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INSPECTION METHODS FOR SAFEGUARDS SYSTEMS
AT NUCLEAR FACILITIES

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INSPECTION METHODS FOR SAFEGUARDS SYSTEMS AT NUCLEAR FACILITIES

DISCLAIMER

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SUMMARY

A project team at Lawrence Livermore National Laboratory has been developing inspection procedures and training materials for the NRC inspectors of safeguards systems at licensed nuclear facilities. This paper describes 1) procedures developed for inspecting for compliance with the Code of Federal Regulations, 2) training materials for safeguards inspectors on technical topics related to safeguards systems, such as computer surety, alarm systems, sampling techniques, and power supplies, and 3) an inspector-oriented methodology for evaluating the overall effectiveness of safeguards systems.

INTRODUCTION

The Code of Federal Regulations (CFR) prescribes requirements for the establishment and maintenance of a safeguards system for the protection of special nuclear material (SNM) at fixed sites and in transit [10 CFR - Part 73 - Physical Protection of Plants and Materials]. Inspections of these safeguards systems are designed to assure that licensees are adequately protecting facilities and shipments against radiological sabotage, and theft and diversion of SNM.

A project team at the Lawrence Livermore National Laboratory (LLNL) has been developing inspection procedures and training materials for the NRC Office of Inspection and Enforcement (IE) inspectors of safeguards systems at nuclear facilities covering the entire fuel cycle.

INSPECTION PROCEDURES

Separate manuals of inspection procedures have been written for strategic special nuclear material (SSNM) at fixed sites, special nuclear material of low (LSNM) and moderate strategic significance (MSNM), power reactors, transportation of SNM, guard training and qualification plans, contingency plans, and licensee safeguards implementing procedures.

The manuals developed by the Inspection Methods for Physical Protection (IMPP) project offer systems engineered guidance for inspectors to use in the field when inspecting for compliance with 10 CFR Part 73.

Inspection procedures have been written for all elements of a physical protection system: hardware, such as alarms and detection aids; personnel, including security organization management and response force; and procedures, such as those for contacting local law enforcement agencies during safeguards emergencies. A complete list of procedures is given in Table 1.

TABLE 1. Inspection methods for physical protection procedures.

81100 Series: Power Reactor Inspection Procedures

81110	Preinspection
81114	Site Orientation
81118	Security Plan and Implementing Procedures
81122	Security Organization - Management
81126	Security Organization - Personnel
81130	Security Organization - Response
81134	Security Program Audit
81138	Records and Reports
81142	Testing and Maintenance
81146	Locks, Keys, and Combinations
81152	Physical Barriers - Protected Area
81154	Physical Barriers - Vital Area
81158	Security System Power Supply
81162	Lighting
81166	Assessment Aids
81170	Access Control - Personnel
81172	Access Control - Packages
81174	Access Control - Vehicles
81178	Detection Aids - Protected Area
81180	Detection Aids - Vital Area
81184	Alarm Stations
81188	Communications
81190	Postinspection

81200 Series: SSNM Fixed Sites Inspection Procedures

81210	Preinspection
81214	Site Orientation
81214	Security Plan and Implementing Procedures
81222	Security Organization - Management
81226	Security Organization - Personnel
81230	Security Organization - Response
81234	Security Program Audit
81238	Records and Reports
81242	Testing and Maintenance
81246	Locks, Keys, and Combinations
81252	Physical Barriers - PA
81254	Physical Barriers - VA, MAA, & CAA
81258	Security System Power Supply
81262	Lighting
81266	Assessment/Surveillance Aids
81270	Access Control - Personnel
81272	Access Control - Packages, Material, and SNM
81274	Access Control - Vehicles
81278	Detection Aids - PA
81280	Detection Aids - VA, MAA, & CAA
81284	Alarm Stations
81288	Communications
81290	Postinspection

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81300 Series: Transportation of SNM Inspection Procedures

Irradiated Fuel

- 81305 Preinspection
- 81310 General Requirements
- 81315 Communications
- 81320 Postinspection

SNM Low and Moderate

- 81330 Preinspection/Moderate - Low
- 81335 Shipments - Moderate SNM
- 81340 Shipments - Low SNM
- 81345 Postinspection/Moderate - Low

SSNM

- 81350 Preinspection
- 81354 General Performance Objectives
- 81357 In-transit Performance
- 81360 General Physical Protection System Requirements
- 81363 Security Organization and Audit
- 81366 Response and Contingency Plan/Procedures
- 81368 Access Control
- 81372 Testing and Maintenance
- 81375 Road Shipment Requirements
- 81376 Air Shipment Requirements
- 81377 Sea Shipment Requirements
- 81388 Delivery and Receiving Requirements
- 81390 Postinspection

81400 Series: Special Nuclear Material of Moderate and Low Strategic Significance Inspection Procedures

- 81475 Preinspection
- 81480 General Requirements for MSNM Fixed Sites
- 81485 General Requirements for LSNM Fixed Sites
- 81490 Postinspection

81500 Series: Personnel Training & Qualifications Plan (Appendix B to 10 CFR 73) Inspection Procedures

- 81501 General Requirements for Personnel
- 81502 Additional Requirements for Power Reactor and Fixed Site Personnel
- 81503 Additional Requirements for Transportation Personnel

81600 Series: Safeguards Contingency Plans (Appendix C to 10 CFR 73) Inspection Procedures

- 81601 Safeguards Contingency Plan Implementation Review

81700 Series: Licensee Implementing Procedures Evaluation Inspection Procedures

- 81791 Instructions and Sample Worksheets
- 81792 Regulation Catalog for Power Reactors
- 81793 Regulation Catalog for Fixed Sites
- 81794 Regulation Catalog for SSNM in Transit

Most procedures have seven sections:

Section 1 states objectives for the inspection of the particular physical protection system element (e.g., "alarms") being addressed by the procedure.

Section 2 gives the appropriate requirements for the physical protection system element, taken from the Code of Federal Regulations.

Section 3 gives guidance and methods for both routine and initial inspections of the physical protection system element. The guidance is detailed, but broad enough to cover a variety of situations.

Section 4 provides additional guidance for initial inspections only (e.g., for newly installed physical protection system elements).

Section 5 provides information on scheduling, coordination of inspection activities for related physical protection system elements, and equipment recommended for carrying out the inspection.

Section 6 gives, verbatim, applicable sections of the Code of Federal Regulations and NRC-produced Review Guidelines and Regulatory Guides, as well as a selection of appropriate military specifications, industrial standards, and definition of terms.

Section 7 is an expansion of the section on guidance, providing additional technical background and supplementary information related to the particular physical protection system element. This section is useful in supplementing the technical backgrounds of IE physical protection inspectors.

The inspection manuals developed by the IMPP project are in draft form. Current versions reflect the comments and suggestions of inspectors who have read and field-tested drafts of the procedures during the past two years. Workshops were held during June and July 1981 to train inspectors in the use of the manuals and to receive feedback which will be accommodated in final editions to be published in December 1981.

TRAINING MATERIALS

Supplementary training materials in both written and videotape format have been produced to complement sections 7 of the inspection procedures. Twelve chapters of a training manual cover technical topics such as sampling techniques, power supplies, intrusion detectors, and computer-based safeguards systems. A complete list of topics is given in Table 2.

TABLE 2. Training materials contain 12 chapters.

Chapter 1	Design Criteria for Inspection Procedures
Chapter 2	Inspection by Sample
Chapter 3	Emergency Power
Chapter 4	Physical Security System Control
Chapter 5	Computer Security
Chapter 6	Balanced Magnetic Switches
Chapter 7	Microwave Intrusion Detectors
Chapter 8	Explosives Detection Equipment
Chapter 9	X-ray Search Equipment
Chapter 10	Communications
Chapter 11	Locking Devices and Systems
Chapter 12	Penetration Resistance of Physical Barriers
Appendix	E-Field Sensor Systems Script

An IMPP report, "Computer Surety--Computer System Inspection Guidance", is an aid to inspectors in evaluating the effects of the many facets of computer use in safeguards systems. The report stresses the vulnerabilities that using computers can create within a security system. A videotape, "Vulnerabilities in Security Computer Systems," produced especially for new inspectors, complements the report. Another IMPP-produced videotape, "E-Field Sensors" shows inspectors how E-field sensors work and gives guidance for inspecting them.

EFFECTIVENESS EVALUATION

Besides compliance inspection procedures, check lists, and technical information, IE inspectors need a tool for evaluating the overall effectiveness of safeguards systems. IE inspectors are instructed to conduct an analysis of the impact of noncompliance with approved physical security plans on the capability of the licensee's safeguards program 1) to prevent, deter, detect and/or respond to unauthorized access to vital equipment, or 2) to prevent undetected and/or unauthorized removal of special nuclear material at licensed facilities.

Many sophisticated computer methodologies have been developed for evaluating the performance capability of licensees' safeguards systems, but none of these is available in a form suitable for an inspector's use. The IMPP project is engaged in a technology transfer task of adapting these analytical methodologies for this purpose. By using the adapted methodologies, inspectors will be better able to evaluate the extent to which licensees meet their performance requirements than by inspecting for compliance alone.

One of the inspection manuals described above introduced an evaluation methodology for licensee implementing procedures. The methodology provides a way for inspectors to system-

atically review all procedures licensees have issued for implementing 10 CFR 73 and to assure that procedures exist to cover all aspects of 10 CFR 73 which require them.

CONCLUSIONS

Response to IMPP project work has been very good. The manuals of procedures outline compliance inspections in detail without stifling the resourcefulness and flexibility inspectors have traditionally displayed during inspections. Following the manuals results in uniform inspections nationwide and also provides a framework for less-experienced inspectors to add new training information, their own site-specific notes, and techniques gained from senior inspectors.

The IMPP-developed inspection procedures, training materials, workshops, and adapted analytical models combine to increase the quality of inspections of the safeguards systems that protect the civilian nuclear industry.

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