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## A RADIOLOGICAL CONTROL IMPLEMENTATION GUIDE

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## ABSTRACT

A manual is being developed to explain to line managers how radiological controls are designed and implemented. The manual also fills a gap in the Health Physics literature between textbooks and on-the-floor procedures. It may be helpful to new Health Physicists with little practical experience and to those wishing to improve self-assessment, audit, and appraisal processes.

Many audits, appraisals, and evaluations have indicated a need for cultural change, increased vigor and example, and more effective oversight by line management. Inadequate work controls are a frequent and recurring problem identified in occurrence reports and accident investigations. Closer study frequently indicates that many line managers are willing to change and want to achieve excellence, but no effective guidance exists that will enable them to understand and implement a modern radiological control program.

The manual is now in draft form and includes information that will be of use to line managers dealing with improving radiological performance and the practical aspects of radiological controls implementation. The manual is expected to be completed by the fall of 1993 and to be used in conjunction with a performance-based self-assessment training program at the Oak Ridge National Laboratory.

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Many external audits and evaluations have identified the need for cultural change. A review of performance based internal evaluations indicate that many line managers are willing to change and require better performance from radiological control programs, but do not always have all the necessary guidance to do so. Guidance for implementing radiological control programs is widely dispersed throughout DOE, NRC, and INPO documents and various journal articles. No single document provides line managers enough information to understand radiological controls and how to efficiently implement them. Additionally, a degree of frustration has been noted when various reviews continue to find "new" concerns.

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This implementation manual concentrates on explaining the purpose and nature of good fundamental radiological control techniques. Managers responsible for radiological areas and supervising radiological workers must clearly understand the objectives of a radiological control program and the relationship and relative importance of the different parts of such a program. They must also understand the cause-and-effect relationship between radiological deficiencies and radiological events. For example, the different objectives of routine, operational, and special radiological monitoring are frequently not understood when managers decide on staffing levels for radioactive operations. This has been observed to result in staffing levels based on operational requirements only.

Concepts and terminology consistent with DOE orders 5480.19 "Conduct of Operations...", 4330.4A "Conduct of Maintenance...", and N5480.6 "Radiological Control Manual", are emphasized throughout the document to provide a consistent, coherent method of conducting radiological work. These orders have been surveyed for information pertinent to radiological control programs and the information source referenced. DOE Order 5000.3B is supported by explaining what kinds of events are tracked and why. Typical problems observed with tracking and trending reportable events are discussed.

Attachment 1 is part of an expanded material condition checklist that includes typical radiological protection deficiencies including some work practices. This was developed at the request of managers conducting Management By Walking Around tours to serve as reminders prior to conducting a tour.

Attachment 2 is a guide for line managers observing work. It is intended to reinforce concepts of the DOE "Conduct of..." orders and the Rad-Con Manual, and to help determine the causes of observed deficiencies. The list also serves as a reminder that these practices are considered deficiencies, and that reviewers of a given program could be expected to comment on them.

Other topics covered include administrative limits and controls, work observation, review of radiation work permits and other documentation, record reviews, job planning, scheduling, and coordinating, cost-benefit aspects of operational controls, and when and how to use procedures. These topics are discussed generically from the aspect of sound fundamental control practices and therefore may be adapted to the degree necessary for a given operation or facility.

# **RADIATION PROTECTION**

## **POSTINGS**

- Postings uniform and consistent on all sides of areas and are visibly displayed
- Postings legible and understandable
- Barriers (rope, chains, etc.) clearly positioned to require conscious action to cross
- Purpose of barriers readily determined
- Signs and tags legible, complete, and up to date
- Radiological survey maps posted or on file for radiological areas
- Hoods posted with protective equipment requirements
- Hood flow inspection current
- Radiological boundaries clearly marked
- Radiation work permits posted or available

## **BOUNDARY CONTROL STATIONS**

- Number of step-off pads are appropriate for the number of layers of protective clothing worn
- Check sources on or near friskers
- Frisking instructions posted at boundary control stations
- Frisking instructions require frisking the mouth-nose area where the possibility of airborne activity exists
- Boundary control stations are clean and free from loose, used protective clothing
- Different receptacles for disposable and reusable protective clothing and for respirators are provided
- Receptacles for protective clothing are not overflowing and are properly labeled
- Friskers and instruments are in current calibration and properly checked for response

Disposable and reusable protective clothing are not mixed together in receptacles

Items are not stored across radiological boundaries

Step-off pads are surveyed at least weekly at active Regulated and Contamination area boundary control stations

Protective clothing removal procedures are posted at boundary control stations

## CONTAMINATION AND RADIATION

Survey frequency appropriate for type of area and frequency of use

Unnecessary items and equipment not stored in radiological areas

Containment systems in good physical and mechanical condition. Tape is **not** used to permanently contain radioactive material in systems.

Radiological waste is properly packaged, marked, and promptly disposed of

Evidence of eating, drinking, or tobacco use **is not present** in radiological areas

Very-High Radiation areas are **locked, attended**, or appropriate interlocks provided

Contamination from leaks, spills, etc. is promptly decontaminated and the cause fixed

Drip pans, absorbent material, etc. are only used until permanent repairs can be made

Instruments are properly located, operable, and are in current calibration

X-ray radiography unit controls locked and keys removed when not in use

"Walk-in" vaults have "scram" switches inside

Radioactive materials properly wrapped to control contamination and labeled

## PERSONNEL PRACTICES

Personnel wear only approved clothing in contamination areas

Personnel wear clothing required by radiological postings and permits

Personnel **do not** reach across radiological boundaries; material enters and exits through boundary control stations

Personnel frisk or monitor properly as required by posted instructions at boundary control stations

Personnel have the required training to perform work

Personnel wear protective clothing properly; buttoned up, covering inner layer

Personnel wear dosimetry properly; correct locations, not separated

### WORK CONTROL

Personnel read work permits and have the opportunity to ask questions before work

Supervisors question workers prior to work to verify understanding of critical steps or information

All involved work groups are notified of work sufficiently in advance to prepare for their duties or formulate adequate radiological controls

Supervisors and health physicists observe work and correct deficiencies on-the-spot

Procedures describe the type of radiological surveys to be made for work permits and work packages: surveys are appropriate for the situation

Personnel have all the tools, parts, materials, and information to be productive while in radiological areas

Dose margin information is available for job planning

Job coordination ensures that all work groups are available when needed

Job scheduling ensures that facility managers are aware of upcoming work so that operations can be appropriately planned

## WHAT TO LOOK FOR, WORK PRACTICES

Observation	Examine
Frequent personnel or area contaminations	Housekeeping, Job closeout, Poor attitude, Supervisors not controlling work, Permit controls, Poor surveys, Material condition deficient, Poor occurrence evaluation
Too many or too few tools, parts, materials	Job planning, Pre-job briefing, Job coordination with other units, Procedures, work pkgs.
Superficial or poor radiological controls	RP Tech training, Poor Surveys, Job planning did not provide lead time, Work permit, Poor attitude, Procedures, Scope of work changed,
Existing radiological controls not followed	Poor attitude, Supervision not controlling work, Pre-job briefing
Required personnel not available, wasted time	Job planning, Job coordination, Job scheduling

Personnel in radiation or contamination areas not productive

ALARA planning,  
Rad training,  
Supervision not controlling work,  
Items not available (planning),  
Job scheduling

Simple radiation and contamination reduction methods not used

ALARA planning,  
Poor surveys  
Pre-job briefing,  
RP Tech training,  
Work permit

Poor response to abnormal conditions

Poor anticipation (planning),  
RP Tech training,  
Rad training,  
Procedures,  
Pre-job briefing,  
Supervisors not involved in work

Unexpected conditions encountered

Poor surveys,  
Poor lockout and verification,  
Procedures,  
Scope of work changed,  
Hold points not used,  
Scope of work not well defined (planning)

Poor frisking practices

Rad training,  
BCS layout,  
Poor posted instructions,  
Supervisors not enforcing policy

Instructions not understood

Poor communication system,  
pre-job briefing,  
Instructions confusing



**"Cultural change" may be well under way: most line managers are willing to change, but in some cases do not have sufficient guidance.**

**Continual identification of "new" deficiencies during audits and surveillances are a source of frustration to many line managers.**

**Implementation guidance is widely scattered throughout periodicals, DOE, NRC, and INPO documents: no single reference document is available.**

**Develop a guide for line managers to address the following aspects of radiological controls.**

- Illustrate the cause-and-effect relationship between radiological deficiencies and radiological events.**
- Support DOE N5480.6 Rad-Con Manual by stressing basic good radiological control methods.**
- Support ideas and terminology of DOE "Conduct of...." Orders, 5480.19 and 4330.4A.**

**How does this manual differ from existing publications?**

- **Practical on-the-floor guidance based on problems observed in the DOE contractor system.**
- **Relates this guidance to ICRP, NCRP guidance when possible.**
- **Includes comprehensive list of material condition deficiencies including those of particular interest to DOE contractors: criticality safety, radiological protection, hazardous waste.**

**Stresses importance of occurrence reporting and trending**



I wonder  
if I should  
report this.