Radiation and Nuclear Safety Authority 5/0002/2017
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Guide YVL E.13 Ventilation and air-conditioning equipment of a nuclear facility

1 Introduction

Ventilation and air conditioning equipment is used at nuclear facilities to manage the temperature, humidity and purity of indoor air and to prevent radioactive materials from spreading inside the plant or into the environment.

Most of ventilation and air-conditioning equipment is serially manufactured, and the purpose has been to take this into account when preparing the requirements. If a requirement only applies to serially manufactured equipment or built-to order equipment, this is expressed in the requirement.

The Guide provides requirements for the design, manufacture, installation, commissioning, use, condition monitoring and maintenance of the ventilation and air conditioning equipment of a nuclear facility and describes the regulatory control measures applied by STUK and an authorised inspection body (AIO) to monitor compliance with the requirements.

2 Scope of application

The Guide applies to ventilation and air-conditioning equipment of nuclear facilities belonging to safety classes 2 and 3, such as ducts and their parts, fans, filters, control and closing devices, cooling and heating units, water cooling units, cooling fan assemblies and standard air-conditioning units in all stages of their life cycle.

The Guide does not apply to exhaust gas handling systems, condenser vacuum systems or leak collection systems.

The requirements apply to the licensee and, where applicable, to the licence applicant, plant or equipment supplier and manufacturers.

Requirements for containment isolation valves, pressure equipment and fire dampers are presented in other YVL Guides as well as laws and decrees (for example, the Decree of the Ministry of the Environment on the Indoor Climate and Ventilation of New Buildings). Requirement 354 of Guide YVL B.8 “Fire protection at a nuclear facility” concerns the tightness and insulation of fire dampers. Requirement 5527 of Guide YVL B.1 concerns the fire safety of filters. The plant- and system-level requirements are presented in Guide YVL B.1 “Safety design of a nuclear power plant”.

3 Justifications of the requirements

3.1 Chapter 1 Introduction

The chapter presents the requirements of the Nuclear Energy Act (990/1987), the Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant (STUK Y/1/2018) and the Nuclear Safety Authority Regulation on the Safety of

Disposal of Nuclear Waste (STUK Y/4/2018) on the topic and lists YVL Guides that present requirements regarding ventilation and air-conditioning equipment at a nuclear facility.

In addition to the Guide, other laws and decrees valid in Finland regarding this equipment, such as the Decree of the Ministry of the Environment on the Indoor Climate and Ventilation of New Buildings (1009/2017), and regulations issued by authorities shall be complied with. As a rule, these have not been repeated as requirements in the Guide.

The legislation, decrees and guidelines concerning the field of refrigeration are also valid at nuclear power plants. Companies and persons working in the field of refrigeration must have appropriate approval and qualification granted by Tukes. The Finnish Environment Institute SYKE is responsible for the market surveillance of refrigerants and equipment containing refrigerants.

3.2 Chapter 3 Licensee's equipment requirement specifications

It has not been considered necessary to determine in detail the form in which the information of the licensee's equipment requirement specification should be presented: the information may be in data sheets as presented in Guides YVL E.8 "Valves of a nuclear facility" and YVL E.9 "Pumps of a nuclear facility" or as otherwise instructed for ventilation and air-conditioning equipment and considered suitable by the licensee.

The licensee shall have in place general equipment requirement specifications for ventilation and air-conditioning equipment presenting the design, quality control and regulatory requirements and the standards and guidelines used in design and dimensioning that are considered acceptable. Nuclear standards take priority, but general standards concerning ventilation and air-conditioning equipment may also be used. A shared equipment requirement specification may be prepared for equipment of the same type, since it is not necessary to prepare a component-specific specification in that case.

Regarding the quality control requirements, the equipment requirement specification shall describe the inspections and tests to be conducted during procurement, manufacturing, installation and commissioning. The description typically presents the references to inspection and testing procedures, reporting requirements and supervisory parties. If the procedures are not publicly available, they shall be made available to STUK and, upon request, delivered to STUK's use in accordance with Guide YVL A.1 "Regulatory oversight of safety in the use of nuclear energy". Similarly, the procedures shall also be available to the AIO.

The requirements for built-to-order equipment shall be separately described in the general equipment requirement specification if the requirements differ from the requirements set for serially manufactured equipment.

The requirements for the requirement specification and configuration management are set forth in Sections 3.5 and 3.3 of Guide YVL B.1.

Requirement specification for equipment service place shall refer to the equipment requirement specification prepared for the planned service place. The Requirement specification for equipment service place shall include design requirements for the equipment derived from the plant and system levels. Characteristics required at the service place include environmental qualification (temperature, relative humidity, pressure, pressure difference, radiation and vibration), operability requirements (normal use, accident situations and after accident situations), tightness and integrity requirements and the safety and seismic classification of the equipment.

The requirement specifications for equipment service place shall be kept up to date. The update need shall be checked if there have been changes at the plant or system level during design, manufacturing, installation, commissioning or operation. The requirements shall be traceable to the plant- and system-level requirements, and it shall be possible to verify the conformance.

In accordance with requirement 312, the requirement specification of equipment in safety class 2 shall be inspected by an expert that has not been involved in the design of the item in question. The above-mentioned expert may work in the same organisation as the designer if the expert has not been involved in the design.

3.3 Chapter 4 Manufacturer

The manufacturer of ventilation and air-conditioning equipment in safety classes 2 and 3 shall have in place a successfully certified management system or a similar management system independently assessed by a third party.

In case of built-to-order equipment, the management system of a safety class 2 equipment manufacturer shall comply with the requirements regarding the management system of supplier presented in Guide YVL A.3 “Leadership and management for safety”. The management system may be supplemented as necessary with a delivery-specific quality plan in accordance with Guide YVL A.3 if the requirements of Guide YVL A.3 concerning the management system are not complied with.

A delivery-specific quality plan is not required when procuring serially manufactured components.

According to requirement 404, the manufacturer shall have documented procedures for the qualification of manufacturing methods and personnel (YVL E.12 “Testing organisations for mechanical components and structures of a nuclear facility”), validity of qualifications, manufacturing, testing and handling of non-conformances. According to requirement 405, the manufacturer shall have in place qualified manufacturing methods for the manufacture of components of nuclear ventilation and air-conditioning equipment or the preparedness to qualify the methods before manufacture is started. The manufacturing methods shall be qualified with the aid of procedure tests conducted under the supervision of a recognised third-party supervisor. Persons making permanent joints shall be qualified under the supervision of a recognised third-party supervisor. 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 are 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.

As regards the supply chain of parts important to the safety function, the manufacturer shall ensure that subcontractors are aware of the requirements related to the delivery.

Before assembly, the manufacturer shall ensure that the components manufactured by the subcontractors fulfil the requirements related to the delivery.

3.4 Chapter 5 Design

3.4.1 Section 5.1 General requirements for equipment

General requirements applying to all ventilation and air-conditioning equipment, which are not repeated in equipment-specific sections, have been collected in Section 5.1. Equipment type-specific additional requirements are presented in their own sections. If there are no additional requirements for an equipment type, no separate section has been added to the Guide.

In the design of ventilation and air-conditioning systems, Guides YVL E.3 “Pressure vessels and piping of a nuclear facility”, YVL E.8 and YVL E.9 may be followed. For structures, Guide YVL E.6 “Buildings and structures of a nuclear facility” may also be followed.

In accordance with requirements 502 and 503, the equipment shall meet the equipment service place requirements (design bases) and be protected from the effects of operational occurrences and accidents it is designed to manage. The equipment shall be designed following an established standard. Standards considered acceptable have been specified in the general equipment requirement specification.

According to requirement 504, accessibility and the maintenance of operability during and after an accident shall be taken into account in designing and selecting equipment. In assessing accessibility, routes to the equipment service place and any maintenance measures needed in the long term shall be taken into account. Accessibility is discussed in requirements 422a and 423 of Guide YVL C.1 “Structural radiation safety at a nuclear facility”.

According to requirement 506, the conformity of the equipment and its suitability for its intended application shall be demonstrated in the construction plan. According to requirement 507, the materials (seals, filter materials, surfacing, etc.) shall be selected so that, for example, radiation or humidity does not make the equipment inoperable in design basis operating conditions, including accidents where the system does not function as planned or the safety function is not fulfilled any longer. In addition to material selections, the execution of the system and the safety function

in design basis operational conditions may also be influenced in ways not included in the scope of this Guide.

According to requirement 508, ventilation and air conditioning equipment and its casing, mounting racks and seals shall be leak tight to prevent bypass leakage from impairing the operation of the system, to enable the effective handling of radioactive or toxic gases and to prevent the spread of radioactive and toxic gases to clean areas. The requirement shall also be taken into account when designing and implementing installations. Tightness requirements for equipment have been presented in the Decree of the Ministry of the Environment (1009/2017) and in standards.

Requirements 509 and 510 apply to type-approved building products and their use in safety class 3. According to standard SFS-EN 15650, fire dampers may be granted a CE marking. The standard refers to test standard SFS-EN 1366-3 and classification standard 13501-3, according to which the integrity (E) and insulation (I) of fire dampers is defined. With a CE marking, the manufacturer assures that the characteristics of a building product are in accordance with a European harmonised product standard or a European technical approval. In a building product, a CE marking alone does not guarantee the fulfilment of the equipment service place requirements because the testing of one characteristic is sufficient for granting the marking. Type approval is a voluntary way for the manufacturer to demonstrate that a building product's characteristics meet the essential technical requirements prescribed for it in the intended use indicated by the manufacturer. The manufacturer may optionally apply for type approval for a building product on which a type approval decree has been issued. The type approval decrees issued by virtue of the previous Land Use and Building Act (132/1999) were repealed in 2017. The new type approval decrees for ventilation and air-conditioning equipment are not yet in force.

3.4.2 Section 5.2 Ducts

Tightness requirements of the ventilation ducts are affected by the content of radioactive or toxic substances in the ducts, the rooms through which the ductwork are conducted and the pressure difference between the ducts and their surroundings. In addition, any explosive substances shall be taken into account. The Guide does not present detailed requirements for airtightness classes or standards to be followed for different ductworks. The purpose is to select the necessary tightness taking into account, for example, the duct routes (accessibility, radiation protection aspects) and the content of toxic or radioactive substances in the ductworks. Stricter tightness requirements may therefore be set, for example, for ductworks in rooms requiring continued stay. Tightness requirements for ducts are presented, for example, in standards SFS-EN 15727 and KTA 3601. Ventilation airtightness classes are defined in the Decree of the Ministry of the Environment on the Indoor Climate and Ventilation of New Buildings (1009/2017 §19).

According to requirements 512 and 513, the design shall take into account fire safety requirements, decontaminability of the ducts from potential radioactivity and prevention of the formation and dispersion of whiskers. The general decontaminability of ducts is discussed in, for example, standard SFS-EN 12097. No detailed requirements or standard/guide references have been given for acceptable materials,

coatings and geometrical shapes; the suitability and acceptability of design solutions and selections for their intended use are assessed case-specifically. The selection and design bases to be applied and the suitability for the intended use may also be presented as generally applicable. Fire safety requirements are presented in, for example, the Decree of the Ministry of the Environment on the Fire safety of Buildings (848/2017, Section 19 Ventilation system, Section 17 Fire doors, windows and shutters and Section 16 Fire compartmenting building elements and partitioning building elements). Talotekninen teollisuus ja kauppa ry's guide on the fire safety of ventilation stations ("Opas ilmanvaihtolaitosten paloturvallisuudesta") includes guiding texts.

3.4.3 Section 5.3 Filters

In accordance with Guide YVL B.1, the ducts shall include HEPA filters in connection with the activated-carbon filters. The filters shall be efficient in order to prevent the dispersion of carbon dust from the carbon filter from migrating into the ductwork and possibly onwards into facility rooms or the environment.

According to requirement 403 of Guide YVL C.3 "Limitation and monitoring of radioactive releases from a nuclear facility", *adequate delay systems for off-gases shall be provided to reduce the releases of noble gases. The gas treatment and ventilation systems of the plant shall be fitted with effective particle filters and activated carbon filters to reduce radioactive aerosol and iodine releases*.

According to requirement 515, the particle and activated carbon filters of exhaust air systems shall be efficient in order to reduce aerosol and iodine emissions. The Guide does not set requirements for minimum efficiency or target values or refer to individual standards. The efficiency of the filters is discussed in, for example, standards SFS-EN ISO 16890, EN 1822 and ISO 29462. Generally, the methyl iodide retention factor of new filters is at least 99.9% and particle retention factor at least 99.99%. Usually, values lower than these cannot be considered acceptable. It shall also be observed that, for example, the particle retention factor decreases, and pressure loss increases due to moisture and that the efficiency of carbon filters depends on the relative humidity. The placement of high-efficiency aerosol filters in connection with activated carbon filters is discussed in requirement 5511a of Guide YVL B.1. If necessary, the aerosol filter may also be installed before the activated carbon filter. Advances in technology shall be taken into account when selecting filters.

Requirement 516 requires that supply air filters shall be efficient so that the requirements of Guide YVL B.1 are met. The intake air filters of the control room, the emergency control room and other rooms occupied in accident situations and important to the management of accident situations shall be efficient to enable working in the rooms without protective equipment. In other words, the requirement applies to all rooms that are occupied in accident situations. In addition to radioactive gases, toxic and asphyxiating gases used, stored and transported at the plant site shall also be prepared for in filtering. Transports taking place in the vicinity and events in accordance with Guide YVL A.11 "Security of a nuclear facility" shall also be taken into account.

According to requirement 517, the maintenance and replacement of filters shall be possible in such manner that avoids contamination of the clean side. Carbon change, for example, poses specific requirements.

Requirements 518–520 discuss the testing of filters. According to requirement 518, testing the filters at the service place shall be prepared for. This requirement covers in situ tests conducted on the filters. Carbon filter retention factor tests and tests on particle filters and separate filter sections (for example, a paraffin oil test of filter sections according to the DIN standard or a test according to standard ISO 16170:2016 “In situ test methods for high efficiency filter systems in industrial facilities”) are conducted at the plant site. In situ tests also ensure that the filter has no bypass leakages affecting the efficiency of filtering and possibly the accessibility of filters. Filter bypass leakages shall be assessed as part of system design.

According to requirement 519, laboratory testing of activated carbon shall be prepared for in the design of the filters in order to determine the retention factor or auto-ignition temperature. This can be implemented, for example, by equipping the filters with separate test lines or preparing for taking drill samples. Removable test cartridges may be installed in the test lines to be loaded with carbon of the same delivery batch as that used in the actual filters. In addition, the conditions and retention times shall be similar in the filter and the test cartridge to ensure the representability of the laboratory results. If a drill sample is used, it is important to ensure that the sample is representable and taking the drill sample does not compromise the operation of the filter.

If possible, incombustible materials shall be used in filter equipment, and the possibility of fire shall be taken into account in the design (see Guide YVL B.1, requirement 5527). Carbon filters have heavy fire loads, and self-ignition of the filters is possible. Fire in a filter may cause the release of radioactive substances accumulated in the filter.

In accordance with requirement 520, individual factory tests shall be performed for filter sections and the activated carbon batch in order to define their retention factor. For example, the retention factor of particle filters may be compromised when they are transported and moved around. Acceptance tests ensure that filter sections remain in acceptable condition. After reception, filter section and activated carbon shall be stored so that their properties are retained. Provisions shall also be made for the possibility that during operation, for example due to an operational event, additional field tests are needed to ensure the operability of filters. The test results shall be recorded, and trends shall be monitored to ensure timely maintenance.

Requirement 521 requires that the sections of a filter consisting of several filter sections shall have similar characteristics. This means that sections of different types (particle filter, minipleat, traditional, etc.) or, for example, with different passing times that would be detrimental to the operation of the filter as a whole may not be installed in the same filter.

According to requirement 523, the filters shall be handled so that they retain their operability. For example, incorrect handling of particle filter sections may significantly impair the retention factor of the filter.

According to requirement 524, the storage conditions of filters and filter materials (filter sections, activated carbon) shall be determined and monitored so that the operability of the filters and filter materials is maintained.

3.4.4 Section 5.4 Control and closing devices

Due to stresses caused by the operation (ageing phenomena, accident conditions, long-term durability), special attention shall be paid to the selection of seal materials in order to retain tightness (see requirement 525). The general requirements (e.g. 507) cover this, so there is no separate requirement for this in the Guide.

According to requirement 526, CE-marked fire dampers may be used in safety class 3. A fire damper may be assigned to safety class 3 based on functional requirements. Requirements set elsewhere for fire dampers are not repeated in this Guide.

Guide YVL E.7 “Electrical and I&C equipment of a nuclear facility” presents requirements concerning damper actuators and position indication. For control and closing devices contributing to the containment isolation function, Guide YVL E.8 shall be complied with (similarly to other equipment contributing to containment isolation).

3.4.5 Section 5.5 Machine units

Serially manufactured machine units may be addressed as a whole. For example, if one or more components of a serially manufactured unit are replaced or a machine unit is assembled from separate parts (built-to order), it shall be addressed component-specifically (requirements 529 and 530).

Requirement 531 applies to failures and common cause failures to be analysed. In that case, machine units shall be handled component-specifically because the same components may have been used in different equipment by different manufacturers.

3.5 Chapter 6 Construction plan

Chapter 6 concerns the preparation of construction plans for safety class 2 and 3 equipment. The construction plan of ventilation and air-conditioning equipment may be more concise than the construction plan prepared for pressure equipment, and it shall focus on the assessment of the suitability of the equipment. The requirements for construction plans are based on the Annex of Guide YVL 5.6 (published in 2004). If it is decidedly unnecessary to present some information, it may be left out of the construction plan for a justified reason, but the reason shall then be presented in the construction plan for clarity. For serially manufactured ventilation and air-conditioning equipment, the information of the construction plan has often been presented at a sufficient level in the product brochure and technical brochure, in which case the brochures may be added to the construction plan and it is not necessary to move the information contained in the brochures to other parts of the construction plan.

According to requirement 601, the licensee shall, as part of selecting a component in safety classes 2 and 3 or procuring a spare part, prepare an assessment of the suitability and conformity of the component. In connection with the construction plan,

the licensee shall present a justified conclusion on the suitability of the component for its intended use. The Guide does not specify in more detail the presentation method and content of the assessment. The licensee may specify the presentation method, but in order to harmonise the presentation, it is probably necessary to provide instructions concerning the presentation method and content. The requirements of other YVL Guides in the E series may be used for reference, although it may be unnecessary to present all the information required by the guides about ventilation and air-conditioning equipment.

According to requirements 602–603, the construction plan shall include a description of the component and its operation, the design bases for the component, its functions, the importance of its operation for the operation of the system and its planned service places. The design data shall include all the plant's operational states and accidents in which the component has been designed to function. For equipment procured for storage and intended for general use, the design bases and suitable service places shall be presented. The other information shall be presented when the service place of the equipment and the importance of its operation for the operation of the system are known.

Requirements 604–605 require the presentation of type test data and operating experiences.

According to requirement 606, the construction plan shall include a manufacturer analysis that contains information concerning the manufacturer's organisation and operations, copies of valid certification decisions and information on the recent delivery references. Requirement 607 poses an additional requirement for safety class 2 built-to-order equipment if special processes are used in their manufacture.

According to requirement 608, the construction plan shall include a test and inspection plan (ITP) if the equipment is not serially manufactured. The Guide includes no detailed requirements for the presentation method or content. The plan typically includes the work stages of quality management during manufacture, such as any inspections carried out by authorities. The result documentation of equipment is discussed in Chapters 7 and 8 of Guide YVL E.13.

According to requirement 609, the construction plan shall, if necessary, include a testing organisation report presenting the qualifications and approval of the testing organisation in accordance with Guide YVL E.12. The accreditation certificate of the testing organisation carrying out laboratory tests on the filters is a sufficient report.

Requirement 611 requires the performance analysis to be included in the construction plan. The analysis demonstrates the operation of the equipment assembly (for example, machine unit, fan and motor or damper and actuator) and the compatibility of the design (for example, mechanic, electric or I&C). The Guide does not restrict the presentation method of the analysis.

According to requirement 612, the construction plan of filters belonging to safety classes 2 and 3 shall present retention efficiency, pressure losses (for a clean filter and maximum allowable), tightness requirements (for the filter casing and mounting frames), filter section material, filter material quality, amount of carbon, number of filter sections, retention time and environmental conditions. The most essential

information about the filter materials of particle filters are the general quality and strength characteristics of the filter paper, the material of any filter pleat separators and, if necessary, the adhesives or other mounting accessories employed for the assembly. The most essential information about the filter materials of gas filters are the base material of the carbon, particle size distribution, BET area, hardness, impregnation agent and its amount, volume weight and auto-ignition temperature. In addition, operating experience data and type approvals may be presented.

In accordance with requirement 613, the following shall be presented for fans, pumps and compressors: operating method, quality of the medium (temperature, pressure, humidity), required operating point and performance curve, tightness requirements, environmental conditions and installation method as well as structural data on the shaft seals, if specific tightness requirements have been set for the fan, pump or compressor.

Requirement 618 applies to the party performing the construction plan inspection.

3.6 Chapter 7 Manufacture

In accordance with requirement 703, a material certificate is required for air conditioning and ventilation equipment. A material certificate of a higher level shall also be approved in all cases. Standard SFS-EN 10204 is applied to all metal products and can also be applied to other products. For equipment within the scope of this Guide, it is usually sufficient to have the manufacturer’s declaration that the products are in compliance with the order: type 2.1 (quality assurance) or type 2.2 (test certificate) presenting, in addition to the above, the test results based on the manufacturing method-specific inspection. For welding filler material, type 2.2 is usually required, but for structural material, type 2.1 is often sufficient. A material certificate of a higher level shall also be approved in all cases.

In addition, the Guide presents the general requirement 704 for structural materials for which a batch-specific material certificate is required (types 3.1 and 3.2).

3.7 Chapter 8 Construction inspection

Requirement 803 applies to the party performing the construction inspection.

According to requirement 804, a manufacture result documentation review and visual inspection independent of the manufacturer shall be performed for safety class 2 and 3 equipment. In accordance with requirement 805, the inspection for serially manufactured equipment may be combined with a receiving inspection, in which case a separate construction inspection is not needed. At least in the case of individual, easily removable equipment, the construction inspection may be performed as a receiving inspection at the storage.

3.8 Chapter 9 Installation

Requirements 901 and 903 require reception and installation inspections to be performed on safety-classified equipment. According to requirement 902, the licensee shall have an installation plan or procedure in place. Requirement 903 applies to the party performing the installation inspection.

3.9 Chapter 10 Commissioning

Chapter 4 of the Decree of the Ministry of the Environment (1009/2017) concerns ventilation system commissioning measurements. Section 21 of the Decree concerns airtightness and Section 27 the verification of ventilation system compliance with design specifications.

In accordance with requirement 1001, the licensee shall have a plan or procedure in place for commissioning ventilation or air-conditioning equipment. Requirement 1002 requires a commissioning inspection for air conditioning and ventilation equipment in safety classes 2 and 3. The commissioning inspection may be performed by the licensee's in-house inspection organisation or an organisational unit of the licensee that is independent of design, manufacture and installation. The party performing the commissioning inspection may therefore be from the same organisation. The commissioning inspection for safety class 2 built-to-order equipment is performed by an AIO.

3.10 Chapter 11 Operation, condition monitoring and maintenance

The requirements of Chapter 11 require that the operating parameters and load, process and environmental conditions be monitored and maintained within the limits of design basis operational conditions. Unnecessary loads and unfavourable operating conditions shall be avoided, and the equipment shall remain operable. Procedures shall be provided for the operation, condition monitoring and maintenance of the equipment, and operating experiences shall be taken into account.

3.11 Chapter 12 Modifications

Requirement 1201 requires that equipment modifications shall not impair the safety of the nuclear facility. The acquisition of a spare part that is significant in terms of operability is also considered a modification whenever the manufacturer, material or structure of the equipment changes.

According to requirement 1202, serially manufactured equipment shall, after a modification, be handled like built-to-order equipment, applying requirements and procedures presented for new built-to-order equipment. If a spare part different from the original part is installed into serially manufactured equipment, the original approval of the equipment as serially manufactured is no longer valid and the equipment shall be handled like built-to-order equipment. The justification for this is that the approval procedure has been lighter for the product originally procured as serially manufactured. After the modification, the equipment is no longer the same as that for which the approval was granted.

In the modification construction plan, the licensee shall justify the acceptability of the modification and present information with which the conformity of the equipment can be verified. The handling of a spare part modification of equipment originally procured as built-to-order may therefore be lighter than a modification of serially manufactured equipment.

In accordance with requirement 1204, the change of an individual component, such as a water-cooling unit, may be a system modification if the coolability of rooms important to safety changes significantly. In this case, the system modification is processed according to Guide YVL B.1.

Requirement 1205 requires processing the modification in logical order so that the plant and system levels are processed before the equipment level. The system level shall be approved before equipment-level documents may be processed and approved.
Requirement 1206 requires commissioning testing after modifications.

3.12 Chapter 13 Regulatory oversight by the Radiation and Nuclear Safety Authority

Chapter 13 concerns oversight by the Radiation and Nuclear Safety Authority: STUK assesses the quality management systems, participates in the audits by the licence holder and monitors the manufacture, implementation and commissioning testing at its discretion. The monitoring is focused on new suppliers of safety class 2 equipment and equipment that guarantees the habitability of control rooms and that has not been used before at Finnish nuclear power plants or represents new technology.

3.13 Chapter 14 Documents to be submitted to the Radiation and Nuclear Safety Authority

Requirement 1401 concerns information presented in preliminary and final safety analysis reports for components. The key design bases of components include

- the principal design data in terms of the operation of the filtering equipment, such as the filter type and retention efficiency, if a system's safety function is to restrict releases or to reduce occupational radiation exposure
- tightness requirements, materials, geometrical shapes and coatings for the ducts
- general tightness requirements for control and closing devices
- cooling or heating capacity and other essential design values of heating and cooling units
- cooling capacity and other essential design values of the water cooling unit and the necessary auxiliary systems.

Requirements 1402 and 1403 concern submitting the requirement specifications, and requirement 1405 concerns submitting the construction plans. According to requirement 1404, the service place-specific requirement specification and the licensee's assessment of the suitability and conformity of the component shall be submitted to STUK for information for safety-classified equipment, serially manufactured equipment in safety classes 2 and 3 and built-to-order equipment of safety class 3 (when a construction plan is not prepared or submitted to STUK for approval).

Requirement 1407 concerns submitting construction plans of serially manufactured equipment to STUK upon request. In connection with the system processing, STUK states whether it is exceptionally required to submit the construction plan for information. This might be the case, for example, for equipment that guarantees the habitability of control rooms and that has not been used before at Finnish nuclear power plants or represents new technology.

4 International provisions concerning the scope of the Guide

The international provisions mainly apply to system design, but they also contain some equipment-level requirements.

- IAEA SSS-2/1 (rev. 1), Safety of Nuclear Power Plants: Design, 2016
- IAEA Tecdoc-1744 Treatment of Radioactive Gaseous Wastes, 2014
- IAEA STI/DOC/010/325 Particulate Filtration in Nuclear Facilities, 1991
- ISO 26802:2010 Nuclear facilities – Criteria for the design and the operation of containment and ventilation systems for nuclear reactors
- NS-G-1.7 Protection against internal fires and explosions in the design of nuclear power plants
- KTA 3601, Ventilation Systems in Nuclear Power Plants, 2017
- WENRA reference level R and S, 2014, touches on this Guide; there are no other WENRA requirements.

5 Impacts of the Tepco Fukushima Dai-ichi accident

The Tepco Fukushima Dai-ichi accident did not affect Guide YVL E.13.