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In the event of any differences in interpretation of this guide, the Finnish version shall take precedence over this translation.

## MECHANICAL COMPONENTS AND STRUCTURES OF NUCLEAR POWER PLANTS. INSPECTION LICENSES

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## GENERAL

This guide deals with the licensing procedure and other prerequisites for the inspections performed for the mechanical components and structures of nuclear power plants.

The general premise is that the companies performing inspections have at their disposal

- enough expertise for the design and implementation of the inspections and for the analysis of results,
- proper equipment and facilities for the inspections,
- competent personnel, and
- administrative procedures to ensure reliable activities.

The inspection licenses for the mechanical components and structures in Safety Classes 1, 2 and 3 shall be issued by the Institute of Radiation Protection (IRP). Components and structures in Class EYT can also be inspected on the basis of inspection licenses granted by the Technical Inspectorate (TTL). In that case, the licenses granted by the TTL and the statements given by the Technical Research Centre of Finland (VTT) or copies of the Nordtest certificates shall be submitted to the IRP for information.

In this guide, inspection activities are divided into

- licensable inspection and expertise activities, for which both the company and its inspectors shall have inspection licenses given by the authorities, and
- other inspection activities, wherein the company

is responsible for the competence of its inspectors and for the other obligations set for the company.

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### DEFINITIONS

Mechanical components and structures denote pressure vessels, piping, pumps, valves, cranes, fuel handling equipment, pool linings and other such structures as well as the construction materials and test pieces needed in their manufacture.

Licensable inspection and expertise activities are occupations of the person responsible for the inspection activities, expertise activities in destructive and in non-destructive testing, occupations of the construction inspector, radiographing and interpretation of radiographs, ultrasonic inspection, magnetic particle inspection, liquid penetrant inspection, and other inspections requiring special skills.

Companies performing inspections denote organizational units performing inspection work regardless of whether they function as a part of a certain organization, as an independent profit unit, or as an independent company.

Nordtest certificate denotes a certificate on the competence of an inspector given by a National Examination Centre that is approved by the Technical Committee of Nordtest.

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### SCOPE

This guide is applied to all the parties (power company, manufacturer, inspecting agency, research institute, etc.)

that perform inspections for the mechanical components and structures of nuclear power plants.

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#### APPROVAL OF A COMPANY PERFORMING INSPECTIONS

A company performing licensable inspections shall be approved for its activities.

The manufacturer of pressure vessels can present the application concerning his quality control department and its inspectors, as required in this guide, in connection with the application for a manufacturing license prepared in accordance with Guide YVL 3.4.

The application with the enclosed supplements is submitted to the IRP pursuant to Guide YVL 1.2, except that the applicant can also deliver the application directly to the IRP. The direct application must not in any way diminish the power company's responsibility for fulfilling the quality assurance principles set forth in Guide YVL 1.4. The application delivered to the IRP shall include:

1. A certificate of the company registration
2. Quality assurance manual in accordance with Guide YVL 1.4 or some other description of the organization and administrative procedures of the company. The responsibilities and authority of the various units and persons in the company shall be explicitly defined in the description.
3. An account of the person responsible for inspections and his status in the organization. The approval of the person responsible for inspections is a prerequisite for the issuance of a license

to the company.

4. A description of the inspection methods used by the applicant and of the available inspection equipment and their maintenance. To control the condition of the equipment, the company shall have an active system of regular maintenance.
5. A description of the expert knowledge available to the applicant. The technical expertise available to the company shall be in a right proportion to the operation of the company. When necessary, the expertise shall be proved by means of records of the education and working experience of the technical personnel and/or by means of agreements made with external companies.
6. A description of the certification scheme for inspectors performing licensable inspections, if the certification is based on some other system than the Nordtest scheme.
7. An account of the previous inspection activities of the applicant.

The IRP assesses the qualifications for a company-specific license on the basis of the submitted documents and audits conducted by the IRP to the company. During the audits, extra emphasis is placed on the correspondence between the company's activities and the documents presented together with the application.

The company-specific license is valid for a maximum period of 5 years and a new application shall be submitted to the IRP not later than two months before the expiration of the license.

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## APPROVAL OF INSPECTION PERSONNEL

The following occupations are licensable:

1. person responsible for the inspection activities in a company performing inspections
2. expert on destructive testing
3. expert on non-destructive testing
4. construction inspectors
5. inspector performing radiographing and inspector interpreting radiographs
6. inspector performing ultrasonic inspections
7. inspector performing magnetic particle inspections
8. inspector performing liquid penetrant inspections
9. inspector performing other inspections requiring special skills.

The issuance and validity of inspection licenses presuppose that both the company-specific license and the personal competence certificates are valid.

## 5.1

## Application documents

The application documents are submitted to the IRP pursuant to Guide YVL 1.2, except that the applicant can also deliver them directly to the IRP. The direct application must not in any way diminish the power company's responsibility for fulfilling the quality assurance principles set forth in Guide YVL 1.4.

The application shall include a list of inspectors stating each inspector's occupation and the license that is applied for.

The extent of the descriptions needed for the issuance of personal inspection licenses depends on the certification scheme that is used as the basis. According to the certification principles, the applications can be grouped as follows:

1. Applications based on the Nordtest scheme for certification
2. Applications based on statements by VTT or on certification schemes other than the Nordtest scheme
3. Applications not based on schemes for certification
4. Applications whose contents shall be agreed upon beforehand with the IRP separately in each case.

The application based on the Nordtest scheme for certification shall be delivered to the IRP supplemented with:

- a copy of the Nordtest certificate, and
- an education card, whose correctness shall be demonstrated to the IRP or to an IRP inspector, when necessary.

The applications based on statements by VTT or on certification schemes other than the Nordtest scheme shall be delivered to the IRP supplemented with:

- a statement given by VTT on the person's competence or a certificate on competence issued in accordance with the certification scheme in question,
- a description of the certification scheme
- a certificate showing that the issuer of the certificate is entitled to give certificates on the basis of the certification scheme in question,
- an education card, whose correctness shall be

demonstrated to the IRP or to an IRP inspector, when necessary.

Applications not based on schemes for certification shall be delivered to the IRP supplemented with:

- an education card,
- copies of certificates in support of information that is presented on the education card and is essential to the review of the application, and
- a description of the certification procedure.

A separate agreement between the applicant and the IRP is needed in each case for the approval of inspectors that perform other inspections requiring expert skills. Such special methods include, for instance, eddy current inspections, mechanized inspections, acoustic emission inspections and inspections by ultrasonic holography.

The education card shall contain the following information:

1. personal data (full name and social security number)
2. basic and occupational education
3. supplementary and special education (e.g. inspection courses)
4. knowledge of languages
5. working experience (places and times of employment, occupations)
6. position and occupations in the present job and a description of any proprietary relationships to the company
7. other indications of the person's competence.

The education card shall bear a photograph of its holder.



## 5.2

## Acceptance criteria

In accepting inspection personnel, attention is paid to the training and working experience of the persons and to the certification scheme used as the basis of the certification.

A summary of the requirements set for the inspection personnel can be found in Appendix 1.

The person responsible for the inspection activities in a company performing inspections must have the degree of a diploma engineer (M.Sc. in Engineering), an engineer or a technician that is applicable to his duties. He shall have four years' experience in the design, manufacture or inspection of mechanical components and structures and enough familiarity with inspection methods.

The expert on destructive testing must have the degree of a diploma engineer or an engineer that is applicable to his duties. He shall have two years' experience in the manufacture or research of construction materials and enough familiarity with construction materials and their properties.

The expert on non-destructive testing must have the degree of a diploma engineer or an engineer that is applicable to his duties. He shall have two years' experience in the planning and implementation of inspections and in the evaluation of the results and enough familiarity with the applications and limitations of non-destructive testing methods.

The construction inspector must have the degree of a diploma engineer, an engineer or a technician that is applicable

to his duties. He shall have at least two years' experience in the design or manufacture of mechanical components and structures or as a full-time inspector of pressure vessels.

The inspector performing non-destructive testing shall have completed the comprehensive school or the equivalent education and additionally, he shall have at least one year's technical education. Comprehensive practical experience can replace some of the education required above.

Besides the basic education, it is required that the inspector performing non-destructive testing has had training on the inspection method in question in accordance with the Nordtest scheme. The courses arranged by the Institute for the Development of Occupational Skills are in Finland accepted as such training.

As concerns the required working experience, full-time working as an apprentice or an assistant with the inspection method in question is considered to be acceptable. The working experience required in various duties is shown in Appendix 1.

As concerns special methods, the company shall agree with the IRP on the approval procedure of the inspection personnel and on the applicable requirements. Such questions as detailed competence requirements, e.g. special training and familiarization with the inspection method provided by the equipment supplier or the employer, are agreed upon.

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## DUTIES OF THE INSPECTION PERSONNEL

The inspector shall comply with the acts and decrees concerning his inspection work and with the guides and decisions issued by the IRP.

The inspector is not entitled to inspect such products for which he is responsible as the supervisor of the manufacture or as a foreman.

If an inspector is licensed as a construction inspector, he is not, however, entitled to inspect the construction of those products for which he has performed non-destructive testing.

The approved inspection personnel has the following duties:

1. The person responsible for the inspection activities in a company performing inspections
  - supervises the inspection activities performed by the company
  - is responsible for the updating and supplementing of the documents attached to an application
  - is in contact with the IRP in matters concerning the inspections
  - supervises that inspection procedures and standards are properly used
  - supervises that the inspection personnel is certified and approved
  - is responsible for the regular maintenance of the inspection equipment.
  
2. The expert on destructive testing

- works as a technical expert in matters concerning destructive testing
- is entitled to indicate the objects of sampling
- is entitled to supervise the material tests required by the regulations and to sign the certificates mentioned in Standard SFS 3.

3. The expert on non-destructive testing

- works as a technical expert in matters concerning non-destructive testing
- is entitled to approve the inspection procedures used in the inspection work before they are submitted to the IRP
- trains and guides other members of the inspection personnel
- follows the research and development in the field and applies the results to the work of the inspection agency

4. The construction inspector

- performs construction and start-up inspections as well as inspections of repairs and modifications within the framework of the license issued by the IRP

5. The inspector performing non-destructive testing

- performs non-destructive testing within the framework of the license issued by the IRP.

6. Other inspection personnel needing approval

- performs other inspections requiring special skills.

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REQUIREMENTS FOR THE ACTIVITIES OF A COMPANY PERFORMING INSPECTIONS

A company performing inspections shall in its activities comply with the pertinent acts and decrees as well as with the guides and decisions given by the IRP. Especially the following requirements shall be given consideration:

1. The applicant is responsible for the updating of the contents of the application documents that have been delivered to the IRP. The requirement for updating applies also to companies that operate on the basis of licenses granted by TTL.

2. When a person responsible for the inspection activities is resigning his employment, the company shall notify the IRP without delay and within one month present an application for the approval of a new person responsible for the inspection activities. The company shall appoint a temporary office-holder for the period of time which it takes before the new person is approved and may start his work. If some other person approved by the IRP resigns his employment in the company, the company shall notify the IRP within one month.

3. A company approved by the IRP for performing ins-

pections is allowed to use outside inspectors and inspection equipment in its inspection work, if the outside company and its inspectors have also been approved by the IRP.

4. In those inspection activities that do not require inspection licenses issued by the IRP, the company shall supervise and maintain the professional skills of the personnel participating in the inspection activities. On demand the company is obliged to give a report to the IRP or to an IRP inspector concerning compliance with these requirements.

5. When necessary, a company performing inspections or a manufacturer of pressure vessels shall appoint a person to transfer markings. He shall be aware of the responsibility associated with the transferring of markings. The name and the symbol of the person authorized to transfer markings shall be submitted to the IRP for information.

6. Provision for reliable inspection work shall be made. Especially the following items shall be given consideration:

- the time required by the inspections and the point of their performance shall be taken into account in arranging the time schedule

- invoicing and payment arrangements and administrative procedures shall not have an impairing effect on the reliability of the inspection

- the instructions and standards that are given to the inspector shall be written in a language that he is familiar with
7. The instructions to be used in the inspection work shall be available at the site of inspection. The inspection instructions shall be presented to an IRP inspector on demand.
  8. The inspections shall be carried out on the basis of construction and inspection plans approved by the IRP. If the approval of the plans has not been required, the inspections shall be carried out in accordance with approved standards.
  9. The agreements and commissions made between companies shall be prepared in writing and they shall give exact definitions of the duties and areas of responsibility. The agreements and the commissions shall be presented to the IRP or to an IRP inspector on demand.

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## APPROVAL PROCEDURE FOR FOREIGN COMPANIES AND INSPECTORS

The application for a license concerning a foreign company and its inspectors and the supplements of the application shall be delivered to the IRP through the power company.

The requirements applying to foreign companies performing inspections and their inspectors are the same as those applying to Finnish companies and inspectors.

The following procedures can be applied as the basis of the approval:

1. Another certification scheme or a national certification practice is approved along with the Nord-test scheme.

2. International, bilateral, or other such agreements are used as the basis of the approval.

3. Audits are conducted to a company performing inspections with the purpose of assessing its operation.

The agreement and commission rules between countries shall be reported in writing and they shall give exact definitions of the duties and areas of responsibility. The agreement and the commission shall be presented to the ICRP or to an ICRP inspector on request.

APPROVAL PROCEDURE FOR FOREIGN COMPANIES AND INSPECTORS

The application for a license concerning a foreign company and its inspectors and the requirements of the application shall be delivered to the ICRP through the power company.

The requirements applying to foreign companies performing inspections and their inspectors are the same as those applying to Swedish companies and inspectors.

The following procedure can be applied on the basis of the agreement:



## APPENDIX

## COMPETENCE REQUIREMENTS OF THE INSPECTION PERSONNEL

Position	Education	Working experience	Certificate
1. Person responsible for inspection activities	Degree of a diploma engineer (M.Sc. in Engineering), an engineer or a technician. Special courses	4 years' experience in the design, manufacture or inspection of mechanical components and structures and enough familiarity with inspection methods	-
2. Expert on destructive testing	Degree of a diploma engineer or an engineer. Special courses	2 years' experience in the manufacture or research of construction materials and enough familiarity with construction materials and their properties	-
3. Expert on non-destructive testing	Degree of a diploma engineer or an engineer. Special courses	4 years' experience in the planning and implementation of inspections and in the evaluation of results and enough familiarity with the applications and limitations of non-destructive testing methods	-
4. Construction inspector	Degree of a diploma engineer, an engineer or a technician. Courses on the design, manufacture and inspection of mechanical components and structures	2 years' experience in the design or manufacture of mechanical components or structures or as a full-time inspector of pressure vessels	-
5. Radiographic inspection, radiographing	Comprehensive school or equivalent education and at least one year's technical education. Courses on radiographic inspection ( 32 h )	3 months as an apprentice	VTT <sup>1)</sup>
6. Radiographic inspection, interpretation of radiographs	Comprehensive school or equivalent education and at least one year's technical education. Courses on radiographic inspection ( 70 h )	12 months <sup>3) 4)</sup>	VTT <sup>1)</sup> Nordtest <sup>2)</sup>
7. Ultrasonic inspection	Comprehensive school or equivalent education and at least one year's technical education. Courses on ultrasonic inspection	12 months <sup>4)</sup>	Nordtest <sup>2)</sup>
8. Liquid penetrant inspection	Comprehensive school or equivalent education and at least one year's technical education. Courses on liquid penetrant inspection ( 16 h )	3 months <sup>4)</sup>	Nordtest <sup>2)</sup>
9. Magnetic particle inspection	Comprehensive school or equivalent education and at least one year's technical education. Courses on magnetic particle inspection ( 16 h )	4 months <sup>4)</sup>	Nordtest <sup>2)</sup>
10. Inspector performing other inspections requiring special skills	Basic education to be agreed upon with IRP and special courses	working experience to be agreed upon with IRP	

## Footnotes to the table

- 1) A new statement by the VTT shall be submitted to the IRP every three years.
- 2) A copy of the renewed Nordtest certificate shall be submitted to the IRP annually.
- 3) The interpreter of radiographs shall also be licensed to perform radiographing and the working experience shall also include the interpretation of radiographs.
- 4) Working with non-destructive testing methods is accepted as working experience. However, half of the required time must be practice with the method in question.