

DEFICIENCIES IN RADIATION PROTECTION RECORD SYSTEMS(a)

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ABSTRACT

Radiation protection records are a fundamental part of any program for protecting radiation workers. Records are essential to epidemiological studies of radiation workers and are becoming increasingly important as the number of radiation exposure litigation cases increases. Ready retrievability of comprehensive records is also essential to the adequate defense of a radiation protection program. Appraisals of numerous radiation protection programs have revealed that few record-keeping systems comply with American National Standards Institute, Standard Practice N13.6-1972. Record-keeping requirements and types of deficiencies in radiation protection records systems are presented in this paper, followed by general recommendations for implementing a comprehensive radiation protection records system.

INTRODUCTION

The authors have participated in numerous appraisals of radiation protection programs implemented at both Nuclear Regulatory Commission (NRC) licensee and Department of Energy (DOE) contractor facilities. Major deficiencies have been identified in most of the programs' radiation protection records systems. It was apparent that many health physicists were not sufficiently familiar with the recommendations of ANSI N13.6 or they had not made adequate attempts to implement the recommendations of the standard. The purpose of this paper is to summarize the major deficiencies in radiation protection records systems and discuss the recommendations of ANSI N13.6 that should be implemented to correct these deficiencies. Adequate record-keeping systems are becoming increasingly important as the number of radiation exposure litigations cases increases.

The principal goal of a radiation protection records system is the compilation of complete and accurate individual exposure histories with substantial documentation. Valid exposure histories assist in the protection of the individual by helping to control subsequent radiation exposure. The records should also enable the employer or facility operator to

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- provide decision-making support, including evaluation of the effectiveness of the radiation protection program
- demonstrate and facilitate compliance with contractual obligations and applicable legal and regulatory requirements
- reconstruct, if needed for medical or legal purposes, situations and conditions for analysis of an individual's radiation dose
- facilitate coordination and compliance with other programmatic concerns, such as quality assurance/quality control, vital records, controlled documents, and sensitive records (Privacy Act of 1974)
- provide timely, easily retrievable information to enhance organizational efficiency.

REQUIREMENTS FOR RADIATION PROTECTION RECORD SYSTEMS

The types and content of radiation protection records, as well as storage and retention requirements, are specified in 10 CFR 20 (CFR 1990) and Regulatory Guide 8.7 (USAEC 1973) for NRC licensees. Similar requirements are specified in DOE Order 5480.11 (DOE 1988a) for DOE contractors. Both NRC and DOE requirements refer to ANSI N13.6-1972, "American National Standard Practice for Occupational Radiation Exposure Records Systems" (ANSI 1972).

The minimum NRC requirements for records include: radiation exposure records (of exposure from both internal and external sources), radiation survey reports, contamination monitoring reports, radioactive effluent records, and radioactive waste disposal records. Many other records are needed to demonstrate compliance with other requirements of 10 CFR 20 (CFR 1990), such as air sampling and monitoring records, inventory records, records of transfers and shipments of radioactive materials, incident reports, and training records. DOE requires essentially the same records, as well as records of ALARA programs and records that document monitoring methods, techniques, and procedures (DOE 1988a).

ANSI N13.6 (ANSI 1972) provides recommendations for records related to an individual, the radiation status of a work area, and the radiation protection program. Individual records should include: positive identification of the individual, radiation exposure received during prior employment, exposure received by the individual at other installations during current employment, simultaneous exposure at another installation, relevancy of records to exposure limits, external radiation exposure records, records of internal exposure, records of unusual exposures, radiation work orientation and training, and medical services provided by the employer. Records related to the radiation status of a work area should include: radiation safety analysis and evaluation reports, radiation work procedures, radiation survey reports, contamination monitoring reports, area

monitoring instrumentation records, and airborne radioactivity monitoring records. Records related to the radiation protection program should include: radiation protection policies and standards, procedures and methods for interpretation and evaluation of individual exposure data, capabilities of dosimeters and instruments, calibration and maintenance records, program appraisal reports, and documentation of changes in procedures and methods. ANSI N13.6 also provides recommendations for retention and storage of radiation protection records.

DEFICIENCIES IN RADIATION PROTECTION RECORD SYSTEMS

Radiation protection appraisals were conducted against DOE criteria (DOE 1990) and the authors reviewed the appraisal reports for over 30 major nuclear facilities to summarize the deficiencies found in radiation protection records systems. Very few programs were found by the appraisers to be in compliance with DOE regulations and the recommendations of ANSI N13.6. The most serious deficiency found was the complete lack of some essential radiation protection records. There were many instances of incomplete and inaccurate records. One of the most common deficiencies was the lack of a central record storage location. Another common deficiency was the lack of adequate protection of records against catastrophic loss. These and several other less serious deficiencies are described below.

Lack of Records

With the minimum record-keeping requirements so clearly defined by regulations, it was difficult to understand how some major nuclear facilities had failed to generate or retain some essential radiation protection records. Examples of missing records include:

- no records of the radiological status of work areas
- no radiation work procedures or permits
- no instrument calibration or maintenance records
- no radiation protection training records
- no records of incident reports, investigations, corrective actions, or follow-up activities
- no documentation of radiation survey and monitoring methods
- no records that describe the technical and administrative basis for the radiation protection program.

Incomplete and Inaccurate Records

Most radiation protection programs generate and retain the essential records, but specific deficiencies can be found in nearly every program. Even with the most well designed and administered program, inaccuracies or gaps creep into the records unless a rigorous quality assurance program is also implemented. Routine problems with the record-keeping system, such as employee absences, breakdown of computers, inattention to detail, or misfiled records, if not immediately solved, can lead to significant deficiencies in the records themselves. Unauthorized disposal of old records can lead to significant gaps in records, a condition that emphasizes the need for backup copies of required records.

The review of radiation protection program appraisals revealed numerous examples of inadequate or incomplete records, such as:

- radiation exposure records for some employees were missing with no explanation
- radiation exposure records for certain months were missing with no apparent attempt to reconstruct or estimate doses
- survey requirements and frequencies were established by procedures, but many surveys were not done as scheduled
- there were major gaps in the historical records that defined the radiation protection program
- radiation survey records did not include quantitative information or descriptions of the location or object being surveyed.

Records Storage Problems

The review of radiation protection record programs revealed that one of the most common deficiencies in record programs continues to be the lack of a well organized, central storage location. Health physicists generate radiation protection records at many locations within a facility and it is reasonable to retain records in working files for a limited period of time. However, many radiation protection programs do not specify the frequency for moving records from field files to a central storage location or they do not rigorously observe the frequency that is established. Consequently, records tend to be decentralized, and in many cases records are incomplete, disorganized, and not secured. In a decentralized system, many people with different priorities tend to maintain records by a variety of methods. The result is often a poor quality record system.

Another common deficiency in record systems is the lack of secure storage that is protected against catastrophic loss. Records are frequently stored in unlocked file cabinets located in unlocked offices. In many cases, fire protection systems (sprinklers) are not provided where records are stored. Very few facilities have microfilmed (or other back-up) copies of radiation protection records stored in separate, secure, fireproof locations.

Other Concerns

Numerous other specific deficiencies were noted in radiation protection records systems at the facilities visited. Some examples are:

- no defined retention periods for radiation protection records
- no documented policy or procedures by which to operate the records system
- no clearly defined responsibilities for record-keeping staff
- no quality assurance or data verification to prevent errors
- no use of records for dose evaluations or trend analysis
- no provision of annual reports of radiation exposure to employees
- a large backlog of unfiled records that affects retrievability.

Each of these problems tends to impede the proper function of a radiation protection records system.

RECOMMENDATIONS FOR A COMPREHENSIVE RADIATION PROTECTION RECORDS SYSTEM

Every radiation protection records program should emphasize good record-keeping practices. To be useful for operational radiation protection programs, epidemiology, and legal purposes, records must be administered in accordance with the highest standards of records management. A good approach for such a records system is the life cycle approach--controlling the records from creation to disposition. The life cycle approach leads to the identification of all radiation protection program records that are produced in the normal course of business. These records are then managed through the stages of creation, distribution, use, arrangement, storage, retrieval, media conversion, and disposition.

Good practices include the generation and retention of occupational radiation exposure records for individuals, programmatic documentation, records of work place conditions, and radiation detection equipment

calibration and maintenance records--each complete, accurate, and appropriately stored.

Generation, Content, and Retention of Essential Records

Radiation protection records systems should contain records that describe the occupational radiation exposure of individuals (employees, contractor employees, and visitors), and the conditions under which the exposure occurred. To accomplish this, comprehensive records should be generated and retained in the following categories:

- radiation exposure records that are related to an individual, e.g., bioassay data and results, results from individually worn dosimeters, skin contaminations, exposure investigations, and involvement in radiological incidents
- radiation protection records that are related to the status of work areas, e.g., air sampling results, radiation surveys, and contamination levels
- records that describe work requirements, i.e., radiation work permits (RWPs) that prescribe protective clothing and equipment, dosimetry to be worn, and special instructions
- records that describe the technical and administrative basis for the radiation protection and dosimetry programs, e.g., standards, policies, procedures, and methods of evaluation
- records that describe the radiation protection training program and identify the training received by individuals exposed to radiation
- records that describe the radiation protection staff, past and present, e.g., organization, position descriptions, qualifications, and training
- records that describe radiation detection instruments used in the field and laboratory and records of their calibration and maintenance.

Complete and Accurate Records

Information contained in individual records must be complete, legible, accurate, reliable, identifiable, and interpretable. Certain records, such as personal information, must be held confidential. Because many of the records may be used in litigation, they must be able to meet the rules of evidence. The system must also contain sufficient safeguards to protect the records from unauthorized access and alteration. Records must contain

sufficient information to be linked to other records. For instance, in the case of an RWP, all the radiation surveys that were used to determine the working requirements and the names of all the individuals that worked under the RWP should be cross referenced. Similarly, an individual's exposure records should reference any incidents he/she was involved in so that the incident reports can be readily identified and retrieved.

Program records should be maintained so that the policies, procedures, technologies, equipment, etc., in use at any particular time in the past can be described. They should be identifiable by the purpose and the time period they were in use. For instance, the original issue and all succeeding revisions of the radiation protection and dosimetry procedures should be retained and be readily retrievable.

Individual records must be maintained on all personnel, present and past, that are potentially or actually exposed to radiation or radioactive materials. When recording dosimetry results, recording the fact that no exposure was received is just as important as recording exposure. Records that should be maintained on individuals include:

- personal identification data such as social security number and name (including previously used names)
- external dosimetry results
- internal dosimetry results
- exposure history
- any investigations of exposure such as lost or damaged dosimeters, radiological incidents, processing problems, or skin contaminations
- planned special or abnormal exposures
- training records.

Work-place records should be maintained on a long-term basis. Work-place records that should be kept include :

- radiation work permits (or the equivalent)
- radiation dose rate and contamination surveys
- airborne radioactivity surveys
- ALARA program records
- protective equipment usage, maintenance, and cleaning
- incident reports and investigations
- dose equivalent summaries.

Other records not directly related to the worker radiation protection program, such as radioactive material shipping and receiving and environmental surveys are not included here.

Radiation detection equipment used in the personnel protection program includes portable survey instruments, air sampling and monitoring

equipment, fixed area monitors, portal monitors, sample counting and analysis equipment, in vivo analysis equipment, etc. Records of calibration and maintenance of radiation detection instruments should also be retained for long periods of time, as defined by DOE Order 1324.2A (DOE 1988b). The records that should be kept include:

- description and inventory of equipment used
- description of the calibration facility and calibration procedures
- calibration source certification/traceability to the National Institute of Standards and Technology (NIST)
- actual calibration and source check records
- maintenance and repair records.

Records Retention

Retention of records is an important consideration. All individual records should be retained until after the individual has died or all possibility of litigation has passed. Other records that back up the individual records should also be retained until they are no longer needed for litigation purposes. DOE requires that individual records and certain backup records, such as equipment calibration data that establish authenticity of dose results and survey records and logbooks, be retained for 75 years. DOE also requires permanent retention of a historical file of standards, procedures (including revisions), and background records defining philosophy of development, methods of evaluation, and mode and scope of radiation protection efforts.

In 10 CFR 20 (CFR 1990) the NRC requires that individual records be retained until the NRC authorizes their disposition. However, the requirement for survey results, except for certain specified results, to be retained for only 2 years is also stipulated in 10 CFR 20. American Nuclear Insurers, which specifies record retention for its insureds, requires a number of records to be retained for the lifetime of the plant plus the discovery period, so that the records will be available for litigation if necessary. Epidemiological studies are becoming increasingly important to the nuclear industry and they require accurate and complete exposure records for the lifetime of the facility. Litigation requires a wide variety of records to prove that the individual litigant was properly recruited, trained, and protected during his/her employment. In addition, proof that recorded doses are accurate and complete, as well as ALARA, are required in the event of litigation.

SUMMARY

In summary, the quality of a radiation protection program can be severely degraded by deficiencies in its records and its record-keeping system. The records system must include a comprehensive collection of accurate and complete radiation protection records, stored in a secure, fireproof, central location, with microfilmed or other backup copies stored in an alternate location. Management must make a long-term commitment to generate and retain radiation protection records by means of a program that complies with the recommendations of ANSI N13.6. The importance of records in litigation cases was emphasized by Forbes (1990) when he stated that all cases that have been won by the defendants have had high direct costs (about \$200,000 per case) plus indirect cost to the employer for staff time and resources. Forbes stressed the importance of good record keeping, availability of records without exhaustive searching, and that record keeping needs to be done in a manner so that records exude credibility.

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