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

NUCLEAR POWER PLANT PRESSURE VESSELS. INSERVICE INSPECTIONS

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1 GENERAL

The pressure vessels, piping, pumps and valves in safety classes 1 and 2 as well as their supports and the internals of the reactor pressure vessel undrgo periodic examinations which are performed using non-destructive testing methods. These examinations include the inservice examinations carried out during the shutdowns of the nuclear power plant and the preceding preservice examinations.

This guide does not deal with the tests required in the Technical Specifications or the inservice inspections stipulated in the Decree on Pressure Vessels, which are also performed for objects that are within the scope of this guide.

The basis of the inservice inspection programs shall be formed by ASME Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, Division 1 (hereinafter referred to as ASME Code, Section XI).

The owner of the nuclear power plant is responsible for compliance with the principles presented in this guide.

1.1 Definitions

The terms that are used in this guide relative to the reporting of the results of inspections are defined as follows:

Flaw indication denotes the evidence of a flaw obtained by application of a non-destructive testing method.

Indication denotes both a flaw indication and an indication originating in the geometry of the object of examination or in some other cause obtained by application of a non-destructive testing method.

Recording level denotes in an ultrasonic examination the lowest level of echo amplitude where indications shall be entered into

the inspection records.

Reporting level denotes in an ultrasonic examination the lowest level of echo amplitude where indications shall be determined in size, identity, location and orientation so that they can be compared with acceptance standards.

Acceptance standard denotes a standard presented in ASME Code, Section XI or some other acceptance standard approved by the Institute of Radiation Protection (IRP).

2 DESCRIPTION OF INSERVICE INSPECTION PRINCIPLES

The description of the inservice inspection principles forms a part of the Preliminary Safety Analysis Report and it is examined in accordance with Guide YVL 1.1 "The Institute of Radiation Protection as the Supervising Authority of Nuclear Power Plants". The description shall give the general inservice inspection principles and show that the qualifications for reliable and representative inservice inspections have been guaranteed.

3 INSERVICE INSPECTION PROGRAM

In this guide, the inservice inspection program denotes the combination of documents which comprises

- the summary program,
- the preservice examination program, and
- the inservice examination programs

for the inservice inspection of the nuclear power plant. The inservice inspection program shall fulfil the requirements given in Guide YVL 1.2 "Formal requirements for the documents to be submitted to the Institute of Radiation Protection". The inservice inspection program shall be updated and supplemented so that there are explicit and unambiguous instructions available at each time of inspection.

3.1
Summary program

The summary program shall be submitted to the IRP early enough so that it can be examined before the IRP gives a pronouncement on the application for the nuclear power plant operating license to the Ministry of Trade and Industry.

The summary program shall cover all pressure vessels, piping, pumps and valves in safety classes 1 and 2 as well as their supports and the internals of the reactor pressure vessel. It shall disclose the principles for the selection of the objects, methods and intervals of examination, the reporting procedure of the results of examination and the evaluation procedures of flaw indications from the preservice examinations of the nuclear power plant up to the end of the operating life.

The owner of the nuclear power plant is under an obligation to prepare acceptance standards corresponding to and equal or superior in security to the acceptance standards presented in ASME Code, Section XI and to submit them to the IRP for approval if the acceptance standards presented in ASME Code, Section XI cannot be applied because the design bases differ from those given in ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components.

The edition of ASME Code, Section XI that is used as the basis of the program and its addenda shall be indicated and any deviations shall be justified.

The summary program shall include the following items. However, they need not be grouped as shown below.

a) General procedures for various examination activities, quality assurance, and the principles that are followed in choosing the components to be inspected and their objects of examination.

- practices followed in the preparation and acceptance of programs

- general selection principles of examination objects, methods, ranges and intervals
- reporting of results and evaluation procedures of flaw indications

b) List of main components to be inspected while in service

- safety class
- system
- components to be inspected (pressure vessels, pipelines, pumps and valves with component numbers)
- objects of inspection (welded joints are specified in pressure vessels, in primary coolant pumps and in main stop valves)
- structural material
- examination methods

c) Inspection equipment of the reactor pressure vessel and other mechanized inspection equipment

d) Necessary drawings

- structural drawings of pressure vessels, primary coolant pumps and main stop valves, which shall reveal the welded joints and other objects of inspection
- flow charts (areas that will be examined are clearly marked and specified according to safety class).

It is presupposed that all the above-mentioned descriptions are already given in the summary program so that there is enough time for solving any problems before the preparation of pre-service examination programs and the planned commission of the nuclear power plant.

3.2
Preservice examination program

The preservice examination program shall be submitted to the IRP for approval not later than three months before the planned

time of examination.

Preservice examinations are performed for all objects that will be inspected periodically. The preservice examination shall also be performed if a component or a part of the piping within the scope of the examinations is repaired, modified or supplemented after the commissioning of the nuclear power plant.

The purpose of the preservice examinations is to provide data on the condition of the objects of inspection that lie within the scope of inservice inspections before the start-up of the nuclear power plant and to form a basis for comparison with subsequent examinations. The examinations shall be conducted with methods, techniques and equipment equivalent to those that are expected to be employed for subsequent inservice examinations.

The owner of the nuclear power plant shall show that the examination methods employed give results that are at least as reliable as the results obtained with the examination technique determined in ASME Code, Section XI, if the examination methods that are employed in the preservice examinations or in subsequent inservice examinations differ from the methods determined in ASME Code, Section XI.

The preservice examination program shall include the following items if they have not already been included in the summary program. The grouping of subjects may differ from the presentation below.

a) Description of inspection agencies

- inspection ranges of each agency
- description of the working-site organization and responsible persons of each agency
- applicable working instructions

b) List of objects of inspection

- number of component or piping

- safety class
- unambiguous specification of welded joints and other objects of inspection (reference to drawings)
- nominal dimensions of the object to be inspected
- structural material
- examination category in accordance with ASME Code, Section XI
- examination method
- procedures for examination

c) Drawings of the objects of inspection

- isometric drawings of the piping (with objects of inspection marked)
- structural drawings of the components (with objects of inspection marked)
- detailed drawings of the welded joints and other objects of inspection which reveal the shapes and dimensions of the object of inspection

d) Drawings of reference blocks

- information on structural materials and applicable standards

e) Drawings of sound beam paths, if they are necessary for determining the extent of the examinations

f) Procedures for inspection

g) Calibration procedures for inspection equipment

The information required above shall be given about the examinations that have been or will be carried out during manufacture and installation, if it is intended that these examinations replace some of the preservice examinations. Furthermore, it is presupposed that the examinations of pressure vessels are performed after the pressure test.

3.3
Inservice examination programs

The inservice examination program shall be submitted to the IRP for approval not later than one month before the planned time of examination.

The instructions given above in sub-section 3.2 for the preservice examination program also apply to the program that is prepared for a single examination during operation. However, the program for each examination presents only the actions that will be taken in connection with that single examination.

It is not necessary to supplement the inservice examination program, which is submitted to the IRP, with descriptions that have been submitted in accordance with sub-section 3.2 "Preservice examiantion program" and that are still unchanged when compared with the descriptions presented in connection with earlier inservice examination programs or with the preservice examination program.

The inservice examination programs shall be prepared in such a way that the examination ranges are fulfilled during the inspection intervals, as defined in the summary program.

4
IMPLEMENTATION OF INSERVICE INSPECTIONS

The agency performing inservice inspections and its examination personnel shall have the approval of the IRP in accordance with Guide YVL 1.3 "Mechanical Components and Structures of Nuclear Power Plants. Inspection Rights".

The inservice inspections shall be performed pursuant to programs approved by the IRP. Deviations shall be justified and presented in the summary report of the examinations. The IRP shall also be notified during the inspections if the deviations are of essential significance.

The scope of the inspections shall be extended in accordance with ASME Code, Section XI to cover other corresponding objects of inspection if the examinations performed during operation reveal flaw indications that exceed the acceptance standard.

Components and piping or parts thereof, which in inservice examinations display flaw indications exceeding the acceptance standard, shall be repaired or replaced. If the flaw indications are accepted through additional analyses, their eventual growth shall be observed by increasing the frequency of inspections in accordance with ASME Code, Section XI until it can be shown that the growth of the flaws between examinations is not significant. The procedure shall have the acceptance of the IRP before the reactor is again made critical.

Guide YVL 1.8 "Supervision of Repairs and Modifications on Nuclear Power Plants during Operation" shall be applied in repair and modification work.

Inspectors employed by the IRP supervise the examinations, their general arrangement, the reporting of results and the flow of information between the various parties (inspection agency, power company, regulatory authority) by conducting audits. To facilitate supervision, the power company shall submit the preliminary examination schedule of main components or their parts to the IRP and nominate a contact person of the power company. On the basis of the schedule, the IRP inspector designates those objects of inspection of which the exact commencement time of examination shall be given to the IRP inspector.

5 REPORTING OF INSERVICE INSPECTIONS AND TREATMENT OF FLAW INDICATIONS

In accordance with Guide YVL 1.5 "Reporting Nuclear Power Plant Operation to the Institute of Radiation Protection", the owner of the nuclear power plant is required to submit to the IRP a notification on pressure vessel damage immediately by telex, if it is detected in the course of the examinations that there are flaw indications exceeding the acceptance standards.

A concluded preservice examination is one prerequisite for the inspection record that the IRP submits to the Ministry of Trade and Industry pursuant to Guide YVL 1.1 "The Institute of Radiation Protection as the Supervising Authority of Nuclear Power Plants". Therefore the IRP shall be given a written notification of the conclusion of the examinations indicating

- the examinations that have been performed (reference is made to programs)
- deviations from the accepted examination program and the reasons for these
- flaw indications exceeding the acceptance standard and actions caused by them.

A written notification of concluded inservice examinations is one prerequisite for re-starting the reactor after a shutdown. The notification shall give the same information as the notification of the conclusion of the preservice examination. However, it is possible, within the limits allowed by ASME Code, Section XI, to defer part of the planned inservice examinations to the following examination time, if there exists no special reasons for performing the examinations at that particular time.

The summary reports of a preservice examination or an inservice examination shall be submitted to the IRP for approval within three months after the examinations have been concluded.

The summary report shall include the following items:

a) Summary of the examinations that have been performed

- description of the agencies and examination personnel that have taken part in the examinations
- examinations that have been performed (reference is made to the program)
- explicit statement on the acceptability of the examination results
- deviations from the accepted examination program and procedures and the reasons for these

- detected flaw indications and further actions that have been taken and planned
- comparison with the results obtained in earlier examinations
- fulfilment of the inspection range during the inspection interval

b) Detailed list of the performed examinations

- welded joints and other objects of inspection
- examination method
- reference to inspection procedures (revision symbol) in each object of inspection
- detected indications and their character
- reference to inspection records
- reference to the determination records of indications and to other supplementary analyses
- reference to possibly existing deviation reports

c) Description of indications exceeding the reporting level

- object of inspection
- determination records of indications
- deermination of the size, identity, location and orientation of flaw indications according toASME Code, Section XI and comparison with acceptance standards
- explicit statement on the acceptability of the flaw indications
- comparison between the sizes of the flaw indications at various inspection periods

d) Examination equipment and devices

6 FILING AND UPDATING OF THE INSERVICE INSPECTION DOCUMENTS

The inservice inspection programs and the resulting reports are filed and they are needed all through the operating life of the nuclear power plant. For this reason, extra attention shall be paid to the accuracy of the documents, explicitness of the presentation and lucidity of the filing and updating systems.

The owner of the nuclear power plant shall have a clear-cut filing and updating system of the inservice inspection documents which covers all the documents relating to inservice inspections.

The documents shall have unambiguous headings in accordance with the nomenclature used in this guide. The documents shall indicate how they are combined with the other relating documents within the framework of the filing and updating system.

All inservice inspection programs shall be examined within a specified time and they shall be modified, when necessary. Reasons for modifying the programs include:

- standards and requirements are changed and developed
- examination techniques are developed
- experience gained from the examinations
- operating experience of nuclear power plants in Finland and elsewhere
- additional requirements possibly given by the IRP.

An inspection shall be once more included in the program without a separate request after the facilities for examination have improved, if it has earlier been necessary to abandon an examination required by the IRP because of technical difficulties.

If the IRP in its resolutions presupposes that also some other examinations, similar in character to those presented in this guide, should be carried out periodically, they are added to the inservice inspection program and dealt with as required in this guide.

The owner of the nuclear power plant shall see to it that changes are recorded in the documents without delay. All revised pages of the program shall be submitted to the IRP for approval. The revised sections shall be clearly marked and, if necessary, justified.

7

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