LA-UR- 93-1366

Title: RADIOLOGICAL HAZARD CLASSIFICATION OF DOE/FACILITIES BY DOE-STD-1027-92: LANL NUCLEAR FACILITY LIST

Author(s): John C. Elder

Submitted to: DOE 1993 Radiation Protection Workshop
Las Vegas, NV
April 13-15, 1993

Los Alamos
NATIONAL LABORATORY

RADIOLOGICAL HAZARD CLASSIFICATION OF DOE FACILITIES BY DOE STD-1027-92: LANL NUCLEAR FACILITY LIST

John C. Elder
Risk Management Support Group
Los Alamos National Laboratory

ABSTRACT

Los Alamos facilities containing significant radiological hazards have been reclassified according to DOE-STD 1027-92, a recently issued guide for hazard classification. DOE-STD 1027-92 was provided in support of DOE Order 5480.23 to identify which facilities would be governed under DOE 5480.23 requirements; these would presumably be called nuclear facilities. This new classification has affected the original list of 18 LANL nuclear facilities by increasing it to 39. It has also lowered the classification of TA-55-4, the plutonium processing facility containing highest intrinsic hazard at LANL, from the highest classification to an intermediate classification. This presentation addresses the impact of these changes in the nuclear facility list in the areas of radiological health, safety analysis documentation, and risk management.

INTRODUCTION

Hazard classification or categorization (HC) of facilities and operations has been an ongoing effort in the safety analysis and review area of DOE nuclear projects. It was mandated in DOE 5481.1B, Safety Analysis and Review, and has been continued in DOE 5480.23, Nuclear Safety Analysis Reports. In its vigorous self-assessment in 1989 and 1990, DOE noted wide variation in HC practice from site to site and even at the same site over time. Greater consistency was needed complex-wide in establishing the types and numbers of facilities which should fall under more stringent rules.

HC aids the safety analyst, the facility operator, and any oversight person (internal or external) to reach a common perception of the hazards and risks involved in an operation. Achieving a common perception of risk or hazard by all participants - including members of the public - has proven to be very difficult. The safety analyst desires to adhere to a HC with a strong technical basis, leaving political issues to be dealt with at a different level by different people. Although it may not seem politically acceptable to use a dose criterion in HC, radiological dose has been thoroughly studied and remains the best measure of consequence.

HC is ordinarily the first step after conceptual design of a new facility or may be applied to an existing facility which may have no classification or may be inappropriately classified. Input to a HC is the quantity of hazardous material present, its form, and some knowledge of what energy sources might be present as dispersing agents. Because a higher HC can exert a large impact on level of effort and expenditure of resources, the facility owner or operator should be very much concerned about the hazard category of the operation. The price of overconservatism in HC would be unnecessary expenditures in the areas of: design, construction, procurement, quality assurance, safety analysis, worker protection, training, environmental monitoring, and the like. The potential price of underconservatism in HC is the health, economic, and political aftermath of a serious accident.

Intrinsic hazard of an operation is the key to its HC. HC is based on analysis of postulated credible accidents (extremely unlikely events with potentially high consequences). The analyst considers how credible releases of hazardous material could be caused and ignores any active controls or mitigating features which might reduce the released quantity. Atmospheric dispersion through distance remains as the only effective reduction mechanism.

METHODOLOGY

DOE has expended major effort in recent years to develop a quantitative methodology for HC. The methods, summarized in Table 1, were based primarily on radiological dose criteria. This presentation addresses the effect of the most recent method, DOE STD 1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance DOE Order 5480.23, dated December 1992.

DOE STD 1027-92 says the HC should be based on magnitude of the hazard, stage of facility life, and complexity of the facility and/or its safety systems. Preliminary HC can be accomplished by table lookup of radioactive material thresholds in Attachment 1 of DOE STD 1027-92. Final HC follows detailed hazards assessment in Section 4 of DOE STD 1027-92. This hazards assessment also aids in applying the graded approach within each category.

DOE modified threshold quantities of radiological materials stated by NRC in 10CFR302.4, Appendix B. The thresholds in DOE STD-1027-92 Attachment 1 were based on the conditions summarized in Table 2.

RESULTS

Table 3 shows that 13 LANL facilities would be Cat. 2 and 26 would be Cat. 3 facilities by preliminary HC according to DOE STD 1027-92. Because all Cat. 1, 2, or 3 facilities apparently will fall under DOE 5480.23 requirements, these 39 facilities could be assumed by LANL to be nuclear facilities. Although explicit determinations of HC have not been provided by DOE, we expect that LANL Cat. 1, 2, or 3 facilities will be called nuclear facilities and significant upgrades in safety related programs and documentation will be requested. Upgrades of safety analysis and review have already been started on most of these facilities. We estimate that an additional 15-18 graded SARs will be required to meet

DOE 5480.23 requirements. Although grading of SARs according to hazard magnitude, complexity, and stage of life will limit the total effort required, we have found over the last 18-24 months that the LANL Facility and Safety Analysis staff at its present strength of 12 full time equivalents is unable to provide the needed documents in a timely manner.

HC CASE STUDIES

The following is a discussion of case studies which illustrate difficulties encountered when applying HC to several facilities at LANL. Latitude either in the STD 1027-92 or in the DOE 5480.23 interpretations at the Field Office level will be needed to establish a workable HC for these facilities.

Case Study 1: TA-55-4 (PF-4) is a plutonium processing facility containing the highest intrinsic hazard at LANL. The largest contributor to the PF-4 intrinsic hazard is plutonium (Pu-238 and Pu-239) in process in kg quantities and sometimes in dispersible form--primarily liquid or powder. The implied Category 2 ceiling on nonreactor nuclear facilities limits the PF-4 HC to Cat 2, although LANL HC called it a high hazard facility (its intrinsic hazard and complexity are high compared to other nuclear facilities at LANL). As a real hazard (or risk) to the public, PF-4 is maintained quite low due to its safety class confinement structures, gloveboxes, and HVAC systems. We propose to maintain a relatively high level of safety treatment at PF-4 and do not expect that PF-4 will be downgraded just because DOE STD 1027-92 guidance appears to allow it.

Case Study 2: Ion Beam Facility (IBF) is an tandem Van de Graaff accelerator facility which, according to DOE 5480.23, is exempted from 5480.23 requirements because it is an accelerator. IBF accelerates tritium nuclei and may have as much as 3 g tritium gas in a single quantity. Three grams or 30,000 Ci of tritium could make IBF a nuclear facility because its tritium inventory exceeds 1000 Ci. A release of 3 g might be credible. This facility is exempted by DOE STD-1027-92; we believe a classification under DOE 5480.23 would be more appropriate for any facility which handles dispersible radiological materials.

Case Study 3: TA-8-23 Betatron is an x-ray machine used to nondestructively examine encased Pu metal components. These components are not opened or unnecessarily handled while in the building. These components are not kept in the building overnight nor ever left unattended. Encasement is not necessarily encapsulation by ANSI sealed source standards but is rugged. This facility would be called Cat. 2 under STD 1027-92; we believe a Cat. 3 (or low) classification would be more appropriate.

CONCLUSIONS

DOE STD 1027-92 tends to place a higher number of facilities in the intermediate category, Cat. 2. This method lacks the gradation which we consider important in making the graded approach workable. The method can be aided to work if the perceptions of hazard or risk are approximately the same for all participants when the project is graded. The case studies discussed indicate that a table lookup threshold approach to hazard classification is not suitable for some DOE operations. Case specific conditions must be studied and the HC set by participants who are flexible, qualified, and authoritative

TABLE 1

PROPOSED VERSIONS OF HC METHODOLOGY

Version	Offsite Dose Criteria (rem)	
	Cat 2 (Onsite)	Cat 1 (Offsite)
Site-Specific HC:		
LANL	100 at 200m	100 at 1620m
ORNL	600	2.5
WHC	25	5
SRP	100	5
RFP	5	25
DOE HC Workshop, 7/91 (PLG, Inc.)	100	100
DOE NS-20	40	40
DOE DP-62	1	na
DOE NE-74 STD 1013-91 (Option A)	1 @ 100m	100
DOE NS (Option B)	5 @ ?	25 @ ?
DOE NE-74 STD 1027-92 October	1 @ 100 m	na
DOE NE-74 STD 1027-92 December	1 @ 100 m	na

TABLE 2

STD 1027-92 CRITERIA

Hazard Category*	CEDE (rem)	Distance (m)	Exposure Time (h)	Meteor-ological Conditions	Dispersion factor(s/m^3)
2	1	100**	24	D at 4.5 m/s	1E-04
3	10	30**	24	40CFR302.4 Appendix B F at 1.0 m/s	?

* Cat. 1 (potential for significant offsite consequences) criteria are not specified in DOE STD 1027-92. Category A reactor facilities (> 20 MWth) fall in Category 1 plus others as determined by DOE headquarters PSOs. Cat. 2 facilities are shown by hazard assessment to have potential for significant onsite consequences; Cat. 3, only significant localized consequences.

** Author's note: Either of these distances (30 m or 100 m) would be within the wake effects of most buildings. Therefore, the dispersion factor (X/Q) would not be realistic (too high by a factor of at least 5 at 100 m). The X/Q should be calculated for the building wake effects (Reg Guide 1.145 contains an acceptable method).

TABLE 3
COMPARISON OF RESULTS
RADIOLOGICAL HAZARD CLASSIFICATION OF LANL FACILITIES
BY LANL HAZCLASS, NS-20, DP-62, STD 1013-92, AND STD 1027-92
4/7/93

	HazClass 5/91	LANL Final*	NS-20 4/92	DP-62 5/92	STD 1013-92 (NE-74) 7/92	STD 1027-92 (20 x NE-74) 12/92
High	2	1	3	0	0	0
Moderate	15	19	22	25	25	13
Low	25	22	10	15	14	26
Other			7 Low/Low	2 None	3 <Category 3	3 <Category 3
Facilities Compared	42	42	42	42	42	42

* Final LANL hazard classifications based on all considerations (technical and administrative) rather than on HazClass (5/91) criteria only.