

## GUIDE YVL E.12

---

# TESTING ORGANISATIONS FOR MECHANICAL COMPONENTS AND STRUCTURES OF A NUCLEAR FACILITY

---

1	Introduction	3
2	Scope of application	6
3	General requirements for testing organisations	8
3.1	Obligations of the licensee	9
4	NDT testing organisations	11
4.1	Accredited testing organisations	11
4.1.1	Approval application and validity of approval	11
4.1.2	Person responsible for technical matters	12
4.1.3	Obligations of the testing organisation	13
4.1.4	Testing organisations approved on the basis of accreditation	14
4.2	Non-accredited testing organisations	14
4.3	Requirements concerning testers	15
4.3.1	Testers performing in-service inspections under Guide YVL E.5	16
5	DT testing organisations	18
5.1	Accredited testing organisations and testing laboratories approved by the Ministry of the Environment	18
5.1.1	Person responsible for technical matters	18
5.1.2	Obligations of the testing organisation	19
5.2	Non-accredited testing organisations	19
6	Testing related to material manufacturing	21
7	Documents required for supervision	23
8	Regulatory oversight by the Radiation and Nuclear Safety Authority	24
9	ANNEX A Component and safety class-specific division related to non-destructive and destructive testing at the material manufacturing phase	26
10	References	30

Definitions

## Authorisation

According to Section 7 r of the Nuclear Energy Act (990/1987), the Radiation and Nuclear Safety Authority (STUK) shall specify detailed safety requirements for the implementation of the safety level in accordance with the Nuclear Energy Act.

## Rules for application

The publication of a YVL Guide shall not, as such, alter any previous decisions made by STUK. After having heard the parties concerned STUK will issue a separate decision as to how a new or revised YVL Guide is to be applied to operating nuclear facilities or those under construction, and to licensees' operational activities. The Guide shall apply as it stands to new nuclear facilities.

When considering how the new safety requirements presented in the YVL Guides shall be applied to the operating nuclear facilities, or to those under construction, STUK will take due account of the principles laid down in Section 7 a of the Nuclear Energy Act (990/1987): The safety of nuclear energy use shall be maintained at as high a level as practically possible. For the further development of safety, measures shall be implemented that can be considered justified considering operating experience, safety research and advances in science and technology.

According to Section 7 r(3) of the Nuclear Energy Act, the safety requirements of the Radiation and Nuclear Safety Authority (STUK) are binding on the licensee, while preserving the licensee's right to propose an alternative procedure or solution to that provided for in the regulations. If the licensee can convincingly demonstrate that the proposed procedure or solution will implement safety standards in accordance with this Act, the Radiation and Nuclear Safety Authority (STUK) may approve a procedure or solution by which the safety level set forth is achieved.

With regard to new nuclear facilities, this Guide shall apply as of 1 April 2019 until further notice. With regard to operating nuclear facilities and those under construction, this Guide shall be enforced through a separate decision to be taken by STUK. This Guide replaces Guide YVL E.12 (20.05.2014).

Translation. Original text in Finnish.

**STUK • SÄTEILYTURVAKESKUS**  
**STRÅLSÄKERHETSCENTRALEN**  
**RADIATION AND NUCLEAR SAFETY AUTHORITY**

Osoite / Address • Laippatie 4, 00880 Helsinki

Postiosoite / Postal address • PL / P.O.Box 14, FI-00811 Helsinki, FINLAND

Puh. / Tel. (09) 759 881, +358 9 759 881 • Fax (09) 759 88 500, +358 9 759 88 500 • [www.stuk.fi](http://www.stuk.fi)

## 1 Introduction

101. According to Section 60 a of the Nuclear Energy Act (990/1987) (Amendment 410/2012): *The Radiation and Nuclear Safety Authority (STUK) approves manufacturers of nuclear pressure equipment for their duties and inspection organisations, testing organisations and qualification body for duties pertaining to the control of pressure equipment, steel and concrete structures, and mechanical components at nuclear facilities within the scope determined by the Radiation and Nuclear Safety Authority. The Radiation and Nuclear Safety Authority supervises the operation of such an inspection organisation, testing organisation, and qualification body.*

*A prerequisite for the approval of an inspection organisation and testing organisation and qualification body is that they are operationally and economically independent and that they carry liability insurance. In addition, the manufacturer, the inspection organisation, testing organisation and qualification body shall have an advanced quality system, a competent and experienced personnel as well as appropriately qualified methods, facilities and equipment required for manufacturing and operation. The approval procedure is prescribed in more detail in a Government Decree.*

*If a manufacturer of pressure equipment, inspection organisation, testing organisation, or qualification body no longer meets the requirements for approval or has materially neglected or breached its obligation or restriction issued in or by virtue of this Act or a regulation issued in a decision and fails to correct the shortcomings in its operations even after receiving notices and warnings, the Radiation and Nuclear Safety Authority (STUK) may withdraw its approval. If justified by reasons pertaining to the assurance of safety, the Radiation and Nuclear Safety Authority (STUK) may, after having granted the corporation or establishment concerned a hearing, change the requirements and conditions established in its decision of approval.*

*STUK specifies the nuclear pressure equipment which have a minor significance to safety whose manufacturer and testing organisation are not required to be approved for their duties in the manner prescribed in Subsection 1 as well as, on similar grounds, the steel and concrete structures and mechanical equipment whose testing organisation is not required to be approved for its duties in the manner prescribed in Subsection 1. In these respects, STUK shall stipulate the necessary requirements concerning the competence of the manufacturer and testing organisation, the fulfilment of which the licensee shall be able to demonstrate. [2013-11-15 ]*

102. According to Section 113 of the Nuclear Energy Decree (161/1988):

*Non-destructive destructive testing of a nuclear facility's structures and components relevant to*

*nuclear safety may only be carried out by a testing organisation approved by the Radiation and Nuclear Safety Authority.*

*The licensee shall submit an application in writing for the approval of the testing company or tester mentioned in Subsection 1 for their duties. [2013-11-15 ]*

103. According to Section 117 b of the Nuclear Energy Decree (161/1988):

*When the Radiation and Nuclear Safety Authority (STUK) approves an authorised inspection body for its duties, it shall define the body's inspection rights and establish the requirements and conditions pertaining to its operations. In the decisions of approval, the period of validity of the decision, the body's obligation to report to the Radiation and Nuclear Safety Authority (STUK) as well as its obligation to observe secrecy under the law shall be stated.*

*What is established in Subsection 1 above shall also be applied to the testing organisation and qualification body referred to in Section 60 a of the Nuclear Energy Act. [2013-11-15 ]*

104. According to Section 4(2) of the Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018), *requirements set for and the actions taken to ascertain the compliance with the requirements of the systems, structures and components implementing safety functions and connecting systems, structures and components shall be commensurate with the safety class of the item in question. [2019-03-15 ]*

105. According to Sections 5(3) and 5(4) of the Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018) ...3) *The requirements set for and the actions to ascertain the compliance with the requirements of the systems, structures and components implementing operational safety functions and connecting systems, structures and components shall be commensurate with the safety class of the item in question; and 4) Systems, structures and components performing long-term safety functions shall be designed, manufactured and installed so that their quality level, and the assessments, inspections and tests required to verify their quality level, are commensurate with the safety significance of the item in question. [2019-03-15 ]*

106. According to Section 60 of the Nuclear Energy Act (990/1987), *the Radiation and Nuclear Safety Authority controls pressure equipment at nuclear facilities as follows:*

*1) pressure equipment whose malfunction may cause a radioactive release (nuclear pressure equipment); and*

*2) pressure equipment at nuclear facilities other than the equipment referred to in item 1 above, to be monitored on the basis of its safety significance (conventional pressure equipment).*

*Unless otherwise provided in or pursuant to this Act, the Pressure Equipment Act (1144/2016)*

*shall be applied to pressure equipment at nuclear facilities. [2019-03-15 ]*

107. According to Sections 117(1)(4) and 117(1)(5) of the Nuclear Energy Decree, (161/1988) as regards pressure equipment, *the Radiation and Nuclear Safety Authority (STUK) shall in particular: [...] 4) carry out control and inspection to ensure that the placement, installation, operation, maintenance and repair of conventional pressure equipment comply with safety requirements and regulations; as well as 5) set requirements pertaining to the licensee's actions and procedures for assuring the safety of pressure equipment in nuclear facilities, as well as monitor the implementation of the requirements. [2019-03-15 ]*

108. According to Section 7(1) of the Government Decree on conventional pressure equipment at nuclear facilities (1548/2016), the essential safety requirements specified in Annex I of directive 2014/68/EU [11] shall be applied to the essential safety requirements for pressure equipment. In accordance with Section 3.1.3 of the aforementioned annex, non-destructive tests of permanent joints of pressure equipment shall be carried out by suitable qualified personnel. For pressure equipment in categories III and IV, the personnel shall be approved by a third-party organisation recognised by a Member State pursuant to Article 20. [2019-03-15 ]

109. Under Guide YVL B.2 "Classification of systems, structures and components of a nuclear facility", pressure equipment classified into safety classes 1, 2, and 3 shall be considered nuclear pressure equipment, and pressure equipment classified into safety class EYT shall be considered non-nuclear pressure equipment. [2019-03-15 ]

## 2 Scope of application

201. This Guide sets forth requirements for testing organisations and testers performing non-destructive testing (NDT) and for testing organisations performing destructive testing (DT) at nuclear facilities in order to verify the integrity of the components and structures of nuclear facilities in accordance with the requirements of safety classes 1, 2, and 3. [2013-11-15 ]

202. The Guide is applied to all organisations or parts thereof that perform, as testing organisations, non-destructive or destructive testing on nuclear pressure equipment, mechanical components or steel and concrete structures during manufacture and installation, as well as during condition monitoring, maintenance, and modifications. The Guide shall also be applied to the testing of materials and test pieces required for qualification and to testing during material manufacturing within the scope presented in the Guide. [2013-11-15 ]

203. The Guide is also applied to class EYT during in-service inspections performed under Guide YVL E.5 "In-service inspection of nuclear facility pressure equipment with non-destructive testing methods". Other requirements concerning the non-destructive and destructive testing in class EYT shall be set by the licensee in the structural requirement specifications of the components; the requirements for structural requirement specifications are set forth in the component-specific YVL Guides of E series. The Government Decree on conventional pressure equipment at nuclear facilities (1548/2016) also applies to non-nuclear pressure equipment at nuclear facilities. [2019-03-15 ]

204. Non-destructive testing methods covered by the Guide include e.g. acoustic emission testing (AT), eddy current testing (ET), leak testing (LT), magnetic particle testing (MT), liquid penetrant testing (PT), radiographic testing (RT), ultrasonic testing (UT), and direct and indirect visual testing (VT), with the exception of a visual testing carried out during the application of another NDT method.

The requirements for direct visual testing are applied to inspections of welds with the exception of condition monitoring during operation and to in-service inspections in accordance with Guide YVL E.5, in which the pre-service inspection has been carried out by means of direct visual testing. [2019-03-15 ]

205. Destructive testing methods covered by the Guide include e.g. tensile tests, bending tests, impact tests, hardness tests, and fracture-mechanics tests. [2013-11-15 ]

206. The Guide is applied to all nuclear facilities. [2013-11-15 ]

207. Following guides provide instructions and set requirements for the use of testing organisations and testers performing non-destructive testing and testing organisations performing destructive testing at nuclear facilities:

- YVL A.1 Regulatory oversight of safety in the use of nuclear energy
- YVL D.7 Release barriers of spent nuclear fuel disposal facility
- YVL E.1 Authorised inspection body and the licensee's in-house inspection organisation
- YVL E.3 Pressure vessels and piping of a nuclear facility
- YVL E.5 In-service inspection of nuclear facility pressure equipment with non-destructive testing methods
- YVL E.6 Buildings and structures of a nuclear facility
- YVL E.8 Valves of a nuclear facility
- YVL E.9 Pumps of a nuclear facility
- YVL E.10 Emergency power supplies of a nuclear facility
- YVL E.11 Hoisting and transfer equipment of a nuclear facility
- YVL E.13 Ventilation and air conditioning equipment of a nuclear facility.

[2019-03-15 ]

208. Requirements 629, 629a and 630 of Guide YVL A.3 "Leadership and management for safety" for suppliers apply to testing organisations in safety classes 1 and 2, for which an approval application shall be submitted to STUK. However, the requirements do not apply to testing organisations for materials in groups 2 and 3 of Annex A. [2019-03-15 ]

209. The requirements set forth in the Guide for licensees also apply to licence applicants.

[2013-11-15 ]

### 3 General requirements for testing organisations

301. The testing organisation shall have valid accreditation from the Finnish Accreditation Service (FINAS) or an equivalent foreign organisation pursuant to standard SFS-EN ISO/IEC 17025 [7] or SFS-EN ISO/IEC 17020 [8]. An accreditation decision by an organisation equivalent to FINAS may be approved if the accreditation in question is covered by the multilateral recognition agreements signed by FINAS (MLA or MRA agreement). [2019-03-15 ]

302. The scope of accreditation shall cover testing methods accordant with applicable technical standards or test procedures, which are used for non-destructive and destructive testing performed under this Guide. A testing organisation performing indirect visual testing shall have accreditation for some non-destructive testing method. [2019-03-15 ]

303. The requirements for the manufacturers' own non-accredited NDT testing organisations are presented in Subsection 4.2, and the requirements for manufacturers own non-accredited DT testing organisations are presented in Subsection 5.2. [2013-11-15 ]

304. The testing organisation shall primarily perform the essential testing tasks itself. [2013-11-15 ]

305. If a testing organisation uses external services in its testing activities, the procedure shall be defined in the management system of the testing organisation. [2013-11-15 ]

306. If a testing organisation subcontracts testing tasks, subcontractors shall be approved by the Radiation and Nuclear Safety Authority (STUK). [2019-03-15 ]

307. If the testing organisation uses external testing personnel for testing tasks and the testers operate under the leadership of the testing organisation's work management following the instructions and using the equipment and supplies of the testing organisation, the external testing organisation that they represent does not require approval under this Guide. [2019-03-15 ]

308. A register or similar up-to-date list shall be maintained on the subcontractors, external testing personnel and persons performing testing-related services used by the testing organisation. [2019-03-15 ]

309. The testing organisation shall demonstrate that it is functionally and financially independent of the manufacturer, licensee, and the inspection organisation assessing the conformity of the item tested, and it shall have liability insurance. [2013-11-15 ]



310. The testing organisation and its personnel shall not engage in activities that jeopardise the independence and impartiality of the operation and decisions; examples of such activities include the design, manufacture, and inspection of the item. The test result shall be solely based on the conformity assessment, and other factors, such as financial factors, pressure or incentives, shall not affect the test result. [2013-11-15 ]

311. In safety classes 1 and 2, an accredited testing organisation shall be independent of the licensee's organisation and inspection organisation performing the conformity assessment of the item tested. In safety class 3, and in safety class 2 whenever justified, an accredited testing organisation may be part of the licensee's organisation or the inspection organisation performing the conformity assessment of the item tested, provided that it is a separate part of the organisation. In this case, the responsibilities of the testing organisation's personnel shall be clearly separated from the responsibilities of persons performing other duties in the parent organisation and the reporting procedures with the parent organisation shall be described. [2019-03-15 ]

312. The manufacturer's own accredited or non-accredited testing organisation may, where justified, operate in safety classes 1, 2, and 3. The responsibilities of the testing organisation's personnel shall be clearly separated from the responsibilities of persons performing other duties in the parent organisation, and the reporting procedures with the parent organisation shall be described. [2019-03-15 ]

313. The testing organisation shall have an advanced quality management system, competent and experienced personnel, as well as appropriately qualified methods, facilities and equipment for testing and operation. [2019-03-15 ]

### **3.1 Obligations of the licensee**

314. The licensee shall apply for STUK's approval for testing organisations and for the applicability of the additional qualifications of testers performing in-service inspections under Guide YVL E.5 in accordance with the requirements laid down in this Guide.

For testing organisations approved on the basis of an accreditation decision, the information required in this guide shall be submitted to STUK for information. [2019-03-15 ]

315. The licensee shall submit the applications and other required documents concerning the approval of testing organisations following the procedure laid down in Guide YVL A.1. The licensee shall be responsible for ensuring that the applications meet the requirements set forth in this Guide. [2013-11-15 ]

316. The licensee shall submit the annual evaluation reports, accreditation decisions, and notifications of changes that are required or are prerequisites for the testing organisation's approval using separate letters for each testing organisation. [2013-11-15 ]

317. The licensee shall have appropriate procedures to organise and manage the use of testing organisations in order to ensure that only testing organisations and testers approved by STUK are used in non-destructive and destructive testing. The procedures shall also ensure that the approval is valid and that the scope of the approval covers the methods used in the testing. [2019-03-15 ]

318. In its management system, the licensee shall specify the procedures whereby it supervises the operation of the testing organisations. [2013-11-15 ]

319. In its management system, the licensee shall specify the procedures whereby it supervises the maintenance of the testing organisations' approvals. [2013-11-15 ]

## 4 NDT testing organisations

### 4.1 Accredited testing organisations

401. The licensee shall apply for STUK's approval for the following:

- a. NDT testing organisations of pressure equipment, mechanical components, and steel structures in safety classes 1 and 2.
- b. NDT testing organisations performing non-destructive testing related to the manufacturing of materials for pressure vessels, internals of main components, piping, valves and pumps in safety classes 1 and 2 in accordance with the component-specific division of group 1 of Annex A. STUK may supplement the division in separate decisions.
- c. NDT testing organisations performing in-service inspections under Guide YVL E.5, and the applicability of the additional qualifications of testers for the in-service inspections at the inspection area.
- d. Testing organisations performing indirect visual testing in safety class 3 if the testers have not been qualified under standard SFS-EN ISO 9712 [9] or an equivalent qualification system.

[2013-11-15 ]

#### 4.1.1 Approval application and validity of approval

402. When seeking approval for a testing organisation, the licensee shall enclose the following information with the application:

- a. The licensee's summary of justifications concerning the acceptability of the testing organisation.
- b. A description of the testing organisation's organisation, independence, and resources.
- c. A description of the person responsible for technical matters as well as his/her training and work experience.
- d. An accreditation decision, with appendices, concerning the methods for which approval is sought.
- e. A description of the testing methods employed by the testing organisation
- f. A list of testers, including the name of each tester, the testing method for which the tester has been qualified, and the number and expiry date of the qualification certificate.
- g. A description of the tester qualification system and organisation if qualification other than one under standard SFS-EN ISO 9712 [9] or an equivalent qualification system is employed.
- h. A description of the persons employed by or available to the testing organisation who have been qualified in accordance with level 3 of standard SFS-EN ISO 9712 [9] or an equivalent

qualification system for the various testing methods.

i. A description of the earlier activities of the testing organisation and the person responsible for technical matters at nuclear facilities or in nuclear power industry-related component manufacture.

j. A description of liability insurance.

k. A demonstration of the fulfilment of Guide YVL A.3 requirements for suppliers.

The summary of justifications must demonstrate the scope, results and acceptance criteria of the licensee's own approval procedure as well as the fulfilment of the requirements of Guide YVL E.12 for the required information. The acceptance criteria must refer to the document or section of document appended to the application. If any non-conformances are detected in the due fulfilment of the requirements, their acceptability shall be justified in detail. [2019-03-15 ]

403. STUK approves the testing organisation per licensee and for a fixed period, which can be five (5) years maximum. Valid accreditation and delivery of annual evaluation reports to STUK in a timely manner are prerequisites for the approval. [2019-03-15 ]

404. Where required, the licensee shall deliver an application for renewal to STUK no later than three months prior to the expiry of the approval. [2013-11-15 ]

#### **4.1.2 Person responsible for technical matters**

405. The person responsible for technical matters shall be competent and experienced in the field of the NDT testing organisation. [2013-11-15 ]

406. The person responsible for technical matters shall be familiar with the NDT methods, performance of the tests and assessment of the results. [2019-03-15 ]

407. The person responsible for technical matters shall ensure that non-destructive testing is carried out in accordance with all relevant regulations and instructions. [2019-03-15 ]

408. The person responsible for technical matters shall be in a contractual employment relationship with the testing organisation and have a close connection with the daily work of the testing organisation. [2013-11-15 ]

409. The person responsible for technical matters shall be responsible for keeping the list of testers up-to-date. [2013-11-15 ]

#### 4.1.3 Obligations of the testing organisation

410. In order to retain the validity of the approval, the testing organisation shall have permanently available:

- a. A person responsible for technical matters.
- b. Sufficient expertise and procedures for the design and implementation of non-destructive testing and for the assessment of results.
- c. Appropriate testing equipment and materials.
- d. Competent personnel.
- e. Administrative procedures for ensuring the reliable functioning of the quality management system.

Furthermore, the testing organisation shall ensure the following:

- f. The application documents shall be kept up-to-date.
- g. The list of testers shall be sent to the licensee each calendar year.
- h. The instructions and standards provided to a tester shall be in a language he/she understands and that they are available at the testing site.
- i. The tests shall be carried out in accordance with the approved testing plans or, if no plans have been required, in accordance with the applicable standards or corresponding instructions.
- j. The tester shall not test such components for the manufacture of which he or she has been responsible.
- k. The documents produced shall be archived for a minimum of 10 years.
- l. The organisation shall actively follow the development in its field and consider the opportunities created by new technology for increasing the reliability of testing. [2019-03-15 ]

411. The objective of the testing organisation shall be to continuously improve its operations and competence. [2013-11-15 ]

412. The testing organisations shall annually submit to the licensee a report on the implementation and the results of the periodic assessments by the accreditation body. [2013-11-15 ]

#### **4.1.4 Testing organisations approved on the basis of accreditation**

413. Testing organisations accredited by FINAS or an equivalent foreign accreditation body may perform non-destructive testing of pressure equipment, mechanical components and steel structures in safety class 3. The scope of accreditation shall cover what is laid down in para. 302. [2013-11-15 ]

414. The licensee shall submit to STUK for information the accreditation decision and its appendices, the licensee's estimate of the independence of the testing organisation, and the list of testers. The list of testers shall indicate the name of each tester, the testing method for which the tester has been qualified, and the number and expiry date of the qualification certificate. The approval of the testing organisation shall remain in force in accordance with the accreditation decision or for a maximum of five years from the date of arrival of the application. [2019-03-15 ]

#### **4.2 Non-accredited testing organisations**

415. The manufacturer's own, non-accredited testing organisation may, for a justified reason, be approved to perform non-destructive testing of pressure equipment, mechanical components, and steel structures in safety classes 1, 2, and 3. [2019-03-15 ]

416. The licensee shall apply for STUK's approval for the manufacturers' own, non-accredited NDT testing organisations. [2013-11-15 ]

417. When approval is sought for a non-accredited NDT testing organisation:

- a. The manufacturer's quality management system shall, at minimum, meet the requirements set forth in standard SFS-EN ISO 9001 [10] or the requirements of another quality management system approved by STUK, and it shall be externally independently audited.
- b. The NDT activities shall be part of the manufacturer's audited quality management system.
- c. The additional requirements for the quality management systems of manufacturers set forth in the component-specific YVL Guides of E series shall be taken into account. [2019-03-15 ]

418. A notified body pursuant to the Pressure Equipment Directive may perform the conformity assessment of the NDT activities of a non-accredited testing organisation in terms of technical competence and operational independence under the following conditions:

- a. The accreditation of the notified body shall cover module H or H1.
- b. The assessor working for the notified body shall have knowledge of the function assessed as well as training and experience in quality management system assessments.
- c. The technical aspects (components, procedures, performance) of NDT activities shall be assessed by a person who is employed by an accredited testing organisation approved by

STUK and who has at least level 2 qualification under standard SFS-EN ISO 9712 [9] or an equivalent qualification system in the testing methods for which approval is sought.

d. The assessment shall be based on the licensee's assessment procedure approved by STUK. [2019-03-15 ]

419. When assessing testing organisations which perform radiographic testing, conformity with national radiation protection requirements of the testing facilities shall be considered. [2013-11-15 ]

420. The licensee shall demonstrate the conformity of the notified body and the assessor working for the notified body that performed the assessment as well as the competence of the technical assessor in connection with the approval application for a testing organisation. [2019-03-15 ]

421. The requirements set forth in subsection 4.1.1 apply to the approval of non-accredited NDT testing organisations and the validity period of the approval. The accreditation decision shall be replaced by a statement by the notified body concerning the technical expertise and independence of operation of the testing organisation. [2013-11-15 ]

422. A certification decision or certificate from an independent audit of the manufacturer's quality management system and the essential procedures concerning the operation of the testing organisation shall be enclosed with the approval application. [2013-11-15 ]

423. The person responsible for technical matters shall meet the requirements set forth in Subsection 4.1.2. [2013-11-15 ]

424. The prerequisite for the validity of the approval shall be that the testing organisation meets the obligations set forth in subsection 4.1.3. The periodic assessments by an accreditation body shall be replaced by annual assessments performed by a notified body described in para. 418. [2013-11-15 ]

### **4.3 Requirements concerning testers**

425. NDT testers shall have at least a level 2 qualification, under standard SFS-EN ISO 9712 [9] or an equivalent qualification system, for the method used in testing. However, a tester with level 1 qualification may perform exposure required for radiographic testing (RT). A tester with level 1 qualification may also perform automated ultrasonic testing (UT) or eddy current testing (ET) during the manufacturing process of materials. In these cases, the results shall be assessed by a level 2 or 3 tester. [2019-03-15 ]

425a. A certification body providing tester qualifications shall have valid accreditation in accordance with SFS-EN ISO/IEC 17024 [12], and the scope of accreditation shall include standard SFS-EN ISO 9712 [9] or an equivalent qualification system. The accreditation must be covered by the multilateral recognition agreements signed by FINAS (MLA or MRA agreement).  
[2019-03-15 ]

425b. The testing organisation's internal qualification system may be approved for a justified reason. In this case, the qualification system must be externally independently audited.  
[2019-03-15 ]

426. The qualification of testers performing indirect visual testing may also be arranged within the testing organisation, without the approval of the qualification system in accordance with requirement 425b. In this case, the document defining the personnel qualification requirements shall be enclosed with the application for the approval of a testing organisation, and the visual testing procedures shall refer to this document. [2019-03-15 ]

427. The requirements set for the personnel performing visual testing shall include an annual vision test. [2013-11-15 ]

428. Those performing replacing or complementary inspections (NDT) related to the periodic inspections of pressure equipment subject to registration shall have the qualification defined in para. 425, and they shall be employed by a testing organisation approved by STUK. Qualification pursuant to para. 425 is sufficient for other condition monitoring. [2013-11-15 ]

#### **4.3.1 Testers performing in-service inspections under Guide YVL E.5**

429. All testers performing in-service inspections under Guide YVL E.5 shall have a basic qualification of level 2 or 3 under standard SFS-EN ISO 9712 [9] or an equivalent qualification system for the inspection method in question. The additional qualification requirements are set forth in subsection 6.7 of Guide YVL E.5. [2013-11-15 ]

430. The testers shall be employed by a testing organisation approved by STUK. Approval of the applicability of the testers' additional qualification to the in-service inspection area shall be sought from STUK in connection with the application for the approval of a testing organisation, or via a separate application. [2013-11-15 ]

431. The licensee shall enclose the following information with the application:

- a. A reference to the approval decision concerning the testing organisation if the approval for the testers is sought with a separate application
- b. A reference to the approval decisions concerning the qualification documentation of the



inspection systems

c. A description of the testers' basic qualifications

d. Qualification certificates concerning the additional qualification of the testers [2013-11-15 ]

432. The approval of a tester expires when the validity of the testing organisation's approval ends. [2013-11-15 ]

## **5 DT testing organisations**

### **5.1 Accredited testing organisations and testing laboratories approved by the Ministry of the Environment**

501. Testing organisations accredited by FINAS or an equivalent foreign accreditation body may perform destructive testing of pressure equipment, mechanical components, steel structures, concrete, and reinforcement steel. The scope of accreditation shall cover the methods used in destructive testing.

Destructive testing of concrete and reinforcement steel may also be performed by a testing organisation approved by the Ministry of the Environment. [2019-03-15 ]

502. The licensee shall submit to STUK for information the accreditation decision and its appendices or a certificate indicating the Ministry of the Environment's approval and the licensee's assessment of the independence of the testing organisation. The approval of the testing organisation shall remain in force in accordance with the accreditation decision or for a maximum of five years from the date of arrival of the application. [2019-03-15 ]

#### **5.1.1 Person responsible for technical matters**

503. The person responsible for technical matters shall be competent and experienced in the field of DT testing organisation. [2019-03-15 ]

504. The person responsible for technical matters shall be familiar with the DT methods, performance of the tests and assessment of the results. [2019-03-15 ]

505. The person responsible for technical matters shall ensure that destructive testing is carried out in accordance with all relevant regulations and instructions. [2019-03-15 ]

506. The person responsible for technical matters shall be in a contractual employment relationship with the testing organisation and have a close connection with the daily work of the testing organisation. [2013-11-15 ]

### **5.1.2 Obligations of the testing organisation**

507. The testing organisation shall ensure that the accreditation is valid and that the periodic assessments required by the accreditation are performed by the accreditation body.

[2013-11-15 ]

508. Changes to the accreditation decision shall be communicated to the licensee immediately.

[2013-11-15 ]

### **5.2 Non-accredited testing organisations**

509. The manufacturer's own, non-accredited testing organisation may, for a justified reason, be approved to perform destructive testing of pressure equipment, mechanical components, and steel structures in safety classes 1, 2, and 3. [2019-03-15 ]

510. The licensee shall apply for STUK's approval for the manufacturers' own, non-accredited DT testing organisations. [2013-11-15 ]

511. When approval is sought for a non-accredited DT testing organisation:

- a. The manufacturer's quality management system shall, at minimum, meet the requirements set forth in standard SFS-EN ISO 9001 [10] or the requirements of another quality management system approved by STUK, and it shall be externally independently audited.
- b. The DT activities shall be part of the manufacturer's audited quality management system.
- c. The additional requirements for the quality management systems of manufacturers set forth in the component-specific YVL Guides of E series shall be taken into account. [2019-03-15 ]

512. A notified body pursuant to the Pressure Equipment Directive may perform the conformity assessment of the DT activities of a non-accredited testing organisation in terms of technical competence and operational independence under the following conditions:

- a. The accreditation of the notified body covers module H or H1.
- b. The assessor working for the notified body shall have knowledge of the function assessed as well as training and experience in quality management system assessments.
- c. The technical aspects (components, procedures, performance) of DT activities shall be assessed by a competent person who is employed by an accredited testing organisation and who has been approved for the said task by the testing organisation.
- d. The assessment shall be based on the licensee's assessment procedure approved by STUK. [2019-03-15 ]

513. The licensee shall demonstrate the conformity of the notified body and the assessor working for the notified body that performed the assessment as well as the competence of the technical assessor in connection with the approval application for a testing organisation. [2019-03-15 ]

514. The requirements set forth in subsection 4.1.1 apply to the approval of non-accredited DT testing organisations and the validity period of the approval, with the exception of paras. 402 f), g), and h). The accreditation decision shall be replaced by a statement by the notified body concerning the technical expertise and independence of operations of the testing organisation. [2019-03-15 ]

515. A certification decision or certificate from an independent audit of the manufacturer's quality management system and the essential procedures concerning the operation of the testing organisation shall be enclosed with the approval application. [2013-11-15 ]

516. The person responsible for technical matters shall meet the requirements set forth in subsection 5.1.1. [2013-11-15 ]

517. The prerequisite for the validity of the approval shall be that the testing organisation meets the obligations set forth in subsection 4.1.3. The periodic assessments by an accreditation body shall be replaced by annual assessments performed by a notified body described in para. 512. [2013-11-15 ]

## 6 Testing related to material manufacturing

601. Annex A presents a component and safety class-specific division related to the non-destructive and destructive testing of pressure vessels, internals of main components, piping, valves, and pumps carried out at the material manufacturing phase. STUK may supplement the division in separate decisions. [2019-03-15 ]

602. Approval of the testing organisation of a material manufacturer performing non-destructive or destructive testing related to the manufacturing of group 1 materials specified in Annex A shall be sought according to the requirements set forth in this Guide for testing organisations of pressure equipment, mechanical components and steel structures in safety classes 1 and 2. [2019-03-15 ]

603. A material manufacturer performing non-destructive or destructive testing related to the manufacturing of group 2 materials specified in Annex A shall have approval for the manufacturing of the said material according to the same standard series which is applied to the design of the component or structure. Furthermore, the manufacturer's quality management system shall, at minimum, meet the requirements set forth in standard SFS-EN ISO 9001 [10] or the requirements of another quality management system approved by STUK, and it shall be externally independently audited. The licensee may also seek approval for the testing organisation in accordance with the requirements of Annex A, group 1.

If testing is performed by an external testing organisation, the requirements set forth in this Guide for testing organisations of pressure equipment, mechanical components and steel structures in safety classes 1 and 2 shall be followed in the approval process. [2019-03-15 ]

604. A material manufacturer performing non-destructive or destructive testing related to the manufacturing of group 3 materials specified in Annex A shall adhere to the requirements of the applicable product standards in testing. Furthermore, the manufacturer's quality management system shall, at minimum, meet the requirements set forth in standard SFS-EN ISO 9001 [10] or the requirements of another quality management system approved by STUK, and it shall be externally independently audited. The licensee may also seek approval for the testing organisation in accordance with the requirements of Annex A, group 1. [2019-03-15 ]

605. A certification decision or certificate from an independent audit of the quality management system of group 2 material manufacturers and group 3 main pressure-bearing parts material manufacturers, as well as a certificate of approval concerning material manufacturing, shall be enclosed with the construction plan of the component manufactured. [2019-03-15 ]

606. The manufacturers of materials for pressure vessels and piping shall also meet the requirements of Guide YVL E.3. [2013-11-15 ]

## 7 Documents required for supervision

701. The licensee shall submit to STUK for approval the approval applications of testing organisations, the amendment applications related to the prerequisites of approval of testing organisations and the applications concerning the applicability of the additional qualifications of testers performing in-service inspections under Guide YVL E.5. [2019-03-15 ]

702. The licensee shall seek STUK's approval for changes that affect the following information of the approval decision:

- a. The name of the testing organisation changes.
- b. A testing method is removed or replaced.
- c. The person responsible for technical matters is replaced.

In these cases, the period of validity of the approval decision concerning the testing organisation remains in force as defined in the earlier decision. [2019-03-15 ]

703. The licensee shall submit to STUK for information the annual evaluation reports which are prerequisites for the testing organisation's approval by the end of April in the year following the first full operating year. If this procedure is not followed, STUK may withdraw its approval by issuing a decision. [2019-03-15 ]

704. The annual evaluation report shall include the following information:

- a. A description of the implementation and results of the periodic assessments by an accreditation body or a notified body meeting the requirements of this Guide.
- b. An up-to-date list of testers.
- c. Annual customer feedback from the licensee and the actions taken based on the feedback.
- d. The licensee's own assessment of the operation of the testing organisation. [2013-11-15 ]

705. When the approval of a testing organisation is based on accreditation, the licensee shall submit to STUK for information the accreditation decision of the testing organisation, the licensee's estimate of the independence of the testing organisation and, for NDT testing organisations, a list of testers, as well as a notification concerning any changes to the testing organisation's accreditation. [2014-05-20 ]

706. The licensee shall submit to STUK for information a notification of changes related to the operational requirements set for material manufacturers in paras. 603 and 604. [2013-11-15 ]

## **8 Regulatory oversight by the Radiation and Nuclear Safety Authority**

801. Via a decision it issues and on application by the licensee, STUK approves the testing organisations, the amendments related to the prerequisites of approval of testing organisations, and the applications concerning the applicability of the additional qualifications of testers performing in-service inspections under Guide YVL E.5. [2013-11-15 ]

802. STUK processes as received for information the accreditation decisions of testing organisations approved on the basis of accreditation, estimates of the independence, the lists of testers and any related changes, the annual evaluation reports required by the testing organisation's approval, and the notifications concerning changes to the operational prerequisites of material manufacturers. [2014-05-20 ]

803. STUK supervises the operation of the testing organisations it has approved as part of its own inspection activities and by means of control visits related to the testing organisations' operation within the scope it considers necessary.

The supervision covers the following issues, for instance:

- a. Efficiency of the quality management system.
- b. Reliability of testing activities.
- c. Implementation of training.
- d. General arrangements of testing activities.
- e. Reporting of the results.
- f. Compliance with the conditions stated in the approval decision concerning a testing organisation.
- g. Implementation of the accepted testing plans.
- h. The validity of the provisions, regulations and standards available to the testers.

[2019-03-15 ]

804. STUK supervises that the requirements set in the Guide are met through document reviews and construction inspections, and as part of the construction and periodic inspection programmes. [2013-11-15 ]

805. When maintaining the pressure equipment register, STUK inspects the qualification of testers performing non-destructive testing related to periodic inspections of pressure equipment subject to registration. [2019-03-15 ]

806. During the review of the condition monitoring results, STUK inspects the qualifications of NDT testers performing condition monitoring. [2013-11-15 ]



807. Pursuant to the Nuclear Energy Act, STUK may withdraw its approval of a testing organisation if the operation of the testing organisation falls short of the stipulated requirements and conditions or those established in the approval decision. If justified by reasons pertaining to the assurance of safety, STUK may, having granted the corporation or establishment concerned a hearing, change the requirements and conditions established in its approval decision.

[2019-03-15 ]

## 9 ANNEX A Component and safety class-specific division related to non-destructive and destructive testing at the material manufacturing phase

### A01. Pressure vessels and heat exchangers

Component or part		Group 1	Group 2	Group 3	
<b>Pressure vessels and heat exchangers</b>	Pressurised main components and internals of main components	<ul style="list-style-type: none"> <li>• Casing</li> <li>• Ends</li> <li>• Body flanges</li> <li>• Tube bundle</li> <li>• Tubular plate</li> </ul>	<ul style="list-style-type: none"> <li>• Main components of primary coolant circuit</li> <li>• SC 1 and SC 2 non-standardised parts</li> <li>• Parts with LBB design basis</li> <li>• Manhole bolting in reactor, steam generator, and pressuriser</li> </ul>	Main components of primary coolant circuit; standardised parts	Other parts
	Other pressure retaining parts	<ul style="list-style-type: none"> <li>• Nozzles</li> <li>• Flanges</li> <li>• Manhole covers</li> </ul>		SC 1: DN > 50 SC 2: DN > 100	Other parts
		<ul style="list-style-type: none"> <li>• Nuts and bolts</li> </ul>		M > 50	Other sizes
	Parts welded onto pressure retaining body			SC 2 supports for main components	Other parts
	Primary coolant circuit	<ul style="list-style-type: none"> <li>• internals of main components</li> <li>• supports for main components</li> </ul>	Reactor pressure vessel core support structures	SC 2 supports Steam separator Steam dryer Feedwater sparger	Other parts

#### Abbreviations

LBB: Leak Before Break

M: Metric thread

DN: Nominal diameter

[2019-03-15 ]

## A02. Piping

Component or part		Group 1	Group 2	Group 3	
<b>Piping</b>	Main coolant piping; piping with LBB design basis; non-standardised parts	<ul style="list-style-type: none"> <li>• Pipes</li> <li>• Forged or formed adapters (tapers, T pieces, bends)</li> <li>• Flanges</li> </ul>	SC 1: DN > 50 SC 2: DN > 100	SC 1 and SC 2 other sizes	Other parts
	Other pressure retaining piping	<ul style="list-style-type: none"> <li>• Pipes</li> <li>• Forged or formed adapters (tapers, T pieces, bends)</li> <li>• Flanges</li> </ul>		SC 1: DN > 50 SC 2: DN > 100	Other parts
		<ul style="list-style-type: none"> <li>• Nuts and bolts</li> </ul>		M > 50	Other sizes
	Parts welded onto pressure retaining piping				All parts
	Whip restrains and supports			Main coolant piping	Other parts

### Abbreviations

LBB: Leak Before Break

M: Metric thread

DN: Nominal diameter

[2019-03-15 ]

### A03. Valves

Component or part			Group 1	Group 2	Group 3
<b>Valves</b>	Pressure retaining parts	Valve bodies (forged and cast): <ul style="list-style-type: none"> <li>• Primary coolant circuit</li> <li>• Systems with LBB design basis</li> <li>• Non-standardised valves</li> </ul>	SC 1: DN > 50 SC 2: DN > 100	SC 1 and SC 2 other sizes	Other parts
		<ul style="list-style-type: none"> <li>• Nozzles</li> <li>• Bonnet</li> <li>• Flanges</li> </ul>		SC 1: DN > 50 SC 2: DN > 100	Other parts
		<ul style="list-style-type: none"> <li>• Nuts and bolts</li> </ul>		M > 50	Other sizes
		<ul style="list-style-type: none"> <li>• Obturators of isolation valves</li> </ul>		Pressure retaining parts	Other parts
	Parts welded onto pressure retaining body	<ul style="list-style-type: none"> <li>• Supports</li> </ul>			All parts
Functional parts	<ul style="list-style-type: none"> <li>• Obturators of valves</li> <li>• Stem and sealing bellows</li> <li>• Other parts of the valve obturator</li> <li>• Control and adjustment unit parts (safety valves, blow-off valves)</li> </ul>			All parts	

#### Abbreviations

LBB: Leak Before Break

M: Metric thread

DN: Nominal diameter

[2019-03-15 ]

## A04. Pumps

Component or part			Group 1	Group 2	Group 3
<b>Pumps</b>	Pressure retaining parts	Pump housings (forged and cast):	SC 1: DN > 50 SC 2: DN > 100	SC 1 and SC 2 other sizes	Other parts
		<ul style="list-style-type: none"> <li>• Primary coolant circuit</li> <li>• Systems with LBB design basis</li> <li>• Non-standardised pumps</li> </ul>			
		<ul style="list-style-type: none"> <li>• Nozzles</li> <li>• Bonnet</li> <li>• Flanges</li> </ul>		SC 1: DN > 50 SC 2: DN > 100	Other parts
		<ul style="list-style-type: none"> <li>• Nuts and bolts</li> </ul>		M > 50	Other sizes
	Parts welded onto pressure retaining body	<ul style="list-style-type: none"> <li>• Supports</li> <li>• Measuring pockets and fasteners</li> </ul>			All parts
Functional parts	<ul style="list-style-type: none"> <li>• Impeller</li> <li>• Shaft</li> <li>• Bearings</li> <li>• Guide vanes</li> <li>• Coupling</li> </ul>			All parts	

### Abbreviations

LBB: Leak Before Break

M: Metric thread

DN: Nominal diameter

[2019-03-15 ]

A05. Requirements for material certificates are set forth in the component-specific YVL Guides of E-series. [2019-03-15 ]

## 10 References

1. Nuclear Energy Act (990/1987). [2013-11-15 ]
2. Nuclear Energy Decree (161/1988). [2013-11-15 ]
3. Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018). [2019-03-15 ]
4. Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018). [2019-03-15 ]
5. Pressure Equipment Act (1144/2016). [2019-03-15 ]
6. Government Decree on conventional pressure equipment at nuclear facilities (1548/2016). [2019-03-15 ]
7. SFS-EN ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories. [2013-11-15 ]
8. SFS-EN ISO/IEC 17020, Conformity assessment. Requirements for the operation of various types of bodies performing inspection. [2013-11-15 ]
9. SFS-EN ISO 9712, Non-destructive testing. Qualification and certification of NDT personnel. General principles. [2013-11-15 ]
10. SFS-EN ISO 9001, Quality management system. Requirements. [2013-11-15 ]
11. Pressure Equipment Directive (2014/68/EU). [2019-03-15 ]
12. SFS-EN ISO/IEC 17024, Conformity assessment. General requirements for bodies operating certification of persons. [2019-03-15 ]

# Definitions

---

## **Accreditation**

Accreditation shall refer to third-party attestation related to conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks. (SFS-EN ISO/IEC 17000, 2005).

## **Concrete structure**

Concrete structure shall refer to concrete, reinforced concrete and prestressed concrete structures.

## **Indirect visual testing**

Indirect visual testing shall refer to an inspection performed using e.g a boroscope, endoscope, fibre optics, binoculars or a TV camera. An automated control and data recording system, manipulator, or robot may be used to assist in the inspection.

## **Notified body**

Notified body shall refer to a notified body as referred to in Article 12 of the Pressure Equipment Directive (2014/68/EU).

## **Qualification**

Qualification is normally used as a synonym for “validation” in YVL-guides. Qualification shall refer to confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

## **Condition monitoring**

Condition monitoring shall refer to the determining of the operability of a SSC.

## **Maintenance**

Maintenance shall refer to the planned service of SSC to reduce the probability of failure in advance, or the overhaul or repair of a SSC undertaken on the basis of observed needs.

## **Quality management system**

Quality management system shall refer to a management system to direct and control an organisation with regard to quality. (SFS-EN ISO 9000:2015).

## **Licensee**

Licensee shall refer to the holder of a licence entitling to the use of nuclear energy. (Nuclear Energy Act 990/1987)

### **Material manufacturer**

Material manufacturer shall refer to an individual or organisation producing material, in basic product form, used in the manufacturing of a component or structure.

### **Mechanical component**

Mechanical components shall refer to, for example, internals of reactor pressure vessel, control rod drives, pumps, motors, filters, valve actuators, cranes, load lifting attachments, fuel handling equipment, final disposal canisters, fans, and air ducts.

### **Pressure equipment**

Pressure equipment shall refer to a vessel, piping and other technical assembly, in which overpressure exists, or in which it may develop, as well as the technical assemblies designed to protect pressure equipment, including elements attached to pressure retaining parts such as flanges, nozzles, couplings, supports, lifting lugs etc.

### **Qualification (personnel)**

Qualification shall refer to a demonstrated ability to apply knowledge and skills. (SFS-EN ISO 9000:2015)

### **Pressure equipment subject to registration**

Pressure equipment subject to registration shall refer to pressure equipment to be registered under Section 51 of the Pressure Equipment Act (1144/2016).

### **Non-destructive testing**

Non-destructive testing shall refer to inspections that do not essentially alter the geometry and size of the item inspected.

### **Destructive testing (DT)**

Destructive testing shall refer to inspections performed in order to determine the mechanical characteristics of a item and which destroy or transform the geometry of the piece inspected.

### **Standardised component**

Standardised component shall refer to a component dimensioned in accordance with the standards applied that is chosen for the intended location of use based on the determined value of its nominal size, pressure rating class, property class etc.

### **Direct visual testing**

Direct visual testing shall refer to inspections performed without the use of additional instruments (with the exception of light sources, mirrors and magnifying glasses).

### **Inspection**



Inspection shall refer to the examination of components or structures and related designs and processes as well as the verification of their conformity to requirements in terms of the requirements presented in STUK's decisions, the YVL Guides and the design bases.

### **Non-nuclear pressure equipment**

Non-nuclear pressure equipment shall refer to pressure equipment classified in class EYT under Guide YVL B.2.

### **Steel structure**

Steel structure shall refer to structural steel components that are delivered as construction products. Typical steel structures of nuclear facilities include: load-bearing structures of buildings, load-bearing steel structures of the concrete reactor containment, vessels subject to hydrostatic pressure, piping break supports, missile protectors, storage racks for fresh and spent fuel, gates and linings of spent fuel pools, crane rail supports, doors and hatches, steel platforms and spent fuel handling equipment and crane rails.

### **Testing**

Testing shall refer to determining one or more characteristics of an object evaluated for conformity to requirements (SFS-EN ISO/IEC 17000, 2005).

### **Testing organisation**

Testing organisation shall refer to an organisation performing testing activities requiring special competence. (Nuclear Energy Act 990/1987)

### **Nuclear facility's pressure equipment**

Nuclear facility's pressure equipment shall refer to nuclear and non-nuclear pressure equipment at a nuclear facility.

### **Nuclear facility**

Nuclear facility shall refer to the facilities used for the generation of nuclear energy, including research reactors, facilities for the large-scale disposal of nuclear waste, and facilities for the large-scale production, use, processing or storage of nuclear material and nuclear waste.

However, nuclear facility shall not refer to:

- a) mines or ore processing plants intended for the production of uranium or thorium, or premises and locations including their precincts where nuclear wastes from such facilities are stored or deposited for final disposal; or
- b) facilities and premises that have been permanently closed and where nuclear waste has been disposed in a manner approved as permanent by the Radiation and Nuclear Safety Authority; or

c) premises or parts of a nuclear facility that have been decommissioned in a manner approved by the Radiation and Nuclear Safety Authority. (Nuclear Energy Act 990/1987)

**Nuclear pressure equipment**

Nuclear pressure equipment shall refer to pressure equipment classified in safety class 1, 2 or 3 under Guide YVL B.2.