STUK

GUIDE **YVL 1.3** / 17 MARCH 2003

# MECHANICAL COMPONENTS AND STRUCTURES OF NUCLEAR FACILITIES

## Approval of testing and inspection organizations


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# Authorisation

By virtue of the below acts and regulations, the Radiation and Nuclear Safety Authority (STUK) issues detailed regulations that apply to the safe use of nuclear energy and to physical protection, emergency preparedness and safeguards:

- Section 55, paragraph 2, point 3 of the Nuclear Energy Act (990/1987)
- Section 29 of the Government Resolution (395/1991) on the Safety of Nuclear Power Plants
- Section 13 of the Government Resolution (396/1991) on the Physical Protection of Nuclear Power Plants
- Section 11 of the Government Resolution (397/1991) on the Emergency Preparedness of Nuclear Power Plants
- Section 8 of the Government Resolution (398/1991) on the Safety of a Disposal Facility for Reactor Waste
- Section 30 of the Government Resolution (478/1999) on the Safety of Disposal of Spent Nuclear Fuel.

# Rules for application

The publication of a YVL guide does not, as such, alter any previous decisions made by STUK. After having heard those concerned, STUK makes a separate decision on how a new or revised YVL guide applies to operating nuclear power plants, or to those under construction, and to licensees' operational activities. The guides apply as such to new nuclear facilities.

When considering how new safety requirements presented in YVL guides apply to operating nuclear power plants, or to those under construction, STUK takes into account section 27 of the Government Resolution (395/1991), which prescribes that *for further safety enhancement, action shall be taken which can be regarded as justified considering operating experience and the results of safety research as well as the advancement of science and technology.*

If deviations are made from the requirements of the YVL guides, STUK shall be presented with some other acceptable procedure or solution by which the safety level set forth in the YVL guides is achieved.

Translation. Original text in Finnish.

# 1 General

In accordance with Section 60a of the Nuclear Energy Act (990/1987) [1], *the Radiation and Nuclear Safety Authority (STUK) approves manufacturers of nuclear pressure equipment for their duties and inspection organisations or testing organisations for duties pertaining to the control of pressure equipment at nuclear facilities.*

*A prerequisite for the approval of an inspection and testing organisation is that the inspection or testing organisation is operationally and economically independent and that it carries liability insurance. In addition, the inspection organisation and testing organisation shall have an advanced quality system, a competent and experienced personnel as well as appropriately qualified methods, facilities and equipment for manufacturing and operation.*

*If the operation of the manufacturer, inspection organisation or testing organisation of pressure equipment falls short of stipulated requirements and conditions, or of those stated in a decision of approval, the Radiation and Nuclear Safety Authority (STUK) may withdraw its approval. If justified by reasons pertaining to the assurance of safety, the Radiation and Nuclear Safety Authority (STUK) may, after having granted the corporation or establishment concerned a hearing, change the requirements and conditions established in its decision of approval.*

In accordance with Section 60 of the Nuclear Energy Act (990/1987), *where technical requirements for conventional pressure equipment at nuclear facilities, demonstration of safety and other preconditions for their placing on the market are concerned, the provisions of the Pressure Equipment Act (869/1999) are in force.* Conventional pressure equipment at nuclear facilities consists of the pressure equipment included in class EYT.

In accordance with Section 113 of the Nuclear Energy Decree (161/1988) [2], *non-destructive testing of a nuclear power plant's structures and components may only be carried out by a testing company or a tester approved by the Radiation and Nuclear Safety Authority (STUK).*

*The licence-holder shall submit an application in writing for the approval of the testing company or tester mentioned in subsection 1 for their duties.*

In accordance with Section 3.1.3 of Appendix I to the Decision of the Ministry of Trade and Industry on pressure equipment (938/1999) [6], *persons involved in the non-destructive testing of permanent joints of pressure equipment shall have an appropriate qualification. With regard to pressure equipment belonging to classes III and IV, the said persons shall be approved by a qualification organisation.*

Section 21 of the Government Resolution (395/1991) [3] requires that *the systems, structures and components important to safety shall be designed, manufactured, installed and operated so that their quality level and the inspections and tests required to verify their quality level are adequate considering any item's safety significance*.

This Guide is applied to all organizations or their units that carry out non-destructive testing (NDT) or destructive testing (DT) of the mechanical components and structures of nuclear facilities in their capacity as a testing organization. Furthermore, this Guide is applied to such organizations or their units that inspect mechanical components and structures of nuclear facilities in their capacity as an inspection organization. The Guide deals with the qualification, acceptance procedure, obligations and supervision of the operations of both the testing organizations and testers, and the inspection organizations and inspectors.

In this Guide, a testing organization refers to an NDT laboratory, a DT laboratory or an NDT inspection organization.

The guides included in group 3 of the YVL Guides give the detailed requirements for pressure equipment. The requirements for other mechanical components and structures are defined in equipment group-specific YVL Guides, and the detailed requirements for construction inspection are given in Guide YVL 1.15.

The concept of **mechanical components and structures** is defined in Guide YVL 1.15.

Non-destructive testing refers to acoustic emission, eddy current testing, leak testing, magnetic particle testing, liquid penetrant testing, radiographic inspection, ultrasonic testing and visual inspection, excluding visual inspection carried out without auxiliary instruments or visual inspection linked with the use of another NDT method.

Guide YVL 3.8 deals with the qualification of inspection systems applied to the in-service inspections of pressure equipment belonging to safety classes 1 and 2.

In this Guide, the licence-holder means the licence-holder referred to in the Nuclear Energy Act (990/1987).

# 2 Non-destructive testing

## 2.1 Testing organization

Non-destructive testing of the mechanical components and structures of nuclear facilities can be carried out by NDT laboratories and NDT inspection organizations.

Standard SFS-EN ISO/IEC 17025 [7] defines the general requirements for the NDT laboratory and its operations. The NDT inspection organization shall fulfil the requirements laid down in Standard SFS-EN 45004 [8]. The testers shall be qualified in accordance with level 2 of Standard SFS-EN 473 [9] or a corresponding qualification system.

The licence-holder shall apply to the Radiation and Nuclear Safety Authority (STUK) for approval of the testing organizations that carry out in-service inspections and non-destructive testing of mechanical components and structures belonging to safety classes 1 and 2 in accordance with Guide YVL 3.8.

When the licence-holder applies for STUK's approval for the testing organization, it shall submit an application, which shall include

- a description of the organizational structure
- a description of the person responsible for technical matters, his/her training and work experience
- a certificate or a statement issued by FINAS or a corresponding organization about the technical competence of the testing organization and independence of its operations, or some other certificate or statement about fulfilment of the requirements that STUK considers sufficient
- a description of the operational requirements and conditions laid down by the licence-holder
- a description of the testing methods employed by the testing organization
- essential instructions relating to the operations
- a list of the testers, including the name of each tester and the testing method for which the tester is qualified, and the number and expiry date of the qualification certificate
- a description of the testers' qualification system and organization, if qualification other than compliance with Standard SFS-EN 473 [9] is applied
- a description of the persons employed by or available to the testing organization, qualified in accordance with level 3 of Standard SFS-EN 473 for the different testing methods
- a description of the previous operations of the testing organization at nuclear facilities.

If STUK's approval is applied for a foreign testing organization, the application shall include descriptions that fulfil the requirements laid down in this Guide.

STUK recognizes, without a separate application, the testing organizations that are deemed competent in accordance with the Decree on recognizing the competence of bodies engaged in testing, inspection, certification and calibration operations (1568/1991) to carry out non-destructive testing of the following mechanical components and structures of a nuclear facility:

- non-destructive testing of pressure equipment belonging to safety classes 3 and 4
- non-destructive testing related to the installation and inspections during operation of pressure equipment belonging to class EYT
- non-destructive testing of other mechanical components and structures belonging to safety classes 3 and 4 and to class EYT.

The competence of the testing organization shall be proved by a certificate or a statement issued by FINAS (the Finnish Accreditation Service) or some other corresponding accreditation body.

If accreditation in accordance with what is stated above is sufficient for the approval of the testing organization, the licence-holder shall submit to STUK for information a copy of the accreditation certificate and a list of the testers, including the name of each tester, the method for which the tester is qualified, and the number and expiry date of the qualification certificate.

For special reasons, testers that have been approved by a qualification organization can be recognized to perform non-destructive testing related to the manufacture during inspection of the construction plan for the manufacture of mechanical components and structures of a nuclear facility belonging to safety classes 3 and 4 and to class EYT. The requirements for the non-destructive testing related to the manufacture of conventional pressure equipment belonging to class EYT have been given in the Decision of the Ministry of Trade and Industry on pressure equipment (938/1999) [6].

As part of the acceptance procedure of its condition-monitoring programme, the licence-holder may define the competence requirements for the testers that perform the non-destructive testing concerned.

The applications and other documents shall be submitted to STUK in accordance with Guide YVL 1.2 through the licence-holder.

The person responsible for technical matters in the testing organization shall maintain close contact with daily work of the testing organization. He/she shall be familiar with the testing methods, performance of the tests and assessment of the results.

The manufacturer of nuclear pressure equipment may submit an application concerning its testing operations that fulfil the requirements laid down in this Guide as part of the application for an approval of the manufacturer in accordance with Guide YVL 3.4.

STUK assesses the preconditions for operations and the operations of the testing organization on the basis of the submitted reports and the inspection visits to the premises of the testing organization.

The licence-holder-specific approval is valid for a maximum of five years at a time. If necessary, a reapplication shall be submitted to STUK no later than three months before expiry of the validity of the approval.

### 2.2 Testers

Only testers employed by a testing organization approved in accordance with Section 2.1 above are allowed to carry out non-destructive testing of the mechanical components and structures of nuclear facilities.

All testers are required to have a basic qualification in accordance with level 2 of Standard SFS-EN 473 [9]. Basic qualifications of the testers shall be complemented by further qualifications approved by STUK for in-service inspections in accordance with Guide YVL 3.8. Guide YVL 3.8 contains a detailed description of the qualification of inspection personnel that carry out in-service inspections.

The tester-specific approvals are valid at most up to the expiry date of the testing organization's period of validity.

## 3 Destructive testing

The testing organization that carries out destructive testing shall be accredited. STUK recognizes the capacity of such a testing organization, without a separate application, to carry out destructive testing of the mechanical components and structures of nuclear facilities. The licence-holder shall submit a copy of the accreditation certificate to STUK for information.

## 4 Inspection of mechanical components and structures

### 4.1 Inspection organization

Standard SFS-EN 45004 [8] defines the general requirements for the inspection organization and its operations.

The tasks of an inspection organization approved in accordance with this Guide involve evaluating and approving the compliance of the design and manufacture of mechanical components and structures of nuclear facilities with the requirements and carrying out inspections during operation. STUK approves the inspection area of the inspection organization by a separate decision on the licence-holder's application in accordance with the general principles laid down in Guide YVL 3.0 concerning the division of inspection areas.

Inspections related to the design and manufacture of conventional pressure equipment of nuclear facilities are carried out by the institutions, the operator's inspection organizations and qualification organizations reported in accord-

ance with the decree on inspection organizations referred to in the Pressure Equipment Act.

When the licence-holder applies for STUK's approval for the inspection organization, it shall submit an application, which shall include

- a description of the organizational structure
- a description of the person responsible for technical matters
- a certificate or a statement issued by FINAS or a corresponding organization or some other certificate or statement that STUK considers sufficient concerning the competence of the organization for inspection tasks of the mechanical components and structures of a nuclear facility
- essential instructions relating to the operations
- a list of the inspectors
- a description of the inspectors' training
- a description of the procedures that the applicant follows when using external services and a description of the way in which the applicant ensures that the performers of external services fulfil the requirements set for the inspectors of an accredited inspection organization.

The person responsible for technical matters shall be competent and experienced in the field of the inspection organization. His/her task is to ensure that the inspections are carried out in accordance with the relevant regulations and instructions. He/she shall be a permanent employee of the inspection organization.

The application shall specify the equipment groups and structures with which the inspections are concerned and the types of inspections covered by the operations.

The inspection organization shall have a written training policy, which indicates the training required for the different jobs as well as the technical knowledge in the field of nuclear facilities. In the training, particular attention shall be focused on, e.g., familiarity with nuclear facilities, design bases, safety analysis reports, technical specifications, and official permits and YVL Guides. The inspection organization shall maintain documentation that describes the competence, training and work experience of the personnel.

The inspection organization shall itself perform the essential tasks related to the inspection operations. If the inspection organization uses external services for its inspection operations, it shall be capable of proving that the performer of these services also fulfils the requirements set for the inspectors of an accredited inspection organization.

The applications and other documents shall be submitted to STUK in accordance with Guide YVL 1.2 through the licence-holder.

STUK assesses the preconditions for operations of the inspection organization on the basis of the submitted reports and the inspection visits to the premises of the inspection organization.

The approval of the inspection organization is valid for a maximum of five years at a time. If necessary, a reapplication shall be submitted to STUK no later than three months before expiry of the validity of the approval.

### 4.2 Inspectors

The application shall contain an inspector-specific description of the training, work experience and inspections for which each inspector is qualified. STUK assesses the competence of the inspectors as part of the assessment of the competence of the inspection organization.

# 5 Obligations imposed on the testing and inspection organizations

Guide YVL 3.0 deals with general requirements and obligations pertaining to the operations of the accredited inspection and testing organizations related to pressure equipment. The corresponding obligations also concern the inspection and testing organizations that inspect and test other mechanical components and structures of a nuclear facility. Component- and structure-specific inspection requirements and procedures are discussed in the respective YVL Guides.

The validity of the approval of the testing and inspection organization requires that the organization has the following at its disposal:

- a person responsible for technical matters

- sufficient expertise in the design and implementation of the testing or inspection, and in the assessment of results
- appropriate testing and inspection equipment and materials
- competent and experienced personnel
- administrative procedures to ensure the reliable functioning of the quality management system.

The testing and inspection organizations are obliged to ensure that

- the application documents are kept up to date
- a list of the testers and inspectors is submitted to STUK for information through the licence-holder every calendar year; the licence-holder is obliged to ensure that the data that have changed after the submission are available to STUK's inspectors at the inspection site
- the instructions and standards given to the tester or the inspector are in a language he/she understands and that they are available at the testing or inspection site
- the inspector draws up a memorandum about the inspection of the construction plan, stating the technical and legal bases for his/her decision
- the inspections and tests are carried out in accordance with the approved construction and testing plans, or, if no plans have been required, in accordance with the applicable standards or corresponding instructions
- the inspector fulfils the requirements laid down in Guide YVL 1.15 in conducting the construction inspection
- the tester does not test such components for the manufacture of which he/she has been responsible
- the inspector does not inspect such components for the manufacture of which he/she has been responsible, or on which he/she has carried out non-destructive testing in accordance with an approved quality inspection programme
- if a person qualified in accordance with level 3 of Standard SFS-EN 473 [9] carries out the testing, he/she also has a valid qualification for level 2
- the documents produced are filed for a minimum of 10 years
- the organization actively monitors development in its field and considers the opportunities created by new technology to increase the reliability of tests and inspections.

The accredited testing and inspection organizations shall submit an annual review of their operations to STUK for information through the licence-holder, including a report on the implementation and results of the regular evaluations by the accreditation body.

The testing and inspection organizations are required to co-operate with other organizations in the field. The purpose of co-operation shall be to help enhance technical interpretations and procedures connected with the operations. The objective shall be to continuously improve the operations and know-how.

The testing organization shall directly inform STUK of any issues it has discovered that jeopardize the safety of pressure equipment.

# 6 Supervision of the operations

STUK supervises operations of the testing and inspection organizations it has approved as part of its own inspection operations and by means of control visits related to their operations within the scope it considers necessary. The supervision pays attention to, for instance, the following issues:

- efficiency of the quality management system
- reliability of the tests and inspections
- implementation of the training
- general arrangements of the tests and inspections
- reporting of the results
- compliance with the conditions stated in the decisions of approval of the testing and inspection organizations
- implementation of the approved testing and inspection plans
- the validity of the provisions and standards available to the testers and inspectors.

# 7 References

1. Nuclear Energy Act (990/1987).
2. Nuclear Energy Decree (161/1988).
3. Government Resolution on the general regulations for the safety of nuclear power plants (395/1991).
4. Pressure Equipment Act (869/1999).
5. Decree on the Inspection Organizations Referred to in the Pressure Equipment Act (890/1999).
6. Decision of the Ministry of Trade and Industry on pressure equipment (938/1999).
7. SFS-EN ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories.
8. SFS-EN 45004, General criteria for the operation of various types of bodies performing inspection.
9. SFS-EN 473, Non-destructive testing. Qualification and certification of NDT personnel. General principles.