GUIDE YVL E.8

VALVES 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 3 February 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.8 (15.11.2013).

Translation. Original text in Finnish.

STUK • SÄTEILYTURVAKESKUS
STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY
Osoite / Address • Laippatie 4, 00880 Helsinki
Postiosoite / Postal address • PL / P.O.Box 14, FI-00811 Helsinki, FINLAND
Puh. / Tel. (09) 759 881, +358 9 759 881 • Fax (09) 759 88 500, +358 9 759 88 500 • www.stuk.fi

1 Introduction

101. Valves are used for many applications at a nuclear facility. During normal operation and transients, valves are needed for the nuclear facility's process control and regulation, and during accidents valves are used to manage safety functions. It is important to the safety of a nuclear facility that the operability (integrity, leak tightness and performance) of valves installed at the plant is assured until the end of their specified service life in those postulated situations and conditions that may prevail in their service places. **[**2020-01-20 **]**

102. This Guide presents requirements for the design, manufacturing, installation, commissioning, operation, condition monitoring and maintenance of valves. The requirements shall be applied to both built-to-order and serially manufactured valves; however, the requirements pertaining to procurement of a serially manufactured valve are presented separately in Chapter 14. The Guide also describes the oversight procedures applied by STUK and an authorised inspection organisation (AIO) to verify compliance with the presented requirements. **[**2020-01-20 **]**

103. The following legislation sets the legal basis for this Guide:
Under Section 63(3)(1) of the Nuclear Energy Act 990/1987 [1], *STUK 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 (STUK), and oblige the licensee or licence applicant to arrange for STUK opportunity sufficiently to control manufacture of the fuel or such structures and components.*
Under Section 4(2) of Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018) [3], *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.*
Under Section 5(3) of Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018) [4], *the requirements set for and the actions to ascertain the compliance with the requirements of the systems, structures and components implementing operational safety functions and connecting systems, structures and components shall be commensurate with the safety class of the item in question.* **[**2020-01-20 **]**

2 Scope of application

201. This Guide applies to Safety Class 1, 2 and 3 valves in nuclear facilities in all phases of their service life from procurement to operation. The Guide's requirements apply to licensees as well as parties involved in the valve supply chain. **[**2020-01-20 **]**

202. The system design requirements on which valve design is based are presented in the B series YVL Guides. **[**2013-11-15 **]**

203. The requirements for the electrical and I&C equipment of valves are presented in Guide YVL E.7 "Electrical and I&C equipment of a nuclear facility". The preliminary and final suitability assessments of the electrical and I&C equipment are processed according to the submittal method and schedule specified in Guide YVL E.7. The compatibility of the valve and electrical and I&C equipment shall, however, be demonstrated with an operability analysis to be appended to the valve's construction plan. **[**2020-01-20 **]**

204. Strength analyses are addressed in Guide YVL E.4 "Strength analyses of nuclear power plant pressure equipment". **[**2013-11-15 **]**

205. The requirements for the processes and functions of the licensee's and suppliers' management system are presented in Guide YVL A.3 "Leadership and management for safety". **[**2020-01-20 **]**

206. STUK approves inspection organisations to conduct inspections of nuclear facility valves in accordance with Guide YVL E.1 "Authorised inspection organisation and the licensee's in-house inspection organisation". **[**2013-11-15 **]**

207. STUK approves inspection organisations to conduct tests of nuclear facility valves in accordance with Guide YVL E.12 "Testing organisations for mechanical components and structures of a nuclear facility". **[**2020-01-20 **]**

3 Licensee's general equipment requirement specification for valves

301. The licensee shall have a general equipment requirement specification for the nuclear facility's valves. The general equipment requirement specification shall include the general design and quality control requirements for Safety Classes 1, 2 and 3 valves set by the licensee to be observed in procurement supplemented with the service place-specific requirements. In addition to the valve's safety class, 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 valve's design bases. **[**2020-01-20 **]**

302. With regard to the design requirements of the valves, the general equipment requirement specification shall present safety class-specifically:

- a data sheet for the design bases and values to be specified for the valves
- applicable standards and other requirements based on which the valves are designed and dimensioned
- structural material requirements
- inspectability and maintainability requirements
- all other requirements related to procurement set by the licensee for the valves of the nuclear facility.

[2020-01-20 **]**

303. With regard to the quality control requirements of the valves, the general equipment requirement specification shall describe safety class-specifically the inspections and tests (general inspection plan) to be conducted on the structural materials, parts and finished valve during procurement, manufacturing, installation and commissioning. The following shall be presented for each inspection/testing target:

- description of the inspection or testing
- inspection or testing procedure reference (excluding manufacturer-specific procedures)
- reporting requirement (inspection report, certificate, etc.)
- supervisory parties (witness or hold point).

[2020-01-20 **]**

303a. Inspection and testing procedures referred to in the general inspection plan shall be submitted to STUK for information upon a separate request. The requirement does not apply to publicly available standards used as inspection or testing procedures. **[**2020-01-20 **]**

304. Removed. **[**2020-01-20 **]**

305. The design and quality control requirements for built-to-order and serially manufactured valves shall be separately specified in the general equipment requirement specification if the licensee sets mutually non-conformant requirements for them. **[**2020-01-20 **]**

306. The licensee shall periodically verify the validity of the general equipment requirement specification. The general equipment requirement specification, its reference documents and updates shall be approved by STUK before their application as the valve requirement basis. **[**2020-01-20 **]**

307. Possible requirement specifications regarding the valves of the plant or component supplier shall not contradict the licensee's general equipment requirement specification. **[**2020-01-20 **]**

308. The licensee shall submit the STUK-approved general equipment specification for valves for information to the AIO it uses. **[**2020-01-20 **]**

4 Manufacturer

401. The management system of a valve manufacturer in Safety Class 1 and 2 shall be appropriately certified for the nuclear industry. If the management system has not been specifically certified for the nuclear industry, the management system shall be supplemented with a delivery-specific quality plan. The quality plan shall describe such quality-control ensuring procedures that implement the requirements regarding quality control of Guide YVL A.3 in a valve delivery. The quality plan shall be submitted in connection with a possible manufacturer approval or together with the construction plan of the valve. **[**2020-01-20 **]**

401a. The management system of a valves manufacturer in Safety Class 3 shall be appropriately certified. Otherwise, the licensee may separately apply for approval for other management system assessment performed by an independent third party. **[**2020-01-20 **]**

401b. The licensee shall audit Safety Class 1 and 2 valve manufacturers when an approval according to Guide YVL E.3 ”Pressure vessels and piping of a nuclear facility” is required of the manufacturer. **[**2020-01-20 **]**

402. The manufacturer shall have in their employ competent and experienced personnel, as well as the methods, facilities and equipment required for operation. **[**2013-11-15 **]**

403. The manufacturer shall have documented procedures for the qualification of manufacturing methods and personnel, validity of qualifications, manufacturing, testing and handling of non-conformances. **[**2013-11-15 **]**

404. If the manufacturer uses special processes on the pressure-retaining parts of the valve, the licensee shall apply for a separate workplace-specific approval for the manufacturer from STUK in accordance with Guide YVL E.3. A separate manufacturer approval is not, however, necessary for joint welds of small nozzles (DN32 or smaller) and stem bellows, cladding of sealing and guiding surfaces or for spot and lock welding. **[**2020-01-20 **]**

405. The manufacturing procedures for special processes shall be qualified by procedure tests before manufacturing. As regards demanding components, STUK or an AIO can request for a review of the suitability of manufacturing procedures by works tests before manufacturing or production tests during manufacturing. **[**2020-01-20 **]**

405a. Persons making permanent joints shall be qualified under the supervision of a recognised 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. Recognised third parties for procedure and personal qualification include notified

bodies and recognised third-party organisations (certification bodies) as defined in the Pressure Equipment Directive. 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. **[**2020-01-20 **]**

406. As regards the supply chains of parts important to valve operability, the manufacturer shall ensure that subcontractors know the requirements relating to their delivery, and to be ensured before assembly is that the components manufactured by the subcontractors fulfil these requirements. **[**2020-01-20 **]**

5 Design

5.1 General

501. The system documentation of a nuclear facility shall specify all such service place-specific data, which is required as design bases, when a valve is being designed and dimensioned to maintain the required operability during operational, transient and accident situations. **[**2020-01-20 **]**

502. The valve's structural design and dimensioning shall be based on a standard meant for designing nuclear power plant valves, such as "ASME Boiler & Pressure Vessel Code" (Section III, Division 1); as regards Safety Class 1 on Subsection NB-3500 [6] and as regards Safety Class 2 on Subsection NC-3500 [7]. Standards other than those intended for the design of nuclear power plant valves are acceptable provided that it can be demonstrated that by design and dimensioning based on them an equivalent assurance of valve integrity and operability can be achieved. **[**2020-01-20 **]**

503. The structural design and dimensioning of safety class 3 valves shall be based on a generally applied valve design standard. **[**2020-01-20 **]**

504. If the standards applied present different requirement levels for design and dimensioning requirements, the requirement levels applied shall be relative to the valve's safety class. **[**2013-11-15 **]**

505. The same standard series shall apply in valve design and manufacturing. In case of a deviation from this rule, the licensee shall justify the acceptability of the deviation. **[**2013-11-15 **]**

506. A technically justified assessment of the service life for the duration of which the valve will maintain reliable operability shall be specified. **[**2013-11-15 **]**

507. The valve shall maintain the required operability, i.e., integrity, leak tightness or performance in the event of a limit switch failure if the switch-off inoperability is the valve's design basis. **[**2020-01-20 **]**

508. The condition monitoring of the valve in Safety Classes 1 and 2 shall be fixed and produce online data when the valve is operated in cases where such condition monitoring substantially enhances the effectiveness of the valve's condition monitoring as compared to condition monitoring conducted periodically. **[**2020-01-20 **]**

509. Such valve position data that is needed to ensure safe operation of the nuclear facility and manage transient and accident situations shall be available online in the control room. **[**2020-01-20 **]**

510. The design of the valve's electrical and I&C equipment shall fulfil the design requirements of Guide YVL E.7. **[**2013-11-15 **]**

5.2 Structure

511. The valve's design solutions shall employ proven technology. Fulfilment of the valve's performance requirements shall be experimentally demonstrated if no other reliable evidence can be obtained on conformity. **[**2013-11-15 **]**

512. In the selection of parts, classified as serially manufactured products, to be used in the valve, it shall be ensured that they are suitable in terms of characteristics and quality for their intended use and that they do not weaken the operability required of the valve in design basis operational, transient and accident situations. **[**2020-01-20 **]**

513. The valve shall have sufficient material thicknesses to ensure that the stresses transferred from the piping or loads caused by the actuator will not cause performance-hindering deformations on the moving parts and sealing surfaces in operational, transient and accident situations. **[**2020-01-20 **]**

514. The valve's structural materials and structure as well as the operating environment and process system shall be such that the valve can be inspected, tested and maintained in order to ensure its design basis operability. **[**2020-01-20 **]**

515. Thermal expansion of valve structures or flowing medium shall not impede valve operation. In a gate valve, for example, such phenomena would include thermal binding and pressure locking. **[**2013-11-15 **]**

516. If the nominal size of the valve is larger than DN50, the valve stem shall be fitted with leakage control when the valve is inaccessible during operation and located in pipeline containing a radioactive substance. Leakage control can be omitted when the stem is fitted with a secondary seal in addition to a bellows. **[**2020-01-20 **]**

517. Valve bonnets shall be fitted with a sealing solution that reliably prevents external leakages. In case a valve with a nominal size larger than DN50 in Safety Class 1 is fitted with a double seal solution, a leakage through the first seal shall be detectable in the nuclear facility's control room. **[**2020-01-20 **]**

518. Removed. **[**2020-01-20 **]**

519. Set values of a safety valve shall be sealable. **[**2013-11-15 **]**

520. Valves and their pilot valves which perform safety functions and can be switched off, shall be equipped with a key-operated switch on/off mechanism and the licensee shall have administrative procedures in place to prevent erroneous switching. **[**2020-01-20 **]**

5.3 Materials

521. Valve materials and hard-facings shall withstand stresses arising from design basis operating conditions. Material selection shall ensure that corrosion, erosion, radiation or other corresponding harmful phenomena do not endanger valve operability. **[**2013-11-15 **]**

522. The structural materials of the valve's pressure-retaining parts and parts essential for operation shall be standardised materials, which have been proven suitable in practise for the intended applications. However, the structural materials shall be separately approved in accordance with Guide YVL E.3 if they are not based on a material standard generally known in Finland. **[**2020-01-20 **]**

523. The conformity of material properties shall be demonstrated in the material manufacturing documentation as extensively as required by the material standard Changed material properties shall be specified whenever the delivery condition of the materials, in accordance with the standard, is altered during valve fabrication by heat treatment, forming or welding, ensuring that the changed values are used in analyses associated with the valve's acceptability.
[2013-11-15 **]**

524. Austenitic cast steel shall not be used as the material for the casings of valves subject to in-service inspection in accordance with Guide YVL E.5 "In-service inspection of nuclear facility pressure equipment with non-destructive testing methods", unless their inspectability can be reliably demonstrated. **[**2020-01-20 **]**

525. Materials containing elements that could become activated shall be avoided in any such sealing and guiding surfaces or similar surfaces of valves coming into contact with primary circuit water from which material could peel off due to erosion-corrosion or some other phenomenon. The concentrations of elements that could become activated shall be sufficiently low for them to have no significant effect on the level of radiation at the nuclear facility.
[2013-11-15 **]**

6 Construction plan

601. The licensee shall submit the valve's construction plan containing the following data:

- licensee's summary of justifications
- manufacturer report
- design bases
- design data
- calculations
- operating experience and type test data
- manufacturing procedures
- inspection plan and procedures.

A corresponding construction plan shall also be presented of a spare parts procurement significant for the valve's integrity or performance if the structure or material of the spare part changes.
In the case of replacing an actuator to a valve in operation, the construction plan shall cover only the operability analysis according to Appendix C.
The construction plan of a valve equipped with a non-electrically operated actuator shall include such data on the actuator manufacturer, design and manufacturing quality control that the acceptability of the actuator can be assessed based on the data submitted. **[**2020-01-20 **]**

602. In Safety Classes 1 and 2, the licensee shall apply for approval for the construction plan before the commencement of valve manufacturing. **[**2020-01-20 **]**

603. In Safety Class 3, the licensee shall apply for approval for the construction plan no later than before the valve's construction inspection. **[**2020-01-20 **]**

603a. In Safety Class 1, a separate approval shall be applied for the commencement of material manufacturing of the pressure-retaining parts of the valve's body, if the valve's nominal size is larger than DN50. A description of the manufacturing process, material inspection and testing plans and preliminary strength analyses of the parts in question shall be appended to the application. **[**2020-01-20 **]**

603b. The operability analysis according to Appendix C of a valve equipped with an actuator can be submitted separately if necessary. In that case, an approval for the operability analysis shall be sought before installing the valve to its service place at the latest. **[**2020-01-20 **]**

604. In case the construction plan is updated before the construction inspection, the licensee shall apply for approval for the revisions. Minor revisions can be submitted for information. **[**2020-01-20 **]**

6.1 Summary of justifications

605. The licensee shall append to the construction plan a summary of justifications prepared on the conformity of the valve. It shall include justifications based on the construction plan data as to why:

- manufacturer and their subcontractors, testing organisations and third parties have readiness for a delivery, inspections and supervision
- valve design bases correspond to the requirements set for the valve during operational, transient and accident situations
- dimensioning calculations, analyses, type tests or operating experiences reliably demonstrate the fulfilment of the valve's design bases
- manufacturing quality can be verified by inspections and testing conducted on the structural materials, parts and finished valve.

[2020-01-20 **]**

606. The justifications shall make reference to individual documents of the construction plan and, where necessary in case of extensive documents, also to their chapter or page numbers. **[**2020-01-20 **]**

607. The summary of justifications shall designate testing organisations conducting destructive or non-destructive testing of the valve's materials or parts during manufacture and draw up a status summary of the approvals. A status summary shall also be provided on manufacturer approvals when special processes are used in valve manufacture. **[**2013-11-15 **]**

608. Removed. **[**2020-01-20 **]**

6.2 Manufacturer report

609. The construction plan shall include a manufacturer report containing information on the manufacturer's organisation, operations, qualifications of the personnel and manufacturing procedures, copies of valid management system certification decisions and other assessments and the manufacturer's recent delivery references. A reference to a manufacturer report possibly submitted earlier or a valid approval of manufacturer in accordance with Guide YVL E.3 is sufficient when the information is unchanged. **[**2020-01-20 **]**

610. When the nominal size of the valve is larger than DN50 and it belongs to Safety Class 1 or 2, the manufacturer report shall be presented on the materials manufacturers of pressure-retaining parts of the valve body and those subcontractors who manufacture parts significant to the valve's operability. **[**2020-01-20 **]**

6.3 Design bases

611. The construction plan shall present the valve design bases:

- highest allowable system pressure and temperature of the process system
- design basis operational, transient and accident conditions
- operability requirements
- loads and stresses exerted on the valve
- process driving power and ambient conditions
- valve service life and number of operating cycles during service life
- other requirements placed on the valve by its service place.

[2020-01-20 **]**

612. The valve's design bases shall be determined in the scope of the requirements that have been set for the valve's operability in normal operation, during anticipated operational occurrences, postulated accidents, design extension conditions and severe reactor accidents. **[**2020-01-20 **]**

613. Loadings shall be presented to the extent they are considered the valve design bases. They typically include

- forces and moments exerted by piping and supports
- mechanical and thermal load fluctuations
- obturator pressure difference

- impact loads (accelerations caused by pipe breaks and seismic events)
- actuator forces in case of switch-off failure
- ambient stresses (temperature, humidity, radiation).

[2013-11-15 **]**

6.4 Design data

614. The construction plan shall present valve design and other values and technical data to the extent they apply to the valve to be approved. Based on the data, it shall be possible to assess whether the valve is designed to fulfil the requirements set by its service place:

- service place code and safety class
- design pressure, design temperature and design capacity
- purpose in the process system and functional description (including PI diagrams for local control and auxiliary systems
- construction drawings (assembly and sectional drawings)
- part lists
- structural and coating materials as well as welding filler materials
- valve's allowable forces and moments in piping connections (or other procedures of demonstrating strength)
- range of actuator torque and force (in an electric actuator with undervoltage and with overvoltage)
- opening and closure times
- discharge factor (for a control valve, as a function of opening)
- fail safe position.

[2020-01-20 **]**

615. In addition to the valve's main dimensions, the construction plans shall indicate dimensions, part markings, part materials, hard-facings, surface treatment and welded joints used as both input data for calculations and essential for functioning. **[**2020-01-20 **]**

6.5 Calculations

616. Calculations to be included in the construction plan shall demonstrate that the valve's operability requirements are fulfilled in design basis operational, transient and accident situations. The requirements for the calculations, which shall be included in the construction plan, are provided in Appendix C. **[**2020-01-20 **]**

617. The valve's structural strength shall primarily be demonstrated by classification in accordance with an applicable standard and/or computational analyses, such as a stress analysis based on a standard or one based on detailed modelling of the structure. **[**2013-11-15 **]**

618. Acceptability of parts which are classified as serially manufactured and important to valve integrity or performance shall be justified in the construction plan. This justification shall be done by calculations, manufacturer's dimensioning tables, operating experiences or other reports confirming the conformity of such parts. **[**2020-01-20 **]**

619. As input data for the calculations, the most unfavourable combination of loads and conditions the valve could be exposed to shall be used. Such approval criteria values shall be used for the results that the valve reliably maintains the required operability in the design basis operational, transient and accident situations. **[**2020-01-20 **]**

620. Of the calculations, the standards applied, loads and material properties used as input data, calculation methods, visualised results, approval criteria and conclusions shall be presented. **[**2013-11-15 **]**

621. In safety classes 2 and 3, the construction plan's calculations can be replaced by the operating experience feedback or type test data of a valve having an equivalent construction and design values if the valve's conformity can be equally demonstrated by this data. **[**2020-01-20 **]**

6.6 Operating experience and type test data

622. The construction plan shall include such delivery references and type test records that can be used to assess the delivery capabilities of the manufacturer and the suitability of the valve to be approved for its intended application. In addition, delivery references shall be presented for such subcontractors that manufacture parts significant to the valve's operability. **[**2020-01-20 **]**

623. Acceptable delivery references are valves whose design values, design bases and design solutions have been equivalent to the valve to be approved. Of these, the construction plan

shall present at least the type markings, design values, materials, quantities, delivery years and purchasers of the valves and actuators. It is recommended that operating conditions and periods as well as other corresponding operating experience history are included in the data. **[**2013-11-15 **]**

624. Acceptable type test records are those that present the testing results of a valve that is representative in terms of the design values and solutions. With the report results, it shall be possible to unambiguously confirm the conformity of the design solutions of the valve to be accepted. **[**2020-01-20 **]**

625. In the absence of previously conducted type tests or representative operating experiences, a valve's acceptance requires a type test. **[**2020-01-20 **]**

6.7 Manufacturing procedures

626. When special processes are used in the manufacture of a Safety Class 1 or 2 valve, the manufacturing procedures of the special processes and their qualification data shall be included in the construction plan. This requirement does not apply to the surfacing of seal and guiding surfaces whose qualification is verified in the construction inspection. **[**2020-01-20 **]**

6.8 Inspection plan and procedures

627. A plan for inspections and testing during valve manufacturing shall be included in the construction plan. **[**2013-11-15 **]**

628. The inspection plan shall present the inspections and testing conducted on the valve's structural materials, parts and the finished valve. The following shall be presented for each inspection/testing target:

- identification data (heat, serial and part number, drawing number, structural material, etc.)
- description of the inspection or testing
- inspection or testing procedure reference
- reporting procedure (inspection report, certificate, etc.)
- supervisory parties (witness or hold point).

[2020-01-20 **]**

629. Referred instructions shall define inspection and testing scope, approval criteria for the results, methods, equipment and tester qualification requirements. **[**2013-11-15 **]**

630. The construction plan shall include procedures for the factory tests that allow the verification of the valve's conformity. Typically, such tests include pressure tests of pressure-retaining parts, the obturator strength and leak tests and different functional tests. In safety classes 1 and 2, the construction plan shall also include inspection procedures for the non-destructive testing of valve parts during manufacturing. **[**2020-01-20 **]**

631. The inspection plan shall define the scope of valve disassembly after functional testing and the valve parts that will then be accessible for visual inspection. The scope of disassembly shall typically enable inspection of the condition of sealing and guiding surfaces as well as other parts significant for the valve's integrity and operability. **[**2020-01-20 **]**

632. Factory tests shall be primarily conducted with the valve's final installation assembly. When deviating from this requirement, the use of some other test assembly shall be justified in order to achieve corresponding certainty on the conformity of the valve. **[**2020-01-20 **]**

633. The fulfilment of the valve's functional requirements shall be primarily confirmed with the help of a functional test using the operating parameters. When deviating from this requirement, the use of some other procedure shall be justified in order to achieve corresponding certainty on the conformity of the valve. **[**2020-01-20 **]**

7 Type test

701. The conformity of the valve's design solutions shall have been demonstrated with a type test that allows confirming the valve's design basis performance. A new type test is not needed if conformity can be demonstrated with a previously conducted type test. The type test can be replaced with operating experiences, if the operating experiences represent the design basis conditions and stresses of the valve's service place. **[**2020-01-20 **]**

702. The construction, dimensions and materials of a type-tested item shall correspond to those of the valve to be approved. **[**2020-01-20 **]**

703. Type testing shall be implemented in conditions corresponding to the design basis operational, transient and accident situations using such testing parameters by which the valve's conformity can be unambiguously demonstrated based on the test results. This requirement specifically concerns such performance which cannot be reliably verified by calculations or operating experiences. **[**2020-01-20 **]**

704. Removed. **[**2020-01-20 **]**

705. Verification of the conformity of the valve's electrical and I&C equipment shall fulfil the requirements of Guide YVL E.7. **[**2013-11-15 **]**

706. When a type test is conducted on the valve in connection with procurement, a type test plan shall be prepared to describe the test arrangements and conditions, to set the acceptability criteria for the results and to present the control scope of STUK or an AIO. The licensee shall apply for approval for the type test plan before the type test is conducted and submit the type test results report for information before the valve is installed. **[**2020-01-20 **]**

8 Manufacturing

801. The valve shall be manufactured and manufacturing quality controlled in accordance with an approved construction plan and the associated inspection plan. **[**2013-11-15 **]**

802. The licensee shall, prior to the start of manufacturing, ensure that the manufacturer has the administrative and technical readiness for operations in conformance with requirements, as well as an approved construction plan and the decision pertaining to it. **[**2013-11-15 **]**

803. The machines, equipment and facilities used in manufacturing shall facilitate achievement of a quality compliant with the requirements. The machines and equipment shall be periodically tested and calibrated as required by the manufacturer's quality management system. The test results shall be recorded so that they can be presented on request. **[**2013-11-15 **]**

804. Those structural materials for which a batch-specific material certificate is required shall be identifiable and traceable from their batch-specific melting up until the finished structure. The minimum requirements for the material certificates of construction materials are provided in Appendix B. **[**2013-11-15 **]**

804a. Within the scope of the inspection plan, a third party shall:

- 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 [13],
- witness and confirm procedure and personnel qualifications
- witness and confirm the manufacturing of the component, such as welding, forming and non-destructive testing.

The third party shall identify 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, if the inspection plan does not indicate otherwise. **[**2020-01-20 **]**

805. The manufacturer shall identify the non-conformances detected in manufacturing, establish their causes, assess their importance and carry out corrective actions. The licensee shall apply for approval from STUK or an AIO for any non-conformances remaining in the valve that are significant in terms of operability. Requirements related to the management of non-conformances are provided in Guides YVL A.3 ”Leadership and management for safety” and YVL A.5 ”Construction and commissioning of a nuclear facility”. **[**2020-01-20 **]**

806. For the manufacturing documentation, the manufacturer shall compile testing, inspection and oversight records that comply with the approved construction plan and were drawn up during manufacturing. Inspection documents for construction materials and welding filler materials, qualification certificates of personnel, the non-conformance reports as well as other records drawn up during control of manufacturing and qualification shall be attached to the manufacturing documentation. **[**2020-01-20 **]**

807. The licensee shall ensure that the manufacturer compiles and hands over to the licensee the manufacturing documentation, as well as the installation, operation and maintenance instructions, before the valve's commissioning at the nuclear facility. **[**2020-01-20 **]**

9 Construction inspection

901. The licensee shall request from STUK or an AIO a construction inspection to establish the acceptability of the valve's manufacturing documentation, to conduct the inspections and to witness the tests in the scope of the approved inspection plan. **[**2020-01-20 **]**

902. The construction inspection shall establish evidence that the valve's materials, manufacturing, structures and operation are in compliance with the construction plans. The construction inspection shall be conducted on each valve of the delivery batch. **[**2020-01-20 **]**

903. When making a construction inspection, an inspector of STUK or an AIO shall have access to an approved construction plan, possible modification documents and the related decisions of approval. Construction plan reference documents not included in the construction plan shall also be presented on request. **[**2020-01-20 **]**

904. At the construction inspection, the inspectors shall be provided with adequate lighting, calibrated measuring instruments and auxiliary devices, as well as the necessary assisting personnel. **[**2013-11-15 **]**

905. At the construction inspection, the licensee shall present

- the necessary regulatory approvals (testing organisations, manufacturer)
- systematically compiled and licensee-approved documentation, including the manufacturing records in the scope specified in the inspection plan

and arrange in the scope specified by the inspection plan

- structural inspection (visual quality inspection, dimension inspections, verification of part identification markings)
- supervision of factory tests (pressure, leak tightness and functional tests).

[2020-01-20 **]**

906. Factory tests shall be conducted in accordance with the approved procedures. **[**2020-01-20 **]**

906a. Factory tests cannot begin until an inspector of STUK or an AIO has confirmed testing readiness. If the valve's manufacture has made use of special processes and the manufacturer has been approved according to Guide YVL E.3, the person responsible for manufacture shall prepare before the factory tests a written declaration to be included in the manufacturing documentation stating that the manufacturing of the valve has taken place in accordance with

the accepted construction plan and requirements of the YVL guides. **[**2020-01-20 **]**

907. In Safety Classes 1 and 2 all valves and in Safety Class 3 at least one of identical valves in the delivery batch shall be inspected when dismantled after factory testing. The scope of dismantling shall comply with the accepted construction plan. **[**2020-01-20 **]**

908. If the valve or its parts essential for operability are repaired or modified, or wearing parts other than those that are disposable are replaced at the factory after factory tests, the valve's conformity shall be verified by repeating factory tests. **[**2020-01-20 **]**

909. Removed. **[**2020-01-20 **]**

910. Removed. **[**2020-01-20 **]**

911. The construction inspection of the valve shall be acceptably conducted before installing the valve. **[**2020-01-20 **]**

10 Installation

1001. The licensee shall conduct an acceptance inspection on the valve before storage and installation. In the acceptance inspection, the valve shall be disassembled from its packaging and visually inspected. **[**2013-11-15 **]**

1002. The licensee shall have a construction plan for the valve's installation. The installation construction plan shall present the following:

- procedures, drawings and part lists required in installation
- qualified welding procedures (if the valve is connected to piping by welding)
- inspection plan
- inspection procedures (or their reference data).

The installation construction plan can be submitted as an individual document or as part of other documentation, such as the construction plan of the valve's manufacturing or piping. **[**2020-01-20 **]**

1003. The valve's installation inspection plan shall contain the inspections and their procedures that enable reliable verification of the conformity of the installation. **[**2020-01-20 **]**

1004. The licensee shall request from STUK or an AIO an installation construction inspection to establish the acceptability of the installation documentation and to conduct the inspections in the scope of the approved inspection plan. **[**2020-01-20 **]**

1004a. The installation construction inspection shall establish evidence that the valve installation work and its quality control have been performed according to the installation construction plan. **[**2020-01-20 **]**

1005. At the installation construction inspection event, the licensee shall present the following where applicable

- approved installation construction plan
- approval of the operability analysis (Appendix C) of a valve equipped with an actuator.

Construction plan reference documents not included in the installation construction plan shall also be presented on request. **[**2020-01-20 **]**

1006. Before valve installation, the licensee shall apply for approval of the installation construction plan. **[**2013-11-15 **]**

1007. The installation construction inspection shall be acceptably completed before the valve's commissioning inspection. **[**2013-11-15 **]**

11 Commissioning

1101. The licensee shall request from STUK or an AIO commissioning inspections to demonstrate the readiness of the valve and actuator for a test run and operation. The licensee is responsible for the availability of the documents and records required in the inspection as well as for guidance to the plant. **[**2020-01-20 **]**

1102. The first phase of the commissioning inspection verifies that

- the valve construction plan, construction inspection and installation construction inspection have been approved
- the preliminary and final suitability assessments of the electrical and I&C equipment have been processed according to the submittal method specified in Guide YVL E.7
- the licensee has successfully conducted the licensee's installation inspection of the electrical and I&C equipment
- the valve's test run plan has been prepared
- the operating and maintenance procedures are available for use
- the valve assembly and process interfaces comply with the plans
- there are no obstacles to the safe operation, inspection and maintenance of the valve.

[2020-01-20 **]**

1103. The test run requires a test run plan which enables the performance of the test run in a manner yielding evidence on the required performance of the valve and actuator. The test run plan, which may be a separate document or it can be included in a process system's commissioning plan, shall present the test and measurement arrangements, test phases and result acceptance criteria. **[**2020-01-20 **]**

1104. In the second phase of the commissioning inspection, the test run of the valve and actuator is conducted in compliance with the test run plan. It is verified from the test run records and by witnessing the test run that

- the licensee has acceptably completed the licensee's commissioning inspection of electrical and I&C equipment
- the test run has been completed in a scope complying with the test run plan and the results are acceptable
- there are no non-conformances preventing the commencement of operation.

At facilities under construction, the test run is typically done in connection with a system's test

run, while at operating facilities separate test run arrangements are employed. **[**2020-01-20 **]**

1105. The first phase of the commissioning inspection shall be acceptably conducted before the commencement of the test run. **[**2013-11-15 **]**

1106. Both phases of the commissioning inspection shall be acceptably conducted before a valve operating licence is granted. An operating licence can be granted for a fixed period, if the operation of the valve is safe regardless of the shortcomings preventing the granting of a permanent operating licence. **[**2020-01-20 **]**

12 Operation, condition monitoring and maintenance

1203. A valve's operating parameters as well as its load, process and ambient conditions, shall be monitored and maintained within the limits of design basis operating conditions. Unnecessary loads and unfavourable operating conditions shall be avoided. **[**2013-11-15 **]**

1204. The valve shall reliably maintain its operability over the maintenance interval in all design basis operation. Overhaul need or failure shall be detected before any significant safety risk is caused by debilitation or loss of valve operability. **[**2020-01-20 **]**

1205. There shall be instructions in writing for valve operation, condition monitoring and maintenance. The instructions (operating procedures as well as maintenance, inspection and testing programmes, and related instructions) shall be based on manufacturer recommendations and operational experiences of the licensee or other nuclear facilities. Furthermore, the instructions shall be regularly assessed and the modification needs detected analysed. **[**2020-01-20 **]**

1206. The valve condition monitoring procedures shall present the parameters, methods, inspection and test intervals and acceptance limits to be monitored. The targets and parameters of the valve that allow confirming the fulfilment of the operability requirements set for the valve shall be monitored. These targets and parameters may include

- integrity of pressure-retaining parts
- leak tightness of obturator
- leak tightness of external seals (stem penetration, bonnet and other external seals)
- condition of seal, clearance and guiding surfaces
- condition of load path parts
- set pressures (safety valve opening and closure pressures)
- closure and opening time
- free movability of the obturator
- functioning of position indicators
- current consumed by electronic actuator.

[2020-01-20 **]**

1207. The valve’s maintenance instructions shall define the work and inspections to be carried out during periodic maintenance, timing of the maintenance work, as well as the spare parts and supplies required. **[**2013-11-15 **]**

1208. If special processes are used in valve maintenance, the operator shall have STUK's facility-specific approval in accordance with Guide YVL E.3. **[**2013-11-15 **]**

1209. If a maintenance task is not part of the valve's maintenance programme, the task is considered a repair work for which the licensee shall draw up a repair plan. A repair plan is not required for repair work where parts are only replaced with approved spare parts and during which no special processes are used. **[**2020-01-20 **]**

1210. The repair plan shall include a justification of the acceptability of the repair procedure and information on the performance and quality control that can be used to assess the conformity of the repaired valve and which typically includes manufacturing and inspection procedures, illustrative drawings as well as an inspection plan covering manufacturing, installation and commissioning. **[**2020-01-20 **]**

1211. The licensee shall apply for approval of a valve repair plan before the commencement of repair work. **[**2013-11-15 **]**

1212. The licensee shall request from STUK or an AIO a repair work construction inspection to establish the acceptability of the repair work documentation, to conduct the inspections and to witness the tests in compliance with the approved construction plan. The repair work construction inspection shall be acceptably conducted before the operation of the valve. **[**2020-01-20 **]**

13 Modifications

1301. A valve modification shall not compromise the nuclear facility's safety or the prerequisites for the valve's condition monitoring or maintainability. The procurement of a spare part significant in terms of operability shall also be considered a modification if the structure or material of the spare part is changed. **[**2013-11-15 **]**

1302. The licensee shall draw up a valve modification construction plan. The construction plan shall include justifications for the acceptability of the modification and all data related to the implement and quality control that are needed to verify the conformity of the modified valve and that typically include a description of the modification, applicable calculations, illustrative drawings and an inspection plan covering manufacturing, installation and commissioning. In Safety Classes 1 and 2, the modification construction plan shall also include an analysis of the modification's safety effects. **[**2020-01-20 **]**

1303. Any needs to update drawings, procedures and other documents as a result of a valve modification shall be identified and the updates implemented without delay after the modification. It shall be ensured that the potential effects of the modification on valve operation, condition monitoring and maintenance are communicated to the maintenance organisation. **[**2020-01-20 **]**

1304. If special processes are used during a valve modification, the operator shall have facility-specific approval from STUK in accordance with Guide YVL E.3. **[**2013-11-15 **]**

1305. The licensee shall apply for approval of the valve modification construction plan before the start of the modification work. **[**2013-11-15 **]**

1306. The licensee shall request from STUK or an AIO a modification construction inspection to establish the acceptability of the modification documentation, to conduct the inspections and to witness the tests in compliance with the approved construction plan. The modification construction inspection shall be acceptably conducted before the operation of the valve. **[**2020-01-20 **]**

14 Serially manufactured valves

1401. Removed. **[**2020-01-20 **]**

1402. Removed. **[**2020-01-20 **]**

1403. Removed. **[**2020-01-20 **]**

1404. Removed. **[**2020-01-20 **]**

1405. Removed. **[**2020-01-20 **]**

1406. Removed. **[**2020-01-20 **]**

1407. Removed. **[**2020-01-20 **]**

1408. Removed. **[**2020-01-20 **]**

1409. Removed. **[**2020-01-20 **]**

1410. Removed. **[**2020-01-20 **]**

1411. Removed. **[**2020-01-20 **]**

1412. Removed. **[**2020-01-20 **]**

1413. Removed. **[**2020-01-20 **]**

1414. Removed. **[**2020-01-20 **]**

1415. It is possible to have a valve classified as a serially manufactured product (serially manufactured valve) approved in Safety Classes 2 and 3 for nuclear facility use, if the valve design, dimensioning and manufacturing quality can be demonstrated to fulfil the requirements of the service place. The licensee shall submit for the serially manufactured valve a construction plan that includes the summary of justifications, manufacturer report, product description, operability analysis of a valve fitted with an actuator and an inspection plan for manufacturing quality control.

- The summary of justifications shall present justifications for the implementation of the design values given in the valve's product description. 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 valve's quality level is sufficient to ensure the maintenance of its design values until the end of its design service life in the service place conditions.

- The manufacturer report shall be appended with proof of an acceptably certified (ISO 9001 or similar) management system that also covers possible special processes employed in manufacturing. Otherwise, the licensee may apply for STUK's approval for other management system assessment performed by an independent third party.
- The product description shall include the design values and structural material data, drawings and other necessary documentation needed to establish the valve's structure and operation.
- The operability analysis of a valve fitted with an actuator shall include assessments according to Appendix C. If necessary, it can be submitted separately.
- The inspection plan shall include the inspections and tests that are employed to monitor manufacturing quality at least in the form of random inspections (at the factory or plant site) and that allow the conformity of the valve to be justified. The licensee's further inspections may include NDT and DT tests, material identification (PMI) and a pressure test with an elevated test pressure.

If the valve's service place is known, the construction plan shall justify the sufficiency of the valve's design values in view of the requirements set by the service place. **[**2020-01-20 **]**

1416. The licensee shall apply for an approval from STUK or an AIO for the construction plan of a serially manufactured valve before the construction inspection of the valve. **[**2020-01-20 **]**

1417. The licensee shall request from STUK or an AIO a construction inspection for a serially manufactured valve to establish the acceptability of 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 valve shall be inspected before its installation. The operability analysis of a valve fitted with an actuator shall also be approved before its installation. **[**2020-01-20 **]**

1418. If the construction inspection of serially manufactured valves is performed in the form of random inspections only to a part of the delivery batch and the inspections reveal significant shortcomings, the whole delivery batch shall be inspected. **[**2020-01-20 **]**

1419. The licensee shall have a plan or procedure in place for installing a serially manufactured valve according to which the installation shall take place and the installation work quality ensured. In case the valve has not already been approved for its service place in connection with the processing of the construction plan, the installation plan shall justify as to why the

valve's design values fully fulfil the requirements set forth by the service place. In such a case, an approval shall be sought for the installation plan before the installation. **[**2020-01-20 **]**

1420. The licensee shall request from STUK or an AIO an installation inspection for a serially manufactured valve to establish the acceptability of 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 valve. **[**2020-01-20 **]**

1421. The licensee shall have a plan or procedure in place for commissioning a serially manufactured valve according to which the commissioning shall take place and the valve's performance at the service place ensured. **[**2020-01-20 **]**

1422. The licensee shall request from STUK or an AIO an commissioning inspection for a serially manufactured valve to establish the acceptability of 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 valve's electrical and I&C equipment shall have been processed according to the submittal method and schedule specified in Guide YVL E.7. **[**2020-01-20 **]**

15 Regulatory oversight by the Radiation and Nuclear Safety Authority

15.1 General

1501. The oversight conducted by STUK or an AIO encompasses valve design approvals at system and component level as well as inspections to be conducted during manufacturing, installation, commissioning and operation as specified in this Guide. **[**2020-01-20 **]**

1502. STUK may grant inspection rights in accordance with Guide YVL E.1 to an AIO it has approved. Appendix A defines the principles for the division of inspection responsibilities between STUK and an AIO, which can be supplemented by STUK's decisions. The same party shall inspect all valve parts regardless of, e.g., a possible part-specific classification based on its safety significance. **[**2020-01-20 **]**

1503. STUK or an AIO makes a decision on their design review. Even approval decisions can contain requirements and deadlines for the responses to be submitted on them. **[**2020-01-20 **]**

1504. Removed. **[**2020-01-20 **]**

1505. The licensee shall invite STUK or an AIO to the plant or factory inspections at least 7 days prior to the inspection, however, so that there is sufficient time to prepare for the inspection and to make the necessary travel arrangements. **[**2020-01-20 **]**

1505a. The licensee shall justify and ensure to STUK or an AIO the acceptability of the submitted documents in advance with the help of its own inspections. In the same way, the licensee shall ensure preconditions for the performance of the inspections in accordance with the inspection invitation at the plant and factory inspections. **[**2020-01-20 **]**

1506. STUK or an AIO 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 of the measures given in the requirements. **[**2020-01-20 **]**

1507. 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. **[**2020-01-20 **]**

15.2 General equipment requirement specifications

1508. STUK processes the licensee's general equipment requirement specifications regarding valves and issues a decision on it. **[**2020-01-20 **]**

1509. STUK or an AIO oversees compliance with the general equipment requirement specification for valves in connection with design and factory inspections. **[**2020-01-20 **]**

15.3 Approval of the manufacturer

1510. STUK's approval is required for such valve manufacturers and installation organisations that employ special processes in the manufacture or installation of parts significant for the valve's operability. The requirements as well as approval and oversight procedures are presented in Guide YVL E.3. **[**2020-01-20 **]**

1511. STUK assesses the acceptability of manufacturers other than those using special processes based on the manufacturer information included in the construction plan. **[**2020-01-20 **]**

15.4 Approval of a third party

1512. A notified body or a recognised third-party organisation pursuant to the Pressure Equipment Directive [12] 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 these, also other accredited certification bodies shall 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. **[**2020-01-20 **]**

1513. The expertise of a third-party conducting control of manufacturing is assessed based on a report included in the construction plan. **[**2013-11-15 **]**

15.5 Construction plan

1514. STUK or an AIO reviews the construction plan of the valve submitted by the licensee and issues a decision on it. Approved valve design bases at system level are the prerequisite for a construction plan review. **[**2020-01-20 **]**

15.6 Control of manufacturing, and construction inspection

1515. STUK or an AIO can oversee valve manufacturing by means factory visits during manufacturing before the valve's final construction inspection. **[**2020-01-20 **]**

1516. STUK or an AIO conducts a construction inspection, as specified in this Guide, on completed valves. **[**2020-01-20 **]**

1517. Removed. **[**2020-01-20 **]**

1518. Removed. **[**2020-01-20 **]**

1519. Removed. **[**2020-01-20 **]**

15.7 Type test witnessing

1520. If a type test is conducted on a valve subject to approval in connection with procurement, STUK or an AIO reviews the type test plan, witnesses the performance of the type test and assesses the test results. **[**2020-01-20 **]**

15.8 Control of installation, and installation construction inspection

1521. STUK or an AIO reviews the installation construction plan submitted by the licensee, which shall contain the documents specified in this Guide. **[**2020-01-20 **]**

1522. STUK or an AIO conducts an installation construction inspection, as specified in this Guide, on the valve. **[**2020-01-20 **]**

15.9 Commissioning inspection

1523. STUK or an AIO conducts a two-phased commissioning inspection on the valve as specified in this Guide. **[**2020-01-20 **]**

15.10 Operation, condition monitoring, and maintenance

1524. STUK oversees the operation, condition monitoring and maintenance of the nuclear facility's valves during inspections belonging to its periodic inspection programme (KTO). The oversight also covers instructions and plans relating to these inspections. **[**2013-11-15 **]**

1525. STUK or an AIO reviews the valve repair plan submitted by the licensee and issues a decision on it. A plan for a minor routine repair work under the responsibility of STUK may be submitted for approval by a STUK inspector at the plant site. **[**2020-01-20 **]**

1526. STUK or an AIO conducts a repair construction inspection in a scope based on the repair work inspection plan. **[**2020-01-20 **]**

1527. STUK or an AIO assesses the acceptability of the inspection and testing records and feedback data for valve maintenance work (maintenance, overhauls and repairs). If valves are disassembled during maintenance work, STUK or an AIO visually inspects the parts before assembly. **[**2020-01-20 **]**

15.11 Modifications

1528. STUK or an AIO reviews the construction plan for the valve modification submitted by the licensee and issues a decision on it. **[**2020-01-20 **]**

1529. STUK or an AIO conducts a modification construction inspection in a scope based on the modification inspection plan. **[**2020-01-20 **]**

16 APPENDIX A Valve control scope and division of inspection responsibilities

Approval or witnessing AIO=authorised inspection organisation	**Safety class**		
	1	**2**	**3**
Design			
Manufacturer (when special processes are used in manufacturing)	STUK	STUK	STUK
General equipment requirement specification	STUK	STUK	STUK
Design bases	STUK	STUK	STUK
Construction plan	STUK	STUK/AIO[1)]	AIO
Preliminary suitability assessment of electrical and I&C equipment YVL E.7	-	STUK	STUK
Type test oversight	STUK	STUK/AIO[1)]	AIO
Manufacture			
Manufacturing control	STUK	STUK/AIO[1)]	AIO
Construction inspection	STUK	STUK/AIO[1)]	AIO
Final suitability assessment of electrical and I&C equipment YVL E.7	-	STUK	STUK
Installation and commissioning			
Installation construction plan and inspection	STUK	STUK/AIO[1)]	AIO
Commissioning inspections	STUK	STUK/AIO[1)]	AIO
Maintenance, repairs and modifications			
Maintenance work inspection	STUK	STUK/AIO[1)]	AIO
Plan for repairs and modifications	STUK	STUK/AIO[1)]	AIO
Inspection of repairs and modifications	STUK	STUK/AIO[1)]	AIO

[1)] STUK: blowdown and safety valves as well as nominal size DN>50 valves fitted with actuators that are not low-energy ones / AIO: all others than those mentioned above.

If special processes are used in valve manufacturing, the minimum scope of qualification and control of manufacturing complies with Annex A of Guide YVL E.3 as regards these manufacturing procedures.

[2020-01-20 **]**

17 APPENDIX B Material certificate requirements for valve construction materials and welding filler materials

B01. Table 1: Material certificate requirements for valve construction materials (SFS EN 10204 [13])

Valve part	Valve Safety Class					
	1,2	3*)	1,2	3*)	1,2	3*)
	Valve design basis					
	Integrity		Leak tightness		Performance	
Body and bonnet	3.2	3.1	3.2	3.1	3.2	3.1
Pressure-retaining bolts	3.1	2.1	3.1	2.1	3.1	2.1
Obturator, stem	2.1	2.1	3.1	2.1	3.1	2.1
Other parts significant for operability	2.1	2.1	2.1	2.1	2.1	2.1

*) Also low-energy valves in Safety Class 2.
Note. If the part is in contact with a medium that is primary water or is being led to primary water, the part is required to have a chemical analysis with the 3.1 certificate in all safety classes.

A higher-level material certificate is always acceptable. **[**2020-01-20 **]**

B02. Table 2: Material certificate requirements for valve welding filler materials (SFS EN 10204 [13])

Weld	Safety class		
	1	2	3
Pressure-retaining valve welds	3.2	3.1	3.1
Welded claddings	3.1	2.2	2.2
Other welds significant for valve integrity or operability	2.2	2.2	2.2

A higher-level material certificate is always acceptable. **[**2020-01-20 **]**

18 APPENDIX C Construction plan calculations

Nominal size	DN ≤ 50			DN > 50		
Safety class	**1**	**2**	**3**	**1**	**2**	**3**
All valves						
Pressure dimensioning of the valve's pressure-retaining body parts [1)]	X	X	X			X
Stress analysis of the valve's pressure retaining body parts [2)]				X	X	
Strength calculations of the other valve parts [3)]	X			X	X	X
Valves equipped with actuators						
Operability analysis [4)]	X	X	X	X	X	X
Safety and relief valves						
Flow capacity calculation [5)]	X	X		X	X	

[1)] In compliance with the applicable design standard, definition of minimum wall thickness based on the valve design pressure.
[2)] Design standard-compliant stress analysis, or stress analysis based on detailed structural modelling. If a stress analysis based on the design standard is not possible due to a non-conformant structure or if the valve is subject to loads the resulting stresses of which cannot be reliably analysed, a detailed stress analysis shall be conducted on the valve. The requirements for a detailed stress analysis are presented in Guide YVL E.4. Fatigue analysis shall be presented for parts subjected to fatigue-inducing loads, if the impact of fatigue on the valve's service life cannot be excluded.
[3)] Strength calculations of load-bearing parts important to valve integrity or performance that can be based on a detailed stress analysis, standard formulae or a similar report confirming sufficient strength. Examples of such parts include the obturator, stem and bolts. A fatigue analysis is required, if a part is subject to loading fluctuations and the impact of fatigue on the service life of the part cannot be excluded.
[4)] A calculation or similar report to ensure that the minimum torque generated by the actuator exceeds the maximum torque conveyed from the frictional force of the valve's obturator, stem seals and other parts in all design basis service. In Safety Classes 1 and 2, it shall be justified for valves with a nominal size larger than DN50 that vibrations or changes in plays do not weaken the performance of the valve or its actuator in design basis service. If the valve design bases include limit switch failure, a strength analysis shall also be presented demonstrating the operability required of the valve and actuator also in the situation in question.
[5)] Calculations to ensure the adequacy of the valve's flow capacity in all design basis service. A discharge coefficient measured for the valve type shall be used in the calculations, and the calculations shall include the effect of piping pressure losses and other external factors on valve flow capacity.

[2020-01-20 **]**

19 References

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

2. Removed. **[**2020-01-20 **]**

3. Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018). **[**2020-01-20 **]**

4. Radiation and Nuclear Safety Authority Regulation on the Safety of Disposal of Nuclear Waste (STUK Y/4/2018). **[**2020-01-20 **]**

5. Removed. **[**2020-01-20 **]**

6. ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NB-3500 Valve Design. **[**2020-01-20 **]**

7. ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC-3500 Valve Design. **[**2020-01-20 **]**

8. Removed. **[**2020-01-20 **]**

9. Removed. **[**2020-01-20 **]**

10. Removed. **[**2020-01-20 **]**

11. Removed. **[**2020-01-20 **]**

12. Pressure Equipment Directive 2014/68/EU. **[**2020-01-20 **]**

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

Definitions

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.

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.

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.

Service life

Service life shall refer to the period of time beginning from the commissioning of the SSC fulfilling its operability requirements and ending when the degraded operability is not restored to the required level anymore.

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.

Modification

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

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.

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.

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.

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.

Valve discharge coefficient

Valve discharge coefficient shall refer to the ratio between the measured and theoretical flow capacity.

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.

Valve

Valve refers to a mechanical component which is used to open or close a flow route or to control the flow. In the context of Guide YVL E.8, a valve is considered to include the parts forming an integral part of the valve structure and operations, excluding electrical and I&C equipment, such as the electric-motor actuator.

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.