Asme non destructive testing pdf

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ASME PC currently accepts a limited number of applications for the ANDE Temporary Level III nuclear certification NDE. The new ASME PC Non-Destructive Examination and quality control inspection (ANDE) certifies the skills of staff in knowledge, skills and performance for NDE staff. The ANDE program recognizes a person's ability to conduct non-destructive examination and quality testing in accordance with the ANDE-1 standard. ANDE-1 includes a systematic approach to learning (SAT) based on the practice of the Institute of Nuclear Energy Operations (INPO) and guidelines with performance-based concepts and psychometric principles. The focus of asME PC ANDE's temporary nuclear UT Level III is to conduct training and validation of the use and completeness of the ANDE qualification/continuity card. This is achieved by the signature andE of Provisional Level III in the relevant areas and by a final review prior to the applicant's submission as part of their application. To qualify as an ASME PC ANDE nuclear UT Level III Temporary Certificate holder, a person must be current Level III certified in a non-destructive exam (NDE) and meet the requirements of the right to education, training and experience under a nationally recognized certification program. Applicants must provide documented Level III experience as well as proof of current Grade III certification. This is a limited 36-month program, and if approved for a temporary level of ANDE III, after 12 months of valid testing experience as a temporary nuclear UT Level III, the applicant may provide a practical examination. If the application is successfully completed, it will be transferred to full certification by ANDE nuclear UT Level III. For more information, please visit www.asmepcllc.org/ande or email ande@asme.org Pressure Testing is a non-destructive test performed to ensure the integrity of the shell pressure on new pressure equipment, or on previously installed pressure and pipeline equipment that has undergone changes or repair of its boundary (s). Pressure testing is required by most piping codes to ensure that a new, modified or repaired piping system can safely withstand its high pressure and flow tightly. Compliance with pipeline codes may be authorized by regulators and law enforcement agencies, insurance companies or the terms of the contract to build the system. Pressure testing, regardless of whether required by law, serves a useful purpose in protecting workers and the public. Pressure testing can used to set a pressure rating for a component or a special system for which it is not possible By calculations. The prototype of a component or system is subjected to a gradual increase in pressure until the measurable yields first occur or, alternatively, to the point of rupture. Then, using the factors in the code, or a standard that matches the component or system, you can set a design pressure rating from experimental data. There are so many codes and standards relating to pipeline systems. The two codes that are important for pressure and leakage testing are the ASME B31 Pressure Piping Code and the ASME Boiler and Pressure Vessel Code. While these two codes apply to many pipeline systems, other codes or standards may have to be aligned, as required by the authorities, insurance companies or the owner of the system. Examples include AWWA standards for water transmission and distribution pipelines. The ASME B31 Pressure Code has several sections. They: ASME B31.1 to power ASME B31.2 pipelines for ASME B31.3 fuel gas pipelines for ASME B31.4 pipelines for liquid transport systems for hydrocarbons, Liquefied petroleum gas, anhydrous ammonia, and ASME B31.5 to cool ASME B31.8 pipelines for ASME B31.9 gas transport and distribution pipeline systems as well as several sections of the ASME B31.11 Pipeline for Slurry Transport Pipeline Systems ASME Boiler and Press Supply Code also has several sections that contain pressure and leak testing requirements for piping systems, pressure vessels and other pressure retention elements. To these are: Title I for Power Boilers Section III for components of nuclear power plants Title V for non-destructive examination of Title VIII for the pressure of ships Section X for fiberglass reinforced plastic pressure ships Section XI for in-service inspection of nuclear power plant components There is a great similarity with regard to requirements and procedures for testing among many codes. This chapter will discuss various methods for leak testing, planning, preparation, execution, documentation, and admission standards for pressure testing. Equipment useful for pressure testing will also be included in the discussion. The following materials should not be seen as a substitute for full knowledge or careful consideration of a specific code requirement that should be used to test a particular pipeline system. Leak testing methods there are many different methods for testing pressure and leakage in the field. Seven of them: Hydrostatic testing that uses water or other liquid under pressure of pneumatic or gas-liquid testing that uses air or other gas under pressure Combination of pneumatic and hydrostatic testing, where low-pressure air is first used Leak Detection Initial Test Service, which involves checking the leak when the system is first put into operation By Vacuum Testing, which uses negative pressure to check check The existence of leak static head tests, which is usually done for draining pipelines with water left in the standpipe for a certain period of time Halogen and helium detection leak Hydrostatic leak testing hydrostatic testing is the preferred method of checking leakage and perhaps the most commonly used. The most important reason for this is the relative safety of hydrostatic testing compared to pneumatic testing. Water is a much safer liquid testing environment than air because it is almost uncontrollable. Thus, the amount of work required to compress water to a certain pressure in the pipeline system is much less than the work required to compress air or any other gas, besides pressure. The compression work is stored in the liquid as a potential energy that can be released suddenly in the event of a failure during a pressure test. The calculation of the potential energy of air compressed to pressure of 1000 psig (6900 kPa) compared to the potential energy of the same finable water volume per 1000 psig (6900 kPa) shows a ratio of more than 2500 to 1. Thus, the potential damage to the surrounding equipment and personnel as a result of the failure during the pressure test is much more serious when using a gas-sized testing environment. This does not mean that there is no danger in the test for hydrostatic leakage. In hydrostatic tests there may be a significant danger due to the air stuck in the pipeline. Even if all air is ventilated from the pipelines before the pressure, workers are well advised to conduct any high pressure tests with safety in mind. Pneumatic fluid leakage testing is usually used for pneumatic compressed air test, or nitrogen, if the source of bottled gas. Nitrogen should not be used in a closed zone if there is a possibility that runaway nitrogen may displace air in a confined space. It is known that in such circumstances people are unconscious before realizing that they lack oxygen. Because of the greater risk of injury with a gas-sized testing environment, the pressure that can be used for visually surveying leaks is lower for some piping codes than in the case of a hydrostatic test. For example, for pneumatic tests, ASME B31.1 reduces pressure to below 100 psig (690 kPa) or construct pressure during leakage checks. A combination of pneumatic and hydrostatic testing Low air pressure, most often 25 psig, (175 kPa) is first used to see if there are major leaks. This low pressure reduces the risk of injury, but still allows large leaks to be quickly located. If necessary, can be done before a hydrostatic test. This method can be very effective in saving time, especially if it takes a long time to fill the system with water just to find a leak on the first attempt. If the leaks are in hydrostatic testing, it will take longer to remove the water and dry the pipelines enough to make do Hydrostatic leaks testing is different from the two-stage test in the previous paragraph. In this case, the pressure test is carried out with a combination of air and water. For example, a pressure vessel designed to contain the process of fluid with a phase of steam or air over a liquid may have been designed to support the weight of the liquid to a certain maximum expected fluid height. If the vessel was not designed to support the weight when fully filled with liquid, it would be possible to check the vessel only if it was partially filled with process fluid to a level that duplicated the effect of the maximum expected level. Initial service leak testing This testing category is limited to codes for certain situations. For example, ASME B31.3 limits the use of this category D liquid maintenance method. Category D fluid maintenance services are defined as non-hazardous to humans and must operate below 150 psi (1035 kPa) and at temperatures from -20 to 366 degrees Fahrenheit (-29 and 185 degrees Celsius). ASME Code B31.1, Section 137.7.1, does not allow initial service testing of boiler external pipelines. However, the same section of asme B31.1 allows an initial test of the service of other pipeline systems if other types of leak testing are not practical. Initial maintenance tests are also applicable to inspections of components of nuclear power plants under Article XI of the ASME Boiler Code and pressure vessels. As indicated, this test is usually carried out when the system is first put into operation. The system gradually rises to normal operating pressure, as required by ASME B31.1 or project pressure, as required by ASME B31.3. It is then maintained with this pressure while an examination of the leak is carried out. Vacuum Leak Testing Vacuum Leak Testing is an effective way to determine whether there is a leak anywhere in the system. This is usually done by drawing a vacuum in the system and capturing the vacuum in the system. The leak is indicated if the trapped vacuum rises to atmospheric pressure. The component manufacturer quite often uses this type of leak test as a leak test. However, it is very difficult to determine the location or location of the leak if it exists. Smoke generators were used to determine where the pipeline is located, where smoke is sucked into the pipeline. It is very difficult to use if the leak is large enough to draw all or most of the smoke into the pipe. If there is much more smoke than can be drawn into the pipe, smoke that dissipates in the surrounding air can easily hide the leakage site. Obviously, this method is not suitable for testing pipelines at or above operating pressure if the pipeline is to operate in a vacuum. Static-Head Testing This testing method is sometimes referred to as a drop test because the drop in the water level in the open standup tube is added to the system to create the necessary necessary is a sign of a leak. Once the system and standpipe are filled with water, the level of standpipe is measured and tagged. After the required retention period, the height is re-checked and any decrease in the level and retention period is recorded. Any location of the leak is determined by a visual inspection. Halogen and Helium Leak Testing These testing methods use trace gas to detect the location of the leak and the number of leaks. If halogen leaks are detected, the system is charged with halogen gas. The halogen detector probe is used to probe a tracer gas leak from any open joint. The halogen leak detector, or sniffer, consists of a tubular probe that sucks a mixture of leaking halogen gas and air into a device sensitive to a small amount of halogen gas. This tool uses a diode to feel the presence of halogen gas. The leaking halogen gas is transmitted by heated platinum element (anode). The heated element ionizes the halogen gas. The current proportional rate of ions formation, and thus the flow rate of the leak, is indicated by the meter. The halogen detector probe is calibrated using a hole that passes a known leak stream. The detector probe is transmitted over the hole at the same speed that will be used to study the system for leakage. The preferred micronutrient is refrigerant 12, but refrigerants 11, 21, 22, 114 or methylene chloride can be used. Halogens should not be used with austonic stainless steel. Testing of helium leaks can also be done in sniffer mode, as explained above for halogens. However, in addition, helium leakage testing can be performed using two other methods that are more sensitive in detecting leakage. This is the tracer mode and the hood or closed system mode. In tracer mode, the vacuum is drawn on the system, and helium is sprayed on the outside of the joints to check for leakage. The vacuum system stretches helium through any leaking joint and delivers it to the helium mass spectrometer. In bonnet mode, the system to be tested is surrounded by concentrated helium. The helium leak test hood mode is the most sensitive method for detecting leaks and the only method adopted by ASME Code Section V as quantitative. Manufacturers of components requiring sealing will use the helium leak detection method as a production test for leakage. In these cases, the component may be surrounded by helium in the chamber. The connection to the component is done with a helium leak detector that tries to draw the component's internal organs to a vacuum close to absolute zero. Any helium leak from the surrounding chamber into the component will de be sucked into the leak detector vacuum, which it produces. The helium leak detector contains a mass spectrometer tuned to the sensation of the presence of helium molecules. This method of testing a closed system is capable of leaks to 1X10-10cc/sec (6.1X10-12 cubic per sec), the standard equivalent of atmospheric air. The closed system method is not suitable for measuring a large leak that will flood the detector and render it useless for further measurement until each helium molecule is removed from the detector. The closed system method is not suitable for a pipeline system in the field because of the large volumes. Nor does it show the location of the leak or leak. Finally, the sensitivity of leak detection with a closed system is an order of magnitude greater than is normally required. Helium sniffer is the least sensitive method and is subject to false readings if the helium from a large leak in one place in the system dissipates elsewhere. A large leak can also flood the detector, temporarily rendering it useless until all the helium is removed from the mass spectrometer. The helium pressure used in all these methods usually amounts to one or two atmospheres, which is enough to detect very small leaks. Low pressure also serves to reduce the amount of helium needed for testing. Testing for helium leakage is rarely, if all, used to demonstrate that the system can safely withstand the design pressure rating. Helium leak detectors will not be successful in finding leaks if the component or pipeline system is completely dry. As a result of capillary action, the liquid contained in the small leaks trajectory can compact the leak due to low helium pressure and surface fluid tension. Therefore, great care is required to use this approach in completely dry conditions. Otherwise, this system may be even less sensitive when a leak is detected than a high-pressure hydrostatic test. In addition, the helium leak detector is easily contaminated with oils and other compounds and is inaccurate. Field conditions are generally not free from the possibility of leak detector contamination. The test pressure chosen testing method and the fluid testing environment, along with the applicable code, will also establish rules to follow when calculating the required test pressure. In most cases, pressure greater than the design pressure rating is applied for a short period of, say, at least 10 minutes. The magnitude of this initial test pressure is often at least 1.5 times higher than the design pressure rating for a hydrostatic test. However, it can be different, depending on which code is applicable and whether the test is hydrostatic or pneumatic. In addition, the pressure of the test should never exceed the pressure that can lead to output, or the maximum allowable pressure of a test of any component to be tested. In the case of ASME B31, Section 137.1.4 and boiler and ship codes The maximum pressure of the test should not exceed 90 percent of the yield for any component tested. The pressure of the test is needed to demonstrate demonstrate The system can safely withstand nominal pressure. After this period is larger than the design pressure, it is often permissible to reduce the pressure to a lower value for studying leaks. The pressure of the exam persists over time, required for a thorough code test of the asme type B31.1 Hydrostatic (1) ASME B31.1 Pneumatic ASME B31.1 Initial service ASME B31.3 Hydrostatic ASME B31.3 Initial service (3) ASME I Hydrostatic ASME III Division 1 Subsection NB Hydrostatic ASME III Division 1 Subsection NB Pneumatic ASME III Division 1 Subsection NC Hydrostatic ASME III Division 1 Subsection NC Pneumatic ASME III Division 1 Subsection ND Pneumatic pressure test code minimum ASME B31.1 1.5 times design ASME B31.1 1.2 times design ASME B31.1 Normal operating pressure ASME B31.3 1.5 times design (2) ASME B31.3 1.1 times design DESIGN ASME B31.1 3 Pressure Design ASME I at 1.5 times the maximum allowable working pressure (4) ASME III Division 1 Subsection NB 1.25 times pressure system design (5) ASME III Division 1.25 times pressure system design (6) ASME III Division 1 Subsection NC 1.5 times pressure design system pressure ASME III Division 1 Subsection NC 1.25 times the pressure design system ASME III Division 1 Subsection ND 1.5 times the pressure design system for completed components, 1.25 times pressure design system for ASME III Pipeline Systems Division 1 Subsection ND 1.25 times pressure code development system Test pressure maximum ASME B31.1 Max allowable test pressure of any component or 90 percent of ASME B31.1 yield 1.5 times design or maximum test pressure of any componenet AS4 B31.1 Do not exceed the stress yield ASME B31.3 1.1 times the design plus less of 50 psi or 10 percent test pressure ASME B31.3 Design pressure ASME I Do not exceed 90 percent of stress yield ASME III Division 1 Subsection NB Do not exceed the limits of stress design Section NB-3226 or maximum pressure test of any componenet system (5) ASME III Division 1 Subsection NB Not exceeding the stress design limits section NB-3226 or maximum pressure test of any system componenet ASME III Division 1 Subsection NC If the minimum Test pressure exceeded by 6 percent to set a limit below the analysis of all test loads or the maximum test pressure of any componenet ASME III Division 1 Subsection NC If the minimum test pressure exceeded by 6 percent set a limit below the analysis of all test loads or the maximum test pressure of any componenet ASME III Division 1 Subs ND If the minimum pressure exceeded by 6 percent to set a limit on the bottom of the analysis of all test loads or maximum test pressure of any test ASME III Division 1 Subsection ND If the minimum test pressure exceeded by 6 per cent set a limit below the analysis of all test loads or or or Test pressure of any componenet Code Test held time ASME B31.1 10 minutes ASME B31.1 10 minutes ASME B31.1 10 minutes or time to complete the examination leak ASME B31.3 Time of completion of the examination of the leak, but at least 10 minutes ASME B31.3 10 minutes ASME B31.3 Time to complete the asme I Not examination, indicated, is usually 1 hour ASME III Division 1 Subsection NB 10 minutes ASME III Division 1 Subsection NB 10 minutes ASME III Division 10 minutes ASME III Division 1 Subsection NC 10 or NC 10 or 15 minutes per inch of construction of the minimum wall thickness for pumps and valves ASME III Division 1 Subsection NC 10 minutes ASME III Division 1 Subsection ND 10 minutes ASME III Division 1 Subsection ND 10 minutes Code Examination Pressure ASME B31.1 Design Pressure AS ME B31.1 1 Lower of 100 psig or pressure design ASME B31.1 Normal operating pressure ASME B31.3 1.5 fold design ASME B31.3 Pressure Design ASME B31.3 Pressure Design ASME I Max Permissible Work Pressure (4) ASME III Division 1 Subsection NB Large Pressure Design or 0.75 times pressure test ASME III Division 1 Subsection NB Large Pressure Design or 0.75 times pressure test ASME III Division 1 Subdivision NC Big Pressure Design or 0.75 times pressure test AS ME III Division 1 Subdivision NC Large Pressure Design or 0.75 times pressure test ASME III Division 1 Subsection ND Big Pressure Design or 0.75 times pressure test ASME III Division 1 Subsection ND Large Pressure Design or 0.75 Times Pressure Test Notes: 1. The boiler of external pipelines must be hydrostatic tested under the PG-99 ASME Code Section I. 2. The ASME B31.3 hydrostatic pressure should be raised above 1.5-time construct pressure in proportion to strength at the temperature of the test, divided by strength at the temperature of the structure, but not exceeding the strength at the test temperature. In cases where a vessel whose construction pressure is less than on a pipeline and where the vessel cannot be isolated, the pipeline and vessel can be tested together when the vessel's pressure is tested, provided that the vessel's test pressure is at least 77 per cent of the pipeline's test pressure. 3. Initial testing for ASME B31.3 maintenance is only allowed for Category D. 4 pipelines. Hydrostatic test pressure ASME Code Section I at a temperature of at least 70 degrees Fahrenheit (21 degrees Celsius) and pressure at temperatures less than 120 degrees Fahrenheit (49 degrees Celsius). For a forced flow steam generator with pressure parts designed for different pressure levels, the test pressure should be at least 1.5 times the maximum allowable working pressure in the super-heat outlet, but at least 1.25 times the maximum allowable working pressure of any part of the boiler. 5. Section III of the ASME Code, Division 1, subsection NB, test pressure limits defined in section Also components containing brazed joints and valves to be tested at 1.5 times the system pressure design before installation. 6. Section III of the ASME Code, Division 1, NB Subsection, NB, test pressure for partially filled water components should not be less than 1.25-time systemic pressure. Pressure Equipment Rejection Pressure Ship and Pipeline Systems are widely used throughout the industry and contain a very large concentration of energy. Although their design and installation comply with federal, state and local regulations and recognized industry standards, there are still major disruptions to pressure equipment. There are many reasons for the failure of the pressure equipment: degradation and thinning of materials during perch, aging, hidden deficiencies in the manufacture, etc. Fortunately, periodic tests and internal and external inspections significantly improve the safety of the pressure of the vessel or pipeline system. A good testing and inspection programme is based on the development of procedures for specific industries or types of vessels. A number of accidents have focused on the dangers and risks associated with the storage, processing and transfer of pressure fluids. When pressure vessels fail, it is usually the result of shell failure as a result of corrosion and erosion (more than 50 percent of shell failures). The newly built vessel is ripped apart during a hydrotest All pressure vessels have their own particular hazards, including a large supply of potential force, points of wear and corrosion, as well as a possible failure to over-pressure and temperature control safety devices. The government and industry have responded to the need to improve pressure testing by preparing standards and regulations that define general pressure safety requirements (ASME Boiler and Pressure Vessel Code, MINISTRY Pressure Safety Guidelines and others). These rules set out the requirements for implementing a pressure testing security program. It is essential that project and operational staff use these standards as benchmarks for writing and implementing a pressure testing safety program. The pressure testing program Good safety pressure testing program should detect manufacturing defects and deterioration from aging, cracking, corrosion and other factors before they cause ship failure and determine (1) if the vessel can continue to operate under the same pressure, (2) what control and repair measures may be needed, so that the pressure system can work at initial pressure, and (3) should reduce the pressure for the safety of the system. All pressure-under-pressure equipment companies have almost all expanded engineering guidelines to test pressure vessels and pipeline systems. These guidelines are prepared in accordance with OSHA's safety standards, ASME, local, state and other federal codes and standards. The documentation includes the definition of the responsibilities of engineering, management and safety personnel; General equipment and Hydrostatic and pneumatic testing procedures to verify the integrity of the system and its components; and guidelines for pressure testing, emergency procedures, documentation and hazard control measures. These measures include pressure control, noise protection, environmental and personal control, and protection against toxic or flammable gases and high pressure. The launch of a newly manufactured tank during a pneumatic pressure test with a change in air pressure definition - Change is a physical change in any component that has design implications that affect the pressure that contains the ability of the pressure vessel beyond the elements described in the existing data reports. Corrosion Benefit - Additional thickness of material added by the design to provide material losses from corrosion or erosion attack. Corrosive Service - Any pressure system service that, due to chemical or other interaction with container construction materials, contents or external environment, causes container crack pressure to become embrittled, lose more than 0.01 inches of thickness per year of operation, or toteiorate anyway. Design Pressure is a pressure used in the design of a pressure component along with a parable metal design temperature to determine the minimum allowable thickness or physical characteristics of the pressure boundary. Designer pressure for vessels is shown on the fabrication drawings and for the pipelines, the maximum operating pressure is indicated in the list of lines. The construction pressure for piping is more than 110% of the maximum operating pressure or 25 psi over maximum operating pressure. The Engineering Security Note (ESN) is a management-approved document describing the perceived hazards associated with the equipment and design parameters to be used. High pressure - Gas pressure is greater than 20 MPa gauge (3000 psig) and liquid pressure is greater than 35 MPa gauge (5000). Intermediate pressure - Gas pressure from 1 to 20 MPa sensor (150 to 3000 psig) and liquid pressure from 10 to 35 MPa gauge (1500 to 5000 psig). Leak test - pressure or vacuum test to determine the presence, speed and/or location of the leak. Low pressure-gas pressure is less than 1 MPa sensor (150 psig) or liquid pressure less than 10 MPa (1500 psig). Exploitation in the manned area - Operation pressure, which can be carried out (within the established limits) with personnel. The maximum allowable working pressure (MAWP) is the maximum allowable pressure at the top of the vessel in a normal working position at the working temperature specified for pressure. This is the lowest of the values found for the maximum allowable working pressure for of the main parts of the ship according to the principles established in section VIII ASME. MAWP is displayed on the Plates. MAWP can be taken in the same way as pressure design, but for the most part MAWP is based on a manufactured thickness minus corrosion benefit. MAWP is applied only to pressure vessels. The maximum temperature of the structure is the maximum temperature used in the design and should not be less than the maximum operating temperature. Maximum Operating Pressure (MOP) - The greatest pressure is expected during work. This is usually 10-20% lower than MAWP. Minimum allowable metal temperature (MAMT) is the minimum temperature for an existing vessel to maintain tests or operating conditions with a low risk of a fragile fracture. The IMAT is determined by the assessment of the pressure of vessels built before 1987. This term is used in API RP 579 to assess the fragile fracture of existing equipment. It can be one temperature, or a shell of acceptable operating temperatures as a pressure function. Minimum Metal Design Temperature (MDMT) is the minimum metal temperature used in the pressure vessel design. MDMT is a term as an ASME Code and is usually displayed on a ship plate or U-1 form for vessels developed in Section VIII ASME, Division 1, 1987 edition or later. Mpa - Absolute pressure in SI units. 1 atmosphere (14.7 psig) equals 0.1 MPA. Operational Security Procedure (OSP) - A document used to describe the controls needed to ensure that the risks associated with a potentially hazardous research project or unique activity are at an acceptable level. Pressure equipment - Any equipment, such as vessels, variety, piping or other components that work above or below (in the case of vacuum equipment) atmospheric pressure. Ship pressure is a relatively large volume of component pressure (e.g. spherical or cylindrical container) with a cross-section larger than associated pipelines. Proof Test is a test in which equipment prototypes are pressurized to determine the actual pressure of profitability or failure (splash) (used to calculate MAWP). Remote operation - A pressure operation that cannot be carried out with staff present. Equipment must be installed in test chambers, behind certified barricades, or operated from a safe place. Safety factor (SF) - the ratio of the final (i.e. burst or failure) pressure (measured or calculated) to MAWP. The security factor associated with something other than failure pressure must be identified with the appropriate subscript. Codes, Standards and References of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code: Section VIII Press Of ships ASME B31.3 Chemical Plant and Refinery Piping ASME B16.5 Pipe Flanks and Flanged Fittings of the American Society for and materials (ASTM) ASTM E 1003 Standard method of testing for hydrostatic leakage of the American Petroleum Institute (API) RP 1110 1110 Oil gas, dangerous liquids... API 510 Maintenance, Inspection, Rating, Repair, and Change API 560 Dismissed Heaters for General Refinery Services API 570 Inspection, Repair, modification and re-ranking in the maintenance of api 579 Pipeline Systems API Recommended Practice for Fitness-for-Service Robert B. Adams President and CEO of EST Group, Inc. Harleysville, Pa. Interesting articles about the pressure pressure test of ship failure during the Pneumatic Test Pressure Pressure Pressure System ASME B31.3 Piping are usually designed and built in accordance with applicable code. Of course, the use of ASME B31.3 may be applicable to ships carrying oil, but you should really follow the code that the pipeline system was designed for. Since I am familiar with the B31.3 rather than the European (or other country) equivalent, I will base this answer on B31.3. ASME B31.3 requires verification of a leak of the pipeline system. It's not a structural test, it's just a test to determine if there are points in the system that are leaking. In this case, a hydrostatic test is conducted to verify that the vessel and the attached piping are structurally sound, not just leaking tightly. ASME B31.3, paragraph 345.1 states: Prior to the initial operation and after the completion of the applicable examinations required by paragraph 341, each pipeline system must be inspected for tightness. The test should be a hydrostatic leak test in accordance with paragraph 345.4, except as envisaged. Where the owner deems it impractical to test for a hydrostatic leak, either a pneumatic test under paragraph 345.5 or a combined hydrostatically pneumatic test under paragraph 345.6 can be replaced, recognizing the danger of energy stored in compressed gas. Thus, according to the code, an air leak test can be performed if the system owner considers the hydrostatic test impractical. It is important to understand that the pressure at which the test is carried out is a function of structural pressure. Pressure design is a function of acceptable load limits on the pipeline, which is also a function of operational temperature. For a hydrostatic test, paragraph 345.4.2 requires pressure of at least 1.5 times the pressure of the structure. For a pneumatic test, paragraph 345.5.4 requires pressure of at least 110% of the construction pressure. The next step is for an engineer (preferably a pipeline system designer or stress analyst) to create pressure verification procedures. These pressure test procedures look at the possibility of low temperature fragile failures, which may be a concern about the temperature you are referring to. Pressure testing procedures are actually a set of procedures (usually) that As a method of system pressure, valve position, removal of relief devices, insulation of parts of the pipeline system, etc. As for low temperature, paragraph 345.4.1 states: Liquid should be water if there is no possibility of damage as a result of freezing or adverse water impact on the pipeline or process (see F345.4.1). In this case, another suitable non-toxic liquid can be used. Thus, glycol/water is allowed. To conduct the test pneumatic need to look to the pressure of the test was increased to 25 psi, after which a preliminary check, including examination of all joints. Using a low temperature bubble liquid is very advisable. So to conclude: If the specification you were given to perform a hydro test in 16 bar, then this should be 1.5 times the pressure of the 10.67 bar construction. Therefore, the test for B31.3 should be conducted not in 16 bar, but 1.1 times higher than the pressure of the design or 11.7 bar. You will run the pneumatic pressure only as high as 11.7 bar. The possibility of a fragile failure should be considered by the appropriate engineer. In the case of temperatures below 0 C, the material used should be considered to make sure it is not below the minimum temperature used for this steel. An informed engineer should prepare a set of pressure checks. These procedures should indicate which parts of the pipe are being tested, in which positions the valves should be placed, which reset devices should be removed (or installed), etc. pneumatic test should start with 25 psig and pre-examination for leaks performed before the pressure increased. Most importantly, an informed engineer should also examine the design specification of the pipelines for all requirements related to leakage or pressure testing. Although B31.3 describes it as a leak test, when working hydrostatically at 1.5 times the design, it is in affect, a structural test. Please read the article: United States Department of Labor OSHA OSHA asme standards for non destructive testing. asme code for non destructive testing. asme v non destructive testing. asme non destructive testing pdf

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