



**FORMAT AND CONTENT OF PRE-SERVICE AND  
IN-SERVICE INSPECTION (PSI/ISI) PROGRAM FOR  
NUCLEAR POWER PLANTS**

**REGULATORY GUIDE**

**PAKISTAN NUCLEAR REGULATORY AUTHORITY**

**For Further Details**

*Directorate of Regulatory Framework*

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## **1. INTRODUCTION**

Regulation 8(6) of PNRA Regulations for Licensing of Nuclear Installations in Pakistan - (PAK/909) (Rev.1) requires the licensee to submit Pre-Service and In-Service Inspection (PSI/ISI) Program to the Authority for approval. This submission is part of the application for permission to introduce nuclear material into the system of nuclear power plant.

## **2. OBJECTIVE**

The objective of this regulatory guide is to provide guidance to licensees of nuclear power plants in preparation of PSI/ISI Program.

## **3. SCOPE**

The scope of this regulatory guide covers format and content of PSI/ISI Program of Nuclear Power Plants (NPPs) required by PNRA for granting permission to introduce nuclear material into the system of NPP.

## **4. FORMAT AND CONTENT OF PRE-SERVICE AND IN-SERVICE INSPECTION PROGRAM**

The licensee should prepare and submit PSI/ISI Program in accordance with the format and content described in the subsequent sections of this regulatory guide.

### **4.1. General Guidelines**

The licensee should follow the following general guidelines for preparation of PSI/ISI Program:

- i. Clear, concise, factual and latest information should be provided;
- ii. A table of content including appendices, list of figures, and list of tables etc. along with page numbers should be added;
- iii. Proper multilevel headings should be used with consideration of appropriate sequence of numbering and consistency in font size;
- iv. Definitions and abbreviations should be consistent throughout the program;
- v. Duplication of information should be avoided. If necessary, relevant section should be referred appropriately; and
- vi. Legible drawings, diagrams, layouts, maps and tables should be added, wherever necessary, with proper reference.

## **4.2. Content of PSI/ISI Program**

The PSI/ISI Program for NPPs should contain, but not limited to, the information described in the following sub-sections.

### **4.2.1. Introduction**

This section should briefly introduce the PSI/ISI Program.

### **4.2.2. Objective**

This section should describe the objectives to be achieved by the licensee through preparation and implementation of the PSI/ISI Program.

### **4.2.3. Scope**

This section should describe the scope of PSI/ISI Program including the major limitations and exemptions (if any).

### **4.2.4. Definitions and Abbreviations**

This section should provide precise definitions and abbreviations of different terminologies used in the program.

### **4.2.5. Applicable Documents**

This section should include list of codes, standards and documents, which will be used for the preparation and implementation of this program.

### **4.2.6. Organizations, Roles and Responsibilities**

This section should provide the following:

- i. Brief introduction of each organization involved in PSI/ISI including contractors and sub-contractors and the relevant authorization (where applicable);
- ii. Roles & responsibilities of each organization involved in PSI/ISI;
- iii. Organogram of the organizational units responsible for PSI/ISI;
- iv. Description of internal and external interfaces for implementation of the PSI/ISI Program depicted in the organogram; and
- v. The details of manpower and resources of the licensee involved in PSI/ISI activities.

#### **4.2.7. *Qualification of Personnel and Equipment involved in PSI/ISI Program***

This section should provide the information regarding the qualification and certification criteria for the following:

- i. Performer of examination;
- ii. Personnel who are responsible for evaluation of results; and
- iii. Personnel who are responsible for review/approval of examination report.

This section should also provide information regarding quality, range, accuracy and calibration acceptance criteria of examination equipment in the light of agreed codes and standards. This section should also include the information regarding calibration blocks to be used for the calibration of the equipment and information on specific procedures used for the maintenance, calibration and functioning of examination equipment including qualification of personnel preparing, reviewing and approving the examination procedure.

#### **4.2.8. *Classification of Systems, Structures and Components (SSCs)***

This section should provide a detailed list and classification of Systems, Structures and Components (SSCs) to be covered in PSI/ISI Program. In case the PSI/ISI Program is based on RSE-M code, the licensee should clearly define the systems & components in each application type i.e. General, Conventional, Specific and Components not requiring qualification.

#### **4.2.9. *Inspection Intervals/Inspection Periods***

This section should provide description of the inspection intervals and inspection periods performed by the licensee as per applicable codes and standards in tabulated form. The details should include the extent of examination per calendar year in examination tables. Refueling outages of NPP should be correlated with inspection intervals. The components along with conditions under which inspection frequency is required to be increased from one hundred percent (100%) in a specific interval should be clearly defined.

Description of plans and schedules for PSI/ISI should also be provided in this section. Arrangements for PSI/ISI should be described if NPP is out of service continuously for more than six (06) months.

#### **4.2.10. *Classification of ISI***

This section should describe the classification of ISI. If not applicable, the

licensee should mention “not applicable” in this section.

#### ***4.2.11. Examination Methods***

Examination methods to be used during the PSI/ISI of the NPP should be described in this section. The details should include at least the following:

- i. Types of examination methods to be used;
- ii. Description of each examination method;
- iii. Equipment & tools used for each examination methods;
- iv. Areas to be examined by a specific technique; and
- v. Recording thresholds.

The selection of examination methods should be shown to correlate with the requirements of applicable codes and standards.

#### ***4.2.12. Limitation of Examination Methods***

This section should provide detailed information regarding limitations experienced in implementation of specific examination methods as per requirements of applicable codes and standards, and the alternative techniques used including the justification of adopting those alternative techniques in relation to reference NPP.

#### ***4.2.13. Examination Procedures***

This section should provide the following details regarding examination procedures:

- i. Process for preparation, review and approval of examination procedure;
- ii. The qualification of examination procedures; and
- iii. The generic contents of examination procedures.

A complete list of examination procedures should be provided in an appendix, which should be referred in this section.

#### ***4.2.14. Contents of Inspection Report***

This section should include the information on preparation, review and approval of inspection report. The generic contents of the inspection report should be described in compliance with the requirements of applicable codes and standards.

#### ***4.2.15. Radiation Protection***

This section should provide information on radiation protection measures

during performance of PSI/ISI activities with reference to radiation protection program.

#### ***4.2.16. Inspection Items of Structures & Components and their Supports***

##### **4.2.16.1. Safety Class 1, 2 & 3 Components and their Supports**

This subsection should provide information on rules and specifications for inspection items and plans for PSI/ISI of safety class 1, 2 & 3 components and their supports in the light of applicable codes and standards.

This information should include details of the examination items in tabulated form for each equipment. Such examination tables should be attached as appendices of the PSI/ISI Program and should be referred in this section. At least following details should be included in examination tables:

- i. Item No.;
- ii. Part to be examined (with mark No. in drawings);
- iii. The extent of examination;
- iv. Examination methods;
- v. Examination category;
- vi. Acceptance standard;
- vii. Access (outside and inside);
- viii. Examination details per calendar year for the lifetime of equipment;  
and
- ix. Remarks.

The equipment drawings used for PSI/ISI should be provided as appendices of the program showing examination marks, which should be referred in examination tables.

This subsection should also include justification of exemption of safety class components and their supports from the PSI/ISI Program.

##### **4.2.16.2. Seismic Category 1 (Structures)**

This subsection should provide the details of PSI/ISI of metallic liner and concrete structures as per requirements of applicable codes and standards. If these details are included in other programs then these programs should be referred in this section.

##### **4.2.16.3. Other Components (not addressed by code)**

This subsection should provide the details of PSI/ISI of components not



addressed in applicable codes and standards (if any).

#### ***4.2.17. Illustration through Drawings***

This section should provide illustration of areas to be examined through drawings in components and their integral attachments in different safety classes with reference to applicable codes and standards. The areas to be examined should be detailed in the corresponding examination procedures.

#### ***4.2.18. Areas of Inaccessibility***

This section should provide the details regarding areas of inaccessibility for PSI/ISI activities. The details should include a complete list of such areas and the measures taken for examination of each area.

#### ***4.2.19. Marking, Specification and Reference System for Welds (Where Applicable)***

This section should provide information regarding marking, identification, specification and location of examination for all welds and areas subjected to examination. If not applicable, the licensee should mention “not applicable” in this section and marking system should be defined in specific procedure.

#### ***4.2.20. System Pressure Testing***

This section should provide the details of the pressure testing of systems and components, including leakage tests, pneumatic tests and hydrostatic tests as per applicable codes and standards. The information provided should also include the criteria and specifications for selection of the pressure retaining components and jurisdiction boundary, acceptance criteria and the exempted systems and components from the pressure testing.

#### ***4.2.21. Evaluation of the Examination Results***

This section should include the following information:

- i. Recording threshold of indication;
- ii. The process for analysis of defect;
- iii. Acceptance of test results;
- iv. Additional examination requirements; and
- v. Corrective actions for non-conforming items.

The details provided in this section should demonstrate compliance with the requirements of applicable codes and standards.

#### **4.2.22. Repair and Replacement**

This section should include the information regarding repair and replacement of those components evaluated as unacceptable for further service as per applicable codes and standards.

#### **4.2.23. Reviews and Revisions of PSI/ISI Program**

This section should provide information on the criteria and methodology used for the review and revision process of this program. The licensee should also define and provide the revision frequency of this program keeping in view major changes in applicable codes and standards.

#### **4.2.24. Control of Records**

This section should include information on record system of implementation of the PSI/ISI Program, its retention, maintenance and retrieval.

In case, the record system is covered by other NPP programs or procedures, licensee may refer to those programs or procedures in this section.

#### **4.2.25. Appendices**

This section should include a list of appendices attached with the program.

### **5. REFERENCES**

1. Regulations for Licensing of Nuclear Installations in Pakistan - (PAK/909)(Rev.1), Pakistan Nuclear Regulatory Authority (PNRA), Islamabad (2012).
2. Regulations for Safety of Nuclear Power Plant Operation - (PAK/913) (Rev.1), Pakistan Nuclear Regulatory Authority (PNRA), Islamabad (2012).
3. IAEA Safety Guide No. NS-G-2.6 Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (2002).
4. Industrial Codes and Standards (ASME Section XI & RSE-M)



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