GUIDE YVL E.3

PRESSURE VESSELS AND PIPING OF A NUCLEAR FACILITY

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 and 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 are binding on the licence holder, while preserving the licence holder's right to propose an alternative procedure or solution to that provided for in the regulations. If the licence holder can convincingly demonstrate that the proposed procedure or solution will implement safety standards in accordance with this Act, the Radiation and Nuclear Safety Authority may approve the procedure or solution.*

With regard to new nuclear facilities, this Guide shall apply as of 1 January 2020 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.3 (15.11.2013).

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1 Introduction

101. By virtue of Section 63(1)(3) of the Nuclear Energy Act (990/1987), the Radiation and Nuclear Safety Authority is authorised to *require that nuclear fuel or the structures and components intended as parts of the nuclear facility be manufactured in a manner approved of by the Radiation and Nuclear Safety Authority, and oblige the licence holder or licence applicant to arrange for STUK sufficient opportunity to control manufacture of the fuel or such structures and components.* **[**2019-12-15 **]**

102. According to Section 117 of the Nuclear Energy Decree (161/1988):
As regards pressure equipment, the Radiation and Nuclear Safety Authority (STUK) shall in particular:
1. set detailed requirements for the safety of nuclear pressure equipment;
2. carry out control and inspection to ensure that the design, manufacture, placement, installation, operation, maintenance and repair of nuclear pressure equipment comply with safety requirements and regulations;
3. set more detailed requirements for the manufacture of nuclear pressure equipment and for related quality assurance;
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. **[**2019-12-15 **]**

103. According to Section 4(2) of the Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (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.* **[**2019-12-15 **]**

104. According to Section 3 of the Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (Y/1/2018):
The safety of a nuclear facility shall be assessed when applying for a construction license and operating license, in connection with plant modifications, and at Periodic Safety Reviews during the operation of the plant. It shall be demonstrated in connection with the safety assessment that the nuclear facility has been designed and implemented in a manner that meets the safety

requirements. The safety assessment shall cover the operational states and accidents of the plant. The safety of a nuclear facility shall also be assessed after accidents and, whenever necessary, on the basis of the safety research results.
The nuclear facility's safety and the technical solutions of its safety systems shall be assessed and substantiated analytically and, if necessary, experimentally.
The analyses shall be maintained and revised as necessary, taking into account operating experience from the plant itself and from other nuclear facilities, the results of safety research, plant modifications, and the advancement of calculation methods.
The analytical methods employed to demonstrate compliance with the safety requirements shall be reliable, verified and validated for the purpose. The analyses shall demonstrate the conformity with the safety requirements with high certainty. Any uncertainty in the results shall be considered when assessing the meeting of the safety requirements. **[**2019-12-15 **]**

105. According to Section 5 of the Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (Y/1/2018), *the design, construction, operation, condition monitoring and maintenance of a nuclear facility shall provide for the ageing of systems, structures and components important to safety in order to ensure that they meet the design-basis requirements with necessary safety margins throughout the service life and decommissioning of the facility.*
Systematic procedures shall be in place for preventing such ageing of systems, structures and components which may deteriorate their availability, and for the early detection of the need for their repair, modification and replacement. Safety requirements and applicability of new technology shall be periodically assessed in order to ensure that the technology applied is up to date, and the availability of the spare parts and the system support shall be monitored.
[2019-12-15 **]**

106.According to Section 23 of the Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (Y/1/2018), *systems, structures and components important to the safety of a nuclear facility shall be available as detailed in the design basis requirements. Operability and the effects of the operating environment shall be monitored by means of inspections, tests, measurements and analyses. Operability shall be checked in advance by regular maintenance, and provisions shall be made for maintenance and repairs in the event of any deterioration in operability. Condition monitoring and maintenance shall be planned, supervised and implemented so that the integrity and operability of systems, structures and components are reliably preserved throughout their service life.* **[**2019-12-15 **]**

107. According to Section 60 of the Nuclear Energy Act, *the Radiation and Nuclear Safety Authority shall control the pressure equipment of a nuclear facility, which includes:*
1) pressure equipment, failure of which may cause an emission of radioactivity (nuclear pressure equipment); and
2) pressure equipment of a nuclear facility other than the pressure equipment referred to in paragraph 1 that is classified to be controlled on the basis of its significance to safety (ordinary pressure equipment).
Unless otherwise provided in or under this Act, the pressure equipment of a nuclear facility shall be governed by the Pressure Equipment Act (1144/2016). **[**2019-12-15 **]**

107a. According to Section 60(1–2) of the Nuclear Energy Act, *in derogation from the Pressure Equipment Act, with regard to the pressure equipment of a nuclear facility:*
1) the control authority shall be the Radiation and Nuclear Safety Authority;
2) the licence holder shall apply for registration of pressure equipment with the Radiation and Nuclear Safety Authority;
3) a registration number or the following in-service inspection shall not be marked on the pressure equipment or its data plate.
The obligations of a licence holder shall be governed by the provisions of the Pressure Equipment Act on the obligations of an owner and a holder. A commissioning inspection shall be governed by the provisions of the Pressure Equipment Act on the first in-service inspection.
[2019-12-15 **]**

108. In accordance with Section 6 of the Government Degree on Pressure Equipment Safety (1549/2016) [4], pressure vessels are divided into types of pressure equipment subject and not subject to registration, based on their operating parameters and contents. **[**2019-12-15 **]**

109. According to Section 60 a(1–5) of the Nuclear Energy Act:
The Radiation and Nuclear Safety Authority shall approve the manufacturer of nuclear pressure equipment for its duties and the inspection organisation, the testing organisation and the qualification body for performing duties that are part of the inspection activity for pressure equipment, steel and concrete structures and mechanical devices of nuclear facilities to the extent indicated by the Radiation and Nuclear Safety Authority. The Radiation and Nuclear Safety Authority shall oversee the operations of the manufacturer, the inspection organisation, the testing organisation and the qualification body.
A precondition for the approval of the inspection organisation, the testing organisation and the qualification body shall be that they are operationally and financially independent and that they

have taken out liability insurance. In addition, the manufacturer, the inspection organisation, the testing organisation and the qualification body shall have an advanced quality system, competent and experienced personnel and duly qualified methods, facilities and equipment required by manufacture and operations. Further provisions on the approval procedure referred to in subsection 1 shall be issued by a government decree.
If the manufacturer of pressure equipment, the inspection organisation, the testing organisation or the qualification body no longer fulfils the preconditions of approval or if it has materially neglected or breached an obligation or restriction provided in or under this Act or a provision issued in a decision and the cautions or reprimands issued have not led to rectification of the shortcomings in the operations, the Radiation and Nuclear Safety Authority may cancel its approval. If there are reasonable grounds with a view to ensuring safety, the Radiation and Nuclear Safety Authority may, after reserving for the body or facility a possibility to be heard, change the requirements or terms set in the decision on approval.
The Radiation and Nuclear Safety Authority shall determine nuclear pressure equipment of minor significance with regard to safety, the manufacturer or testing organisation of which need not be approved for their tasks as provided in subsection 1 as well as, on corresponding grounds, the steel and concrete structures and mechanical devices the testing organization of which need not be approved for its duty as provided in subsection 1. In this respect, the Radiation and Nuclear Safety Authority shall set the necessary requirements regarding the competence of the manufacturer and the testing organization whose fulfilment shall be indicated by the licence holder.
The Radiation and Nuclear Safety Authority may require that a recognized third-party organization controlling the manufacture of nuclear pressure equipment of significance to safety shall have the competence of a notified body or other corresponding applicable competence.
[2019-12-15 **]**

109a. The division of inspection responsibilities for safety-classified pressure vessels and piping (STUK/AIO/LH) is determined by Annex C of the Guide. **[**2019-12-15 **]**

110. According to Section 117 a(2) of the Nuclear Energy Decree, *the manufacturer of nuclear pressure equipment must, if required, be able to demonstrate that a piece of pressure equipment and its design and manufacture meet the requirements set for the safe use of nuclear energy.* **[**2013-11-15 **]**

111. According to Section 113 of the Nuclear Energy Decree: *Non-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.* **[**2013-11-15 **]**

112. Within the EU, the non-nuclear pressure equipment of a nuclear facility is brought to the market in accordance with the Pressure Equipment Directive 2014/68/EU [5], and the inspections related to their design and manufacture are performed by notified bodies, user inspectorates and certification bodies referred to in the Pressure Equipment Act (1144/2016) [6] and in the Act on Notified Bodies Concerning Certain Product Groups (278/2016) [7] . The Government Degree on Pressure Equipment (1548/2016) [8], and the Government Degree on Pressure Equipment Safety (1549/2016) [4], also apply to non-nuclear pressure equipment. **[**2019-12-15 **]**

113. If a pressure vessel or piping contains a dangerous liquid or gas, the requirements of the Chemicals Act (599/2013) [9], the Act on the safe handling of dangerous chemicals and explosives (390/2005) [10], and the Decree (685/2015) [11] issued by virtue of the two Acts shall be applied in addition to the provisions of this Guide. **[**2019-12-15 **]**

2 Scope of application

201. The requirements of this Guide apply to the pressure vessels (including heat exchangers) and piping of nuclear facilities, and the materials and test pieces required for their manufacture and for the qualifications of the manufacture. The requirements shall be applied to both built-to-order and serially manufactured pressure vessels; however, the requirements pertaining to procurement of a serially manufactured pressure vessel are presented separately in Annex E. The Guide also covers the pressure vessels and piping that are related to the auxiliary systems of emergency power supplies described in Guide YVL E.10, “Emergency power supplies of a nuclear facility”. This Guide only applies to pressure vessels and piping with the maximum allowable operating pressure of more than 0.5 bar [5]. The Guide does not apply to transportable pressure vessels, pressure vessels and piping only needed in the construction of a nuclear facility or temporarily serving maintenance duties, or other pressure vessels and piping excluded from regulatory control and inspections by virtue of the safety classification document of the facility. Pressure equipment excluded from regulatory control and inspections shall be operated and inspected in accordance with the Pressure Equipment Act [6]. Furthermore, the Guide does not apply to ventilation and air-conditioning equipment whose requirements are discussed in the Guide YVL E.13, “Ventilation and air-conditioning equipment of a nuclear facility”. **[**2019-12-15 **]**

202. The system design requirements forming the foundation for equipment design are presented in the YVL B series Guides. **[**2013-11-15 **]**

203. Pressure vessels and piping classified into safety classes 1, 2, and 3 are considered nuclear pressure vessels and piping; pressure vessels and piping classified into safety class EYT are considered non-nuclear pressure equipment. The requirements for safety classification are presented in Guide YVL B.2, “Classification of systems, structures and components of a nuclear facility”. **[**2019-12-15 **]**

204. The requirements set for pressure vessels are also applied to the internal structures of the reactor pressure vessel (including control rod drives), of the steam generator and of the pressuriser, and to the steam boiler, of a nuclear power plant. **[**2019-12-15 **]**

205. The requirements set forth for pressure vessels are also applied to the design, manufacture and inspections of the steel containment, and the steel penetrations of the concrete containment, of a nuclear power plant unit. Guide YVL E.6, “Buildings and structures of a nuclear facility”, sets forth requirements for the steel, concrete, and composite structures of the containment. Guide YVL E.6 gives the requirements for non-pressurised (operating

pressure ≤ 0.5 bar g) vessels and piping. If a non-pressurised vessel or non-pressurised piping is to be manufactured and put into service using the requirements of Guide YVL E.3 in accordance with requirement 208 of Guide YVL E.6, the licensee shall specify a nominal design overpressure for the vessel or piping for the purpose of design. The nominal overpressure shall be sufficiently high so that the vessel or piping using it as input data complies with the same safety level as a non-pressurised vessel or non-pressurised piping manufactured in accordance with Guide YVL E.6. **[**2019-12-15 **]**

206. Removed. **[**2019-12-15 **]**

207. The licensee sets forth the detailed requirements for non-nuclear pressure equipment in its requirement specifications. However, this Guide sets forth requirements related to the commissioning and periodic inspections of pressure equipment subject to registration and classified into safety class EYT, as well as the division of inspection responsibilities in class EYT. **[**2013-11-15 **]**

208. The Guide is applied to nuclear facilities, unless it is expressly stated that the requirement only applies to nuclear power plants. **[**2013-11-15 **]**

209. The requirements set forth in the Guide are applied to the licensee and, where applicable, to the licence applicant, plant or equipment supplier, and manufacturers of pressure vessels and piping. **[**2013-11-15 **]**

210. The Guide covers the entire life cycle of the pressure vessels and piping, including the requirement specification, approval of the manufacturers of the pressure equipment and materials used, design, manufacture, installation, construction and commissioning inspection, periodic inspections, maintenance, modifications and decommissioning. **[**2019-12-15 **]**

211. Guide YVL E.8, “Valves of a nuclear facility”, sets forth the requirements for the valves which are regarded as pressure accessories, and Guide YVL E.7, “Electrical and I&C equipment of a nuclear facility”, sets forth the requirements for electrical and instrumentation and control equipment related to the operation of pressure equipment. Guide YVL E.9, “Pumps of a nuclear facility”, applies to the pumps of a nuclear facility. The requirements for ventilation and air conditioning equipment are presented in Guide YVL E.13, “Ventilation and air conditioning equipment of a nuclear facility”. **[**2019-12-15 **]**

212. The requirements for the licensee’s and supplier’s management system processes and functions are presented in Guide YVL A.3, “Leadership and management for safety”. Guide YVL A.5, “Construction and commissioning of a nuclear facility”, sets requirements for the

construction of a new nuclear facility and plant modifications at existing facilities. In this Guide, the requirements of Guide YVL A.5 are taken to also apply to individual deliveries of equipment, where applicable. **[**2019-12-15 **]**

213. The strength analyses of pressure vessels and piping are discussed in Guide YVL E.4, “Strength analyses of nuclear power plant pressure equipment”. Guide YVL C.1, “Structural radiation safety at a nuclear facility” covers system design and material selection for equipment from a radiation safety viewpoint. **[**2019-12-15 **]**

214. Guide YVL A.8, “Ageing management of a nuclear facility”, discusses ageing management, and Guide YVL E.5, “Inservice inspection of nuclear facility pressure equipment with non-destructive testing methods”, contains provisions for non-destructive in-service inspection performed on pressure equipment from the perspective of nuclear safety. **[**2019-12-15 **]**

215. Guide YVL D.4, “Predisposal management of low and intermediate level nuclear waste and decommissioning of a nuclear facility”, presents the structural and other requirements related to the decommissioning of a nuclear facility. Guides YVL D.5, “Disposal of nuclear waste” and YVL D.7, “Release barriers of spent nuclear fuel disposal facility”, sets forth the requirements pertaining to the final disposal of nuclear waste during the decommissioning of a nuclear facility. **[**2019-12-15 **]**

216. In accordance with this Guide, inspections of the pressure vessels and piping of a nuclear facility are performed either by STUK or inspection organisations approved under Guide YVL E.1, “Authorised inspection body and the licensee’s in-house inspection organisation”. The principles for the division of inspection responsibilities between STUK and the inspection organisations with regard to the inspection of pressure vessels and piping are presented in the annexes to this Guide. The approval of testing organisations is presented in Guide YVL E.12, “Testing organisations for mechanical components and structures of a nuclear facility”. **[**2019-12-15 **]**

217. Guide YVL A.1, “Regulatory oversight of safety in the use of nuclear energy”, sets forth requirements concerning the documents to be submitted to STUK. **[**2019-12-15 **]**

3 Equipment requirement specification for pressure vessels and piping

301. For the procurement of a nuclear facility's safety classified pressure vessels and piping, the licensee shall have in place a general requirement specification for pressure vessels and piping based on its management system, containing the design and inspection requirements for each equipment group and safety class. The classification of the requirements is discussed in Guide YVL A.3. **[**2019-12-15 **]**

302. In procurement, the requirement specification for equipment shall be the basic design and inspection requirement that the licensee shall supplement in the procurement documents with the necessary requirements resulting from the intended location of use, for example. In addition to the safety class of the pressure vessel or piping, the requirements can also be proportioned part-specifically, in which case the requirement level depends on the significance of the part to the fulfilment of the design bases of the pressure vessel or piping. **[**2019-12-15 **]**

303. The licensee shall define the set of standards to be used for the design, manufacture, testing and installation of pressure vessels and piping for each facility on the basis of the YVL Guides. If the set of standards used in manufacture and testing differs from that used in design, the licensee shall ensure that the requirement level does not fall below the level specified in either set of standards. **[**2013-11-15 **]**

304. The licensee shall acquire approval from STUK for the set of standards used for nuclear pressure equipment, separately for each facility. According to Guide YVL B.1, "Design of the safety systems of a nuclear facility", a description of the key sets of standards to be complied with in system design and manufacture shall be supplied at a general level in conjunction with the application for a decision-in-principle; a more detailed description shall be provided in connection to the application for a construction licence. The licensee shall have in place a set of standards concerning normal pressure equipment.
The general component requirement specification, its reference documents, and any updates thereto shall be approved by STUK before they are used as the requirement basis of pressure vessels and piping. **[**2019-12-15 **]**

305. By means of the requirement specification for pressure vessels and piping, the licensee shall ensure that the requirements set forth in the YVL Guides and STUK's decisions are brought to the attention of the plant and equipment suppliers. **[**2013-11-15 **]**

306. The licensee shall have in place the procedures required in Guides YVL A.3 and YVL A.5 for the management of non-conformities. STUK's approval shall always be obtained for

deviations from the requirement level of the YVL Guides and STUK-approved specifications. Other deviations may also be approved by an authorised inspection organisation (AIO) authorised by STUK or the licensee's own inspection organisation (UI) according to the approved division of inspection responsibilities. **[**2019-12-15 **]**

307. The manuals and instructions related to the licensee's management system and other documents containing requirement specifications for equipment shall be submitted to STUK following the guidelines laid down in Appendix A to Guide YVL A.1. **[**2013-11-15 **]**

308. As part of the requirement specification for equipment, the licensee shall have a general inspection plan that presents the inspections and control of manufacturing that are performed on the pressure vessels and piping, and components thereof, of a nuclear facility. **[**2019-12-15 **]**

309. The general inspection plan shall define the inspection and supervision sequences which are either witness points (W) or hold points (H) to STUK or an inspection organisation approved under Guide YVL E.1, a recognized third party, the licensee, and other parties. **[**2019-12-15 **]**

310. The requirements in the general inspection plan shall be presented for each safety class. The scope of inspection and supervision shall also take other factors apart from the safety classification into consideration. **[**2019-12-15 **]**

311. The general inspection plan shall cover the stages from material procurement to the commissioning of the equipment, and it shall serve as the minimum requirement level when drawing up equipment-specific construction plans.
The minimum scope of supervision by STUK, an authorised inspection body, a third party or the licensee in the deliveries of nuclear pressure vessels and piping is presented in Annex A.
[2019-12-15 **]**

312. The general inspection plan shall present the reporting requirements and procedure references (with exception of procedures set by manufacturer) concerning the inspections and testing defined in the plan. The inspection and testing procedures included in the plant instruction manuals shall be appended to the inspection plan, except for standards and other reference documentation that are generally available. STUK may require a testing extent exceeding the requirements of the standards. **[**2019-12-15 **]**

313. Removed. **[**2019-12-15 **]**

314. Possible equipment requirement specifications of the plant or component supplier shall not contradict the licensee's general equipment requirement specification. **[**2019-12-15 **]**

315. Removed. **[**2019-12-15 **]**

4 Manufacturer

4.1 General requirements for the manufacturers of nuclear pressure vessels, piping and piping components

401. Guide YVL A.3 specifies the requirements for the management system of the manufacturer of a nuclear pressure vessel, piping and piping components. The design of pressure equipment is part of the manufacture. The manufacturer shall have in place a management system that is appropriately certified. Otherwise, the licensee may apply for STUK's approval for other management system assessment performed by an independent third party. **[**2019-12-15 **]**

402. Removed. **[**2019-12-15 **]**

403. Removed. **[**2019-12-15 **]**

404. The quality management system used by a manufacturer performing welding in safety classes 1, 2 and 3 shall take into account the requirements of standard SFS-EN ISO 3834-2 [13]. In its quality management system, a manufacturer performing heat treatment in connection with welding and allied processes shall observe the requirements of standard SFS-EN ISO 17663 [14]. **[**2019-12-15 **]**

404a. Guide YVL A.3 also presents the licensee with requirements concerning the supplier selection procedure. Before the manufacturer approval, the licensee shall audit all management systems of safety class 1 pressure equipment manufacturers and those safety class 2 pressure equipment manufacturers that use special processes requiring manufacturer approval in accordance with this Guide. The auditing requirement of pressure equipment manufacturers only concerns material manufacturers of main components. **[**2019-12-15 **]**

405. The manufacturer shall have in place systematic and documented procedures for the assessment, selection and supervision of its subcontractors. **[**2013-11-15 **]**

406. The manufacturer shall evaluate the effectiveness of the subcontractor's management system and ascertain that the subcontractor has the prerequisites for delivering products or services that satisfy all requirements.
The same regulations and obligations shall apply to both the manufacturer proper and the subcontractors involved in the manufacture. The manufacturer shall also be responsible for the work of the subcontractor. **[**2019-12-15 **]**

407. The manufacturer shall have documented requirements and procedures in place for the qualification of manufacturing procedures and personnel, for the manufacture itself, for testing, and for the processing of non-conformities. **[**2013-11-15 **]**

408. The manufacturer shall have in place procedures for monitoring the validity of the approved manufacturing procedures and personnel qualifications. **[**2013-11-15 **]**

409. The manufacturer shall employ professional, experienced personnel, and appropriately qualified procedures, tools and equipment required for the activities. **[**2013-11-15 **]**

410. The manufacturer shall maintain a list of the persons who are authorised to transfer material identification markings. **[**2013-11-15 **]**

411. The manufacturer shall submit to the licensee the necessary information to either apply for the approval required under chapter 4.2, or, if a separate approval is not required, be appended to the construction plan. The manufacturer shall keep the information provided to the licensee up-to-date. **[**2019-12-15 **]**

4.2 Approval of a nuclear pressure equipment manufacturer for special processes

4.2.1 Requirements

412. Whenever special processes are used in the manufacture or installation of nuclear pressure vessels, piping components or piping, the licensee shall apply for STUK's approval for the manufacturer and subcontractors separately for each location. The one-time approval may be applied for separately or in connection with the construction plan. On application by the licensee, STUK may issue separate decisions to define the pressure vessels, piping components and piping which have a minor impact on nuclear safety, and for which no separate manufacturer or subcontractor approval is required even if special processes are used in manufacture. **[**2019-12-15 **]**

413. The licensee shall keep the information provided in the application up-to-date. If essential changes take place in the preconditions for manufacture, the licensee shall inform STUK of them without delay. **[**2013-11-15 **]**

414. In assessing manufacturers of nuclear pressure vessels, piping components or piping, modules intended to verify the conformity to requirements of the equipment in accordance with pressure equipment legislation and which the manufacturer has in use may be utilised. If these modules are used, the manufacturer and the licensee shall assess in the application that the requirement level set forth in the YVL Guides is met. **[**2013-11-15 **]**

415. If the use of modules creates non-conformance from the requirement level of the YVL Guides, the manufacturer shall implement supplementary measures that result in the requirement level of the YVL Guides being achieved. A report on these measures shall be attached to the manufacturer approval application. **[**2019-12-15 **]**

416. If the manufacture is performed according to the standard, ASME Boiler and Pressure Vessel Code Section III [15] or another standard that has been approved by a nuclear energy authority, the licensee shall in the application demonstrate how the requirement level set forth in this YVL Guide is met. **[**2019-12-15 **]**

417. The manufacturer shall have in place qualified manufacturing procedures for the manufacture of nuclear pressure vessels, piping components or piping, or the preparedness to qualify the procedures before manufacture is started. The manufacturing procedures shall be qualified with the aid of procedure tests conducted under the supervision of a competent third-party supervisor. **[**2019-12-15 **]**

418. Persons making permanent joints shall be qualified under the supervision of a competent third-party supervisor, and, in addition to demonstrating the person's practical skills, the qualification shall verify the job knowledge of the person to be qualified concerning joining technology. Competent third parties for procedure and personal qualification include notified bodies and recognized third-party organisations (certification bodies) as defined in the Pressure Equipment Directive [5]. In addition to certification bodies accordant with the Pressure Equipment Directive, also other accredited certification bodies shall be accepted within the scope of their area of qualification. In such a case, the accreditation shall be covered by the Multilateral Agreements (MLA) or Mutual Recognition Arrangements (MRA) entered into by FINAS and the accreditation shall be conducted against the requirements of standard EN ISO/IEC 17020, 17021, 17024 or 17065. **[**2019-12-15 **]**

419. A manufacturer performing welding shall have available competent welding coordination personnel, who plan, draw up and qualify the necessary welding and work procedures according to the standard applied. **[**2013-11-15 **]**

4.2.2 Approval application

420. In the application, the licensee shall specify the equipment groups (pressure vessels, piping, safety accessories, and pressure accessories) and manufacturing processes which the application concerns. A summary of justifications shall be appended to the application (see chapter 7.2). **[**2019-12-15 **]**

421. For the approval of manufacturers of pressure vessels, piping components and piping belonging to safety classes 1 and 2, the licensee shall present in the application the following necessary information related to the evaluation of the manufacturer:
a. the Finnish Business ID of a manufacturer operating in Finland, or the corresponding information from similar registers that a company operating outside of Finland is registered in,
b. the location of manufacture and the premises and equipment used in manufacturing,
c. the management and quality management system, its certifications and other independent assessments, and the results of the assessments. Additionally, results of possible licensee's own audit,
d. the training of the personnel,
e. the organisation and resources,
f. the manufacturer's earlier experience of nuclear facilities,
g. the equipment group, the manufacture of which is concerned,
h. any external services, labour or equipment used by the manufacturer,
i. the quality management of the manufacturing processes,
j. the technical expertise concerning the manufacture of pressure equipment,
k. the information on the person responsible for the manufacture under chapter 4.2.3 and his/her substitute,
l. the procedure tests of the various manufacturing procedures performed and their supervision, and the licensee's opinion on their acceptability and suitability for the manufacture in question,
m. the qualification of the persons that make permanent joints,
n. the qualified manufacturing and welding procedures,
o. the procedures to verify the traceability of materials. **[**2019-12-15 **]**

422. For the approval of manufacturers of pressure vessels, piping components and piping belonging to safety class 3, the application shall contain a description of the following:
a. the quality management system for the manufacture of pressure equipment approved by a notified body or some other competent third party,
b. the meeting of the general manufacturer requirements set forth in Section 60a of the Nuclear

Energy Act,
c. the equipment group, the manufacture of which is concerned,
d. the person responsible for the manufacture and his/her substitute,
e. the procedure tests of the various manufacturing procedures performed and their supervision, and the licensee's opinion on their acceptability and suitability for the manufacture in question, and
f. the qualification of the persons that make permanent joints. **[**2019-12-15 **]**

423. The manufacturer approvals for special processes are licensee-specific, and they are valid for 5 years at a time at most. A new application for an extension of the period of validity of the approval shall be submitted by the licensee no later than three months before the period of validity of the approval expires. A separate manufacturer approval is not necessary for welds of small nozzles (DN32 or smaller), for cladding of sealing and guiding surfaces or for lock, spot and caulk welding. **[**2019-12-15 **]**

424. For a justified reason, a manufacturer approval application may be submitted for a single equipment delivery in conjunction with the construction plan. In such a case, the construction plan shall be submitted to STUK for approval, and the approval of the manufacturer shall be of a one-time nature. **[**2013-11-15 **]**

4.2.3 Requirements for the person responsible for the manufacture

425. Nuclear pressure vessels, piping components and piping shall be manufactured under the supervision of a person responsible for the manufacture who is proven to be competent for the task. STUK shall verify the competence of the person in question in conjunction with the manufacturer approval. **[**2013-11-15 **]**

426. If the manufacturer has several persons responsible for the manufacture, the area or object of responsibility of each person shall be clearly defined. **[**2013-11-15 **]**

427. Substitute(s) shall be named for the person(s) responsible for the manufacture. The same requirements shall apply to both the primary person responsible for the manufacture and his/her substitute. **[**2013-11-15 **]**

428. The person responsible for the manufacture shall have basic technical training, further training in the manufacturing technology in question, and at least two years of practical work experience in the design, manufacture or inspection of pressure equipment. **[**2013-11-15 **]**

429. The manufacturing technology training of persons responsible for welding and related heat treatment shall be the training described in Appendix A to standard SFS-EN ISO 3834-5 [16], or training that has similar contents and is documented and verified by examination. **[**2013-11-15 **]**

430. The person responsible for the manufacture shall be familiar with the Finnish nuclear energy legislation related to the pressure equipment manufactured, and with the YVL Guides. If the manufacture takes place at the plant site, the person responsible for the manufacture shall have knowledge of nuclear facilities. **[**2019-12-15 **]**

431. The person responsible for the manufacture of pressure vessels, piping components and piping in safety classes 1 and 2 shall have knowledge of the requirements set for the manufacture by the safety culture of a nuclear facility. **[**2019-12-15 **]**

432. The person responsible for the manufacture shall be employed by the manufacturer, and his/her place of work shall primarily be at the location of manufacture. **[**2013-11-15 **]**

433. The person responsible for the manufacture shall not work as an inspector or a tester of items for the manufacture of which he/she has been responsible. **[**2013-11-15 **]**

434. The person responsible for the manufacture shall participate in reviews concerning technical and administrative requirements, or the manufacturer's management system shall otherwise verify the correctness of the matters related to manufacture and processed in the reviews. **[**2019-12-15 **]**

4.2.4 The duties of the person responsible for the manufacture

435. The person responsible for the manufacture shall ensure that:
a. the conditions stated in the decision of approval issued by STUK are complied with and that the obligations imposed on the manufacturer in the YVL Guides are fulfilled,
b. the vessel, piping component or piping is manufactured in accordance with the accepted construction plan in a technically appropriate manner and in accordance with the regulations issued,
c. the persons making permanents joints have proper, valid certificates of qualification,
d. the manufacturing procedures have been appropriately qualified and proper instructions have been drawn up,
e. the equipment used in manufacture is maintained and its operability is checked at regular intervals,
f. the measuring devices have been calibrated,
g. the instructions given on the marking of materials are followed,

h. if heat treatment or hot working is included in the manufacturing process, the accuracy of the temperature-monitoring equipment is sufficient and the control and measuring devices have been regularly checked. **[**2013-11-15 **]**

436. Upon completion of the control of manufacturing of a pressure vessel, piping components or piping, the person responsible for the control of manufacturing shall draw up a declaration for each item of pressure equipment verifying that the manufacture has taken place in accordance with the requirements set forth in the approved construction plan and the YVL Guides. This declaration and the declaration of conformity (PED or standard) provided by an equipment supplier or plant supplier for a complete component shall not replace one another. **[**2019-12-15 **]**

437. The declaration shall present STUK's decisions pertaining to the construction plan of the equipment to be delivered, the meeting of the requirements set forth in the decisions, and the compliance to the YVL Guides concerning pressure equipment. **[**2013-11-15 **]**

438. A list of non-conformance reports related to the manufacture of the equipment shall be appended to the declaration. In essential parts, the non-conformances shall be closed. The processing status of open reports shall be presented. **[**2013-11-15 **]**

439. The declaration concerning a pressure vessel shall be given before the pressure test of the shell side. The declaration concerning piping components shall be given before the final construction inspection of factory manufacture, or before the pressure test, if a pressure test is performed on the components at the factory. If measures that change the structure of the pressure equipment are taken after the pressure test, the declaration issued shall be updated in this respect. **[**2019-12-15 **]**

440. For piping manufactured and installed at the plant site, the declaration shall be given before the pressure test. **[**2013-11-15 **]**

4.2.5 Obligations of a manufacturer approved for special processes

441. The manufacturer of nuclear pressure vessels, piping components or piping shall comply with the Nuclear Energy Act and the Nuclear Energy Decree, the Government Decree on the Safety of Nuclear Power Plants, and the YVL Guides, and decisions issued by STUK as well as any standards that have been or are stipulated to be followed. **[**2013-11-15 **]**

442. The manufacturer shall ensure that sufficient prerequisites exist for compliant operations and that manufacturing is carried out in accordance with the applicable regulatory requirements, decisions and manufacturing documents. **[**2019-12-15 **]**

443. The manufacturer shall submit to the licensee an annual report on the performance and results of the independent periodic audits of the management system. **[**2019-12-15 **]**

4.2.6 Obligations of the licensee

444. The licensee shall follow up on the realisation of the independent periodic inspections of the manufacturer's management system in order to ensure that the manufacturer maintains and adheres to its management system. **[**2019-12-15 **]**

445. These periodic inspections shall be conducted at such time intervals that a complete re-evaluation is carried out as a whole every three years. **[**2019-12-15 **]**

446. The licensee shall submit a summary of the annual assessments to STUK for information every calendar year. The annual assessment reports shall be submitted to STUK by the end of April in the following year as of the first full operating year. If this procedure is not followed, STUK may withdraw its approval by issuing a decision. **[**2019-12-15 **]**

447. The summary shall include the results of the licensee's own inspection visits and a statement on the fulfilment of the requirements and conditions established in the decision of approval, and of those set by the licensee itself. Requirements concerning the licensee's obligations in the management of the supply chain are presented in Guides YVL A.3 and YVL A.5. **[**2013-11-15 **]**

4.3 Manufacture of materials and standardised components

448. The manufacturers of materials and standardised components of nuclear pressure equipment shall adhere to the general requirements presented in chapter 4.1 of this Guide. **[**2019-12-15 **]**

449. Approval according to chapter 4.2 shall be applied for the manufacturers of materials and standardised components when manufacturing the following items:
a. welded ends of pressure vessels in safety classes 1 and 2,
b. welded heat delivery tubes of heat exchangers in safety classes 1 and 2,
c. other welded pipes in safety class 2, with the exception of piping materials that are part of a low-energy pipeline where the technical requirements of safety class 3 may be applied.
Guide YVL E.12 sets forth the requirements for the approval of testing organisations in the context of material manufacture. **[**2013-11-15 **]**

450. Manufacturers of other materials or standardised components of nuclear pressure vessels and piping (elbows, reducers, pipe tees) do not require approval from STUK. However, any

manufacturer of these components shall, in safety classes 1 and 2, meet the general requirements laid down in chapter 4.1 and the manufacturer must have approval for material manufacturing as set by used material standard. **[**2019-12-15 **]**

5 Construction materials and welding consumables

5.1 General requirements

501. The construction materials and welded joints of nuclear pressure vessels and piping shall meet the requirements for chemical and mechanical characteristics set forth in the material data. **[**2013-11-15 **]**

502. The selection of construction materials and welding consumables shall be based on the following criteria:
a. the safety class of the equipment or structure,
b. the significance of the part in the assembly,
c. the loading conditions,
d. the effect of operating temperature on strength,
e. operating conditions and environmental conditions, such as local corrosion phenomena, general corrosion, and the transfer of radioactivity,
f. requirements and limitations caused by manufacture and testing.
Guide YVL C.1 discusses the requirements imposed on material selection by radiation safety. **[**2013-11-15 **]**

503. The material testing methods and testing scope shall be defined by the safety class, material type and manufacturing method, operating conditions and dimensions. The scope of application of a construction material or welding consumables may require that the scope of the testing be extended from the provisions of the standard. **[**2013-11-15 **]**

504. The definition of the composition and impact toughness properties of materials subjected to significant neutron radiation during the operation of a nuclear power plant shall take into consideration the changes in the material properties due to neutron radiation. **[**2013-11-15 **]**

505. Non-metallic materials shall not be allowed in pressure vessels of safety classes 1 and 2. Separate justification shall be provided for them in safety class 3. **[**2019-12-15 **]**

506. Piping components made of austenitic cast steel shall not be used for locations that undergo in-service inspections under Guide YVL E.5, unless their inspectability can be reliably demonstrated. **[**2013-11-15 **]**

507. As a rule, plastic piping shall not be allowed in safety classes 1 and 2. However, plastic piping may be approved for seawater pipelines in safety class 2 if separate justification for its use is provided. **[**2013-11-15 **]**

508. No segmented bends, welded pipes or pipe bends shall be allowed in piping in safety class 1. Their use in safety class 2 may be approved with special justification. If pipes with longitudinal or spiral welds are used, the welds shall be subjected to 100% volumetric testing. **[**2013-11-15 **]**

5.2 Materials to be approved

509. Primarily, the materials used shall be materials generally approved for use in pressure equipment. These include

a. the materials compliant with the harmonised standards referred to in Section 24 of the Pressure Equipment Act (1144/2016) [6],

b. the materials approved under the European Approval for Materials (EAM) referred to in Section 24 of the Pressure Equipment Act (1144/2016) [6],

c. pressure equipment materials nationally standardised in the country of manufacture of the pressure equipment; however, for such materials it shall be demonstrated that they meet the requirements laid down for similar materials in the SFS-EN standards. **[**2019-12-15 **]**

510. For special reasons, materials other than those listed in the pressure equipment standards may be approved to be used in the manufacture of nuclear pressure equipment; these may include, for example, materials compliant with the material manufacturer's factory standard. For these, at least the following information shall be presented:

a. the process of manufacture of the material (melting process, method of deoxidation, vacuum treatments),

b. chemical composition of the material and the highest allowable concentration of impurities,

c. delivery state of the material (condition of forming, welding, heat treatment and surface treatment),

d. mechanical properties required of the material, with the approval limits (for example, yield and tensile strength, elongation to fracture, impact and fracture toughness, fatigue resistance, hot tensile strength, creep strength),

e. other guaranteed material properties, such as physical properties, strain ageing resistance and special requirements concerning the internal integrity of the material,

f. treatments allowed for the material that may alter the delivery state (forming, welding, heat treatment, surface treatment), and procedures and limitations concerning the treatments,

g. restrictions on the use of the material,

h. other information concerning the material.

When necessary, the information shall be supplemented with appropriate material and manufacturing technology tests. **[**2019-12-15 **]**

511. If a Particular Material Appraisal (PMA) in accordance with Section 7 of the Government Decree on Pressure Equipment [8] has been drawn up for nationally standardised pressure equipment materials and materials standardised under factory standards, the manufacturer of the pressure equipment shall include the results of the Particular Material Appraisal in the material specifications submitted. **[**2019-12-15 **]**

5.3 Approval of materials in various safety classes

512. In safety class 1, the plant supplier shall prepare equipment-specific specifications of the materials used; in other safety classes, the specifications shall be plant or equipment-specific. **[**2013-11-15 **]**

513. The specifications shall be submitted to STUK for approval prior to the submission of the construction plans. **[**2013-11-15 **]**

514. For the approval of materials used in pressure vessels and piping in safety class 1, an analysis shall be drawn up that justifies the selection of the material and demonstrates that a statistically significant sample of research data and operating experience documentation has been taken into consideration in the selection of the material. The evaluation shall take into account the variations taking place in production, and the allowed areas of use of the material. The key characteristics in terms of material selection include the following:

a. chemical composition of the material and the highest allowable concentration of impurities, microstructure and grain size,

b. maximum number of elements that may activate contained in materials used in the core area of the primary circuit or contained in materials introduced to the core area as corrosion products,

c. mechanical properties at room temperature and applicable elevated temperatures,

d. toughness properties (impact toughness, fracture toughness, crack arrest toughness, tearing resistance),

e. perpendicular strength and toughness properties, if necessary,

f. fatigue resistance under operating conditions,

g. creep strength, if necessary,

h. ageing resistance (strain ageing and thermal ageing),

i. hardenability,

j. weldability and inspectability,

k. effect of radiation on mechanical properties and on impact resistance (materials subjected to direct neutron radiation),
l. corrosion resistance,
m. effect of forming, welding and heat treatment on material properties. **[**2013-11-15 **]**

515. The same clarifications as for safety class 1 are required in safety class 2, if the assumed application of the material imposes additional requirements when compared to the standard. **[**2013-11-15 **]**

516. In safety classes 2 and 3, the suitability of the material for its specified application will be assessed during the processing of the construction plan. The suitability shall be justified if necessary. **[**2013-11-15 **]**

5.4 Approval of welding consumables

517. The welding consumables used for the welding of nuclear pressure vessels and piping shall be classified according to the applicable classification standards. The acceptable standards include: the SFS-EN standards and ASME Boiler and Pressure Vessel Code Section II C [17]. Other classification standards may also be used for justified reasons. **[**2013-11-15 **]**

518. The plant supplier shall draw up a plant and/or equipment-specific general specification of the welding consumables to be used as well as the testing and inspection thereof and submit it to STUK or inspection body for approval before the submission of the construction plans. The requirements for welding consumables shall also apply to brazing materials, where applicable. **[**2019-12-15 **]**

519. The following information shall be provided by the purpose of use:
a. welding process,
b. classification and brand name,
c. analysis of the deposited weld metal,
d. tensile strength of the deposited weld metal in a welded and/or heat treated condition,
e. hot tensile strength of the deposited weld metal in a welded and/or heat treated condition,
f. impact toughness of the deposited weld metal in a welded and/or heat treated condition,
g. holding time, temperature and temperature increase and decrease rates of the heat treatment of the deposited weld metal,
h. ferrite content of the deposited weld metal,
i. other properties of the deposited weld metal. **[**2013-11-15 **]**

520. Welding consumables shall be selected in a manner that allows for the welded joints of pressure equipment to withstand any reasonably foreseeable operating or testing condition. **[**2013-11-15 **]**

521. The welding consumables shall be compatible with the planned methods of manufacture, and no significant detrimental effects shall occur when combining different materials. **[**2013-11-15 **]**

522. The welded joints shall have good integrity, toughness and resistance, and their brittle failure shall be preventable. **[**2013-11-15 **]**

523. The design shall take into consideration any substantial changes to the weld metal's chemical, mechanical or physical properties during the service cycle that are essential in terms of operational safety. **[**2013-11-15 **]**

524. The hot tensile strength and impact toughness of the deposited weld metal shall meet the general design requirements applied to mechanical components at nuclear facilities. **[**2013-11-15 **]**

525. When testing the weld metal in a heat treated condition, the heat treatment shall correspond to the total heat treatment time required of the manufacture of pressure equipment. **[**2013-11-15 **]**

526. The maximum allowed amounts of elements that may activate in the weld metal shall be defined for the welding of equipment belonging to the primary circuit or systems connected thereto. **[**2013-11-15 **]**

527. In the welding of nuclear pressure equipment, the properties of the deposited weld metal and the weldability of the filler material shall be determined before the filler material is taken into use. **[**2013-11-15 **]**

528. Welding tests shall be used to demonstrate the properties of the welding filler material by each manufacturing batch or manufacturing method in accordance with chapter 5.5. **[**2019-12-15 **]**

529. The instructions provided in the applicable welding filler material standards, such as the ASME Code Section II C [17], the RCC-M Section IV [18] or the SFS-EN 14532-1, -2 [24] shall be followed when defining the manufacturing batch and test batch. **[**2019-12-15 **]**

5.5 Material certificates

530. The information required in material certificates is defined in the standards concerning material certificates, materials and welding consumables. If necessary, the licensee shall supplement the requirements in other documents. **[**2013-11-15 **]**

531. The material certificate or other document shall include a confirmation from the manufacturer of the material or welding consumable that the delivered products are compliant with the requirements of the order and the product specification to which reference is made. **[**2013-11-15 **]**

532. The material certificate of a material or a welding filler material shall clearly indicate the certificate type under standard SFS-EN 10204 [19] or a corresponding standard.
The material certificate requirements for the materials and welding consumables of nuclear pressure vessels and piping are presented in Annex B to this Guide. **[**2013-11-15 **]**

6 Design

6.1 General requirements

601. Pressure vessels, piping, piping accessories and components shall form a safely operating assembly. In addition to nuclear and pressure equipment safety, the design shall take into account chemical safety as well. The plant shall be equipped with reliable leak monitoring systems to ensure safety. **[**2019-12-15 **]**

602. All structural configuration shall be justified by using standards, analyses, experimental methods, type tests and/or operating experience. **[**2013-11-15 **]**

603. The design shall be based on the requirements and standards referred to in the safety analysis report, safety analyses and system descriptions. **[**2013-11-15 **]**

604. The pressure vessel and piping shall meet the requirements set for systems design presented in the YVL B series Guides. The design shall cover all conditions (design loads, normal operational conditions, transients and accidents), under which requirements are set for the operability of the equipment. **[**2013-11-15 **]**

605. Pressure vessels and their internal structures as well as piping shall be designed in a manner where flow rates, flow-induced vibrations, phase changes of the flowing medium, and temperature variations do not cause erosion, corrosion, flow accelerated corrosion, metal fatigue or other damage in a safety compromising manner. **[**2019-12-15 **]**

606. If necessary in the case of significant flow rates or temperature differences, the internal structures of the pressure vessel, and the pressure shell of the vessel or piping, shall be protected against loads caused by the flow by means of impact protection or thermal shields. **[**2013-11-15 **]**

607. The process nozzles, instrumentation nozzles and internal structures shall be located and designed in a manner that prevents significant changes in temperature, pressure losses or other phenomena from interfering with the functionality of equipment or the process. **[**2019-12-15 **]**

608. Structural design and material selection shall be used to limit the number of work phases performed under radiation and the duration of radiation exposure as much as possible. Guide YVL C.1 sets forth radiation safety requirements for plant and equipment design. **[**2019-12-15 **]**

609. The design of structures and the location and geometry of welds shall ensure that sufficient space has been reserved for manufacture inspections, in-service inspections,

condition monitoring, service and repairs, and that they are technically feasible. **[**2019-12-15 **]**

610. Demanding welds and heat treatments shall be avoided, particularly in the installation phase. The difficulty of installation welds shall be reduced by planning dissimilar weld joints and welds requiring heat treatment to be handled during factory manufacture, where possible, so that welds of an easier requirement level are handled as installation welds (safe end structure). **[**2019-12-15 **]**

611. The number of welds on the pressure vessel and piping shall be kept as low as is reasonably achievable. **[**2019-12-15 **]**

612. Strength analysis shall be performed on the basis of the applicable standards using methods of design by formula and/or design by analysis. In addition to strength calculation rules, design by formula, in other words dimensioning, also includes other conditions and limitations, such as regulations concerning geometry and the number of pressure loads. In the design by analysis, stress analysis shall demonstrate the fulfilment of the acceptance limits set by the applicable standard. The acceptance limits are compared with calculated and classified stresses. If necessary, a stress analysis shall be conducted to establish the stresses and fatigue of the structure caused by thermal transients and points of discontinuities. **[**2019-12-15 **]**

613. Upon request, STUK may approve the use of other standards than those listed in chapters 6.3 and 6.4. One condition for approval in safety class 1 is that the pressure vessel or piping design and strength analysis standard in question has been applied previously in the construction of nuclear facility of the same type. **[**2019-12-15 **]**

614. When using an EN standard, accidents shall be classified as exceptional operating conditions unless otherwise agreed with STUK. **[**2013-11-15 **]**

615. Guide YVL E.4 sets the detailed requirements for the preparing and reporting of loading analysis, stress analyses, fatigue analyses, brittle fracture analyses, leak before break (LBB) analyses and calculations performed using the finite element method on pressure equipment and their parts, which are constructed in accordance with the highest safety and quality requirements. **[**2019-12-15 **]**

616. In safety classes 2 and 3, no separate strength calculations are required for the dimensioning of pressure rated parts (for example, fittings, flanges and couplings) that have been dimensioned under harmonised European standards. In choosing standardised components, it shall be ensured that the effects of temperature and external loadings have been taken into account. **[**2013-11-15 **]**

617. In case the standards do not provide dimensioning instructions due to unusual loading or structural configuration, strength analyses are required. **[**2013-11-15 **]**

618. Supports, brackets, fixed points and penetrations shall primarily be designed by applying the same set of standards as is used for the equipment that they support. **[**2013-11-15 **]**

619. Supports (primary and secondary supports) shall be designed to withstand all loads they are subjected to under service and during accidents, according to the design basis. **[**2013-11-15 **]**

620. Supports of the pressure vessel or piping must be connected if necessary to concrete structures by means of anchor plates installed in the cast concrete or anchor bolts drilled in at a later time, as presented in Guide YVL E.6. **[**2019-12-15 **]**

621. Removed. **[**2019-12-15 **]**

622. Removed. **[**2019-12-15 **]**

6.2 Hydrodynamic design

623. Hydrodynamic design shall be based on the process engineering requirements or other design requirements defined for the equipment or structure in question, so that the dimensioning, geometry and capacity of the components make the hydraulic operation of the system possible. **[**2013-11-15 **]**

624. Design solutions shall aim to avoid areas of flow discontinuities or exceptionally high flow rates. **[**2013-11-15 **]**

625. Hydrodynamic design shall take into account the flow loads, vibration excitations, pressure shocks, cavitation, erosion, flow mixing and stratification. **[**2013-11-15 **]**

626. The detailed requirements set for the hydrodynamic analysis of transients and accidents, as well as those concerning the analysis of resulting loading conditions, are presented in Guide YVL E.4. **[**2013-11-15 **]**

6.3 Pressure vessels

6.3.1 General requirements

627. Pressure vessels shall be equipped with inspection openings and manholes that enable their condition monitoring and maintenance. **[**2019-12-15 **]**

628. The pressure vessel shall have the necessary nozzles (venting nozzle, gauge nozzle and draining nozzle) that are required for a periodic pressure test, and the machine plate. The structure of the pressure vessel and the associated piping shall enable the performance of periodic inspections in accordance with the Pressure Equipment Act. **[**2019-12-15 **]**

629. In the reactor pressure vessel, locating of welds in areas of high neutron radiation shall be avoided. **[**2013-11-15 **]**

630. In order to limit embrittlement caused by neutron radiation, the reactor pressure vessel shall be designed so that sufficient distance between the wall of the vessel and nuclear fuel is ensured; alternatively, the effects of radiation shall be limited by other means of structural design. **[**2019-12-15 **]**

631. Heat exchangers shall be designed in a manner that allows them to achieve their required heat transfer capacity under all design basis operational conditions. **[**2013-11-15 **]**

6.3.2 Pressure retaining parts

632. The dimensioning or stress analyses of nuclear pressure vessels shall conform to the rules given in the following standards:
a. SC1, ASME Code Section III [15], NB 3300, NB 3200, alternatively, other standard if approved by STUK,
b. SC2, SFS-EN 13445-3 [20], alternatively, other standard if approved by STUK,
c. SC3, SFS-EN 13445-3 [20], alternatively, other standard if approved by STUK. **[**2013-11-15 **]**

633. The dimensioning and geometry of nuclear pressure vessels and their support structures shall meet the requirements of the applied standards with the given design values.
[2019-12-15 **]**

634. A fatigue analysis shall be conducted on pressure vessels in safety classes 2 and 3, unless the possibility of fatigue is excluded by conservative estimations in accordance with the applicable standard. **[**2013-11-15 **]**

635. Removed. **[**2019-12-15 **]**

636. When using the design by analysis method in the design of safety classes 2 and 3 pressure vessels, the wall thickness of the shell shall satisfy the minimum wall thickness requirements determined by design formula. **[**2019-12-15 **]**

6.3.3 Internal structures of the pressure vessel

637. The internal structures of the pressure vessels that are important for safety shall be dimensioned or analysed. When evaluating the safety significance of the internal structures, the consequences of loose parts resulting from damage to the internal structures, among other things, shall be considered. **[**2013-11-15 **]**

638. The design of the internal structures shall take into account the following issues, as a minimum:

a. cleanliness and manufacturing tolerances,

b. thermal movements,

c. mechanical strength and corrosion resistance,

d. pre-stress and residual stresses,

e. hydraulic loads,

f. flow-induced vibration,

g. temperature changes related to start-up and shutdown,

h. neutron flux and hot reactor water affecting the internal structures of the reactor pressure vessel. **[**2019-12-15 **]**

639. The internal structures of the pressure vessel shall primarily be designed by applying the same set of standards as is used for the pressure vessel itself. **[**2013-11-15 **]**

640. The design of the core support structure of a reactor pressure vessel shall be based on strength analysis. A strength analysis report shall be prepared. **[**2013-11-15 **]**

641. In a pressurised water reactor, the internal structures of the steam generators and the pressuriser shall maintain their integrity and operability under all design basis operational conditions. The design of the steam generator’s internal structures shall be performed by applying the same set of standards for the primary and secondary side; the set of standards applied shall be selected on the basis of the higher safety class. **[**2019-12-15 **]**

642. The internal structures of small pressure vessels shall be dimensioned and analysed according to the same safety class as the pressure vessel itself. **[**2013-11-15 **]**

6.4 Piping

6.4.1 General requirements

643. The hydrodynamic dimensioning of piping shall take into account pressure losses created in piping and its accessories, the characteristic parameters of pumps connecting to the same system as well as flows entering or exiting piping ends and branches. Analyses of cavitation that stresses the piping shall consider pipe sections on the suction side as well as pipe sections where heavy pressure reductions occur. **[**2013-11-15 **]**

644. Special attention shall be paid to dynamic loadings on piping. Depending on the circumstances, the following shall be taken into account:
a. mechanical vibration loads caused by machinery and equipment,
b. pressure shock loads caused by the opening and closing of valves or by process adjustments,
c. loads caused by a turbulent or uneven flow as well as by the condensation or stratification of liquid or gas in the piping,
d. loads caused by pipe contents discharging after a pipe rupture and loads caused to the piping by missiles from pipe. **[**2019-12-15 **]**

645. The supporting forces and moments exerted on pumps, valves and other components connected to piping shall be restricted so that they do not impair the leak tightness, integrity and operability of the components. **[**2019-12-15 **]**

646. The flexibility in the piping appropriate for the operating conditions shall be created by design of supports (location and type), so that the dynamic loads, thermal expansion and heat transients do not break the piping, equipment or equipment connections. **[**2019-12-15 **]**

647. Piping shall be located, routed and provided with accessories in a way that enables appropriate operation, maintenance and inspection. **[**2013-11-15 **]**

648. Structural design (primary and secondary supports, venting, slopes, pressure equalisers, thermal shields etc.) shall be used to prevent harmful dynamic and fatigue-inducing loads such as vibrations, pressure shocks, the restriction of thermal expansion, temperature fluctuations in thermal mixing locations and thermal stratification of the fluid. If necessary, structural design shall be used to limit structural stresses. **[**2013-11-15 **]**

649. The design shall also consider phase changes of the flowing fluid and the accumulation of non-condensable gases in the piping. **[**2013-11-15 **]**

650. Piping inclinations shall be designed so that the slope requirements of the piping are met under all operating conditions. Operating conditions include, for example, draining, purging and venting, as well as normal operation, where no water pockets shall be formed inside the steam pipe. **[**2013-11-15 **]**

6.4.2 Pressure retaining components and parts

651. Dimensioning and analysis of nuclear piping shall conform to the rules given in the following standards:
a. SC1: ASME Code Section III [15], NB 3600, NB 3200, alternatively, other standard if approved by STUK
b. SC2: SFS-EN 13480-3 [21], alternatively, other standard if approved by STUK.
c. SC3: SFS-EN 13480-3 [21], alternatively, other standard if approved by STUK. **[**2013-11-15 **]**

652. The piping shall be subjected to dimensioning, a flexibility analysis or stress analyses according to the applicable standard if the safety class, diameter and temperature of the piping are as follows:
a. SC1: DN ≥ 25,
b. SC2: DN > 50 and T > 110 °C,
c. SC3: DN > 100 and T > 110 °C. **[**2013-11-15 **]**

653. In other cases, routing guideline or a simplified flexibility analysis (simplified pipe stress analysis) may be utilised, if the licensee has had the procedure approved in its requirement specifications. **[**2013-11-15 **]**

654. The flexibility of piping shall be determined in order to define loads affecting the piping itself or the accessories and pipes connected to it. For safety class 1 components, this may be done in accordance with ASME Code Section III [15] or a corresponding approved standard. **[**2019-12-15 **]**

655. In safety classes 2 and 3, the need for a flexibility analysis is determined on the basis of the nominal diameter, design temperature and components attached to piping. Small pipes (SC 2, DN ≤ 50, T ≤ 110 °C and SC 3, DN ≤ 100) shall be designed so that they will not have a detrimental effect on the thermal movement of the main piping. **[**2019-12-15 **]**

656. The routing guideline shall be based on a piping standard, operating experience, or a combination thereof. **[**2013-11-15 **]**

657. When using a routing guideline, the sufficient flexibility of the piping shall also be ensured to prevent the piping from being damaged by the thermal movement of larger pipes or equipment. **[**2013-11-15 **]**

6.4.3 Piping supports

658. The strength analysis of piping supports and the provisions made against pipe breaks by means of pipe whip restraints shall be made in accordance with the requirements of Guide YVL E.4. **[**2013-11-15 **]**

659. Loads specified in the flexibility analysis and mechanical design loads shall be taken into account in the dimensioning calculations. In addition, the dynamic loads and thermal transients referred to in chapter 6.4.1 shall be included in the stress analysis.
STUK's approval for standard supports may be applied for by means of a separate list of supports. **[**2013-11-15 **]**

6.5 Selection of materials

660. Construction materials and welding consumables used for nuclear pressure vessels and piping shall be approved. The requirements for construction materials and welding consumables are presented in chapter 5. **[**2019-12-15 **]**

661. The containment requirements of Guide YVL E.6 shall be applied in the requirements and testing concerning the coating materials of components and steel structures inside the containment. **[**2013-11-15 **]**

7 Construction plan

7.1 Drawing up the construction plan

701. The licensee shall draw up a construction plan for the manufacture of nuclear pressure vessels, piping and piping components, presenting the following:
a. the YVL Guides and standards applied, and justification for any deviations,
b. safety classification and identification marking of component,
c. a summary by the design organisation of how the design bases are met,
d. general design,
e. calculations,
f. type test results and operating experience data,
g. construction materials, welding consumables and coatings used,
h. construction drawings and manufacturing drawings,
i. information on the organisations related to manufacture, and if necessary, quality plan for supply according to the requirements of Guide YVL A.3,
j. information on manufacture and its control and inspections. **[**2019-12-15 **]**

702. The licensee shall approve the construction plan of nuclear equipment in compliance with Guide YVL A.1 and draw up a summary of justifications described in chapter 7.2 of present Guide, before submitting the construction plan to STUK or an authorised inspection body, as defined in the division of inspection responsibilities. Requirements for the submission of documents are given in Annex B to Guide YVL A.1. Construction plans of simple and ordinary modifications and repairs may also be approved by STUK's inspector. **[**2019-12-15 **]**

703. The construction plan shall be sent for approval as a logical entity, and primarily as one application prior to the commencement of manufacture. Chapter 8.3 provides certain equipment-specific further details, however. **[**2019-12-15 **]**

704. If the construction plan is approved in several parts using justifications pursuant to chapter 8.3 of this Guide, the licensee shall, in connection with each application for approval, provide a description of the plans forming the construction plan entity and their approval and/or completion status. **[**2019-12-15 **]**

705. The construction plan shall present detailed and clear references to source literature. **[**2013-11-15 **]**

706. The licensee shall submit for information the necessary reference documentation to the organisation inspecting the construction plan, except for standards and other reference documentation that is generally available. **[**2013-11-15 **]**

707. A construction plan shall also be drawn up for the installation of a nuclear pressure vessel or piping; it may be delivered separately or included in the manufacture construction plan. Special requirements for the installation construction plan are presented in chapter 10.1. **[**2013-11-15 **]**

7.2 The licensee's summary of justifications

708. The construction plan shall contain a summary of justifications where the licensee presents the scope, results and acceptance criteria of its own inspection. In the summary of justifications, the licensee briefly demonstrates the conformity to requirements and acceptability of the construction plan. A clarification shall be presented particularly if the construction plan deviates from the requirements of the YVL Guides, the safety analysis report or STUK's decisions. In this case, the summary of justifications shall describe how the safety level required in the YVL Guides can be achieved. The summary of justifications shall include justifications based on the construction plan data as to why:

- the manufacturer, its subcontractors and any third parties have the readiness to make the delivery
- the design bases of the pressure vessel or piping correspond to the requirements of the intended location of use and operational conditions
- the selected design, manufacturing and testing standards are suitable for the site
- calculations, operating experience and tests indicate that the design basis requirements are met
- manufacturing quality can be extensively determined using inspections and tests performed on the structural materials, parts and the pressure equipment itself.

[2019-12-15 **]**

709. The justifications shall make reference to individual documents of the construction plan and, where necessary in case of extensive documents, also to their page numbers. **[**2019-12-15 **]**

710. The summary of justifications shall name the testing organisations that will be performing destructive or non-destructive testing on the structural materials of the pressure vessel or piping

or the parts of the pressure vessel, and present a status summary of their approvals. The status summary shall also be presented for manufacturer approval whenever special processes are used in the manufacturing of the pressure vessel or piping. **[**2019-12-15 **]**

711. A separate approval for the deviation shall be obtained from STUK if the inspection of the construction plan falls under the area of inspection of an authorised inspection organisation. **[**2019-12-15 **]**

712. Any deviations from the facts given in the preliminary or final safety analysis report shall be assessed and presented. **[**2013-11-15 **]**

7.3 Design bases

713. The design basis shall include requirements set by the operation, technical properties, operating environment and external conditions of the equipment or structure:
a. safety class,
b. process and instrumentation diagrams,
c. operation of the equipment and connection to the system,
d. mechanical loads and load combinations,
e. operation and design data,
f. pressure test data,
g. forces and moments exerted by piping and actuators,
h. dynamic loadings (periodic operation, pressure and temperature transients),
i. pipe breaks,
j. external dynamic loadings (seismic event, aircraft collision, pressure wave),
k. ambient conditions (temperature, humidity, radiation etc.),
l. ageing mechanisms affecting service life,
m. fluid properties,
n. requirements for integrity, leak tightness and operability according to the intended usage,
o. inspectability,
p. decontamination. **[**2013-11-15 **]**

714. The design bases shall be presented so that it is possible to evaluate the selection of the equipment or structure, the prerequisites for the system's operation and its structural requirements, as well as to review the calculations and condition monitoring requirements. **[**2013-11-15 **]**

7.4 Calculations

715. The calculations presented in the construction plan shall demonstrate that the operability requirements of the equipment are met under design basis operational conditions. The equipment-specific minimum requirements are provided in chapter 6. **[**2013-11-15 **]**

716. If STUK has, in accordance with chapter 6.4.2, approved a pipe routing guideline or simplified flexibility analysis for use, the construction plan shall include a summary of the calculation results. **[**2013-11-15 **]**

717. In other cases, the following information shall be presented for any heat transfer calculation, hydrodynamic design, dimensioning calculations, flexibility analysis, stress analyses, and strength analyses included in the construction plan, also those assessing the load conditions of the structures or components:

a. input data,
b. construction drawings,
c. calculation methods,
d. acceptance criteria,
e. calculation results,
f. results illustrated with plots and figures,
g. acceptability of results,
h. conclusions. **[**2013-11-15 **]**

718. The construction plan shall present the standards and reference literature, on which the calculation methods are based, and also indicate the sections that have been used. **[**2013-11-15 **]**

719. The construction plan shall indicate how the loads used in the dimensioning calculations and strength analyses have been derived from the design bases. **[**2013-11-15 **]**

720. In addition to the final results of calculations, a sufficient number of intermediate results shall be presented in order to verify the correctness of the calculations. **[**2013-11-15 **]**

721. The acceptance criteria shall be clearly presented as a separate section. **[**2013-11-15 **]**

722. The construction plan shall demonstrate the acceptability of the structural design so that all the requirements of the design bases and the applicable standard are met. **[**2013-11-15 **]**

723. For heat exchangers, the heat transfer calculations and their initial data shall be presented in the following extent:
a. calculation of heat transfer capacity,
b. calculation of heat transfer coefficients,
c. fouling factor of heat transfer surfaces,
d. thermal conductivity of heat transfer surface material,
e. inlet and outlet temperatures and flows of fluids, and the calculation of transferred thermal power under operating conditions. **[**2013-11-15 **]**

724. Hydrodynamic dimensioning calculations performed on pressure vessels and piping as well as related accessories shall demonstrate that the equipment and its accessories function as intended under normal operating conditions, transients and during accidents. **[**2013-11-15 **]**

725. The drawings required for reviewing the hydrodynamic design, dimensioning calculations and strength analyses shall be enclosed with the documentation, or reference shall be made to any documentation submitted earlier. **[**2013-11-15 **]**

726. If necessary, hydrodynamic design shall be used to demonstrate that the operational capacity and geometry of the pressure vessel or piping is structurally suitable for the purpose. **[**2013-11-15 **]**

727. Dimensioning calculations of structures which retain pressure or other mechanical loads, shall demonstrate that the dimensioning and geometry requirements of the applied standard are met. **[**2013-11-15 **]**

728. When a stress analysis or piping flexibility analysis is performed on piping, the dimensioning calculations or stress analysis results of the piping supports shall be included in the construction plan. If STUK has, under chapter 6.4.3, approved a list of standard supports to be used, the construction plan shall include a summary of the calculation results. **[**2013-11-15 **]**

729. A sketch or structural model shall be presented of the equipment/structure dimensioned and analysed. **[**2013-11-15 **]**

730. The results illustrated with plots and figures shall be sufficiently comprehensive and include the following:
a. diagrams of displacement, vibrations and stress, and temperature distributions,
b. transient analysis results for time-dependent temperatures and loads,
c. structural response of time-dependent temperatures and loads, such as displacement, forces,

moments, strains and stresses. **[**2013-11-15 **]**

731. If necessary, the construction plan shall include an description of the implementation and results of model tests or full scale tests performed to demonstrate the acceptability of the structural design. The organisation reviewing the construction plan may in their decision require the performance of type tests if there are special grounds justifying them.
As part of the justifications for structural design, the construction plan may present operating experience from similar equipment and structures under similar operating conditions.
[2013-11-15 **]**

7.5 Construction materials and welding consumables

732. In the construction plan of the pressure vessel and piping, the licensee shall present the construction materials and welding consumables to be used, and the materials used for painting and coating the equipment. **[**2013-11-15 **]**

733. The licensee shall demonstrate how the requirements set for construction materials, welding consumables and the materials used in painting and coating are met. **[**2013-11-15 **]**

734. A plant or equipment-specific approval shall be applied for construction materials and welding consumables in accordance with the requirements of chapter 5 of this Guide before the submission of the construction plans. **[**2019-12-15 **]**

735. For structures subjected to substantial neutron radiation, a detailed explanation shall be submitted on how the radiation-induced alteration of the mechanical properties of the construction materials and weld metal is monitored. **[**2013-11-15 **]**

736. The extent of the monitoring shall be selected on the basis of how well the effects of neutron radiation on the characteristics of the construction material, weld metal or heat affected zone of the structure in question are known. **[**2013-11-15 **]**

7.6 Drawings

737. The drawings included in the construction plan shall describe the assembly and details of the equipment or structure in a way that the size, geometry, manufacture and installation of parts and their allowable tolerances are given in adequate detail. The drawings shall be unambiguous and explicit. **[**2013-11-15 **]**

738. The construction drawings shall present the information that is required to review the structural designs. These include
a. main dimensions,

b. safety classes and their boundaries,
c. PI diagram,
d. parts lists,
e. dimensions of parts,
f. locations, sizes, groove and joint types of welds. **[**2019-12-15 **]**

739. The manufacturing drawings and their parts lists shall present the following:
a. main dimensions,
b. safety classes and their boundaries,
c. assembly and subassembly information of the equipment, with references to drawings,
d. dimensions, tolerances, surface roughness requirements and material information required for the manufacture of non-standardised components, separately for each part,
e. locations, sizes and groove types of welds and weld-specific references to welding procedures,
f. nominal sizes and pressure rating classes of standardised components,
g. reference to the equipment-specific inspection plan and/or inspection and testing standards and procedures. **[**2013-11-15 **]**

740. The manufacturing drawings shall be based on the dimensioning calculations and/or strength analysis of mechanical components. **[**2013-11-15 **]**

741. Furthermore, isometric drawings shall be provided for DN > 50 piping to give sufficient information for piping prefabrication as well as the location and type of supports for the purpose of flexibility analyses. **[**2013-11-15 **]**

742. Isometric drawings shall be created for small-diameter piping (DN ≤ 50), and they shall be submitted together with the construction plan before the start of prefabrication, or presented to STUK's inspector before manufacturing at the plant site is started. **[**2013-11-15 **]**

7.7 Manufacturers, subcontractors, testing organisations, and third parties

743. In connection with the construction plan, references to STUK's decisions concerning the approval of material and equipment manufacturers as well as subcontractors utilising special processes shall be presented, with their periods of validity. **[**2013-11-15 **]**

744. For a justified reason, one-time approval for a manufacturer utilising special processes may be applied for in connection with the construction plan submitted to STUK. In this case, the construction plan shall present the particulars required in chapter 4 of this Guide. **[**2013-11-15 **]**

745. If manufacturer approval under chapter 4 of this Guide is not required, the construction plan shall present how the general requirements of chapter 4 are met. **[**2019-12-15 **]**

746. When a testing organisation is approved by STUK, the construction plan shall make a reference to STUK's decisions concerning the approval of the testing organisation, with its period of validity. **[**2013-11-15 **]**

747. If the testing organisation has been approved based on accreditation, and without a separate application, the construction plan shall refer to the certificate of accreditation submitted to STUK for information and its covering letter. **[**2013-11-15 **]**

748. The construction plan shall present information on the third party that supervises the manufacture, testing and qualification. The requirements concerning the third party are presented in chapter 8 of this Guide. **[**2013-11-15 **]**

7.8 Description on the manufacture

749. The construction plan shall include, for example, the following information or necessary documents:
a. the manufacturing methods used,
b. a technical description of the manufacture,
c. qualified manufacturing procedures, and for information the corresponding procedure test results,
d. production tests to be performed,
e. performance of heat treatments and cumulative accumulated values,
f. cleanliness requirements adhered to in the work. **[**2013-11-15 **]**

750. As regards the submission of manufacturing procedures and procedure tests, it is also possible to submit a specification for procedure tests for approval as part of the construction plan. In this case, the record of the procedure test may be approved by means of a protocol prepared during a control visit to manufacturing or a construction plan supplement submitted separately for approval. A summary of the procedure test results shall be submitted for information for the purposes of the approval proceedings of the manufacturing procedures. The manufacturing procedures shall be approved before using them in manufacture. **[**2019-12-15 **]**

751. The technical specifications, inspections and control of manufacturing shall also be presented on the manufacturing of materials, when required. This requirement especially applies to the manufacturing of large forgings of the main components, such as the reactor pressure vessel, steam generators, main coolant piping. **[**2013-11-15 **]**

7.9 Inspection, testing, and control of manufacturing

7.9.1 Inspection plan

752. The plan for the inspections, testing and control of manufacturing of pressure vessels, piping and piping components, prepared for each safety class and included in the documents described in chapter 3, shall be completed in the construction plan into an inspection plan suitable for a single item of equipment or an assembly. **[**2019-12-15 **]**

753. The inspection plan shall specify:
a. the procedures, phases and parties involved in the control of manufacturing,
b. the manufacturing and inspection sequences of safety class 1 and 2 piping components, piping and pressure vessels requiring independent third party supervision,
c. the inspections and testing of equipment and their materials, components and permanent joints, including the following information:
i. performer and supervisor of inspections and testing,
ii. reporting requirements for inspections and testing,
iii. references to specifications, inspection and testing procedures, and standards,
iv. methods by means of which the fulfilment of the requirements set for coating materials and surface finishing systems and surface finishing work is verified,
d. component or weld-specific identification data and references to drawings,
e. standards-compliant markings on construction materials and welding consumables as well as the necessary reference to material specifications,
f. joint or joint type-specific references to the manufacturing procedures of permanent joints,
g. references to heat treatment and cold or hot working procedures. **[**2019-12-15 **]**

754. The plan shall present the hold points and witness points of STUK or an inspection organisation, a third party, the licensee and other parties. **[**2013-11-15 **]**

755. If the licensee uses independent external companies for its manufacture control, a description of the expertise of the company and the persons performing the supervision shall be presented in the construction plan for the equipment or structure. **[**2013-11-15 **]**

756. Destructive and non-destructive testing shall be phased to be performed after the final heat treatment, unless otherwise approved on the basis of manufacturing procedure tests, applicable standards or approved working procedures. In pressure equipment where the selection of materials and welding filler material is particularly important to safety and service life, inspections during manufacturing shall contain comprehensive material identification (PMI)

of the weld and base material of the finished product. **[**2019-12-15 **]**

757. If the manufacture includes production tests defined in chapter 8, a separate plan shall be presented for inspecting them, the contents of which are determined by the principles of inspection plans for manufacturing. **[**2013-11-15 **]**

758. The inspectability of equipment shall be designed in advance in a manner where inspection is not made impossible or rendered more difficult as manufacturing progresses. If necessary, the inspections shall be divided across several phases of manufacture. **[**2013-11-15 **]**

759. If the properties of structures or welded joints are altered during manufacture to an extent where the information presented in the material specification no longer applies, the necessary additional tests shall be added to the testing plan. **[**2013-11-15 **]**

7.9.2 Inspection and testing procedures

760. The procedures for the inspections and testing performed on the materials, structures and operation of the equipment or structure shall be enclosed with the construction plan. Applicable standards may also be used as procedures. **[**2013-11-15 **]**

761. The inspection and testing procedures shall include the necessary procedures, extent of inspection and testing, reporting requirements, testers' qualification requirements, and acceptance criteria. As to details, a reference to applicable standards may be made. **[**2019-12-15 **]**

762. The procedures shall cover the destructive and non-destructive testing of materials, with the applicable requirements for material certificate and supervision of testing. Testing and inspections performed during manufacture and on completed products shall be covered as well. **[**2013-11-15 **]**

763. The pressure used in pressure test as part of construction inspection shall be defined according to the standards used in the design. **[**2013-11-15 **]**

764. In cases where a hydrostatic or pneumatic pressure test of individual welds (connection welds) could be considered detrimental or impractical, the welds shall be tested using suitable NDT methods to discover their internal defects and surface defects. The NDT methods used, the extent of testing and the justifications for omitting the pressure test shall be presented in the construction plan. **[**2019-12-15 **]**

8 Manufacture

8.1 Requirements concerning the licensee

801. Prior to the commencement of manufacture, the licensee shall make sure that the manufacturing organisation has the technical, organisational and administrative skills to operate in compliance with the regulations. **[**2019-12-15 **]**

802. Before launching operations, the licensee shall ensure that the manufacturer of a nuclear pressure vessel, piping component or piping as well as the manufacturer's subcontractors, testing organisations, inspection organisations and third parties have the approvals and qualifications required in the YVL Guides, and that the inspections and control of manufacturing as required by STUK can be carried out. **[**2019-12-15 **]**

803. In the procurement agreement, the licensee shall reserve for STUK the opportunity to pay inspection visits to ensure that the manufacturer maintains and complies with its quality management system and follows the other terms and conditions on which the approval is based. Inspection visits may be made both prior to commencement of manufacture and during manufacture. **[**2019-12-15 **]**

804. In its agreements, the licensee shall set a condition that allows the various parties to control the manufacturing and make inspections, not only on the premises of the manufacturer but also on the premises of the subcontractors. **[**2013-11-15 **]**

805. The licensee shall ensure that the manufacturer of a nuclear pressure vessel, piping component or piping has, in order to commence manufacture, available an approved construction plan for manufacture, and a decision on it by STUK or an authorised inspection body, as well as the other relevant technical data, requirements and regulations. The decision shall, if necessary, be translated into the language used in the project. **[**2013-11-15 **]**

806. The licensee shall ensure that an approved construction plan and the inspection plan contained in it are complied with during manufacture. **[**2013-11-15 **]**

807. The licensee may use third party service providers in the control of manufacturing. Supervision by an independent external company shall be defined in the procurement documents. **[**2013-11-15 **]**

8.2 Third party

808. Within the scope of the inspection plan, a third party shall:
a. witness the sampling, stamp transfer and destructive testing of materials and confirm the results with a certificate of type 3.2 under standard SFS-EN 10204 [19]
b. witness and confirm procedure and personnel qualifications
c. witness and confirm the manufacturing of the component, such as welding, forming and non-destructive testing.
The third party shall verify the material before the removal of the samples to be tested and ensure the traceability of the samples to the product either by stamping or by other applicable methods. The witnessing person shall be present in the testing event that he/she is to witness, unless agreed otherwise in the approved inspection plan. **[**2019-12-15 **]**

809. A notified body pursuant to the Pressure Equipment Directive [5], an recognized third party or another organisation approved by STUK, within the scope of its area of qualification, may act as a third party in these tasks depending on the task (Annex A). In addition to certification bodies accordant with the Pressure Equipment Directive, other accredited certification bodies shall also be accepted to perform procedure and personnel qualification of permanent joints within the scope of their area of qualification. In such a case, the accreditation shall be covered by the Multilateral Agreements (MLA) or Mutual Recognition Arrangements (MRA) entered into by FINAS and the accreditation shall be conducted against the requirements of standard EN ISO/IEC 17020, 17021, 17024 or 17065.
An authorised inspection body approved under Guide YVL E.1 may also act as both a third party and an inspection organisation performing public administrative tasks for the same structure or equipment within the scope of its area of qualification, but in this case, the inspection organisation shall ensure personal independence between different tasks.
[2019-12-15 **]**

810. In connection with single material testing or procedure or personnel qualification, the same third party organisation shall oversee the entire witnessing and testing complex. The supervision shall be confirmed with a certificate. Different complexes may have different third parties. **[**2019-12-15 **]**

811. Within the scope of the inspection plan, a third party shall oversee production, including welding, cold or hot working, non-destructive testing and heat treatment. A report on the competence of such a third party shall be appended to the construction plan of the equipment or structure supervised. **[**2019-12-15 **]**

812. A third party shall be independent of the other parties involved in the activities in question. A third party may not be the designer, manufacturer, supplier, subscriber or holder of the equipment it supervises, or a representative or someone in the employ of such a party. **[**2019-12-15 **]**

813. A third party may not participate in any activity that compromises the independence or neutrality of its inspection operations or decisions. **[**2013-11-15 **]**

814. The organisational role of someone representing a third party shall be such that any other functions of the organisation cannot influence his or her decisions. **[**2013-11-15 **]**

8.3 Commencement of manufacture prior to the approval of the construction plan

815. An approved construction plan is a prerequisite for starting the manufacture of a safety class 1 or 2 nuclear pressure vessel, piping component or piping. This requirement may be deviated from if equipment must be replaced immediately in the interests of safety. For safety class 3, the construction plan shall be approved before the construction inspection. **[**2019-12-15 **]**

816. The prefabrication of a pressure vessel or piping component may also commence before the entire construction plan is completed when the commencement of manufacture can be justified by an exceptionally long manufacturing time. In such cases, the licensee shall, prior to commencement of manufacture, submit for approval the parts of the construction plan that relate to the prefabrication, on the basis of which the fulfilment of equipment's design bases and the acceptability of the prefabricated component's dimensioning, geometry, manufacturing and inspection can be evaluated. **[**2019-12-15 **]**

817. For certain equipment, the sections of the construction plan shall be approved before commencement of manufacture, as follows:
a. to commence the manufacture of the material for the main equipment in the primary circuit, the material shall have an approval according to chapter 5 of this Guide, and the sections of the construction plan that relate to the selection of material, manufacturing procedures and manufacture drawings, destructive and non-destructive testing and inspection plans have been submitted and approved,
b. to commence the welding of the main equipment of the primary circuit in manufacture, the construction plan shall be approved in its entirety, except for the final stress analyses,
c. to commence prefabrication of the piping, the isometrics, pressure design, manufacturing procedures and NDT plans shall be approved,

d. to commence the prefabrication of piping supports, the support drawings, manufacturing procedures and NDT plans needed for the construction inspection shall be approved.
The manufacture of other safety class 1 or 2 equipment shall not be started before the construction plan is approved. **[**2019-12-15 **]**

818. One condition for the commencement of manufacture before the construction plan is approved in its entirety is that the licensee ensures that the inspections and testing deemed necessary by the organisation approving the construction plan can be conducted. **[**2013-11-15 **]**

819. If the manufacture commences before the construction licence is granted, the requirements of Guide YVL A.5 chapter 3.5 shall be taken into account. **[**2019-12-15 **]**

8.4 Manufacturing requirements

8.4.1 Procurement, testing and handling of materials

820. Materials, such as plates, pipes, bars, forgings, castings and welding consumables, shall satisfy the requirements of related specifications or the standard to be complied with, in accordance with the approved construction plan. **[**2013-11-15 **]**

821. The manufacturer shall ensure that the fulfilment of all requirements is verified by means of materials testing and their certificates in accordance with the construction plan.
Requirements for the approval of testing organisations that test materials are provided in Guide YVL E.12. **[**2019-12-15 **]**

822. Samples shall be removed in accordance with the construction plan, generally not until after the final heat treatment of the material. **[**2013-11-15 **]**

823. The person witnessing sampling shall stamp the number of the sample and his/her identifying mark on the sample and in the material's stamp area before the sample is removed. **[**2019-12-15 **]**

824. If the tested batch has to be re-heat treated or if the sample can no longer be removed after the final heat treatment, tests may be carried out on the samples removed from the product prior to heat treatment. The samples shall in such a case be heat treated correspondingly and primarily in conjunction with the test batch. **[**2019-12-15 **]**

825. If it is necessary to heat treat samples separately from the testing batch, the process shall be the same as that for the heat treatment of the testing batch. **[**2019-12-15 **]**

826. Materials for which a delivery-specific material certificate is required in the construction plan shall be identifiable and traceable from their individual melting batches all the way to the

completed structure. Only materials and welding consumables approved in inspections may be used. **[**2013-11-15 **]**

827. In connection with the approval process of materials requiring delivery-specific traceability, a permanent identifying mark of the manufacturer and the person witnessing the destructive testing, as well as heat and production batch numbers and the material type shall be marked on these materials on the premises of the manufacturer, unless the standard or specification used requires more extensive markings. **[**2019-12-15 **]**

828. Markings may be replaced with a clear code marking if all the mentioned details can be reliably traced from it. The marking of pipe materials may be made with colour markings under the standard in safety class 3 and small-diameter piping in safety classes 1 and 2. The standardised components of pressure equipment in safety class 3, such as flanges, screws and nuts, shall have markings that enable the identification of the material used. **[**2013-11-15 **]**

829. Markings made on materials shall be presented in the material certificate in order to verify their traceability. **[**2013-11-15 **]**

830. The manufacturer shall possess procedures, which specify the practises in receiving and handling materials and welding consumables (e.g. carbon steels and stainless steels separately). The procedures shall be based on the recommendations of material and welding consumable suppliers. **[**2019-12-15 **]**

831. The handling, storage and transport of the materials and welding consumables shall be arranged in a way that does not impair their quality. **[**2013-11-15 **]**

832. Welding consumables shall be handled so that they may be identified in every phase of handling. **[**2013-11-15 **]**

833. If the material markings are in danger of being lost due to cutting or some other form of handling, the person authorised to transfer markings shall make new, permanent markings before cutting or handling them in another way, so that the origin of the parts can be verified during the construction inspection. **[**2019-12-15 **]**

834. The person transferring a marking shall endorse them with his or her personal stamp. **[**2013-11-15 **]**

835. Materials that prove unsuitable shall be clearly marked and immediately removed from the manufacturing area. **[**2013-11-15 **]**

836. The repair of minor material defects found in materials or those induced during the manufacture of equipment or structure shall be done in compliance with the applicable material

standard or other procedure approved for the delivery. **[**2013-11-15 **]**

837. Repairs to materials made by welding shall be documented if they concern a pressure retaining part of a nuclear pressure vessel or piping, or if the applicable materials standard requires documentation. **[**2013-11-15 **]**

8.4.2 Machinery and equipment used in manufacturing

838. The manufacturer shall have a maintenance plan in place for machinery and equipment. The machinery and equipment shall be regularly tested and calibrated to ensure that they are in perfect working order. The results shall be recorded. **[**2013-11-15 **]**

8.4.3 Manufacturing procedures and qualification

839. Procedures with essential parameters shall be drawn up for demanding work processes such as welding, cold or hot working and heat treatment, which affect material strength and properties. Other manufacturing methods shall also have the necessary procedures to ensure the quality of work. **[**2013-11-15 **]**

840. The manufacturer-specific welding procedures, heat treatment procedures and hot and cold working procedures for the manufacture and installation of nuclear pressure vessels and piping shall be qualified by procedure tests carried out prior to manufacture. **[**2013-11-15 **]**

841. The procedure test shall demonstrate that the properties of materials approved as the design basis are retained during manufacture and that the manufacturer is qualified to use the manufacturing procedure. **[**2013-11-15 **]**

842. The procedure test shall be conducted under the supervision of an authorised third-party supervisor. Procedure tests carried out for each location of manufacture shall remain valid indefinitely until the manufacturing based on them takes place within the range of essential parameters defined in the applicable standard. **[**2013-11-15 **]**

843. To supplement the welding procedure test and to verify the mechanical properties, the manufacturer shall, if necessary, conduct production weld tests using the actual parameters of the welding work. The requirement level for the procedure tests and production tests shall be one which complies with the applicable design standard. In demanding applications, STUK may require production tests even when the standard does not require them. **[**2019-12-15 **]**

844. When an item is important to nuclear safety or when the procedure test does not reflect the actual working conditions, a review shall be made of the suitability of the manufacturing procedures and personnel qualifications with works tests carried out prior to the

commencement of manufacture. **[**2019-12-15 **]**

845. Procedures for the qualification of personnel and prolongation of qualifications shall be based on the requirements specified in chapter 4 of this YVL Guide, and the used standard for the joining method in question. **[**2019-12-15 **]**

8.4.4 Manufacture

846. Nuclear pressure vessels, piping component and piping shall be manufactured in accordance with a construction plan approved by STUK or an authorised inspection body. **[**2013-11-15 **]**

847. The construction plan approved for manufacturing, procedures and standards shall be available at the place of manufacture. **[**2019-12-15 **]**

848. The manufacturer shall supervise all demanding work phases. When supervising welding, the requirements of the quality management standard that serves as the basis of the manufacturer's approval shall apply. **[**2013-11-15 **]**

849. Prior to commencement of manufacture, the manufacturer shall ensure that needed independent third party fulfils the requirements of this YVL Guide. **[**2019-12-15 **]**

850. Personnel engaged in the heat treatment of a component or structure shall have the proper training and instructions for the task. In heat treatment, the requirements of the quality management standard that serves as the basis of the manufacturer's approval shall apply. **[**2013-11-15 **]**

851. A report on heat treatment shall be drawn up showing at least the identification data relating to the component or structure heat treated, the heat treatment temperature, holding time, temperature increase and decrease rates, the number and location of thermocouples, and the procedure followed. **[**2013-11-15 **]**

852. If the construction plan states that a nuclear pressure vessel, piping component or piping shall be heat treated after welding, a repair welding after heat treatment requires a repair plan approved by STUK or an authorised inspection body. **[**2013-11-15 **]**

853. When manufacturing has been completed, the manufacturer shall inspect the surface condition and cleanliness of the item of equipment or structure in accordance with the construction plan as well as ensure that product quality is preserved during storage and transport. **[**2013-11-15 **]**

854. The various parties shall draw up a protocol on the control of manufacturing or otherwise confirm what manufacture, inspection and testing phases have been included in the control process. **[**2013-11-15 **]**

855. The manufacturer shall produce non-conformity reports to investigate the reasons for defects and non-conformities discovered during manufacture, assess their significance, put forward a repairs proposal and suggest the corrective actions. Non-conformities shall be classified and a register shall be kept of them. **[**2013-11-15 **]**

856. The approval process of non-conformities shall be in accordance with the procurement agreement and the manufacturer's quality management system. If a non-conformity remains in a product, approval for this shall be justified in the non-conformity report. Requirements for the management of non-conformities are also given in Guides YVL A.3 and YVL A.5. **[**2013-11-15 **]**

8.4.5 Testing and inspection

857. The manufacturer shall have at its disposal competent and qualified personnel for conducting inspections, testing and supervision in accordance with the construction plan. **[**2013-11-15 **]**

858. The manufacturer shall ensure that testing organisations have been approved under Guide YVL E.12. **[**2013-11-15 **]**

859. NDT testing personnel shall in principal have at least a level 2 qualification under standard SFS-EN ISO 9712 [22]. More detailed requirements for personnel qualifications are given in Guide YVL E.12. **[**2013-11-15 **]**

860. Inspection, measuring and testing devices shall be regularly checked and calibrated and the results recorded. **[**2013-11-15 **]**

861. An approved inspection plan shall be followed in inspections and testing. **[**2013-11-15 **]**

862. Inspections and testing shall be conducted during the manufacturing phase designated for them. Destructive and non-destructive testing shall be performed after the final heat treatment process, unless otherwise approved in the construction plan. **[**2013-11-15 **]**

863. The manufacturer shall address any non-conformities found in testing and inspections in accordance with the prescribed equipment delivery procedures. **[**2013-11-15 **]**

8.5 Subcontracting

864. The manufacturer may assign part of the manufacturing or inspections to a subcontractor. The use of subcontractors must be shown when manufacturer approval is sought or in the section of the construction plan that describes the manufacturer. **[**2013-11-15 **]**

865. It is the manufacturer's responsibility to ensure that the subcontractor possesses all the relevant technical specifications and requirements. **[**2013-11-15 **]**

866. If necessary, the manufacturer shall provide training for its subcontractors in order to familiarise them with the requirements related to manufacturing. **[**2013-11-15 **]**

867. The manufacturer shall ensure that the procedures used by subcontractors and subcontractor personnel are qualified in accordance with set requirements. **[**2013-11-15 **]**

8.6 Manufacturing records

868. The manufacturer shall compile into manufacture documentation the testing, inspection, and supervision protocols that have been prepared during manufacturing according to an approved construction plan. **[**2013-11-15 **]**

869. To the manufacture documentation the following records shall be appended: the material certificates for construction materials and welding consumables, the qualification certificates of personnel, the non-conformity reports processed, and other records created during manufacture, the control of manufacturing and testing. **[**2013-11-15 **]**

870. The manufacturer or importer shall compile instructions for installation, operation, condition monitoring and maintenance and present them and the manufacture documentation to the licensee. **[**2013-11-15 **]**

9 Construction inspection

9.1 Construction inspection prerequisites

901. The licensee shall request STUK or an authorised inspection body to conduct a construction inspection of a nuclear pressure vessel, piping component or piping no later than approximately two weeks before the planned date.
The construction inspection shall ensure that the nuclear pressure vessel, piping component or piping has been manufactured, installed, modified or repaired in accordance with the approved construction plan and approved procedures, and that the inspections and tests have been carried out on them in accordance with the construction plan. It shall also be established in the construction inspection that the vessel, piping component or piping has not been handled in a way that would be detrimental to its durability and operation during use. **[**2013-11-15 **]**

902. Removed. **[**2019-12-15 **]**

903. A final construction inspection shall usually be made on complete equipment on the premises of the manufacturer before the equipment is delivered. Justification shall be provided for any departures from this procedure. **[**2013-11-15 **]**

904. The licensee, plant and equipment supplier and manufacturer shall ensure that personnel with the necessary expertise are available during the construction inspection. **[**2013-11-15 **]**

905. The licensee shall agree on the essential construction inspection dates with the manufacturer, plant supplier or importer. **[**2013-11-15 **]**

906. When agreeing on a date for the construction inspection, attention shall be given to the approval procedures related to the various manufacturing phases and any necessary partial construction inspections in accordance with the construction plan. The manufacturer shall ensure that construction inspections and partial construction inspections are conducted during the work phase for which they were planned. **[**2013-11-15 **]**

907. A prerequisite for the construction inspection is that the construction plan for the item to be inspected has been approved, either by STUK or an authorised inspection body, as is defined in decisions concerning the inspection responsibilities. **[**2013-11-15 **]**

908. At the beginning of the inspection, the licensee shall present the approved construction plan, related decisions by STUK or an authorised inspection body, and any approved document revisions. **[**2019-12-15 **]**

909. The licensee shall ensure that all plans and related approvals and conditions concerning the manufacture of a pressure vessel, piping component or piping are known during the construction inspection. **[**2013-11-15 **]**

910. The licensee, the manufacturer and, in plant projects, the plant supplier shall, upon request, submit to the inspector any other documents related to the construction plan or presented in its references. **[**2013-11-15 **]**

911. The licensee, the manufacturer and, in plant projects, the plant supplier shall ensure beforehand, by conducting inspections themselves, that the requirements for starting a construction inspection are met and that the pressure vessel, piping or their subassembly are ready to be inspected and approved in the construction inspection. **[**2013-11-15 **]**

912. The licensee, the manufacturer and, in plant projects, the plant supplier shall establish the conformity to requirements of the equipment before the construction inspection by STUK or an authorised inspection body. **[**2013-11-15 **]**

912a. The nameplate on the pressure equipment subject to registration shall have stamping with the following information: location marking, serial number, the maximum and minimum allowable operating temperature, the maximum and minimum allowable operating pressure, the pressure test date, the test pressure, and the inspector’s identity marking. **[**2019-12-15 **]**

9.2 Construction inspection of the pressure vessel and piping

9.2.1 Content of the construction inspection

913. In the construction inspection of a nuclear pressure vessel, piping component or piping, the manufacturer and the licensee shall:
a. present the manufacture documentation and manufacture quality control results for examination,
b. present the equipment, with its identification and location markings, for inspection, and perform a dimensional inspection or verification thereof,
c. if necessary, organise pressure tests, leak tightness tests, functional tests and loading tests. **[**2019-12-15 **]**

914. If inspection becomes more difficult as manufacturing proceeds, or after assembly, a sufficient number of partial construction inspections shall be carried out during the various manufacturing phases. These partial inspections of the documentation and structure that take place at manufacture and assembly phases according to the construction plan include

a. an internal and external inspection of pressure equipment with more than one chamber,
b. inspections of the documentation and equipment prior to the pressure test and leak tightness test,
c. pressure and leak tightness tests,
d. an inspection of the equipment or structure to be coated before coating,
e. other partial inspections as described in the construction plan. **[**2019-12-15 **]**

915. When partial inspections are conducted, the manufacturer shall present the inspector with the documentation obtained so far during the various sequences of manufacture and testing, with any non-conformities. **[**2013-11-15 **]**

9.2.2 Manufacture and quality control documentation

916. The documentation inspected shall be systematically compiled and contain the test reports as required in the approved inspection plan and procedures approved in the construction plan and in other regulations. **[**2013-11-15 **]**

917. The licensee, manufacturer and, in plant projects, plant supplier shall evaluate and approve in writing the manufacture documentation of the nuclear pressure vessel, piping component or piping before it is presented to STUK or an authorised inspection body. **[**2019-12-15 **]**

918. Written remarks recorded in connection with partial construction inspections shall be cleared prior to the final construction inspection. **[**2013-11-15 **]**

919. In accordance with chapter 4.2.4 of this Guide, a written pressure equipment-specific declaration of manufacture, provided by the person responsible for the manufacture shall accompany the documentation of nuclear pressure vessels, piping components and piping. The declaration is not required from a manufacturer from which a separate manufacturer approval is not required. **[**2019-12-15 **]**

920. The manufacturer’s declaration shall be presented at the partial inspection carried out prior to the pressure test, and it shall be appended to the final documentation, updated as necessary. With the declaration, the manufacturer confirms that the manufacture is ready for the pressure test. **[**2019-12-15 **]**

921. The documentation shall demonstrate that
a. the manufacturer has been approved in accordance with this Guide,
b. the testing organisations conducting destructive and non-destructive testing on the equipment have been approved in accordance with Guide YVL E.12,

c. the testing organisations conducting destructive and non-destructive testing on materials have been approved in accordance with Guide YVL E.12,
d. the NDT testers have the required qualifications,
e. a third party meeting the requirements of this Guide has acted as the organisation witnessing and verifying certificate type 3.2 sampling and testing, and supervising the welding filler material tests and their testing as well as qualifications,
f. the manufacturing procedures have been qualified under the supervision of an authorised third party,
g. the equipment has been manufactured, tested and inspected in accordance with the construction plan and the conditions relating to manufacture,
h. the materials and welding consumables used have been selected and tested as required in the construction plan; the results have been validated by means of conforming material certificates; and the results of materials testing fulfil the requirements of the material standard and the construction plan,
i. personnel engaged in making permanent joints have a valid qualification meeting the requirements set forth in this Guide, and the joints have been made following the procedures given in the approved construction plan,
j. the construction plan and instructions in the relevant standards have been complied with in any heat treatment process and in its monitoring, and that the organisation performing heat treatment of nuclear equipment has been approved under this Guide,
k. control of manufacturing by the manufacturer, licensee, plant/equipment supplier and any third party has been conducted as required under the approved inspection plan and this Guide. **[**2019-12-15 **]**

922. The manufacturing documents shall contain the documentation on any deviations and repairs. **[**2013-11-15 **]**

923. The licensee shall archive the construction inspection records until the equipment or structure has been taken out of service. **[**2013-11-15 **]**

9.2.3 Visual or dimensional inspection of equipment or structure

924. The inspection shall be performed on a completed pressure vessel, piping component or piping following any heat treatment but before coating. **[**2013-11-15 **]**

925. The inspectors shall be provided with adequate lighting, calibrated measuring and auxiliary devices and the necessary assistants. **[**2013-11-15 **]**

926. For the purposes of the inspection, the manufacturer shall ensure that there is safe access to the inspection distance of all the structural details of a pressure vessel, piping component or piping. The manufacturer shall be responsible for the accessibility and the inspection arrangements. **[**2013-11-15 **]**

927. If necessary, the structure shall be raised or rotated, thus allowing it to be inspected on all sides. **[**2013-11-15 **]**

928. In the inspection of structures, the manufacturer shall demonstrate that
a. pressure vessels and piping have been properly marked and are traceable,
b. the main dimensions essential for the vessel and piping and their strength conform to the manufacturing drawings,
c. the piping or piping component has been installed in accordance with the drawings,
d. the material can be identified and verified as conforming to the approved construction plan, and that the markings of materials correspond to the manufacture and testing result documentation,
e. the material has not been damaged during manufacture,
f. the traceability of permanent joints and non-destructive testing can be verified,
g. the welded joints meet the requirements laid down in the construction plan; special attention shall be paid to weld smoothness and smooth transition, excess weld metal, any undercuts, root concavity and arc strikes,
h. any temporary supports and brackets used during manufacturing and installation have been removed properly,
i. there are no local transformations in the structure,
j. the equipment’s main components and nameplate bear the markings required under the regulations. **[**2019-12-15 **]**

9.2.4 Pressure test

929. A pressure test shall be performed on nuclear pressure equipment to demonstrate the integrity and strength of the completed product. **[**2013-11-15 **]**

930. The licensee, manufacturer and, in plant projects, the plant supplier shall ensure that all remarks made in the partial inspection of the documentation or of equipment, carried out prior to the pressure test, and imperfections detected in the structure that could compromise the safety and acceptability of the pressure test are clarified before the pressure test. **[**2013-11-15 **]**

931. For the purposes of the pressure and leakage test, the manufacturer shall ensure that the pressure equipment has been cleaned and that all pressure retaining parts and joints can be properly inspected, that the necessary equipment is made available for the pressure and leakage tests, and that safety is ensured. **[**2013-11-15 **]**

932. The pressure test shall be conducted in accordance with an approved pressure test plan approved as part of the construction plan. As part of construction inspection, the pressure test may be conducted after the documentation and the structure have been inspected and the inspector from STUK or from an authorised inspection body has established that testing may go ahead. **[**2013-11-15 **]**

933. Before the test starts, the licensee shall provide the inspector with an approved pressure test plan, details of the test arrangements, the measuring devices used, with calibrations, and, if necessary, a water analysis report. **[**2019-12-15 **]**

934. The pressure test shall be carried out under controlled conditions with appropriate safety precautions and equipment and in a way that allows those responsible for the test to inspect all pressure retaining parts. If a hydrostatic pressure test is not practical, it may, for justified reasons, be replaced with a pneumatic pressure test or a combined hydrostatic/pneumatic test in accordance with what is approved in the construction plan. **[**2013-11-15 **]**

935. The occupational safety of the pressure test, especially if it is a pneumatic test, shall be guaranteed. **[**2013-11-15 **]**

936. Prior to the approval of a pressure test, the manufacturer may not carry out any work sequences on the component that would have an effect on the inspectability of pressure retaining parts, such as painting, insulation, brickwork, lining, galvanising and enamelling. **[**2013-11-15 **]**

937. If it is not practicable, due to the size, the mode of manufacture or other technical reasons, to pressure test complete equipment, the replacing of the pressure test with a 100% volumetric inspection and a surface NDT inspection of the welds, along with its justifications, shall have been approved in the construction plan. Even then, a tightness test at operating pressure shall primarily be performed on the equipment. **[**2019-12-15 **]**

938. No pressure equipment shall be subjected to shock loading, such as hammering, when undergoing pressure testing. **[**2013-11-15 **]**

939. During the pressure test, there may be no leaks due to pressure or visible deformations in the pressure shell. **[**2013-11-15 **]**

9.2.5 Inspection of equipment or structure after a pressure test

940. The pressure equipment shall be inspected after the pressure test has been completed and when the equipment has been drained and cleaned. The inspection shall show that the pressure test has not caused deformation or other damage to the pressure retaining structure. **[**2013-11-15 **]**

941. All blind flanges fitted to isolate components not subject to pressure testing and every gauge fitted to the equipment for the purpose of pressure testing shall have been removed. **[**2013-11-15 **]**

942. The construction inspection of the surface treatment of equipment or steel structure shall, where necessary, be arranged in accordance with the inspection plan. **[**2013-11-15 **]**

9.3 Processing non-conformities observed

943. If it is revealed in the construction inspection that a pressure vessel, piping component or piping does not meet the requirements set in the construction plan, or it reveals shortcomings and defects affecting safety, the inspector shall report them to the licensee and manufacturer and, if necessary, prohibit the further use of the equipment until the non-conformities have been approved.
If the inspector finds deficiencies, defects or discrepancies in materials testing, manufacture documentation, or inspection of the structure, he/she may, instead of issuing a rejection, expand the inspections or, at his/her discretion, call for the performance of additional testing to supplement original materials testing to become convinced of the acceptability of the equipment. **[**2013-11-15 **]**

944. If, during an inspection, it is wanted that the inspector approves minor common non-conformities that do not have an effect on the operability, strength or function of a pressure vessel or piping, the non-conformities shall have been approved by the licensee, (in plant projects) the plant supplier, and the manufacturer. **[**2013-11-15 **]**

10 Installation

10.1 Installation construction plan

1001. The licensee shall draw up an installation construction plan for pressure vessels and piping. The installation construction plan may be submitted separately or included in the manufacture construction plan. Where applicable, the requirements for the manufacture construction plan shall also apply to the installation construction plan. **[**2019-12-15 **]**

1002. The installation construction plan shall be submitted for approval to STUK or an authorised inspection body in accordance with the division of inspection responsibilities. **[**2013-11-15 **]**

1003. For piping (DN > 50), the installation drawings with parts lists shall be given in the installation construction plan. **[**2013-11-15 **]**

1004. Requirements for the location plans of systems and related equipment are given in Guide YVL B.1. The location of the pressure equipment shall also meet the requirements laid down in Section 6 of the Pressure Equipment Act (1144/2016) [6]. **[**2019-12-15 **]**

1005. In the installation construction plan shall be included a description of connecting the equipment to other systems, including descriptions of supports and of any protection against jet impingement. Guide YVL E.4 gives the requirements for piping whip restraints. **[**2019-12-15 **]**

1006. The licensee shall determine the requirements for the personnel competency in the assembly of bolted flange connections of the pressure equipment. Standard SFS-EN 1591-4 [23] is an example of the relevant guidelines that may be used. **[**2013-11-15 **]**

1007. The tightening torques and reporting requirements shall be determined for bolted connections. **[**2013-11-15 **]**

1008. Drawings of those piping supports and brackets that are non-standard shall be given by support type. **[**2013-11-15 **]**

1009. A separate procedure shall be drawn up for the manufacture and inspection of the anchor plates and attachment points on piping supports. The procedure shall focus on such areas as materials, dimensioning, welds, surface treatment, testing and inspections. **[**2013-11-15 **]**

1010. Anchor bolt fasteners attached to concrete structures shall have a type approval that is in force in Finland or an approval based on tests carried out by an approved testing organisation, as well as installation procedures. **[**2013-11-15 **]**

1011. A separate procedure shall be drawn up for the installation of anchor bolt fasteners and inspection of the installation work, including a description of the personnel competence. **[**2013-11-15 **]**

1012. A report on the use, installation and inspection of fasteners other than those approved in Guide YVL E.6 shall be drawn up and appended to the construction plan. **[**2013-11-15 **]**

10.2 Installation work

1013. The installation of pressure vessels and piping shall be carried out in accordance with the construction plan approved for them. **[**2013-11-15 **]**

1014. A requirement of the commencement of the installation of piping shall be that their flexibility analyses and support calculations have been approved in all essential areas. **[**2013-11-15 **]**

1015. Installation may commence when the pressure vessel or piping components have been approved in the manufacturing construction inspection without any restraints on installation in their location of use and when the licensee in its receiving inspection after transportation to the plant site has stated that the condition of the construction-inspected equipment still conforms to requirements. **[**2019-12-15 **]**

1016. The licensee shall, irrespective of whether the employee is employed by the licensee or an external company, arrange the site-specific knowledge and familiarisation training needed to perform the work and shall ensure that all employees have the adequate instructions and appropriate tools at their disposal. **[**2013-11-15 **]**

1017. The same requirements and procedures shall apply to the installation of nuclear pressure vessels and piping as to their manufacturing process, including the approval of the manufacturer. **[**2019-12-15 **]**

10.3 Installation construction inspection

1018. The licensee shall request STUK or an authorised inspection body, in accordance with the division of inspection responsibilities, to conduct an installation construction inspection no later than approximately two weeks before the planned date.
The installation construction inspection and partial inspections are organised to check the acceptability of the documentation of the mechanical installation of the pressure vessel or piping and the documentation of the installation. **[**2019-12-15 **]**

1019. In the installation construction inspection of a nuclear pressure vessel and piping, the requirements governing the plant supplier, installation organisation and licensee shall be the same as those that are applied in the construction inspection of this equipment. **[**2013-11-15 **]**

11 Commissioning

11.1 Preconditions for the commissioning inspection

1101. The licensee shall, in accordance with the division of inspection responsibilities, request STUK, an authorised inspection body or licensee's in-house inspection organization to conduct a commissioning inspection of a nuclear pressure vessel and piping (Pressure Equipment Act Sections 53 and 55) no later than approximately two weeks before the planned date. **[**2019-12-15 **]**

1102. Prior to the commissioning inspection, the licensee shall ensure the equipment's conformity to requirements and readiness for operation.
The inspection may commence when the pressure vessel or piping have been installed and it and its accessories have been approved in previous inspections. **[**2013-11-15 **]**

1103. The licensee shall ensure that the decisions or evaluations regarding the pressure vessel or piping plans do not contain anything that would prevent the commissioning of the equipment. **[**2013-11-15 **]**

1104. The requirements issued in inspections preceding the commissioning inspection and non-conformities discovered shall have been clarified in the manner approved in the licensee's management system. **[**2013-11-15 **]**

1105. The licensee shall be able to demonstrate that the functional inspections and tests relating to the installation of the electrical and I&C systems connected with the equipment have been acceptably performed. **[**2013-11-15 **]**

1106. The licensee shall ensure that the personnel needed to perform the functional tests in the commissioning inspection are available at the time of the tests. **[**2013-11-15 **]**

1107. The licensee shall compile in a pressure equipment dossier referred to in Section 69 of the Pressure Equipment Act all the essential and original documents pertaining to the approval and inspection of pressure equipment subject to registration prior to the commissioning inspection. **[**2019-12-15 **]**

1108. With regard to piping, and pressure vessels not subject to registration, the licensee shall compile for presentation documentation corresponding to a pressure equipment dossier. **[**2013-11-15 **]**

1109. The licensee shall ensure that the equipment manufacturer or importer has forwarded the equipment's operation and maintenance instructions to be included in the pressure equipment

dossier or another form of inspection documentation. **[**2013-11-15 **]**

11.2 Commissioning inspection procedure

1110. The licensee shall present to STUK, an authorised inspection body or licensee's in-house inspection organization, following the division of inspection responsibilities, the commissioning inspection in two phases:
a. Phase one shall constitute an inspection to check that the equipment is ready for functional tests. The approved first phase and the approved testing programme presented by the licensee shall be preconditions for the test licence to be granted for functional tests.
b. In the second phase, the functional tests shall be conducted in accordance with the approved testing programme to discover if readiness for operation is as planned. Approved functional tests are a precondition for granting the operating licence. **[**2019-12-15 **]**

1111. The first phase of the commissioning inspection of pressure vessels and heat exchangers shall be implemented for each item of equipment whenever it concerns pressure equipment subject to registration or when the equipment is important for personal and/or nuclear safety. **[**2013-11-15 **]**

1112. Individual items of equipment shall have a testing licence for functional tests before pre-operational testing of systems. **[**2013-11-15 **]**

1113. Functional tests shall be conducted on entities that are as large as possible, such as the piping of the entire system and its components. **[**2013-11-15 **]**

1114. The instructions supplied by the manufacturer of the pressure equipment shall apply in commissioning. **[**2013-11-15 **]**

11.3 The first phase of the commissioning inspection

11.3.1 Inspection of the pressure equipment dossier or equivalent documentation

1115. In the first phase of the commissioning inspection, concerning pressure equipment subject to registration, the licensee shall present a pressure equipment dossier. Similar documentation shall be produced for other pressure equipment and piping. **[**2013-11-15 **]**

1116. The pressure equipment dossier or other documentation shall contain the key design data for equipment or structure, decisions on the construction plan and installation construction plan, drawings, material certificates, inspection protocols, heat treatment data, operating and maintenance instructions, a list of the accessories with their reference data, programme for periodic inspections, the monitoring plan for the operability of the equipment, and details

concerning any spare parts. **[**2013-11-15 **]**

1117. The licensee shall produce reports on the fulfilment of the conditions of the approval decisions or evaluations, or the fulfilment of the remarks made in the inspections. **[**2013-11-15 **]**

1118. The licensee shall ensure that the construction and installation plans for equipment or structure commissioned are at the inspector's disposal. **[**2013-11-15 **]**

11.3.2 Operation supervisor

1119. The licensee shall appoint from among its personnel a person responsible for operation and a deputy, for pressure equipment subject to registration. The person responsible for operation shall monitor the use and condition of pressure equipment and also ensure that their use is followed in accordance with the Pressure Equipment Act [6] Sections 70 and 71. **[**2019-12-15 **]**

1120. The person responsible for operation shall be appointed before the plant unit is in the pre-operational testing phase. The licensee shall notify STUK of the details of the person responsible for operation. **[**2019-12-15 **]**

1121. The person responsible for operation shall have the necessary expertise pertaining to the structure, operation and maintenance of the pressure equipment in accordance with requirements in the Pressure Equipment Act Section 72 [6]. **[**2019-12-15 **]**

11.3.3 Inspection of location and equipment

1122. In the first phase of the pressure equipment commissioning inspection, the licensee shall demonstrate that the pressure equipment and its accessories are located in accordance with the approved plans and that the surrounding rooms and structures are built in accordance with the same plans, so that:

a. any pressure discharges in the event of failures or transients do not cause damage to people, property or the environment,

b. the pressure equipment and all its accessories can be properly operated, maintained, repaired, tested and inspected, and that there is proper accessibility during periodic and in-service inspections,

c. the requirements for radiation safety laid down in Guide YVL C.1 are met,

d. the location meets the requirements stated in Sections 6 and 7, and if necessary Section 60 of the Pressure Equipment Act [6]. **[**2019-12-15 **]**

1123. Moved to para. 912a. **[**2019-12-15 **]**

11.3.4 Inspection of accessories

1124. The pressure equipment shall have the reliable accessories required by operation and operational safety. Accessories include safety accessories and pressure accessories.
In the first phase of the commissioning inspection, it shall be verified that the pressure equipment and its accessories have been installed in accordance with a flow diagram approved by STUK and installation plan processed by STUK or an inspection body. **[**2019-12-15 **]**

1125. The licensee shall, prior to the inspection by STUK or an inspection body, perform an installation inspection of the electrical and instrumentation and control equipment of nuclear pressure equipment and confirm their conformity to requirements in an inspection report. The requirements for electrical and instrumentation and control equipment are presented in Guide YVL E.7. **[**2019-12-15 **]**

1126. The accessories shall bear such individual identification markings on the basis of which it is possible, if necessary, to trace the materials and manufacturer as well as verify the permitted operating parameters. **[**2013-11-15 **]**

1127. A type test certificate, type plate information and installation protocol shall be presented with regard to bursting disks. **[**2013-11-15 **]**

1128. As part of the pressure equipment dossier, there shall be a list of pressure equipment accessories presenting the following:
a. equipment identification markings,
b. designations,
c. exhaust capacities and set pressures of the safety accessories,
d. type markings,
e. serial numbers,
f. nominal sizes,
g. nominal or design pressures,
h. nominal or design temperatures,
i. materials of pressure-retaining parts,
j. the necessary references to standards,
k. manufacturers.
The list shall be approved by the licensee. **[**2013-11-15 **]**

1129. The valves and other controllers that shall be locked in the open or closed position during operation and that affect the safety of pressure equipment shall be listed. **[**2013-11-15 **]**

11.3.5 Testing programme

1130. The testing programmes of the systems shall be prepared and delivered to STUK for approval in accordance with Guide YVL A.5. Normally, there is no separate programme for testing individual equipment: rather, functional tests are performed using the equipment's operating parameters. The approval status of programme shall be examined during the first phase of the commissioning inspection. **[**2019-12-15 **]**

11.4 The second phase of the commissioning inspection (functional tests)

11.4.1 General requirements

1131. As part of the pre-operational testing of a nuclear facility, functional tests shall be conducted on all safety-related accessories of the installed pressure equipment. The purpose of these tests is to prove that

a. the safety accessories function reliably and have an adequate exhaust capacity,
b. the pressure and temperature measurement, regulation and relief devices and regulation and measurement devices of fluid level all function correctly,
c. the thermal expansion joints and supports of the piping perform as designed,
d. the other equipment affecting pressure equipment safety is operable,
e. the pressure equipment and joints are leak-proof,
f. operating values of the system correspond to the design. **[**2013-11-15 **]**

1132. As part of piping pre-operational testing and regardless of their safety classification, all safety-related valves units of the pressure equipment, such as shut-off valves, shall undergo functional tests in accordance with a testing programme approved in advance. The requirements of the functional tests performed on the valves are presented in Guide YVL E.8 and for the pumps in Guide YVL E.9. **[**2019-12-15 **]**

1133. The results of the functional tests shall be recorded in such a way that they can be used as basic values when carrying out periodic functional tests during operation. **[**2013-11-15 **]**

1134. The licensee shall report the functional tests in accordance with Guide YVL A.5 requirement 446. **[**2019-12-15 **]**

11.4.2 Safety accessories

1135. By means of the functional tests of safety accessories it shall be demonstrated that all safety valves and other safety accessories function reliably under operating conditions and that their exhaust capacity is adequate. Records concerning the supervision of tests and test results shall be presented to the inspector. **[**2013-11-15 **]**

1136. Once the functional test has been performed, the safety valve shall be sealed so that it is impossible to alter the opening pressure and time as well as the closing pressure and exhaust capacity without breaking the seal. **[**2013-11-15 **]**

1137. If the operation of the safety valve is tested in a test bench, the safety valve shall be finally approved in the commissioning inspection only after it has been installed in place. **[**2013-11-15 **]**

11.4.3 Measurement and regulation devices

1138. The measurement, regulation and relief devices for pressure, temperature and fluid level, required by pressure equipment safety, shall be operable and they shall fulfil the qualification and operability requirements presented in Guide YVL E.7 and the other applicable Guides. **[**2019-12-15 **]**

1139. The licensee shall, prior to the inspection by STUK or an authorised inspection body, perform a commissioning inspection of electrical and I&C equipment of nuclear pressure equipment and confirm their conformity to requirements in an inspection report. **[**2013-11-15 **]**

11.4.4 Piping, pipe supports, thermal expansion and vibrations

1140. The piping with its accessories and supporting structures shall be approved prior to commissioning. However, to adjust the equipment and to test operational readiness, pre-operational testing of the piping and other pressure equipment is allowed prior to the commissioning inspection, provided that sufficient care is taken. **[**2013-11-15 **]**

1141. The flexibility of the piping and the functioning of the supports shall be demonstrated during pre-operational testing. **[**2013-11-15 **]**

1142. Piping vibration shall be measured in accordance with the measurement plan prepared by the licensee. The measurements shall show highest vibration stresses in the piping either directly or by means of a calculation model applied to the results. **[**2013-11-15 **]**

1143. The licensee shall monitor the vibration in safety class 1 piping by means of measurements both under circumstances corresponding to normal operation and during tests causing dynamic impact loads. In addition, vibration in all accessible piping shall be visually observed applying the criteria approved by STUK for each case. Compliance with the criteria shall be demonstrated by measurements, where necessary. **[**2019-12-15 **]**

1144. If the criteria are exceeded, the vibration shall be attenuated to an acceptable level by finding out its initiator or altering the construction of supporting. The changes shall be approved by the organisation that approved the construction plan. **[**2019-12-15 **]**

1145. There shall be adequate margin for thermal movement in the piping and related structures and equipment, and when cooled down to the initial temperature the thermal displacements shall be restored. Thermal movements shall be controlled by measurements. **[**2013-11-15 **]**

1146. During the commissioning inspection, it shall be ascertained by the licensee that the piping is in compliance with the system description – among other things, the process and instrumentation charts. **[**2013-11-15 **]**

1147. Inspection of the mechanical performance of the piping shall be continued also after the start-up of the nuclear facility, unless the performance otherwise can be demonstrated to be appropriate when using the normal operating parameters of the piping. **[**2019-12-15 **]**

1148. The measurement programmes implemented at various capacity ranges, and the result reports, of the monitoring of piping thermal movements and vibration shall be presented to the inspecting organisation for approval during the commissioning of the system. **[**2013-11-15 **]**

11.5 Pressure equipment registration

1149. During the commissioning inspection, the licensee shall request registration of the pressure equipment in accordance with Section 51 of the Pressure Equipment Act [6]. The licensee requests registration from STUK. STUK shall perform the registration also when an authorised inspection body or the licensee’s in-house inspection organisation carries out the commissioning inspection. The serial number provided by the manufacturer, together with the location code, acts as the unique identifier of the equipment. **[**2019-12-15 **]**

1150. The pressure equipment dossier, supplemented with the commissioning inspection information, shall be presented for approval in connection with registration. **[**2013-11-15 **]**

12 Operation

12.1 General

1201. The licensee shall operate the pressure equipment in accordance with Section 5 of the Pressure Equipment Act [6]. **[**2019-12-15 **]**

1202. The licensee shall see to it that pressure equipment owned by controlled by it is operated, maintained and monitored in accordance with regulations as well as the operating and maintenance instructions of the manufacturer or importer. The licensee shall inform other organisations that own pressure equipment at the site area of the requirements set by the Pressure Equipment Act for the use of pressure equipment. **[**2019-12-15 **]**

1203. The licensee shall employ experts in the construction, operation and maintenance of the pressure equipment. **[**2013-11-15 **]**

1204. The licensee shall ensure that the prerequisites facilitating the supervision of the condition and safety of the pressure equipment are arranged for the supervisor and shall provide the information on the use and condition of the pressure equipment for his or her use. **[**2013-11-15 **]**

1205. The person responsible for the operation shall inform the licensee of the significant matters connected with the operation or condition of the pressure equipment. **[**2013-11-15 **]**

1206. The licensee shall store the pressure equipment dossier or corresponding documentation and keep it up-to-date during the period of the equipment's service life. Similarly, the necessary records concerning quality control, including the radiographic films and other samples needed, shall be stored. **[**2019-12-15 **]**

1207. The licensee shall ensure that sufficient information on the design, manufacturing and inspection of the pressure equipment is available to other participating organisations. **[**2013-11-15 **]**

12.2 Pressure equipment record

1208. The licensee shall maintain a record of the nuclear facility's pressure equipment in which all pressure vessels, heat exchangers and steam boilers are given, system by system. **[**2013-11-15 **]**

1209. The pressure equipment identification code, serial number, name, safety class (separately if multi-compartment pressure equipment), pressure equipment class, design pressure and temperature as well as volume and contents of the pressure equipment shall be marked in the record. **[**2019-12-15 **]**

1210. The record of pressure equipment shall indicate which organisation conducts periodic inspections and whether the equipment is subject to registration. **[**2019-12-15 **]**

1211. In plant projects, a preliminary pressure equipment record shall be delivered to STUK for information as early as possible, and the final record shall be delivered during the commissioning phase of the nuclear facility. Any changes made to the record shall be delivered for information on an annual basis. **[**2013-11-15 **]**

12.3 Periodic inspections and other condition monitoring

1212. The licensee shall have clearly defined working principles and guidelines at its disposal on the periodic inspections and condition monitoring of the nuclear facility's pressure equipment. **[**2013-11-15 **]**

1213. The non-destructive in-service inspections laid down in the Nuclear Energy Act shall be performed on the pressure vessels and piping important to nuclear safety in accordance with Guide YVL E.5. **[**2013-11-15 **]**

1214. On the pressure equipment important to pressure equipment safety that is subject to registration, periodic inspections shall be performed in accordance with the Pressure Equipment Act [6] and chapter 12.4 of this Guide. The periodic inspections shall be conducted by STUK, an authorised inspection body or the licensee's in-house inspection organisation, in accordance with the division of inspection responsibilities. **[**2019-12-15 **]**

1215. The licensee shall ensure that the periodic inspections are carried out by the set date (the pressure equipment shall not be in use or pressurised after the set date), and that the prerequisites for appropriate inspections exist. In particular, the safety of the internal inspections of the pressure equipment shall be ensured. **[**2019-12-15 **]**

1216. The approval requirements of the testing organisations and the personnel qualifications required for non-destructive testing in connection with condition monitoring and periodic inspections are presented in Guide YVL E.12. The requirements laid down in Guide YVL E.5 shall be observed in the in-service inspections detailed in Guide. **[**2019-12-15 **]**

1217. The plans for periodic inspections of the nuclear facility's pressure equipment subject to registration, approved by the person responsible for operation, shall be presented to STUK's inspector for approval by the licensee before the dates of the periodic inspections. The periodic inspections for pressure equipment are in accordance with Section 56 of the Pressure Equipment Act [6]:
a. internal inspection,
b. operational inspection,
c. periodic pressure test. **[**2019-12-15 **]**

1218. The licensee shall enter into the pressure equipment dossier the information concerning the implementation and results of the periodic inspections on the pressure equipment subject to registration. **[**2019-12-15 **]**

1219. The licensee shall present to STUK's inspector, for inclusion into the pressure equipment register, the results and result documentation of those periodic inspections that an inspection organisation has carried out on the nuclear facility's pressure equipment subject to registration. **[**2013-11-15 **]**

1220. The licensee shall prepare a programme for the purpose of monitoring the condition of pressure equipment not subject to registration, by which means it shall assess the condition and safety of the pressure equipment. The condition monitoring programme ensures the meeting of the pressure equipment safety requirements. **[**2019-12-15 **]**

1221. The licensee shall annually prepare condition monitoring plans for the piping and deliver them to STUK for information. The methods of monitoring include for example wall thickness measurements, monitoring of vibrations, inspection of supports and brackets as well as monitoring of pressure and thermal transients. **[**2013-11-15 **]**

1222. The licensee shall deliver to STUK for information an annual summary of the results of the condition monitoring of piping and the most significant observations. **[**2013-11-15 **]**

12.4 Periodic inspections of pressure equipment subject to registration

12.4.1 Periodic inspection intervals

1223. An inspection (periodic inspection) defined in the Pressure Equipment Act [6] shall be performed at set intervals on pressure equipment subject to registration. This is to ensure that the pressure equipment does not endanger the health, safety or property of any persons when used in an appropriate manner. The setting of inspection periods begins from the commissioning inspection. The licensee may postpone a periodic inspection by one month at maximum without separate approval. **[**2013-11-15 **]**

1224. Within its own responsibility area, an authorised inspection body or the licensee's in-house inspection organisation may, at the request of the licensee, postpone the date of an in-service inspection by no more than six months. The inspection organisation shall report the postponement in writing to STUK's resident inspector. A postponement does not affect the determination of subsequent inspection dates. **[**2013-11-15 **]**

1225. The licensee shall submit a request of postponement to the inspection organisation in such wise that processing it prior to the due date is possible. If the set date has already expired, the application for postponement shall be addressed to STUK. **[**2013-11-15 **]**

1226. STUK may postpone the date of the periodic inspection by 13 months at maximum upon the licensee's request. STUK's inspector may postpone the date of the periodic inspection by six months at maximum upon the licensee's request. Postponement shall be applied for in good time prior to the date of the periodic inspection. The postponement does not affect any subsequent inspection dates.
In case an inspection is performed more than 13 months earlier than planned, the setting of inspection periods shall begin from the date of the inspection conducted on an earlier date. In case a periodic inspection is to be performed earlier than planned, it is sufficient to submit this for information to STUK. The document shall indicate the new date of the inspection.
[2019-12-15 **]**

1227. Pressure equipment subject to registration shall be internally inspected every four years. The internal inspection of a pressure vessel made of reinforced plastic shall be performed every two years. **[**2013-11-15 **]**

1228. On application by the licensee, the time interval between internal inspections may be doubled at the most. Grounds for the safe and reliable use of the pressure equipment during the extended inspection period shall be presented in the application. **[**2013-11-15 **]**

1229. The interval between internal inspections is to be shortened, if necessary, according to the condition of the pressure equipment. **[**2013-11-15 **]**

1230. A pressure test shall be carried out on the pressure equipment subject to registration in connection with every second internal inspection. The pressure test interval may be, at maximum, doubled from the interval based on the default internal inspection interval (4 or 2 years). **[**2013-11-15 **]**

1231. Operational inspections shall be performed on the steam boilers at two year intervals, and every four years on other pressure equipment subject to registration. The time period between operational inspections may be extended by one year at the most. **[**2013-11-15 **]**

1232. In connection with each inspection, the inspector shall specify the next inspection date for the pressure equipment subject to registration. STUK enters, on the basis of the dates set, the inspection dates of the pressure equipment subject to registration as well as revisions thereto in the pressure equipment register it maintains. **[**2019-12-15 **]**

12.4.2 Replacing a periodic inspection with a pressure equipment condition monitoring system

1233. The operational inspection, internal inspection or periodic pressure test of pressure equipment subject to registration may be replaced with a pressure equipment condition monitoring system in accordance with section 64 of the Pressure Equipment Act [6], if the effects of the system correspond to a periodic inspection. **[**2019-12-15 **]**

1234. The licensee shall apply for STUK's approval for the pressure equipment condition monitoring system. The condition monitoring systems may be commissioned after the first internal inspection has been conducted in a normal schedule **[**2013-11-15 **]**

1235. The inspections to be replaced by the system, a description of compensatory measures, and the grounds for ascertaining the reliability and safety of the pressure equipment by means of the system shall be stated in the application. **[**2013-11-15 **]**

1236. Compensatory measures shall be justified by risks arising from the item inspected, and operational risks as well as the information gained from earlier inspections. **[**2013-11-15 **]**

1237. A description of the system, the duties and competence requirements of those participating in the activities as well as the maintenance of the measuring devices required in the operations shall also be attached to the application. **[**2013-11-15 **]**

1238. The date of presenting the condition monitoring results shall be given in the programme. **[**2013-11-15 **]**

12.4.3 Replacing a periodic inspection with pressure equipment follow-up

1239. The periodic inspections of pressure equipment may be replaced, entirely or in part, by pressure equipment follow-up in accordance with section 63 of the Pressure Equipment Act [6] if the safety of the pressure equipment can be ensured by means of follow-up. **[**2019-12-15 **]**

1240. The licensee shall apply for STUK's approval for the pressure equipment follow-up. **[**2013-11-15 **]**

1241. The application shall contain the following information: a follow-up plan, the inspections to be replaced by follow-up entirely or in part, and the grounds for verifying pressure equipment reliability and safety by means of follow-up. **[**2013-11-15 **]**

1242. The follow-up plan shall include the procedures for updating and developing the plan. **[**2013-11-15 **]**

1243. The date of presenting the follow-up results shall be given in the plan. **[**2013-11-15 **]**

12.4.4 Internal inspection

1244. In the internal inspection of pressure equipment subject to registration, it shall be verified according to Section 58 of the Pressure Equipment Act [6] that the pressure equipment and its accessories do not have faults or features that endanger their safe use or compromise their reliable operation. **[**2019-12-15 **]**

1245. Internal inspection shall, where necessary, be complemented with other non-destructive testing methods. **[**2013-11-15 **]**

12.4.5 Operational inspection

1246. The operational inspection of a nuclear facility's pressure equipment subject to registration shall verify according to Section 57 of the Pressure Equipment Act [6] the safe and reliable operation of the pressure equipment. **[**2019-12-15 **]**

1247. An operational inspection shall cover the testing of the performance of equipment and equipment systems with a bearing on operational safety, such as safety accessories, valves, regulation devices and measurement devices. The inspection of other pressure equipment accessories shall also be included. **[**2013-11-15 **]**

1248. If the internal in-service inspections have been entirely replaced with pressure equipment follow-up, or by a condition monitoring system, the reports generated in the context of this replacement shall be presented to an inspector from STUK or an inspection organisation during an operational inspection. **[**2013-11-15 **]**

12.4.6 Periodic pressure test

1249. In the pressure test according to Section 59 of the Pressure Equipment Act [6] of a nuclear facility's pressure equipment subject to registration, the leak-tightness of the pressurised walls of the pressure equipment at test pressure and the absence of safety-endangering deformations in their structure shall be ascertained. **[**2019-12-15 **]**

1250. Possible instructions issued by the manufacturer of the pressure equipment shall be considered when performing the test. **[**2013-11-15 **]**

1251. A hydrostatic pressure test shall be conducted at a pressure not less than 1.3 times the maximum allowable operating pressure. A pneumatic pressure test shall be conducted at a pressure 1.1 times the maximum allowable operating pressure. The pneumatic pressure test may be carried out only in exceptional cases when, for structural reasons, a hydrostatic pressure test is not reasonably possible or when not even small amounts of liquid are allowed inside the pressure equipment. For special reasons, some other test pressure may be approved for use. **[**2013-11-15 **]**

1252. The periodic pressure test of the pressure vessel may not be required if the strength and integrity of the vessel have been verified in an internal inspection. The licensee must obtain an approval for not conducting the pressure test. In the approval application, the grounds shall be given. The assessment of the continuation of the exemption procedure shall be considered when drawing up plans for forthcoming vessel internal inspections. **[**2019-12-15 **]**

1253. When, during the design of a nuclear facility's systems, reasonable preparations cannot be made for the periodic pressure tests of individual items of pressure equipment, the structural integrity and leak tightness of the equipment shall be ensured by means of a periodic system pressure test in accordance with the requirements of the design standard. Test pressure is then determined by the requirements of the design standard. **[**2019-12-15 **]**

12.5 The effect of neutron radiation on mechanical properties

1254. The licensee shall monitor the effect of neutron radiation on the mechanical properties of the equipment material, weld metal and heat affected zone in accordance with the procedure approved in the construction plan. **[**2013-11-15 **]**

1255. If the pressure equipment must be heat-treated due to radiation embrittlement, the licensee shall draw up a plan for principles that includes a safety assessment of the pressure equipment as well as research-based grounds for the actions taken. **[**2013-11-15 **]**

1256. A detailed heat treatment programme with parameters and an inspection plan shall be prepared that ensure a successful completion of the heat treatment. **[**2019-12-15 **]**

1257. A plan similar to that prepared for new pressure equipment shall be drawn up on the monitoring of re-embrittlement to the heat treated pressure equipment. **[**2013-11-15 **]**

12.6 Maintenance

1258. The licensee shall be obliged to carry out maintenance and repairs to the pressure vessels and piping following the principles laid down in Guide YVL A.8. **[**2013-11-15 **]**

1259. On service work, it is not necessary to draw up a construction plan, if the work can be carried out following normal maintenance procedures and approved spare parts and materials are used for service work. If these requirements are not met, a plan shall be prepared and presented to an inspector from STUK or an inspection organisation for approval. **[**2013-11-15 **]**

1260. If service work has required a partial or full disassembly of the equipment, the equipment shall undergo a construction inspection in accordance with this YVL Guide. If the service of the equipment has included tests for operability, leak tightness and/or load-bearing capacity, a protocol or some other record shall be presented to the inspector. **[**2013-11-15 **]**

1261. For repair work, the licensee shall draw up a construction plan, which shall include the same information as in the plan for a new structure or sufficient references to previously approved plans. All repairs shall be justified. **[**2013-11-15 **]**

1262. The construction plan shall be submitted for approval in accordance with the division of inspection responsibilities. A repair work plan under the responsibility of STUK may be submitted for approval by a STUK inspector, if the work in question is minor and conventional and does not alter the functional properties of the system. **[**2013-11-15 **]**

1263. Plans and construction inspections of spare parts shall be carried out correspondingly and in a extent equal to that of original parts. **[**2013-11-15 **]**

1264. After a repair to the pressure retaining parts, the pressure vessel or piping shall undergo a pressure test or leak tightness test to ensure the operability of the equipment. Replacing the test with non-destructive testing shall be submitted for approval separately. **[**2013-11-15 **]**

1265. If the repair work is very extensive, covering, for example, construction or installation of entirely new pressure equipment or other large units, the commissioning inspections shall be conducted in accordance with the inspection requirements set for new equipment. In minor repairs, the equipment's readiness for operation shall be assessed with inspections corresponding to the commissioning inspection, and the operating licence may be granted in a repair or modification protocol after the work has undergone a construction inspection. **[**2013-11-15 **]**

1266. The licensee shall be obliged to maintain an equipment-specific register on repair work completed and parts exchanged. **[**2013-11-15 **]**

13 Modifications

13.1 Requirements

1301. The licensee shall prepare a construction plan for the modifications of nuclear pressure vessels and piping, and have it approved in accordance with chapter 7. In case of a system modification, it shall be sent for approval in accordance with Guide YVL B.1 before sending the approval application of the construction plans for the equipment. As far as possible, the modifications shall adhere to latest requirements set for equipment. A modification plan under the responsibility of STUK may be submitted for approval by a STUK inspector, if the work in question is minor and conventional and does not alter the functional properties of the system. A corresponding construction plan shall also be prepared for modifications of EYT pressure vessels and piping, and it shall be submitted for approval in accordance with Annex D. The construction plan shall be based on the system level plan submitted to STUK. **[**2019-12-15 **]**

1302. Modifications to pressure vessels and piping shall be implemented according to the construction plan approved for them. **[**2013-11-15 **]**

1303. The licensee shall, irrespective of whether the employee is employed by the licensee or an external company, provide the site-specific knowledge and familiarisation training needed to perform the modification work on the plant site and ensure that all employees have adequate instructions and the appropriate tools at their disposal. **[**2013-11-15 **]**

1304. Any plans concerning spare parts shall be prepared and construction inspections conducted correspondingly and in a extent equal to that of original parts. **[**2013-11-15 **]**

1305. The licensee shall be obliged to maintain an equipment-specific register on completed modification works. **[**2013-11-15 **]**

13.2 Modification construction inspection

1306. The licensee shall request a construction inspection for modification from STUK or an inspection body in accordance with the division of inspection responsibilities. The request shall be made approximately two weeks prior to the planned date. The modification construction inspection and partial inspections shall ensure the acceptability of the modification and the documentation of the quality control performed on it. **[**2019-12-15 **]**

1307. In the modification construction inspection of the pressure vessel and piping, the supplier, installation organisation and licensee as well as the inspection procedures shall adhere to the same requirements as those applied in the construction inspection of pressure vessels and piping. **[**2013-11-15 **]**

13.3 Pressure equipment modification inspection

1308. A modification inspection, according to Section 61 and 62 of the Pressure Equipment Act [6], shall be carried out prior to a new commissioning on

a. pressure equipment that may have been damaged or that has undergone significant modifications to its equipment or equipment systems affecting operational safety, or equipment whose purpose of use or operating parameters are intended to undergo changes

b. pressure equipment subject to registration that has been installed to a new location or been transferred or modified so that the approved location plan cannot be adhered to or that has been out of use, as notified to STUK, over one year and will be re-commissioned

c. pressure equipment that has been imported from a member state of the European Economic Area and manufactured before the requirement for the CE marking. **[**2019-12-15 **]**

1309. After modifications, the pressure vessel or piping shall at least undergo a functional test, equivalent to a periodic test, to ensure its operability. **[**2013-11-15 **]**

1310. In connection with STUK-approved system modifications, the testing programme and documentation of test results shall be submitted to STUK for approval according to the requirements of YVL Guide A.5. **[**2019-12-15 **]**

1311. The pressure equipment modification inspection shall ensure that the modification has been carried out appropriately. The commissioning inspection procedures presented in this Guide shall be applied to the modification inspection where applicable. **[**2013-11-15 **]**

14 Decommissioning

1401. When decommissioning pressure equipment and disposing of equipment classified as nuclear waste, Guides YVL D.4 and YVL D.5 shall be followed. **[**2019-12-15 **]**

1402. When pressure equipment is decommissioned, the licensee shall update the pressure equipment record. **[**2013-11-15 **]**

1403. The licensee shall submit to STUK for information a notification of decommissioning equipment. **[**2013-11-15 **]**

15 Regulatory oversight by the Radiation and Nuclear Safety Authority

15.1 Division of inspection responsibilities

1501. STUK may grant inspection and overseeing rights of nuclear facility pressure vessels and piping to an authorised inspection body or the licensee's in-house inspection organisation, approved by STUK, in accordance with Guide YVL E.1. The inspection and monitoring rights of the licensee's in-house inspection organisation are restricted to class EYT (non-nuclear), but it can also perform expert tasks in safety class 3. **[**2013-11-15 **]**

1502. Annex C to this Guide presents the principles of the division of inspection responsibilities for the nuclear pressure vessels and piping. Annex D lists the principles for the inspections of non-nuclear pressure vessels and piping. The division of inspection responsibilities may be supplemented in separate decisions. **[**2013-11-15 **]**

15.2 Requirement specification for equipment

1503. STUK evaluates the requirements placed by the licensee on the safety classified pressure vessels and piping of a nuclear facility by assessing the requirement specifications for equipment and by accepting the general inspection plan. **[**2019-12-15 **]**

1504. The meeting of the set requirements will be verified in connection with document reviews and construction inspections, and as part of the construction and operation inspection programmes. **[**2013-11-15 **]**

1505. The specifications based on the licensee's requirements and prepared by plant and equipment suppliers are approved with STUK's decisions. **[**2013-11-15 **]**

15.3 Approval and oversight of organisations

15.3.1 Approval of the manufacturer

1506. STUK gives approval to nuclear pressure vessel and piping manufacturers and installation organisations that use special processes in their manufacturing, in a separate decision upon application. Other manufacturers are assessed in connection with the construction plan. **[**2013-11-15 **]**

1507. The approval of the manufacturer is based on information supplied and approved by the licensee and manufacturer audits carried out by STUK and the licensee. The audits are primarily directed at suppliers of pressure vessels and piping in safety classes 1 and 2 and are carried out prior to the approval process, as well as monitoring audits during the validity of the

approval of the manufacturer. **[**2013-11-15 **]**

1508. The approval decision of a nuclear pressure vessel and piping manufacturer is licensee-specific, and it is valid for a maximum of five years at a time. If the manufacturer or licensee fails to meet its annual obligations or if the operations fail to meet the conditions imposed upon approval, STUK may issue a decision cancelling the approval. **[**2013-11-15 **]**

15.3.2 Third-party approval

1509. A notified body or a recognised third-party organisation pursuant to the Pressure Equipment Directive [5] may, within the scope of their areas of qualification without separate approval, operate as a third party that witnesses and confirms sampling, destructive and non-destructive testing and qualifications. In addition to certification bodies accordant with the Pressure Equipment Directive, other accredited certification bodies shall also be accepted. In such a case, the accreditation shall be covered by the Multilateral Agreements (MLA) or Mutual Recognition Arrangements (MRA) entered into by FINAS and the accreditation shall be conducted against the requirements of Standard EN ISO/IEC 17020, 17021, 17024 or 17065. **[**2019-12-15 **]**

1510. The expertise of a third party performing control of manufacturing is evaluated on the basis of the information appended to the construction plan. If necessary, expertise can be assessed at a personal level. **[**2019-12-15 **]**

15.3.3 Approval of inspection and testing organisations

1511. The requirements and approval procedure for inspection organisations are presented in Guide YVL E.1, and the requirements and approval procedure for testing organisations are presented in Guide YVL E.12. **[**2013-11-15 **]**

15.3.4 Oversight of design organisations

1512. Oversight of design organisations is covered in Guides YVL B.1, YVL E.4 and YVL A.5. **[**2013-11-15 **]**

15.4 Construction plan

1513. STUK or an authorised inspection body reviews the construction plan of a nuclear pressure vessel or piping which includes the documents laid down in chapter 7 of this Guide. **[**2013-11-15 **]**

1514. The first phase of the construction plan review is the assessment of the licensee's summary of justifications and the pre-inspection of the construction plan. If the pre-inspection indicates that significant supplements or corrections are needed in the document, a detailed review is not performed, but supplements to the document are required by a set date. **[**2013-11-15 **]**

1515. The result of processing the construction plan is presented in a decision by STUK or an authorised inspection body. Minor updates to approved plans may be processed as received for information. **[**2013-11-15 **]**

1516. The approval of the construction plan is a prerequisite for the commencement of manufacture of safety class 1 and 2 equipment as per the plan. For safety class 3, the construction plan shall be approved before starting the construction inspection. **[**2019-12-15 **]**

15.5 Control of manufacturing, and construction inspection

1517. STUK or an authorised inspection body monitors the manufacture of nuclear pressure vessels and piping in connection with partial inspections of the construction inspection, or during separate visits. **[**2013-11-15 **]**

1518. Supervision observations are recorded in the construction inspection protocol and/or inspection memoranda. If any essential shortcomings are discovered, the inspector may suspend manufacturing. **[**2013-11-15 **]**

1519. The construction inspection by STUK or an authorised inspection body includes verification of the equipment's conformity to requirements against the construction plan, review of the manufacture or installation documentation, inspection of equipment, checking the results of strength verification tests as well as the necessary pressure and functional tests. **[**2019-12-15 **]**

1520. Removed. **[**2019-12-15 **]**

1521. STUK or an authorised inspection body draws up a record of their inspections describing the inspection object and itemising the inspections and tests conducted. Potential requirements presented in connection with the inspections are entered in the record together with the due

dates or times for submitting the responses to the requirements. The record is closed and the inspector hands over the signed record to a representative of the licensee once all the specified inspections have been completed and any requirements entered in the record have been resolved. **[**2019-12-15 **]**

1522. In the construction inspection, the inspector enters the identification markings required by the applied standard on the nameplate and shell of the pressure equipment subject to registration. **[**2013-11-15 **]**

1523. An approved construction inspection is a prerequisite for the delivery of the pressure vessel or piping component to the installation site. The piping construction inspection is carried out at the plant site. **[**2013-11-15 **]**

15.6 Control of installation, and installation construction inspection

1524. The supervision of installation, and the installation construction inspection, is performed in a similar manner to the control of manufacturing and the manufacture construction inspection. **[**2013-11-15 **]**

1525. An approved installation construction inspection is a prerequisite for the commissioning inspection of the pressure vessel or piping. **[**2013-11-15 **]**

15.7 Commissioning inspection

1526. The first phase of the commissioning inspection of a nuclear pressure vessel or piping by STUK or an authorised inspection body verifies the approval status of documents, completion of installation, and fulfilment of the safety requirements required by functional tests. **[**2013-11-15 **]**

1527. Readiness for functional tests is demonstrated by granting the equipment or piping a test operating licence in a commissioning inspection protocol. **[**2013-11-15 **]**

1528. In the second phase of the commissioning inspection, the functional tests to ensure readiness for operation are carried out in accordance with the approved testing programme. **[**2013-11-15 **]**

1529. Based on approved functional tests, the equipment or system is granted an operating licence in a commissioning inspection protocol. The operating licence may also be granted for a fixed period. **[**2013-11-15 **]**

1530. The registration of pressure equipment subject to registration is carried out upon commissioning. The information of the nameplate is checked. **[**2013-11-15 **]**

1531. During the commissioning inspection of the pressure equipment subject to registration, the date and type of the next periodic inspection of the pressure equipment is fixed. **[**2013-11-15 **]**

15.8 Operation, condition monitoring, and maintenance

1532. STUK supervises the operation, condition monitoring and maintenance of the pressure vessels and piping of a nuclear power plant during the inspections that are part of its periodic inspection programme and during other inspections it performs. **[**2013-11-15 **]**

1533. The pressure equipment record maintained by the licensee is submitted to STUK for information during the commissioning phase of the nuclear facility, and it is updated annually. The licensee also submits a notification of the person, and his/hers deputy, responsible for operation it has nominated. **[**2019-12-15 **]**

1534. For the purpose of monitoring pressure equipment subject to registration, STUK maintains a register of pressure equipment to control the implementation of periodic inspections of pressure equipment. **[**2013-11-15 **]**

1535. STUK's inspector approves the plans for periodic inspections of the pressure equipment subject to registration on nuclear facility, performed in accordance with the Pressure Equipment Act [6]. **[**2019-12-15 **]**

1536. Periodic inspections of pressure equipment subject to registration include an internal inspection, operational inspections and a periodic pressure test. In compliance with the division of inspection responsibilities, the inspections are conducted by STUK or an inspection organisation approved under Guide YVL E.1. **[**2013-11-15 **]**

1537. STUK may, upon the licensee's request, approve changes to the periodic inspection intervals and dates of pressure equipment as well as the replacement of periodic inspections of pressure equipment with a condition monitoring system or pressure equipment follow-up. An authorised inspection body or the licensee's in-house inspection organisation may also, within its own area of responsibilities, postpone the date of the periodic inspection by no more than six months. **[**2013-11-15 **]**

1538. In each inspection, the inspector defines the next inspection date for pressure equipment subject to registration. STUK's inspector records the inspection dates for pressure equipment subject to registration, as well as changes thereto, in the pressure equipment register. **[**2013-11-15 **]**

1539. STUK processes as received for information the piping condition monitoring programmes and the results thereof. **[**2013-11-15 **]**

1540. STUK monitors the adequacy of the periodic inspection programmes of pressure equipment by following the implementation of the programme and reviewing results. **[**2013-11-15 **]**

1541. In the inspection of maintenance and repair work plans and the construction inspection of spare parts and work the same process as in the approval of the original work is followed. Plans of minor works may be approved by STUK's inspector. Equipment operability after repairs is checked with a functional test. **[**2013-11-15 **]**

15.9 Modifications

1542. Inspections and supervision of modifications are carried out in the same manner as that of a new structure. Plans of minor works may be approved by STUK's inspector. **[**2019-12-15 **]**

1543. A modification inspection is performed on pressure equipment subject to registration, where needed, to ensure equipment operability. **[**2013-11-15 **]**

15.10 Decommissioning

1544. The procedures for decommissioning are outlined in Guides YVL D.4 and YVL D.5. **[**2019-12-15 **]**

1545. As the administrator of the pressure equipment register, STUK removes any decommissioned pressure equipment subject to registration from the register upon notification by the licensee. **[**2013-11-15 **]**

16 ANNEX A Minimum scope of supervision by STUK, a third party and the licensee for pressure vessels and piping in each safety class

Table 1: Supervision before manufacturing

	Safety Class	STUK or AIO [1)]	Third Party	Licensee
Auditing of a pressure equipment manufacturer's quality management system				
	1	H [2)]	–	H
	2	H [2)]	–	H [3)]
	3	W [2)]	–	W
Auditing of a material manufacturer's quality management system [8)]				
	1	H [2)]	–	H
	2	W [2)]	–	H [4)]
	3	W [2)]	–	W
Prerequisite for fabrication (including installations ja modifications)				
• approval of manufacturers, subcontractors, and NDT and DT testing organisations [2)] • approval of construction plan	1	H	–	H
	2	H	–	H
	3	H	–	H
Procedure qualifications				
• manufacturing procedures (permanent joints, forming, heat treatment and other similar)	1	W [7)]	H	W
	2	W [7)]	H	W
	3	–	H	W
Personnel qualifications				
• personnel (permanent joints, NDT)	1	–	H	W
	2	–	H	W
	3	–	H	W

[2019-12-15]

	Safety Class	STUK or AIO [1)]	Third Party	Licensee
Witnessing of material testing and sampling, and stamp transfer [5)]				
Witnessing of material testing for main pressure-retaining parts • tensile tests, bend tests and impact tests, determining brittle failure temperature	1	H	H	H
	2	W [6)]	H	H
	3	--	--	W
• witnessing of welding filler material tests for main components	1	W	H	W
	2	--	--	W
	3	--	--	W
• non-destructive testing (NDT)	1	W	H	W
	2	--	H	W
	3	--	--	W

1) The division of inspection responsibilities between STUK and an authorised inspection body (AIO) is defined in Annex C.
2) STUK
3) Pressure equipment manufacturers using special processes
4) Material manufacturers requiring manufacturer approval
5) Targets are determined in the licensee's plant-specific specifications and equipment-specific plans.
6) With piping, only applicable to d ≥ 100 mm
7) In connection with STUK-approved procedure test specifications
8) Only concerns material manufacturers of main components

H = Hold point W = Witness point **[**2019-12-15 **]**

Table 2: Supervision during manufacturing and commissioning

	Safety Class	STUK or AIO [1)]	Third Party	Licensee
Equipment manufacturing control [5)]				
Welding and non-destructive testing of pressurised main components	1	W	H	W
	2	W	H	W
	3	–	–	W
Heat treatment	1	W	H	W
	2	W	H	W
	3	–	–	W
Production tests	1	W	H	W
	2	W	H	W
	3	–	–	W
Construction inspection and installation construction inspection				
• inspection of equipment and manufacturing documentation before the pressure test • pressure test and inspection of equipment after pressure test • inspection of completed equipment and final documentation	1	H	–	H
	2	H	–	H
	3	H	–	H
Commissioning inspection				
• test operation plan • determining readiness for functional tests • functional tests	1	H	–	H
	2	H	–	H
	3	H	–	H

1) The division of inspection responsibilities between STUK and an authorised inspection body (AIO) is defined in Annex C.
2) STUK
3) Pressure equipment manufacturers using special processes
4) Material manufacturers requiring manufacturer approval
5) Targets are determined in the licensee's plant-specific specifications and equipment-specific plans.
6) With piping, only applicable to d ≥ 100 mm

H = Hold point W = Witness point **[**2019-12-15 **]**

Table 3: Different tasks for third party

	Safety Class	Third party	Definition
Procedure qualifications			
• manufacturing procedures (permanent joints, forming, heat treatment and other similar)	1	H	The third party is an accredited (MLA/MRA) certification body within the scope of its area of qualification. A notified body under PED 2014/68/EU or an recognised third party (such as a welding certification body) is also accepted. Defined in PED Article 24. Accreditation requirement Article 29 item 4.
	2	H	
	3	H	
Personnel qualifications			
• personnel (permanent joints, NDT)	1	H	The third party is an accredited (MLA/MRA) certification body within the scope of its area of qualification. A notified body under PED 2014/68/EU or an recognised third party (such as a welding certification body) is also accepted. Defined in PED Article 24. Accreditation requirement Article 29 item 4. Certification of NDT testers as laid down in Guide YVL E.12
	2	H	
	3	H	
Witnessing of material testing and sampling, and stamp transfer			
Witnessing of material testing for main pressure-retaining parts • tensile tests, bend tests and impact tests, determining brittle failure temperature, supervision of non-destructive testing	1	H	The third party is an inspector referred to in standard EN 10204 as the inspector designated by the official regulations. In the manufacturing of safety-classified components, a notified body under PED 2014/68/EU or an AIO within the scope of its area of qualification serves as the inspector designated by the official regulations.
	2	H	
	3	–	
• witnessing of welding filler material tests for main parts	1	H	
	2	–	
	3	–	

[2019-12-15 **]**

	Safety Class	Third Party	Definition
Equipment manufacturing control			
Welding and non-destructive testing of pressurised main components	1	H	Manufacturing control may be carried out, upon application by a licensee, by an organisation independent of manufacturing and approved by STUK. A notified body under PED 2014/68/EU or an AIO within the scope of its area of qualification is recommended (see notes).
	2	H	
	3	--	
Heat treatment	1	H	
	2	H	
	3	--	
Production tests	1	H	
	2	H	
	3	--	

Notes:

- Upon application by a licensee, an NDT/DT testing organisation may serve as a third party in manufacturing control only if it is an independent party (the testing organisation does not perform testing on a product it controls). NDT/DT testing is part of manufacturing. The application must therefore provide solid justifications, for each person if needed, for the qualification of the control activities, for the technology used in manufacturing for instance. In the control of welding work taking place at the plant site of an operating facility, an NDT tester carrying out testing work and approved by the licensee may be used.
- The scope of the control activities, with justifications, is approved in the component's inspection plan.
- STUK approves third parties in connection with the review of the construction plan.

[2019-12-15 **]**

17 ANNEX B Material certificate requirements for materials and welding filler materials, SFS-EN 10204

Table 1:

Component	Safety Class		
	1	2	3
Main pressure-retaining parts of equipment	3.2	3.2	3.1 [1)]
Other pressure-retaining parts [2)]	3.1 [1)]	3.1 [1)]	2.1 [3)]
Other parts	2.1 [3)]	2.1 [3)]	2.1 [3)]

1) Certificate 3.1 is approved, if the manufacturer has a certified quality management system in place. Otherwise, certificate 3.2 is required.
2) The requirements of other pressure-retaining parts also apply to
a) parts attached to pressure-bearing parts by welding
b) internal structures of main pressure-bearing parts, excluding the core support structure of reactor pressure vessel
c) main components of support structures (main components refer to components, the failure of which will result in the loss of the performance of the support in question)
d) piping in safety class 2, ≤ DN 50.
3) Parts in contact with the primary circuit shall have at least an analysis of each delivery batch. (YVL E.3/514 b). The analysis may be conducted by the manufacturer of the material or an accredited testing organisation (YVL E.12/301), (YVL E.3/514 b).

A higher level material certificate is always acceptable. **[**2019-12-15 **]**

Table 2:

Weld	Safety Class		
	1	2	3
Main welds of main parts	3.2	3.1 [1)]	3.1 [1)]
Welded coatings and main welds of supports	3.1 [1)]	2.1 [2)]	2.1 [2)]
Other welds	2.1 [2)]	2.1 [2)]	2.1 [2)]

1) Certificate 3.1 is approved, if the manufacturer has a certified quality management system in place. Otherwise, certificate 3.2 is required.
2) Welding fillers of welds in contact with the primary circuit shall have at least an analysis of each delivery batch. (YVL E.3/526). The analysis may be conducted by the manufacturer of the material or an accredited testing organisation (YVL E.12/301), (YVL E.3/526).

A higher level material certificate is always acceptable. **[**2019-12-15 **]**

18 ANNEX C Division of inspection responsibilities for safety-classified pressure vessels and piping

Approval or oversight **Pressure vessels and piping**	**Safety Class**		
	1	**2**	**3**
Licensing, planning, and other advance approvals			
Approval of manufacturer for special processes	STUK	STUK	STUK
Inspection organisations	STUK	STUK	STUK
Testing organisations	STUK	STUK	STUK
Requirement specification for equipment	STUK	STUK	STUK
System and location planning	STUK	STUK	STUK
Construction plan [2)]	STUK	STUK/AIO[1,3)]	AIO[3)]
Manufacturing, and construction inspection			
Control of manufacturing	STUK	STUK/AIO[1)]	AIO
Construction inspection [2)]	STUK	STUK/AIO[1)]	AIO
Installation and commissioning			
Installation construction plan	STUK	STUK/AIO[1,3)]	AIO[3)]
Installation construction inspection	STUK	STUK/AIO[1)]	AIO
Test run programme	STUK	STUK	STUK
Commissioning inspection and modification inspection	STUK	STUK/AIO[1)]	AIO
Pressure equipment registration	STUK	STUK	STUK
Oversight and inspections during operation			
Maintenance, repairs and modifications	STUK	STUK/AIO[1,3)]	AIO[3)]
Programs for non-destructive in-service inspections (YVL E.5)	STUK	STUK	STUK
Performance of non-destructive in-service inspections (YVL E.5)	LH	LH	LH
Results of non-destructive in-service inspections (YVL E.5)	STUK	STUK	STUK
Periodic inspection procedures for pressure equipment subject to registration (YVL E.3)	STUK	STUK	STUK
Periodic inspections of pressure equipment subject to registration (YVL E.3)	STUK	STUK	AIO[4)]

AIO = authorised inspection body approved under Guide YVL E.1
LH = licensee
1) STUK/AIO: In safety class 2, an authorised inspection organisation inspects those components of residual heat disposal systems to which the technical requirements of safety class 3 can be applied (low energy equipment). STUK inspects, however, the heat exchangers of these systems. Any other pipes and tanks which fall under an authorised inspection organisation's inspection scope are accepted in connection with the acceptance of the licensee's division of inspection responsibilities document.
2) Inspections of the steam generator and its internal structures are carried out by STUK.
3) If the construction plan deviates from the YVL Guides, the deviation shall be submitted to STUK.
4) STUK shall confirm the operating licenses. **[**2019-12-15 **]**

19 ANNEX D Division of inspection responsibilities for non-nuclear pressure vessels and piping

Approval or oversight Pressure vessels and piping	**Non-nuclear equipment**				
	Factory-produced pressure equipment (vessels)			**Pressure equipment manufactured on-site (piping) and prefabrication of its components**	
	Pressure equipment subject to registration Government Decree 1549/2016, Section 6	**Pressure equipment not subject to registration**			
		Government Decree 1548/2016, Section 10			
		II, III, IV	I and Section 9	II, III, (IV)	I and Section 9
Licensing, planning, and other advance approvals					
Manufacturers, factory production	PED	PED	PED	LH	LH
Manufacturers, on-site	LH	LH	LH	LH	LH
Inspection organisations, factory production	PED	PED	PED	STUK	N/A
Inspection organisations, on-site	STUK	STUK	N/A	STUK	N/A
Testing organisations, factory production	PED	PED	PED	LH	LH
Testing organisations, on-site	LH	LH	LH	LH	LH
System and location planning [1)]	LH/STUK	LH/STUK	LH/STUK	LH/STUK	LH/STUK
Construction plan	PED	PED	PED	AIO/UI	LH
Manufacturing, and construction inspection					
Control of manufacturing	PED	PED	PED	AIO/UI	LH
Construction inspection	PED	PED	PED	AIO/UI	LH
Installation and commissioning					
Installation construction plan	AIO/UI	AIO/UI	LH	AIO/UI	LH
Installation construction inspection	AIO/UI	AIO/UI	LH	AIO/UI	LH
Test run programme [2)]	LH/STUK	LH/STUK	LH/STUK	LH/STUK	LH/STUK
Commissioning inspection and modification inspection	AIO/UI	AIO/UI	LH	AIO/UI	LH
Pressure equipment registration	STUK	N/A	N/A	N/A	N/A

[2019-12-15 **]**

Approval or oversight Pressure vessels and piping	**Non-nuclear equipment**				
	Factory-produced pressure equipment (vessels)			**Pressure equipment manufactured on-site (piping) and prefabrication of its components**	
	Pressure equipment subject to registration Government Decree 1549/2016, Section 6	**Pressure equipment not subject to registration**			
		Government Decree 1548/2016, Section 10			
		II, III, IV	I and Section 9	II, III, (IV)	I and Section 9
Oversight and inspections during operation					
Maintenance, repairs and modifications	AIO/UI	AIO/UI	LH	AIO/UI	LH
Programs for non-destructive in-service inspections (YVL E.5)	STUK	STUK	STUK	STUK	STUK
Performance of non-destructive in-service inspections (YVL E.5)	LH	LH	LH	LH	LH
Results of non-destructive in-service inspections (YVL E.5)	STUK	STUK	STUK	STUK	STUK
Periodic inspection plans for pressure equipment subject to registration (YVL E.3)	STUK	N/A	N/A	N/A	N/A
Periodic inspections of pressure equipment subject to registration (YVL E.3)	AIO/UI [3)]	N/A	N/A	N/A	N/A

PED = a procedure laid down in Pressure Equipment Directive 2014/68/EU
LH = licensee
IO/UI = authorised inspection body or the licensee's in-house inspection organisation
1) STUK, if required by Guide YVL B.1; otherwise, LH.
2) According to Guide YVL A.5, testing programmes for systems in class EYT/STUK shall be submitted to STUK for information; otherwise, LH.
3) STUK shall confirm the operating licences. **[**2019-12-15 **]**

20 ANNEX E Safety-classified serially manufactured pressure vessels and piping

E01. It is possible to have a serially manufactured component approved in Safety Classes 2 and 3 for nuclear facility use, if the component design, dimensioning and manufacturing quality can be demonstrated to fulfil the requirements of the service place. For the serially manufactured component, the licensee shall submit for approval a construction plan that includes the summary of justifications, manufacturer report, product description and inspection plan for manufacturing inspection.

a. The summary of justifications shall present justifications for the implementation of the design values given in the product description of the vessel or pipe. Evidence, which allows the unambiguous justification of the correctness of the design values, may include a type approval granted by an assessment body, qualification records, the manufacturer's dimensioning table, a clarification on the fulfilment of the requirements of the applied dimensioning standard, computational analyses or operating experiences. In addition to this, it shall be justified with measures related to the manufacturing quality assurance and control that the quality level of the vessel or pipe is sufficient to ensure the maintenance of its design values until the end of its design service life in the service place conditions.

b. The manufacturer report shall be appended with proof of an appropriately certified (ISO 9001 or similar) management system. Otherwise, the licensee may apply for STUK's approval for other management system assessment performed by an independent third party. The management system of a manufacturer of a serially manufactured component shall include any special processes used.

c. The product description shall include the design values and structural material data, drawings and other necessary documentation needed to establish the structure and operation of the component.

d. The inspection plan shall include the inspections and tests that are employed to inspect manufacturing quality at least in the form of random inspections (both during manufacturing at the factory and at the licensee's own acceptance inspections) and that allow the acceptability of the manufacturing quality of the component to be justified. Additional inspections of the licence holder may include NDT and DT testing, material identification (PMI) and a pressure test with an elevated pressure. **[**2019-12-15 **]**

E02. If the location of use is known, the construction plan shall also justify that the design values of the component meet the requirements set by the location in all respects. **[**2019-12-15 **]**

E03. The licensee shall apply for an approval from STUK or an authorised inspection organisation (AIO) for the construction plan of a serially manufactured component before the construction inspection of the component. **[**2019-12-15 **]**

E04. A serially manufactured component shall meet the requirements of the design and manufacturing standard selected for the system by the licensee. If the component is installed to be in contact with primary water, the elements contained in the material that could become activated shall be measured for each part. The maximum amount of elements shall not exceed the maximum amount specified by the licensee. **[**2019-12-15 **]**

E05. The licensee shall request from STUK or an AIO a construction inspection for a serially manufactured component to review the manufacturing documentation, to conduct the inspections and to witness the tests in the scope of the inspection plan approved in connection with the processing of the construction plan. The construction inspection shall be performed on the component before its installation. **[**2019-12-15 **]**

E06. The licensee shall have a plan or procedure in place for installing a serially manufactured component according to which the installation takes place and the installation work quality is ensured. In case the component has not already been approved for its service place in connection with the processing of the construction plan, the installation plan shall justify that the design values of the component meet the requirements set by the location in all respects. In such a case, an approval shall be sought for the installation plan before the installation. **[**2019-12-15 **]**

E07. The licensee shall request from STUK or an AIO an installation inspection for a serially manufactured component to review the installation documentation, to conduct the inspections and to witness the tests in the scope of the installation plan or procedure. The installation inspection shall be approved before the commissioning inspection of the component. **[**2019-12-15 **]**

E08. The licensee shall have a plan or procedure in place for commissioning a serially manufactured component according to which the commissioning takes place and the component’s performance in its place of operation is ensured. **[**2019-12-15 **]**

E09. The licensee shall request from STUK or an AIO a commissioning inspection for a serially manufactured component to review the commissioning documentation, to conduct the inspections and to witness the tests in the scope of the commissioning plan or procedure. The commissioning inspection shall be approved before the operation of the component. The preliminary and final suitability assessments of the component's electrical and I&C equipment shall also have been processed according to the submittal method specified in Guide YVL E.7 before the operation of the component. **[**2019-12-15 **]**

21 References

1. Nuclear Energy Act (990/1987). **[**2013-11-15 **]**

2. Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018). **[**2019-12-15 **]**

3. Nuclear Energy Decree (161/1988). **[**2013-11-15 **]**

4. Government Decree on Pressure Equipment Safety (1549/2016). **[**2019-12-15 **]**

5. Pressure Equipment Directive (2014/68/EU). **[**2019-12-15 **]**

6. Pressure Equipment Act (1144/2016). **[**2019-12-15 **]**

7. Act on Notified Bodies Concerning Certain Product Groups (278/2016). **[**2019-12-15 **]**

8. Government Decree on Pressure Equipment (1548/2016). **[**2019-12-15 **]**

9. Chemicals Act (599/2013). **[**2013-11-15 **]**

10. Act on the Safe Handling and Storage of Dangerous Chemicals and Explosives (390/2005). **[**2013-11-15 **]**

11. Government Decree on the Monitoring of the Handling and Storage of Dangerous Chemicals (685/2015). **[**2019-12-15 **]**

12. Removed. **[**2019-12-15 **]**

13. SFS-EN ISO 3834-2, Quality requirements for fusion welding of metallic materials. Part 2: Comprehensive quality requirements. **[**2013-11-15 **]**

14. SFS-EN ISO 17663, Welding. Quality requirements for heat treatment in connection with welding and allied processes. **[**2013-11-15 **]**

15. ASME Boiler and Pressure Vessel Code, Section III. Rules for Construction of Nuclear Facility Components. **[**2019-12-15 **]**

16. SFS-EN ISO 3834-5, Quality requirements for fusion welding of metallic materials. Part 5: Documents with which it is necessary to conform to claim conformity to the quality requirements of ISO 3834-2, ISO 3834-3 or ISO 3834-4. **[**2013-11-15 **]**

17. ASME Boiler and Pressure Vessel Code, Section II C. Specifications for Welding Rods, Electrodes and Filler Metals. **[**2019-12-15 **]**

18. RCC-M, Design and Construction Rules for Mechanical Components of PWR Nuclear Island. **[**2013-11-15 **]**

19. SFS-EN 10204 Metallic products. Types of inspection documents. [2013-11-15]

20. SFS-EN 13445-3, Unfired pressure vessels. Part 3: Design. [2013-11-15]

21. SFS-EN 13480-3, Metallic industrial piping. Part 3: Design and calculation. [2013-11-15]

22. SFS-EN ISO 9712 Non-destructive testing. Qualification and certification of NDT personnel. General principles. [2013-11-15]

23. SFS-EN 1591-4, Flanges and their joints. Part 4: Qualification of personnel competency in the assembly of the bolted connections of critical service pressurized systems. [2013-11-15]

24. SFS-EN 14532-1, -2, Welding consumables. Test methods and quality requirements. [2019-12-15]

Definitions

Installation construction plan (pressure equipment)

Installation construction plan shall, in the context of Guide YVL E.3, refer to a construction plan describing the connecting of the pressure equipment to the rest of the system and including supports.

Authorised inspection body (AIO)

Authorised inspection body shall refer to an independent inspection organisation approved by the Radiation and Nuclear Safety Authority under Section 60 a of the Nuclear Energy Act to carry out inspections of the pressure equipment, steel and concrete structures and mechanical components of nuclear facilities in the capacity of an agency performing public administrative duties. (Nuclear Energy Decree 161/1988, in Finnish). Authorised inspection body and authorised inspection organisation have same meaning in YVL Guides.

Dynamic analysis

Dynamic analysis shall refer to determining the time-dependent behaviour (vibrations) and stresses of a component or structure under an impact-type, seismic or cyclic loading. In particular, the analysis focuses on the resonance risk induced by the excitation of natural oscillations and the strengthening of stress in proportion to the stresses caused by an equivalent static load.

Special process

Special processes shall refer to manufacturing processes, the results of which cannot be directly verified by means of a product inspection or testing after manufacture; instead, any shortcomings in the process may only appear later while the product is in use. Special processes include, for instance welding, forming and heat treatment.

Prefabrication

Prefabrication shall refer to any action carried out on materials used when they are transformed into components that are completed to be installed and joined in the assembly.

Auxiliary welding material

Auxiliary welding materials shall refer to, for example, shielding gases and fluxes used in welding.

Welding consumable

Welding consumables shall refer to welding filler materials and auxiliary welding materials used in welding.

Welding filler materials

Welding filler materials shall refer to the filler wires, covered electrodes and other similar welding consumables used in welding.

Appropriate certification

Appropriate certification shall refer to the certification of a quality system based on auditing in which the accreditation of the certification body has been done against the requirements of standard EN ISO/IEC 17021 and the accreditation is covered by the Multilateral Agreements (MLA) or Mutual Recognition Arrangements (MRA) entered into by FINAS.

Boiler

Boiler shall refer to an assembly intended for the production of steam or the boiling of a liquid other than water to a temperature exceeding 100°C, including at least one piece of heated pressure equipment with the danger of overheating.

Notified body

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

Stress analysis

Stress analysis shall refer to a strength analysis based on the modelling of the actual structure and loads of pressure equipment, which is used to eliminate the risk of failure caused by the loss of the load-bearing capacity, excessive deformation and fatigue, when the acceptance limits that have been set for the calculated stresses governing these mechanisms, as stipulated in the applicable standard, are met.

Third party

Third party shall refer to an individual or organisation that is independent of the individuals or organisations responsible for the design, manufacturing, supply, installation, procurement, ownership, operation or servicing of the item analysed.

Repair work

Repair work shall refer to the restoration of a faulty component or structure to a state which conforms to the original designs.

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.

User inspectorate

User inspectorate shall refer to an inspection organisation as referred to in Article 16 of Pressure Equipment Directive 2014/68/EU.

Operability

Operability shall refer to the integrity and performance of SSC in conformance with its design bases.

Strength analysis

Strength analysis shall refer to determination of stresses and deformations in the structure using the load provided (or other stress), or to determination the maximum loads using the allowable stresses and deformations when the geometry, dimensions and material of the structure are known; strength analyses also include the loading analyses stress analyses, fatigue analyses, brittle fracture analyses and leak before break (LBB) analyses.

Licensee's in-house inspection organisation

Licensee's in-house inspection organisation shall refer to the licensee's separate inspection unit, the position of which is arranged in compliance with the type B requirements of ISO/IEC EN 17020, the operations of which meet the specific requirements laid down by STUK, and which STUK has approved to carry out inspection tasks pertaining to the pressure equipment, steel and concrete structures and mechanical components of a nuclear facility in the form of in-house control by the licensee.

Low energy equipment

Low energy equipment shall refer to Safety Class 2 equipment with a design pressure of up to 20 bar(g) and a design temperature of up to 120 °C and to which the design, dimensioning and quality-control requirements of a corresponding equipment from Safety Class 3 can be applied with technical justifications without having a risk to lose the operability of the equipment.

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 load

Mechanical load shall refer to the pressure, external forces and moments which satisfy the laws of equilibrium between external and internal forces and moments.

Dimensioning calculation

Dimensioning calculations (strength calculations) shall refer to defining the main dimensions of the structure using mechanical loads, allowable stresses and deformations; dimensioning calculations are also used to design a structure so that it is appropriate and meets all requirements.

Modification

Modification shall refer to introducing changes to a system, structure or component so that it no longer corresponds to previous specifications.

Pressure accessory

Pressure accessory shall refer to devices with an operational function and having a pressure-bearing housing, such as valves, pressure regulators, measuring chambers, pressure gauges, glass gauges, filters and expansion joints.

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.

Pressure equipment dossier

Pressure equipment dossier shall refer to a document defined in Section 69 of the Pressure Equipment Act (1144/2016) containing all the protocols and other essential documentation pertaining to pressure equipment.

Pressure design

Pressure design shall refer to determining the material thickness required of pressure equipment under pressure by means of calculation formulae presented in the applicable standard.

Pressure vessel

Pressure vessel shall refer to a housing designed and built to contain fluids under pressure , including direct attachments up to the coupling point connecting it to other equipment. A vessel may contain one or several chambers.

Pressure vessel stress analysis

Pressure vessel stress analysis shall refer to the stress analysis conducted according to the pressure vessel design standard.

Small-diameter piping

Small-diameter piping shall refer to piping with DN ≤ 50.

Piping

Piping shall refer to assemblies used to transport gas, liquid, steam and mixtures thereof, where piping components are connected together for integration into a pressure system.

Piping flexibility analysis

Piping flexibility analysis shall refer to determining piping thermal expansion and calculation of reaction forces and moments at piping supports and equipment joints so that thermal expansion and stresses do not damage piping or cause leaks.

Piping stress analysis

Piping stress analysis shall refer to the stress analysis conducted according to the piping design standard.

Piping component

Piping components shall refer to separate elements such as a pipe or a system of pipes, tubing, fittings, expansion joints, hoses and other pressure retaining components.

Pipe routing guideline

Pipe routing guideline shall refer to pre-defined procedure on ensuring the acceptability of the location of the piping, piping supports and equipment so that thermal expansions and stresses do not damage piping or cause leaks.

Permanent joint

Permanent joint shall refer to a joint which can only be removed using destructive methods.

Certification body

Certification body shall refer to a recognised third-party organisation under Article 24 of the Pressure Equipment Directive 2014/68/EU.

Construction plan

Construction plan shall refer to the design documentation compiled for the purpose of pre-inspection conducted by STUK or an authorised inspection body.

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).

Serially manufactured component

Serially manufactured component shall refer to a component which has not been designed

particularly based on the customer's specification but it is procured from an existing product line of the manufacturer. Typically one is manufactured in large quantities, and can be used for other applications, too. Functionality, structure, dimensions, materials, manufacturing process and quality of the component do not essentially differ within and between production lots.

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.

Design basis

Design bases shall refer to all requirements, definitions and bases for normal operational conditions and accidents that pertain to the design and operation of a plant, system and component. (Nuclear Energy Decree, 161/1988)

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.

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)

Built-to-order product

Built-to-order product shall refer to a product designed and manufactured for a special application as single pieces or in small manufacturing batches.

Production test

Production test shall refer to a test whereby a sample corresponding to a joint or coating is welded during welding work in order to ensure that the properties of the product meet the requirements set.

System/structure/component important to safety

System/structure/component important to safety shall refer to systems, structures or components in safety classes 1, 2 and 3 and systems in class EYT/STUK.

Works test

Works test shall refer to a test carried out by persons performing the work, in conditions equivalent to production conditions and prior to the commencement of the work.

Witness point

Witness point shall refer to an inspection for which advance invitations have been sent to the parties defined in the inspection plan but whose supervision is not a condition for proceeding with the work. Having received the invitation, the invited parties may, however, separately require that they be present in order for the work to be continued.

Manufacturer

Manufacturer shall refer to an individual or organisation responsible for the design, manufacture, testing, inspection and installation of equipment or sets of assemblies. A manufacturer may subcontract one or more of the said tasks under its responsibility.

Control of manufacturing

Control of manufacturing shall refer to a process to monitor the progress of manufacture to ensure that a product or delivery follows all designs and plans.

Spare part

Spare part shall refer to a back-up part for an SSC that can be used to restore the reduced or lost operability to the required level.

Safety accessory

Safety accessory shall refer to devices that are intended to protect pressure equipment against the allowable limits being exceeded. Safety accessories include: a) devices for direct pressure limitation, such as safety valves, bursting disc safety devices, buckling rods and controlled safety pressure relief systems; b) limiting devices which either activate the means for correction or provide for shutdown and lockout, such as pressure switches, temperature switches or fluid level switches and safety-related measurement, control and regulation devices.

Hold point

Hold point shall refer to an inspection for which advance invitations have been sent to the parties defined in the inspection plan and whose supervision is a condition for proceeding with the work unless the parties have given written permission to proceed without their presence.

Hydrodynamic design

Hydrodynamic design shall refer to hydrodynamic dimensioning in normal use as defined in the process requirements; hydrodynamic design also refers to transient and accident analyses when the geometry, dimensions and material of the structure are known.

Nuclear facility's pressure equipment

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

Nuclear pressure equipment

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

General equipment requirement specification

General equipment requirement specification shall refer to a document that includes general equipment group-specific design and quality control requirements for safety classes 1, 2 and 3. When an equipment is procured, the requirements set out in this document will be completed with site-specific requirements.