



# Basic Safety Course Of Leakage Test - Refresh

**COURSE: NR34 – PERIODICAL TRAINING OF BASIC SAFETY COURSE OF LEAKAGE TEST – REFRESH**

## **SCOPE AND APPLICABILITY:**

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Establish the minimum requirements and safety measures to be taken in order to ensure the protection of the health and of the environment in activities related to the leakage tests. The safety measures include the general ones and the specifics, when applicable and this course is aimed for the workers that already have experience or knowledge related to this subject matter.

## **REGULATIONS & STANDARDS**

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- NR34;
- NBR15571;
- NBRNM-ISO-9712;
- N-1591 (Petrobras);
- N-1738 (Petrobras);

## **COURSE CONTENT:**

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### **1. Theoretical Class:**

- a) Study of the NR-34, item 34.14;
- b) Basic principles, purpose and scope of leakage tests;
- c) Physical Quantities;
- d) Technical Standards and leakage testing procedures;
- e) System tests;
- f) Special features of the systems to be tested;
- g) Hazard Identification and Risk Analysis:
  - Hazards and Risk Concepts;
  - Techniques for Identifying Hazards and Risk Analysis;
  - APR - Preliminary Risk Analysis;
- h) Work Permit – WP;
- i) Protection Systems (collective and individual);
- j) Determination of isolation.

### **2. Practical Class:**

- Issuance of Work Permit;
- Isolation and signaling;
- Preliminary inspections, during and after the leakage test;
- Sequence of execution of the activities;
- Temporary fixation and stabilization of structural elements;
- Use of instruments;
- Reading of system test information;
- Safety and relief valves operation.

## **COURSE DESIGN:**

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Theoretical Class – 6 hours

Practical Class – 2 hours

**Total – 08 hours**



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## **PREREQUISITES:**

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Previous Leakage Test Training done with a minimum of 24 hours according to NR-34.

Elementary School.

The participant to be approved must obtain a minimum grade of 70% in the written evaluation and 80% practical assessment.

The participant who did not get satisfactory results in the examination can perform a complementary training and 2 more attempts in each examination in which failed (theoretical or practical). If you do not get satisfactory results after the last attempt, you must perform a new training.

## **MINIMUM/MAXIMUM NUMBER OF ATTENDEES**

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This course requires a minimum of 2, and a maximum of 10 participants.

To offshore trainings, the course number of attendees will comply with the vessels/rig necessity.

## **MAIN SAFETY ISSUES:**

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- Protection and inspection in adjacent areas before the start of the activities;
- Correct use of PPE and CPE;
- Ventilation;
- Respiratory protection (evaluate if applicable);
- Work Permit Issuance;
- Evacuation, Isolation and signaling risk area defined in Procedure;
- All joints should be exposed without insulation or coating;
- It is forbidden to repair, reattach or hammer without in the tested system when pressurized;
- Always use safety valve with opening pressure adjusted according to the test procedure;
- During the tests, the pressure should be increased gradually until the final test pressure;
- Beware Whipping flexible lines;
- The use of personal adornments or contact lenses by those involved in the task is forbidden;
- Expansion joints, accessories, instruments, and pressure gauge glass that cannot be subjected to pressure testing must be removed and isolated;
- Precautions such as performing open or ventilated testing to avoid exposure to solvents (used for cleaning parts), as well as the use of gloves and respiratory protection when using diesel or other liquid flammable as capillary liquid. Impact gloves should be used when cleaning the parts with steel brushes, as well as the necessary precautions if the conditions resemble hot work;
- After reaching the test pressure test system should be blocked from the tested system.

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## REQUIRED EQUIPMENT:

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- All PPE and CPE recommended:
  - Apron or long-sleeved shirt;
  - Hearing protection;
  - Safety glasses;
  - Shaving mitt;
  - Safety Boots;
- Safety signaling and isolation equipment in the defined risk area of the procedure;
- Pressure regulator;
- Safety valve and relief valve;
- Pressure gauge with current calibration and easy to read;
- Vacuum box;
- Positive pressure system (pump and support pipes);
- Cleaning rags;
- Negative pressure system (pump and support pipes);
- Solvent for surface cleaning;
- Diesel or kerosene oil for the preparation of the bubble-forming solution;
- Penetrant Liquid for addition as dye to capillary solution;
- Specialized liquid substance to reveal the presence of leakage when in contact with the penetrant liquid;
- Detergent;

## PROCEDURES FOR PRACTICAL EXERCISES:

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- The leakage test is a non-destructive inspection technique that allows not only localizing leakage of a fluid, liquid or gas, but also measuring the amount of material leaking, either in systems that operate with positive pressure or that work with vacuum. Leaks occur in the discontinuities present in welded joints, brazed, glued, threaded, sealed or pressure sealed, as well as in flanges, caps, valves, seals, connections, etc .
- **The practice can take one of the following forms, or a combination of them:**
- **Positive Pressure:**
  - It is used compressed air generated by a compressor.
  - Test Pressure and Pressurization Time.
  - The pressure (gauge) should be:
    - of 69 kPa to 98 kPa (0,7 kgf/cm<sup>2</sup> a 1,0 kgf/cm<sup>2</sup>), or,



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- that stated in the standard of project, manufacture and assembly of the equipment or the part, for equipment with metallic coatings internal or flat surfaces.

- o The pressure should be maintained for a minimum of 15 minutes, except as otherwise specified in the design standards.
- **Negative Pressure:**
  - o Test Pressure and Pressurization Time
  - o The pressure shall be maintained at least 0.14 kgf / cm<sup>2</sup> below atmospheric pressure. This means that in a gauge pressure gauge should indicate a value between -1.0 and -0.14 kgf / cm<sup>2</sup> and in an absolute pressure gauge should indicate a value between 0 and 0.86 kgf / cm<sup>2</sup>.
  - o The required partial vacuum must be maintained for a minimum of 10 seconds.
- As they are carried out under low pressure, there are no serious risks associated with the uncontrolled release of these energies.
- The pressurizing system piping must be a quick coupling type, and the system must have relief valves. The risk of accidents with these pressurized lines is insignificant, as it does not have sufficient energy to cause injury or material losses when carried out in welded joints.
- **Capillarity test:**
  - o The minimum of 5 hours must be used after the penetrant liquid is applied on the surface of the piece of equipment.

## **CERTIFICATION:**

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Training certificate signed by responsible Engineer accredited by Brazilian CREA.

## **CERTIFICATE VALIDITY PERIOD:**

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1 year.