Mažiausia leistina sienelių temperatūra, °C (Min allowed wall temperature)			
Darbinės terpės pavadinimas (Name of operation medium)			
Darbinės terpės charakteristika (Characteristic of operation medium)	Nuodingumas (Poisoness)		
	Gailumas (Piteousness)		
	Kenksmingumas ir kt. (Noxiousness)		
	Degumas (Flammability)		
	Sprogumas (Explosiveness)		
	Didžiausia temperatūra, °C (Max temperature)		
	Mažiausia temperatūra, °C (Min temperature)		
Korozijos, erozijos priedas, mm (Corrosion, erosion allowance)			
Vidinis tūris, l (Internal volume)			
Talpos svoris kartu su vandeniu, kg (Weight filled up with water)			
Tuščio indo masė kg (Weight of empty vessel)			

3. REGISTRACIJA (Registration)

Indas užregistruotas (Vessel registered by)

Registruojančiosios įstaigos pavadinimas (Name of registering agency)

IDENTIFIKAVIMO KODAS(number)

20.....md.

Registruojančiojo asmens vardas ir pavardė, pareigos, parašas
(Full name, position, signature of person responsible for registration)

4. Duomenys apie indo pastatymą (Information about vessel installation)

[illegible]

5. Duomenys apie indo priežiūros meistrą (Information about vessel maintenance foreman)

[illegible]

6. Duomenys apie pakeitimą, remontą (Replacement, repair data)

[illegible]

7. Patikrinimo rezultatų įrašymas

[illegible]

8. Priedų sąrašas (List of Attachments)

Dokumento pavadinimas (Document title)	Skyriaus numeris arba kitos žymos (Chapter number or other marks)	Lapų (puslapių) numeriai (Page numbers)	Pastabos (Comments)
Atitikties deklaracija (Declaration of conformity)			
Atitikties sertifikatas (Certificate of conformity)			
Gamybiniai ir išpildomieji brėžiniai (Fabrication and „AS BUILT“ drawings)			
Stipruminis skaičiavimas (Strength calculation)			
Medžiagų specifikacija ir sertifikatai (Bill of materials and certificates)			
Suvirinimo medžiagų specifikacija ir sertifikatai (Bill of welding materials and certificates)			
Suvirinimo eskizas ir suvirinimo darbų žurnalas (Welding sketch and welding work log)			
Suvirintojų sąrašas ir jų kvalifikacija (Welders qualification list)			
Suvirinimo procedūrų aprašai / suvirinimo procedūrų patvirtinimai (WPS/PQR)			
Kokybės kontrolės planas (Quality control plan)			
Kontrolės protokolai, ataskaitos (Test protocols, reports)			
Neardomos kontrolės personalo pažymėjimai (NDT personnel certificates)			
Terminio apdirbimo žurnalas ir diagramos (PWHT logbook and diagrams)			
Esminiai saugos reikalavimai (Essential safety requirements)			
Taikomos normos (Applicable regulations)			
Rizikos analizė (Risk analysis)			
Aparato naudojimo instrukcija (Operating instruction)			
Hidraulinio bandymo ataskaita (Hydro-test report)			
Dažymo patikros protokolas (Painting inspection report)			
Aparato lentelės nuotrauka (Equipment tag plate photo)			
Montavimo kokybės aktas (Installation quality declaration)			
Aparato pajungimo schema (Equipment connection scheme)			

Įrenginio remonto / montavimo / rekonstrukcijos technologija ir Equipment repair / installation / revamp technology and kokybės kontrolės planas Nr. _____ Quality Control Plan No

Darbų vykdytojas _____ Sutarties Nr. _____
Work executor (Organizacijos pavadinimas, Valstybinės energetikos inspekcijos atestato Nr.) Contract No
(Company name, State Energy Inspectorate certificate No)

Darbų vykdytojo subrangovas _____
Work executor's subcontractor (Organizacijos pavadinimas, Valstybinės energetikos inspekcijos atestato Nr.)
(Company name, State Energy Inspectorate certificate No)

Įrenginio eksploatacijos vieta _____
Equipment location (Gamybės padalinys, kompleksas, baras/sekcija) (Operations Subdivision, Complex, Shop/Section)

Įrenginio pavadinimas ir technologinis Nr. _____
Equipment name and technological No

Įrenginio techniniai parametrai (Equipment technical parameters):	
Darbo terpė Operation fluid	
Didžiausias leidžiamasis slėgis (Ps), bar Maximum allowable pressure (Ps), bar	
Didžiausia leidžiamoji temperatūra (Ts), °C Maximum allowable temperature (Ts), °C	
Įrenginio grupė, kategorija ir klasifikavimo dokumentas Equipment group, category and classification document	
Įrenginio remonto / montavimo / rekonstrukcijos darbų trumpas aprašymas Brief description of equipment repair / installation / revamp works	
Įrenginio remonto / montavimo / rekonstrukcijos atlikimo pagrindimas Justification of equipment repair / installation / revamp	Techninio patikrinimo akto Nr. / projekto Nr. / kitas dokumentas Technical Inspection Report No / Project No / other document)
Įrenginio remonto / montavimo / rekonstrukcijos standartas Equipment repair / installation / revamp standard	LST EN 13480 (vamzdinams/ pipelines)

Darbų atlikimo eiliškumas (Work execution sequence)

Surašoma atliekamų darbų seka kiekvienam remontuojama / montuojamam / rekonstruojamam įrenginio elementui, nurodant metodus ir įrangą. Būtina nurodyti, kokios papildomos priemonės naudojamos (pašildymas, konstrukcijos sutvirtinimas, papildomos atramos ir t. t.). Darbų aprašyme turi būti nuorodos į atitinkamas suvirinimo procedūrų aprašus (SPA). Jei atliekamas terminis apdorojimas, turi būti aprašyta atlikimo metodika (terminio apdorojimo režimai, kokia įranga naudojama, koks kaitinimo plotas, termoizoliacijos plotas ir vietos, temperatūros kontrolės metodas, temperatūros kontrolės taškai). Surašoma flanšinių jungčių surinkimo eiga, nurodant įrangą ir užveržimo momentus kiekvienai flanšinei jungčiai, taip pat turi būti nurodyta užveržimo kontrolės metodika.

Sequence of works for each element of the equipment under repair / installation / revamp with the indication of methods and equipment shall be laid down. Any additional actions (pre-heating, structure reinforcement, additional supports, etc.) used shall be mentioned. Work description shall include references to respective Welding Procedure Specifications (WPS). If heat treatment is used, the method shall be described (modes of heat treatment, equipment used, area of heating, area and locations of thermal insulation, method of temperature control, points of temperature control). Sequence of assembling flanged connections, equipment, tightening torques for each flanged connection as well as the method of tightening control shall be indicated.

Informacija apie naujas ir esamas medžiagas (Information on new and existing materials)

Pateikiama informacija apie visas naudojamas naujas ir esamas medžiagas (vamzdžius, lakštus, fasoninius elementus, suvirinimo pridėtines medžiagas, smeiges, veržles, tarpines ir t. t.). Turi būti nurodyta, kuriam įrenginio elementui ar flanšinei jungčiai medžiaga naudojama, elemento ar gaminio pavadinimas ir matmenys, medžiagos standartas ir markė, gaminio standartas.

Information about all the new and existing materials used (pipes, sheets, fittings, auxiliary welding materials, studs, nuts, gaskets, etc.) shall be provided. Indication of what element of equipment or a flanged connection the material is used for, name and dimensions of the element or the article, material standard and type, article standard.

Darbų schemos ar brėžiniai (Work execution diagrams and drawings)

Darbo schemoje turi būti pavaizduotos ir sunumeruotos visos darbo vietos, suvirinimo ir flanšinės jungtys. Turi būti nurodyti darbo vietų ir elementų matmenys, taip pat turi būti nurodyti atstumai nuo darbo vietos iki įrenginio tam tikro atskaitos taško (gali būti suvirinimo sujungimas, atrama, atvamzdis ar kitas esantis elementas, kurio padėtis įrenginio brėžinyje yra matmenimis nurodyta). Jei naudojami papildomi, laikini sutvirtinimo elementai, jie turi būti pavaizduoti darbo schemoje ar brėžinyje.

All spots under maintenance, welding seams and flanged connections shall be indicated on maintenance diagrams and numbered. Dimensions of spots and elements under maintenance, distances from a spot under maintenance to a certain point of equipment (welding connection, support, nozzle or other existing element, the dimensions and position of which are present on equipment drawing) shall be indicated. If auxiliary temporary reinforcement elements are used, they shall be indicated on maintenance diagrams or drawings.

Priedai (Attachments)

1. Darbų schemos ar brėžiniai (Work execution diagrams and drawings)
2. Projektas (Project).
3. Suvirinimo procedūrų aprašai (SPA) (Welding procedure specifications (WPS))

Kokybės kontrolės planas (Quality Control Plan)							
Eil. Nr. Item No.	Kontrolės objektas (Control object)	Brėžinio ar schemos Nr. (Drawing or diagram No.)	Suvirinimo procedūrų aprašo (SPA) Nr. Welding procedure specification (WPS) No.	Kontrolės metodas Control method	Kontrolės apimtis Control scope	Kontrolės atlikėjas Inspector	Kontrolę patvirtinantis dokumentas Inspection verification document
	Nurodomas kontroliuojamo įrenginio elemento pavadinimas ar Nr., suvirintų jungčių tipas ir/ar Nr. (Name or No. of controlled unit element, type / No. of welded connections)		Nurodomas SPA Nr., jei kontrolė atliekama suvirinimo jungčiai (Indication of WPS No. if welded connection is inspected)	Nurodomas kontrolės ar bandymo metodas (VT, RT ar kitas metodas) (Indication of inspection or test method (VT, RT or other))	Nurodomi procentai, vienetai, plotai, zonos ir kt. (Indication of per cent, units, areas, zones, etc.)	Nurodoma kas turi atlikti kontrolę: rangovas, užsakovas ar trečioji šalis. Jei žinoma, papildomai nurodyti organizacijos pavadinimą. (Indication of who is to carry out inspection: contractor, owner, or a third party. Name of institution if available.)	Nurodomas kontrolės dokumentas (išvados, protokolai, ataskaita ir kt.) (Indication of control document (conclusions, minutes of meeting, report, etc.))

Pastabos (Notes):

1. Prieš atliekant suvirinimo jungčių kontrolę, kontroliuojamas suvirinimo jungtis suderinti su mechanikos skyriaus techninės priežiūros grupės inžinieriumi. (Before performing welding seam inspection, the welds for inspection have to be coordinated with Mechanical Department Equipment Technical Supervision and Materials Analysis Group Engineer.)
2. Kampinėms suvirinimo jungtims (atvamzdžiai iki DN40) atlikti 100 % VT iš vidinės pusės. Nesant galimybei atlikti VT, atlikti 100 % RT kontrolę (VT arba RT kontrolė atliekama vamzdynams, kuriuose transportuojamos 1-os grupės tokiosios medžiagos). (Angular welds (nozzles up to DN40) shall be 100 % VT from inside. In case VT is not possible, 100 % RT (VT or RT performed for group 1 fluid piping) shall be performed.)

Naudojami sutrumpinimai (Abbreviations):

VT – Visual Testing; **Kontrolė** – LST EN ISO 17637:2017; **Įvertinimas** – LST EN ISO 5817:2014, lygis-B
 RT – Radiographic Testing; **Kontrolė** – LST EN ISO 17636-1&2:2013; **Įvertinimas** – LST EN ISO 10675-1:2017, lygis-1.
 MT – Magnetic Particle Testing; **Kontrolė** – LST EN ISO 17638:2017; **Įvertinimas** – LST EN ISO 23278:2015, lygis-2.
 UT – Ultrasonic Testing; **Kontrolė** – LST EN ISO 17640:2011; **Įvertinimas** – LST EN ISO 11666:2011, lygis-2.
 PT – Penetrant Testing; **Kontrolė** – LST EN ISO 3452-1:2013; **Įvertinimas** – LST EN ISO 23277:2015, lygis-2.
 PMI – Positive material identification;
 HT – Hardness testing;
 UT (Th) – Ultrasonic thickness Testing; **Kontrolė** – atitikimas sertifikatui.
 HB – Hidraulinis Bandymas;
 PB – Pneumatinis Bandymas.

Sudarė:

Prepared by Organizacijos pavadinimas, pareigos, Vardas, Pavardė, parašas, data, *(name of organization, job title, full name, signature, date)*

Tvirtina (Approved by):

Darbų vykdytojo vadovas

Work executor's manager Organizacijos pavadinimas, pareigos, vardas, pavardė, parašas, data, *(name of org., job title, full name, signature, date)*

Suderinta (Agreed with):

Įrengimų techninės priežiūros ir
medžiagų analizės vadovas

Equipment Technical Supervision and
Materials Analysis Manager

Vardas, Pavardė, pareigos, parašas, data (full name, position, signature, date)

Įrengimų techninės priežiūros ir
medžiagų analizės grupės suvirinimo inžinierius

Equipment Technical Supervision and
Materials Analysis Group Welding Engineer

Vardas, Pavardė, pareigos, parašas, data (full name, position, signature, date)

Įrengimų techninės priežiūros ir
medžiagų analizės grupės inžinierius

Equipment Technical Supervision and
Materials Analysis Group Engineer

Vardas, Pavardė, pareigos, parašas, data (full name, position, signature, date)

Vessel repair / installation / revamp quality CERTIFICATE

_____, 20__

Work executor _____ Contract No _____
(Company name, State Energy Inspectorate certificate No)

Work executor's subcontractor _____
(Company name, State Energy Inspectorate certificate No)

Vessel location _____
(Operations Subdivision, Complex, Shop/Section)

Vessel name and technological No _____

Technical parameters	
Process fluid	
Maximum allowable pressure (Ps), bar	
Maximum allowable temperature (Ts), °C	
Vessel group, category and classification document	
Brief description of vessel repair / installation / revamp works	
Vessel repair / installation / revamp justification	Technical Inspection Report No / Project No / another document

Please note that the vessel has been revamped / installed / repaired and tested also
(Underline proper name of works)

cleaned-purged according to the requirements in the indicated technical documents:
(Underline proper name of works)

Project No:	
Vessel repair / installation / revamp standard:	
Vessel repair / installation / revamp technology No:	

Work executor's manager _____
(full name, position, signature, date)

[Seal]

Work executor subcontractor's manager

(full name, position, signature, date)

Work executor's / subcontractor's specialist responsible for quality of works _____
(full name, position, signature, date)

REIKALINGŲ DOKUMENTŲ SĄRAŠAS INDŲ REMONTUI, MONTAVIMUI IR GAMYBAI
(LIST OF DOCUMENTS NEEDED FOR VESSEL REPAIR, INSTALLATION AND PRODUCTION)

Eil. Nr.	Dokumento pavadinimas	Document name
1	AB „ORLEN Lietuva“ nustatytos formos pasas ^[2]	Passport of the form established by AB ORLEN Lietuva.
2	Valstybinės energetikos reguliavimo tarnybos atestatas eksploatuoti (remontuoti) naftos ir naftos produktų įrenginius kopija	A copy of the certificate issued by the National Energy Regulatory Council for operation (repair) of crude oil and petroleum product units
3	Leidimas indo uždarymui ^[1]	Permit for vessel closing ^[1]
4	Remonto – montavimo kokybės pažymėjimas.	Repair-installation quality certificate
5	Slėginio indo atitikties PED 2014/68/ES direktyvai deklaracija ir sertifikatas (-ai)	Declaration and certificate(s) of pressure vessel conformity to Directive PED 2014/68/EU
6	Remonto vykdomoji schema	Repair scheme
7	Hidraulinio bandymo schema su nurodytomis aklių ir manometrų pastatymo schemomis	Hydro-test scheme with indicated blind and pressure gauge locations
8	Panaudotų medžiagų specifikacija	Bill of used materials
9	Projekto kopija	Design copy
10	Suvirinimo darbų žurnalas	Welding logbook
11	Suvirintojų sąrašas	List of welders
12	Suvirintojų pažymėjimų kopijos	Copies of welders' certificates
13	Terminio apdirbimo žurnalas ir diagramos	Thermal treatment logbook and diagrams
14	Naujų lakštų, atvamzdžių, vamzdžių, alkūnių ir t. t. faktinių sienelės storių matavimo rezultatai, formuliaras ^[1]	Results of new sheets, nozzles, tubes, elbows, etc. wall thickness measuring ^[1]
15	Elementų ir suvirinimo siūlių cheminės sudėties nustatymo po sumontavimo protokolas (legiruotiems plienams)	Report on determination of elements and welds chemical composition after installation (for alloyed steels)
16	Neardomosios kontrolės išvados	NDT conclusions
17	Remonto – montavimo technologija ir kokybės kontrolės planas ^[1]	Repair-installation technology and quality control plan ^[1]
18	Suvirinimo procedūrų aprašai SPA ir suvirinimo procedūrų patvirtinimo protokolai SPPP	Welding procedure WPS and WPAR
19	Stipruminiai skaičiavimai	Strength calculations
20	Įrenginiui iš austenitinio plieno hidraulinio bandymo atlikimui naudojamo vandens analizės pažyma (chloridų kiekis)	Certificate of water used for hydro-testing of austenitic steel equipment (chloride content)
21	Paslėptų darbų aktas	Report on hidden works
22	Izoliacijos, antikorozinės dangos (dažymo) priėmimo aktas	Insulation, anticorrosive coating (painting) acceptance statement
23	Niveliacijos aktas (jei reikalaujama projekte)	Leveling report (if required according to design)
24	Įžeminimo aktas	Grounding report
25	Priešgaisrininės ir / ar aušinimo sistemos priėmimo aktai	Fire water and/or cooling system acceptance statements
26	Flanšinių sujungimų uždarymo aktas. Darbuotojų, atestuotų kaip flanšinių sujungimų surinkimo specialistai pagal EN 1591–4, sąrašas ir kvalifikaciją patvirtinančios pažymėjimų kopijos.	Report on flanged connections installation. List of personnel certified as flange joint assembly specialists in accordance with EN 1591–4, and copies of certificates.
27	Flanšinių sujungimų užveržimo momentų lentelė arba skaičiavimai	Flanged connections tightening torques or calculations
28	Panaudotų medžiagų sertifikatai su įvadinės kontrolės protokolų kopijomis. Suvirinimo medžiagų sertifikatai	Certificates of used materials with copies of initial inspection protocols. Welding material certificates
29	Armatūros revizijos aktai	Valves inspection reports
30	Slėginio indo naudojimo instrukcija ^[2]	Operations Manual ^[2]

[1] - dokumentas reikalingas tik indo remonto metu (document needed for vessel repairs only). [2] - dokumentas reikalingas tik naujo indo montavimo ar rekonstravimo metu (document needed for new vessel installation or revamp only).
Dokumentų eiliškumas remontinėje dokumentacijoje ar pase pagal aukščiau išvardintą lentelę (The order of documents in maintenance documentation or passport is according to the above stated chart).

Leidimas indo uždarymui
Permit for Vessel Closing

Kompleksas / įrenginys Complex/Unit:		Indo technologinis numeris Vessel number:
Uždarymo data Closing date:		Indo pavadinimas Vessel name:

Kiekvienas specialistas privalo patvirtinti parašu, kad jis patikrino savo kuruojamą dalį ir duoda leidimą aparatui uždaryti. Bet kokie aptikti neatitikimai turi būti surašyti šioje formoje, pasirašant atitinkamam specialistui. Jei specialistas sutinka leisti uždaryti aparatą su neatitikimais, tai šis specialistas turi tai patvirtinti savo parašu skiltyje „Gamybininkas“, kartu su gamybininko parašu.

Specialist shall approve the inspection of the part he is responsible for and the permission for closing by signing. Any discrepancies shall be registered on this form by signing by the relevant specialist. If the specialist approves of closing of a vessel with discrepancies, then this specialist shall approve that by signing in the column „Operations specialist“ together with operations specialist's signature.

Lentelė Nr.1

Table No 1

Specialistas Specialist		Data Date	Pastabos, vardas ir pavardė, parašas Comments, full name, signature
1	Rangovas (užrašyti pavadinimą) Contractor (indicate the name) Aš patvirtinu, kad yra užbaigti šio indo visi darbų apimties punktai, indo vidus yra švarus ir jokių pašalinių daiktų jame neaptikta. <i>I confirm that all scope of work items for this vessel are completed, the interior is clean and no foreign objects were found therein.</i>		
2	Įrengimų techninės priežiūros ir medžiagų analizės grupės inžinierius: Aš patvirtinu, kad šio indo visi techniniai patikrinimai yra atlikti ir indas gali būti saugiai eksploatuojamas nustatytais slėgio ir temperatūros sąlygomis. Equipment Supervision and Materials Analysis Group Engineer: <i>I confirm that all technical inspections for this vessel were performed and it can be safely operated at defined pressure and temperature parameters.</i>		
3	Mechanikos inžinierius (Įrengimų priežiūros ir remonto skyrius): Aš patvirtinu, kad šio indo visi remonto darbai yra atlikti. Mechanical Engineer (Maintenance Department): <i>I confirm that all the repair works for this vessel are completed.</i>		
4	Inžinierius technologas: Aš patvirtinu, kad šis indas bei jo vidinė įranga, įskaitant ir lėkščių liukų uždarymus einant nuo lėkštės prie lėkštės, yra patikrinta ir atitinka projektą (pasirašyti galima kai yra užpildytos Lentelės Nr.2 ir Nr.3) Process Engineer: <i>I confirm that this vessel and its internals, also closing of tray manholes, by going from one tray to another, are inspected and they satisfy the design (signing is possible when Tables No 2 and No 3 are completed)</i>		
5	Inžinierius statybininkas: Aš patvirtinu, kad yra užbaigti šio indo visi antikorozinės dangos (nemetalinės) / futeruotės patikrinimai bei reikalingi remonto darbai, nurodyti darbų apimtyje. Civil Engineer: <i>I confirm that all works (cladding and non-metallic corrosion protection coating inspections), which indicated in the scope of work, are completed</i>		
6	Trečioji šalis (konsultantas): Aš patvirtinu, kad šis indas bei vidinė įranga funkcionuos taip, kaip numatyta projekte. Taip pat patvirtinu, kad patikrinau visą vidinę įrangą, įskaitant lėkščių liukų uždarymus einant nuo lėkštės prie lėkštės. Third party (advisor): <i>I confirm that this vessel and its internals will operate as per design. Also I confirm that I inspected all internals, including closing of tray manholes, by going from one tray to another.</i>		
7	Gamybininkas: Aš patvirtinu, kad indas buvo patikrintas aukščiau minėtų specialistų ir kad indas prieš jį uždarant buvo švarus. Duodu leidimą uždaryti šį indą. Operations Specialist: <i>I confirm that the vessel was inspected by the above mentioned specialists and vessel was clean before closing. I give the permission to close this vessel.</i>		

Leidimas liukų uždarymui
Permit for Manhole Closing

Lentelė Nr.2

Table No 2

Leido uždaryti <i>Permitted by</i>	Rangovas <i>Contractor</i>	Mechanikos inžinierius <i>Mechanical Engineer</i>	Inžinierius technologas <i>Process Engineer</i>	Trečioji šalis (konsultantas) <i>Third party (adviser):</i>	Gamybininkas <i>Operations specialist</i>
Liuko Nr. <i>Manhole No</i>					

Leidimas įkrovos įkrovimui
Permit for Loading

Lentelė Nr.3

Table No 3

Leido užkrauti <i>Permitted by</i>	Rangovas <i>Contractor</i>	Mechanikos inžinierius <i>Mechanical Engineer</i>	Inžinierius technologas <i>Process Engineer</i>	Trečioji šalis (konsultantas) <i>Third party (advisor):</i>	Gamybininkas <i>Operations specialist</i>
Liuko Nr. <i>Manhole No</i>					



Mechanical Department Equipment Technical Supervision and Materials Analysis Group

APPROVED BY:

Chief Mechanical Engineer

(position, full name, signature)

_____, 20__

Vessel Technical Inspection Report

No _____ / _____

Vessel ID No:		Vessel location:		Techn. Inspect. date:	
Ident. code:		Customer:		Date of issue:	
Technical inspection:		Reason for inspection:			
	Steel grade:	Operating fluid:	Operating temperature, °C:	Operating pressure, bar:	Design pressure, bar:
Shell:					
Findings					
No	Inspected object	Findings		Recommendations	
1	Passport data				
2	Foundation, fixtures				
3	Grounding				
4	Service platforms. Auxiliary mechanism.				
5	Insulation				
6	Heating circuit				
7	Cladding, refractory, anticorrosive coating				
8	Valves				
9	Safety devices				
10	Instrumentation				
11	Flanges and other dismountable connections				
12	Condition of external metal surface				
13	Condition of internal metal surface				
14	Welded joints				
15	Internals				
16	Other examinations				

Technical inspection by:

Engineer

(full name, signature, date)

Agreed with:

Equipment Technical Supervision
and Materials Analysis Manager

(full name, signature, date)

Reviewed by: