Department of Energy
Washington, DC 20585

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FROM: John Spitaleri Shaw
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Environment, Safety and Health

SUBJECT: Recommended Approaches for Setting Radiological Control Limiting Conditions

Since May 1995, the Office of Health has provided several clarifications and technical positions regarding the Department of Energy's (DOE) expectations concerning the implementation of selected provisions of title 10, Code of Federal Regulations, part 835 (10 CFR 835), "Occupational Radiation Protection." To further assist field implementation of 10 CFR 835, we have developed, and are now distributing, the attached Radiological Control Technical Position entitled "Recommended Approaches for Setting Radiological Control Limiting Conditions."

The attached technical position does not represent new policy or direction to the field. Rather, it provides clarification at the request of the field, Headquarters, and program offices to facilitate and promote the efficient and cost-effective implementation of 10 CFR 835. The technical position was developed in response to a concern raised from a contractor regarding radiological control limiting conditions for stopping work.

Please distribute the attached technical position to the applicable radiation protection organizations at your facilities. The DOE Radiological Control Coordinating Committee has reviewed this technical position.

For additional information, please contact Dr. Judith D. Foulke, of my staff, on 3-5865.

Attachment

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Department of Energy (DOE)
Office of Worker Protection Policy and Programs
Radiological Control Technical Position (RCTP)
RCTP 2005-01

Recommended Approaches for Setting Radiological Control Limiting Conditions

Issue:

During a recent radiological control assessment at a DOE site, it was noted that the radiological control limiting conditions for stopping work, stated in the radiological work permit (RWP), frequently provided excessive latitude in radiological parameters. For example; the whole body dose rate limiting condition was set at >100 millirem/hr when the general area dose rate was expected to be <1 millirem/hr. This radiological control limiting conditions did not appear sufficiently responsive to unanticipated changes in radiological conditions. Likewise, another example was the airborne radioactivity limiting condition was set at > 1,000 times the derived air concentration (DAC) value although the anticipated airborne radioactivity was only expected to be < 2 times the DAC value.

Use of radiological control limiting conditions which are orders of magnitude greater than the expected radiological conditions provides little confidence that unanticipated changes in radiological conditions would be identified at sufficient levels. Such identification is needed so that the activity is stopped and an investigation of the changing radiological conditions is performed. These actions are needed for maintaining exposures within limits and as low as reasonably achievable.

The DOE Radiological Control Standard (DOE-STD-1098-99) encourages use of radiological control limiting conditions on RWPs. However, there is no guidance on recommended approaches to establishing these conditions. Accordingly, the Office of Worker Protection Policy and Programs (EH-52) is providing guidance.

Introduction:

DOE-STD-1098-99 describes the use of RWPs as an administrative mechanism to establish radiological controls for intended work activities. Among the conditions prescribed in the RWP, as discussed in Article 321.1 of DOE-STD-1098-99, are radiological control limiting conditions (or limiting radiological conditions) that may void the RWP. The radiological control limiting conditions typically provide conditions which, if encountered, require some action, such as stopping work. Examples of radiological control limiting conditions would be encountering unanticipated levels for dose, dose rate, removable surface contamination, airborne radioactivity concentrations, etc.

In order to maintain exposures as low as is reasonably achievable (ALARA) and to control exposures, radiological control limiting conditions are frequently established on RWPs, or in other technical work documents. If radiological control limiting conditions are encountered, the typical action is stopping the work activity until radiological control personnel reevaluate the situation. The radiological control limiting conditions should be established such that they provide a meaningful set of criteria where the radiological conditions significantly vary from expected and a reevaluation is warranted.

Requirements:

title 10, Code of Federal Regulations, part 835 (10 CFR 835)

§ 835.501 Radiological areas.

(d) Written authorizations shall be required to control entry into and perform work within radiological areas. These authorizations shall specify radiation protection measures commensurate with the existing and potential hazards.

DOE-STD-1098-99

Article 321.1:

The RWP should include the following information:

h. Limiting radiological conditions that may void the RWP.

Discussion:

The value of using limiting radiological conditions, if established in a meaningful manner, has been proven over the years. Each site should establish their own procedures for establishing radiological control limiting conditions. In establishing radiological control limiting conditions, there are many factors to consider. These include:

- regulatory limits;
- administrative control limits;
- the magnitude of the potential radiological hazard;
- the frequency/timeliness of monitoring to meeting the limiting radiological conditions; and
- the degree of reliability of the assessment of expected radiological conditions.

In conjunction with the establishment of limiting radiological conditions, many sites have found it useful to establish radiological action limits. Typically, these action limits would be encountered before a limiting radiological condition is reached and would require the performance of some activity for the purpose of mitigating the situation causing the action limit to be exceeded; e.g., additional decontamination efforts are made to reduce dose rates and/or contamination levels. This practice is encouraged.

While the process for determining radiological control limiting conditions is expected to be site-specific, some general guidance may be provided.

Technical Position:

EH-52 encourages the use of radiological control limiting conditions. The following guidance is general, accordingly the process should be site-specific and take into consideration site-specific variables and task specific considerations. Guidance on types of radiological control limiting conditions and their values is provided below.

Dose and Dose-Rate

Whole body dose to any individual:

- Where the expected dose is ≤50 millirem, consideration may be given to using a limiting radiological condition of 25 millirem greater than expected dose.
- Where the expected dose is > 50 and < 200 millirem, consideration may be given to using a limiting radiological condition of 1.5 times the expected dose.
- Where the expected dose is ≥200 millirem, consideration may be given to using a limiting radiological condition equal to the expected dose plus 100 millirem.

Note: These criteria are typically established for doses received over a short time period (up to several days). For long term activities, periodic ALARA reviews should be sufficient to identify significantly higher than anticipated doses and result in commensurate corrective actions.

For example:

Expected Dose (millirem)	Limiting Radiological Condition (millirem)
10	35
100	150
200	300
800	900

Whole body dose rate at the worker location:

- Where the expected dose rate is between 5 and 40 millirem/hr, consideration may be given to using a limiting radiological condition of 3 times the expected dose rate.
- Where the expected dose rate is from 40 to 100 millirem/hr, consideration may be given to using a limiting radiological condition of 2 times the expected dose rate.
- Where the expected dose rate is ≥100 millirem/hr, consideration may be given to using a limiting radiological condition equal to 1.5 times the expected dose rate, provided that the limiting condition does not exceed the expected dose rate by more than 1,000 millirem.

Note: The period of time when individuals are in the area with elevated doses rates should also be considered; e.g., very short time periods in some of these areas may not justify stopping the work.

- In addition to the above, a limiting radiological condition should be set upon encountering unexpected radiation levels which change the radiological classification of the area; e.g., a radiation area becomes a high radiation area.

For example:

Expected Dose Rate (millirem/hr)	Limiting Radiological Condition (millirem/hr)
<1	5 (change in classification)
20	60
40	80
300	450
2,500	3,500

Extremity dose rate:

- Where the expected dose rate is < 1,000 millirem/hr, consideration may be given to using a limiting radiological condition of at least 100 millirem/hr and equal to 2 times the expected dose rate.
- Where the expected dose rate is ≥1,000 millirem/hr, consideration may be given to using a limiting radiological condition equal to 1.5 times the expected dose rate, provided that the limiting condition does not exceed the expected dose rate by more than 10,000 millirem.

For example:

Expected Dose Rate (millirem/hr)	Limiting Radiological Condition (millirem/hr)
150	300
3,000	4,500
30,000	40,000

Removable Contamination Levels

- A limiting radiological condition should be set upon encountering unexpected contamination levels which change the radiological classification of the area (e.g., a contamination area becomes a high contamination area), or indicate that the contamination monitoring or controls in place must be revised or the protective clothing must be upgraded.

For example:

Expected Beta/Gamma Removable Contamination (dpm/100 cm^2)	Limiting Radiological Condition (dpm/100 cm^2)
< detectable	1000 (change in classification)

Airborne concentrations

- Where the expected airborne levels are ≤10 times the 10 CFR 835 appendix A values, consideration may be given to using a limiting radiological condition of at least the 10 CFR 835 appendix A value and 3 times greater than expected.
- Where the expected airborne levels are ≥10 and < 50 times the 10 CFR 835 appendix A values, consideration may be given to using a limiting radiological condition of 2 times greater than expected.
- Where the expected airborne levels are ≥50 times the 10 CFR 835 appendix A values, consideration may be given to using a limiting radiological condition of 1.5 times greater than expected.
- In addition to the above, a limiting radiological condition should be set upon encountering unexpected airborne levels which change the radiological classification of the area; e.g., an area becomes classified as an airborne radioactivity area or which indicate that the respiratory protection must be upgraded.

For example:

Expected Airborne Levels (multiples of appendix A)	Limiting Radiological Condition (multiples of appendix A)
< 0.1	1
5	15
30	60
80	120

References:

10 CFR 835, U.S. Department of Energy, "Occupational Radiation Protection." 63 FR 59662, Federal Register, Volume 63, Number 213, dated November 4, 1998, Washington, D.C.

DOE-STD-1098-99, "Radiological Control," Reaffirmed December 2004.