INFORMATION CLEARANCE FORM

S

A. Information Category

- ☐ Abstract ☐ Journal Article
☐ Summary ☐ Internet
☐ Visual Aid ☐ Software
☐ Full Paper ☐ Report

☒ Other Speech

B. Document Number HNf-4523-SK FP

C. Title

Enhanced Radiological Work Planning

D. Internet Address

E. Required Information

1. Is document potentially Classified? ☒ No ☐ Yes (MANDATORY)

(See attached page.)

Manager's Signature Required

If Yes _____ ☐ No ☐ Yes Classified

ADC Signature Required

2. Internal Review Required? ☐ No ☒ Yes

If Yes, Document Signatures Below

Counsel _____

Program _____

3. References in the Information are Applied Technology ☒ No ☐ Yes

Export Controlled Information ☒ No ☐ Yes

4. Does Information Contain the Following: (MANDATORY)

a. New or Novel (Patentable) Subject Matter? ☒ No ☐ Yes

If "Yes", Disclosure No.: _____

b. Information Received in Confidence, Such as Proprietary and/or Inventions?

☒ No ☐ Yes If "Yes", Affix Appropriate Legends/Notices.

c. Copyrights? ☒ No ☐ Yes If "Yes", Attach Permission.

d. Trademarks? ☒ No ☐ Yes If "Yes", Identify in Document.

5. Is Information requiring submission to OSTI? ☒ No ☐ Yes

If Yes UC- _____ and B&R- _____

6. Release Level? ☒ Public ☐ Limited

7. Charge Code 103012 HN9F0641

F. Complete for a Journal Article

1. Title of Journal

G. Complete for a Presentation

1. Title for Conference or Meeting Applied ALARA Workshop

2. Group Sponsoring FDH Radiation Protection

3. Date of Conference May 24-26, 1999

4. City/State Richland, WA

5. Will Information be Published in Proceedings? ☐ No ☒ Yes

6. Will Material be Handed Out? ☐ No ☒ Yes

H. Author/Requestor

Responsible Manager

William A. Decker, Jr.
(Print and Sign)

J. E. Krutz
(Print and Sign)

I. Reviewers

Yes Print

Signature

Public Y/N (If N, complete J)

General Counsel ☒ Kenneth M. Norris

Office of External Affairs ☒ Debra Miller

DOE-RL ☒ B. M. Pangborn

Other ☐

Other ☐

☒ Y / N
☒ Y / N
☒ Y / N
 Y / N
 Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below.

Information Clearance Approval

- ☒ Applied Technology ☐ Protected CRADA
☐ Personal/Private ☐ Export Controlled
☐ Proprietary ☐ Procurement-Sensitive
☐ Business-Sensitive ☐ Patentable
☐ Predecisional ☐ Other (Specify) _____
☐ UCNi

* Editorial correction made in text.

K. If Additional Comments, Please Attach Separate Sheet

page 1 of 2

INFORMATION CLEARANCE FORM

A. Information Category

- ☐ Abstract ☐ Journal Article
☐ Summary ☐ Internet
☐ Visual Aid ☐ Software
☐ Full Paper ☐ Report

☒ Other Speech

B. Document Number HNF-4523-SX EP 1a

C. Title

Enhanced Radiological Work Planning

D. Internet Address

E. Required Information

1. Is document potentially Classified?
- ☒
- No
- ☐
- Yes (MANDATORY)

(See signature, below.)

Manager's Signature Required

If Yes _____ ☐ No ☐ Yes Classified

ADC Signature Required

2. Internal Review Required?
- ☐
- No
- ☒
- Yes

If Yes, Document Signatures Below

Counsel _____

Program _____

3. References in the Information are Applied Technology
- ☒
- No
- ☐
- Yes

Export Controlled Information ☒ No ☐ Yes

4. Does Information Contain the Following: (MANDATORY)

- a. New or Novel (Patentable) Subject Matter?
- ☒
- No
- ☐
- Yes

If "Yes", Disclosure No. _____

- b. Information Received in Confidence, Such as Proprietary and/or Inventions?

☒ No ☐ Yes If "Yes", Affix Appropriate Legends/Notices.

- c. Copyrights?
- ☒
- No
- ☐
- Yes If "Yes", Attach Permission.

- d. Trademarks?
- ☒
- No
- ☐
- Yes If "Yes", Identify in Document.

5. Is Information requiring submission to OSTI?
- ☒
- No
- ☐
- Yes

If Yes UC-_____ and B&R-_____

6. Release Level?
- ☒
- Public
- ☐
- Limited

7. Charge Code
- 103022

F. Complete for a Journal Article

1. Title of Journal

G. Complete for a Presentation

1. Title for Conference or Meeting
- Applied ALARA Workshop

2. Group Sponsoring
- FDH Radiation Protection

3. Date of Conference
- May 24-26, 1999

4. City/State
- Richland, WA

5. Will Information be Published in Proceedings?
- ☐
- No
- ☒
- Yes

6. Will Material be Handed Out?
- ☐
- No
- ☒
- Yes

H. Author/Requestor

William A. Decker, Jr.

(Print and Sign)

Responsible Manager

J. E. Decker

(Print and Sign)

I. Reviewers

Yes Print

Signature

Public Y/N (If N, complete J)

General Counsel ☒

Y / N

Office of External Affairs ☐

Y / N

DOE-RL ☒B. M. Pangborn

Y / N

Other ☐

Y / N

Other ☐

Y / N

- J. If information Includes Sensitive Information and is not to be released to the Public indicate category below.

Information Clearance Approval

- ☐ Applied Technology ☐ Protected CRADA
☐ Personal/Private ☐ Export Controlled
☐ Proprietary ☐ Procurement-Sensitive
☐ Business-Sensitive ☐ Patentable
☐ Predecisional ☐ Other (Specify) _____
☐ UCN

- K. If Additional Comments, Please Attach Separate Sheet

page 2 of 2

A-6001-401 (02/98)

Applied ALARA Workshops Richland, Washington May 26, 1999

Prepared for the U.S. Department of Energy

FLUOR DANIEL HANFORD, INC.

Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Copyright License By acceptance of this article, the publisher and/or recipient acknowledges the U.S. Government's right to retain a nonexclusive, royalty-free license in and to any copyright covering this paper.

Approved for Public Release; Further Dissemination Unlimited

Applied ALARA Workshops Richland, Washington May 26, 1999

Date Published
May 1999

To Be Presented at
Applied ALARA Workshop
Richland, Washington
May 24-26, 1999

Prepared for the U.S. Department of Energy

FLUOR DANIEL HANFORD, INC.

P.O. Box 1000
Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Copyright License By acceptance of this article, the publisher and/or recipient acknowledges the U.S. Government's right to retain a nonexclusive, royalty-free license in and to any copyright covering this paper.

Approved for Public Release; Further Dissemination Unlimited

LEGAL DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced from the best available copy.

Printed in the United States of America

DISCLM-2.CHP (1-91)

Table of Contents

1.0 Purpose

2.0 Scope

3.0 Discussion

4.0 Standard

4.1 Work origination and work Screening

4.2 Work Package Preparation

4.3 Pre-Work Review

5.0 Radiological Screening and Walk Down

5.1 Discussion

5.2 High Risk

5.3 Medium and Low Risk

5.3.1 Medium Risk

5.3.2 Low Risk

6.0 Risk Based Radiological Planning

6.1 High Risk Planning

6.2 Medium Risk Planning

6.3 Low Risk Planning

6.4 Planning Guidance

7.0 References

ENHANCED RADIOLOGICAL WORK PLANNING

1.0 Purpose

The purpose of this standard is to provide Project Hanford Management Contractors (PHMC) with guidance for ensuring radiological considerations are adequately addressed throughout the work planning process. Incorporating radiological controls in the planning process is a requirement of the *Hanford Site Radiological Control Manual (HSRCM-1)*, Chapter 3, Part 1.

2.0 Scope

This standard is applicable to all PHMC contractors and subcontractors. The essential elements of this standard will be incorporated into the appropriate site level work control standard upon implementation of the anticipated revision of the PHMC Administration and Procedure System.

3.0 Discussion

Reducing individual and collective radiation doses to ALARA levels and controlling contamination are fundamental objectives of any Radiological Protection program. This reduction is desirable because of the inferred connection between collective dose and the health and safety of the workers. This connection has been presumed repeatedly by such organizations as the National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection.⁽¹⁾

The reduction of both individual and collective dose is a result of improvements in all parts of a Radiological Protection program, including planning of work, training of workers, tracking of dose, and contamination control. Contamination control also contributes to protection of the environment. Ultimately, these efforts increase safety, reduce costs, and improve the quality of work performed.⁽¹⁾

In addition to aggressive execution of work with emphasis on dose and contamination reduction techniques, minimizing radiation dose and contamination can be accomplished utilizing the following methods:

1. Preliminary planning and scheduling identifies those jobs that should be reviewed for dose and contamination reduction and allows time to develop methods, write procedures, evaluate design, and train personnel.⁽¹⁾

2. The radiological engineering process provides methods to reduce dose rates and contamination levels or the time spent in radiation areas.⁽¹⁾
3. Radiation dose goals are used as a management tool that involve all facility groups in actively reducing dose and also provide a means of assessing the effectiveness of dose and contamination reduction actions.

Existing PHMC work planning processes function in accordance with WHC-CM-1-8, *Work Management*, and WHC-IP-1217, *Work Management Guidance*. The driving forces for radiological considerations are either the requirement to obtain a Radiological Work Permit (RWP) or, exceeding an ALARA Trigger Level. In most cases applying radiological considerations when obtaining an RWP is too late for smooth integration of radiological controls into work packages. In addition, ALARA Trigger Levels are too high to force radiological involvement in lower risk work packages and, in many cases the Trigger Level is not determined until after the RWP is requested. This has resulted in the Radiological Control Organization (RadCon) not getting involved in work packages until very late in the planning process. This late involvement results in rushed and inadequate radiological planning and slows down the planning process jeopardizing production commitments. Although some facilities have developed facility processes to integrate radiological controls into the work planning process earlier, overall, the current planning process does not adequately address the *HSRCM-1* requirement.

In developing this standard several non-Hanford nuclear facilities' planning processes were reviewed and compared to the fundamental Hanford planning process. In addition, several Hanford facility Radiological Control (RadCon) organizations' processes for incorporating RadCon in planning were reviewed. Two fundamental differences between the Hanford and Non-Hanford processes were observed. First, in the non-Hanford processes all radiological work underwent a radiological hazard screening performed by radiological personnel. Second, non-Hanford facilities employed a graded approach to radiological planning based on the radiological risk associated with the work to be performed.

A flow diagram (Figure 1) shows the fundamental Hanford planning process as given by WHC-CM-1-8 and WHC-IP-1217. Overall, existing PHMC facilities work planning processes have the same basic elements. A second flow diagram (Figure 2) shows radiological planning enhancements to the fundamental planning process to ensure RadCon is adequately addressed. In addition, a Higher Level Review is included later in the planning process when warranted by facility specific criteria. Figure 3 provides a flow diagram of the Radiological Screening process.

4.0 Standard

4.1 Work Origination and Work Screening

In the enhanced radiological work planning process work originates and is screened in the same manner as in the fundamental process. These two portions of the fundamental planning process are unchanged.

4.2 Work Package Preparation

Radiological work, including engineering design work, should be planned as far in advance as practical. During the planning stage, unnecessary work should be deleted, radiation and contamination levels in work areas should be determined, and collective dose estimates should be made.

The Work Package Preparation process has several new steps required for enhancing radiological planning.

The first enhancement step is to require a radiological work screening as a result of identifying the work as radiological on the Job Hazard Analysis form (JHA). The radiological screening should identify the level of risk associated with the work. To accomplish this the radiological screener must be familiar with the radiological aspects of the facility and facility established radiological risk levels as well as the ALARA Trigger levels (see section 5.0 for guidance on risk levels).

The Radiological screener(s) is designated by the facility RadCon Manager. The radiological screener decides the initial radiological risk level of the work and determines the initial involvement of RadCon. If the RadCon screener determines the work to be of low risk, RadCon will have limited involvement until the RWP is requested.

An initial determination of Medium or High risk requires RadCon (not necessarily the screener) to be involved in the initial conceptualization of the work and the walk down to confirm the risk level. During the walk down the RadCon representative collects additional radiological data and answers fundamental radiological questions about the proposed work (see section 5.0).

The next enhancement step is for the RadCon group to work with the planner to provide radiological hold point and work step input for the Work Package Detailed Plan for incorporation into the Work Instructions. This step should save time when RadCon performs its final review and issues the Radiological Work permit.

Job planning should be reflected in the protective requirements shown on the RWP. If conditions are not fully known when the RWP is issued, protective requirements should be based on the most hazardous radiological conditions deemed probable. Therefore, use of a qualifier, such as "per RCT" for protective clothing or respirator requirements should be avoided. Use of such qualifiers prevents workers from resolving questions and acknowledging in writing that the instructions are understood. Additionally, the probability for prescribing deficient protective requirements due to inadequate forethought, knowledge of work conditions, or supervisory review increases. When RWPs need to be revised, the same requirements that govern RWP preparation and issuance should apply to revisions. Clear guidance should be provided on facility policy regarding changes to RWP requirements at the job site (see HNF-CM-4-27, *Radiological Control Practices and Procedures*, Section 3.1, Radiological Work Permits, for guidance).

4.3

Pre-Work Review

The radiological enhancement to this planning element is to apply facility specific criteria developed by the facility to determine the need for a Higher Level Review (HLR). The Higher Level Review process is required to be in place as a result of Enforcement Action 96-02 compensatory actions. A Higher Level Review committee should be interdisciplinary and consist of at least an Operations Manager, a Manager from the facility RadCon organization, and a Manager from the facility safety organization. If an ALARA review is required because the work package exceeded an ALARA Trigger Level (*HSRCM-1* Article H312.3), it should be conducted prior to the Pre-Work Review. The ALARA Review information should be available for a Higher Level Review. In some instances the ALARA Review Committee may qualify as an HLR if the appropriate personnel are part of the ALARA Review Committee.

5.0 Radiological Screening and Walk Down

5.1 Discussion

Radiological screening identifies the initial radiological risk level of the work (high, medium, or low; see suggested risk levels below). If the work is identified as having high or medium radiological risk, RadCon must participate in the conceptualization and walk down phases of the work planning. If the work is identified as having low radiological risk, RadCon planning can be informal and performed in conjunction with the issuance of an RWP.

During the walk down, radiological data related to the work should be assembled or at least requested and the risk level assigned by the RadCon screener should be confirmed. This data is necessary to make radiological planning recommendations and will also be used to develop a job specific RWP. If the walk down determines the risk level is low, RadCon planning need only be informal and can be done in conjunction with RWP development.

A high risk level would require at least a formal ALARA review and may also require a facility Higher Level Review depending on facility criteria. At a minimum the formal ALARA review should consider the criteria specified in Article 312.4 of *HSRCM-1*. For a Medium risk level it is suggested the RadCon organization use the ALARA Management Worksheet to make planning recommendations and that RadCon complete the Post ALARA Review form and include both as part of the Work Package for a historical reference.

The radiological walk down must answer the following key questions for preparing a work package. The radiological screener must also have these questions in mind when initially assigning radiological risk.

- Is the proposed work an infrequent or first time activity as per Article 313 of *HSRCM-1*?
- Will any radioactive systems be breached?
- What is the radiological history of the system?
- What is the radiological history of similar work and are there any lessons learned?
- How much radioactive waste will be generated and what will be its physical form? Will any mixed waste be generated?

- What are the initial radiological conditions and what conditions will be created by the work?
 - airborne
 - beta and gamma dose rates (wholebody and extremity)
 - surface contamination (alpha, beta-gamma) and form of contamination
- Will the work involve cutting, drilling, grinding or welding on potentially contaminated surfaces?
- Are there any surfaces that will be disturbed that have painted contamination?
- Based on radiological data collected or assumed, will any ALARA Trigger levels be reached?
- What engineered controls can be used to mitigate the radiation/contamination levels and minimize the waste created?

The information gathered by these questions will be used to assess the job risk and determine Radiological Work Permit requirements that will affect job planning.

5.2 High Risk

Risk level must be used to determine the ALARA planning effort. High risk levels should not be less conservative than the ALARA Trigger Levels provided by *HSRCM-1*, Article H312.3. In addition, facilities must determine facility specific criteria that will also require formal ALARA reviews and Higher Level Reviews by management. For example, facilities where extremity and/or skin exposure is a concern could add trigger levels for extremities and/or skin, that is, an individual extremity or skin dose of 3,000 mrem or an extremity or skin dose rate of 9,000 mrad/h could trigger an ALARA review or Higher Level Review. High risk levels warrant more extensive (and costly) measures and planning to mitigate radiological hazards. Optimization studies should also be performed to justify the measures.

5.3 Medium and Low Risk

In addition to high risk levels, facilities must develop medium and/or low risk levels.

Medium and low risk levels should follow a graded approach leading to the higher risk levels. The following is an example of medium and low risk levels which might be used based on the ALARA Trigger Levels of *HSRCM-1*.

5.3.1 Medium Risk

- estimated individual dose or collective dose for a task projected to exceed 500 person-mrem.
- estimated individual dose to the extremities and/or skin of 2,000-3,000 mrem.
- predicted airborne radioactivity concentration in excess of one DAC or an integrated exposure of 100-200 DAC-hours.
- work area removable contamination greater than 10 times but less than 100 times the values in Table 2-2 (*HSRCM-1*)
- entry into areas where whole body dose rates exceed 100 mrem/h in a work area.
- tasks that have dose rates to the extremities and/or skin that may exceed 6,000 mrad/h.
- potential releases of radioactive material to the environment that are below DOE M 232.1 reporting requirements.

5.3.2 Low Risk

Radiological work with levels less than Medium risk levels should be considered Low risk.

6.0 Risk Based Radiological Planning

ALARA planning should be done at all three risk levels. However, the difference in planning between the risk levels is the relative benefit associated with the cost of the planning effort. At lower risk levels the benefit may not justify very much effort or cost. However, it is also important to look at the long term radiological risk of work that will be performed routinely. For example, a single job may not warrant exposure reduction because it only saves a few person-mrem or cleans-up a small amount of contamination. However, if the job is to be repeated or other jobs will be performed in the same area, the collective exposure saved or contamination build-up prevented during several low risk jobs may warrant a high risk shielding or contamination control application.

6.1 High Risk Planning

Planning for high risk radiological work should include a formal ALARA Review and may include a facility Higher Level Review. The steps taken to mitigate radiological hazards should be formally documented using the ALARA Management Worksheet (AMW). The work should have a documented Pre-Job ALARA Review Record and Post-ALARA

Review completed by the job supervisor or lead engineer. The AMW, Pre-Job ALARA Review Record, and Post ALARA Review forms are all part of the ALARA Program and available on macros (see WHC-IP-1043, *Occupational ALARA Program*).

RadCon should participate in the conceptualization and walk down of the work and give recommendations to the person responsible for completing the AMW for documentation of those recommendations. RadCon should review the Work Package for radiological hold points and work steps before the RWP is developed.

Unless there are significant changes to procedures or equipment, repetitive high risk work need not undergo the same cycle of RadCon planning for each repetition of the work. However, pre-job meetings should be conducted to ensure all personnel are familiar with their roles and understand radiological conditions and, post job reviews should be utilized to promote continuous improvement and job efficiency.

6.2 Medium Risk Planning

Planning for medium risk radiological work should begin with RadCon participation in the work conceptualization and walkdown. RadCon should input their radiological recommendations. The AMW is one way for RadCon to input and document recommendations. RadCon should also review the Work Package for radiological hold points and radiological work steps before the RWP is developed. If the AMW is used by RadCon it should become part of the Work Package. It is also suggested that RadCon perform a post job review for the work package.

6.3 Low Risk Planning

Planning for Low risk radiological work need only be informal and can be performed in conjunction with preparing the RWP for the job.

6.4 Radiological Planning Guidance

Radiological planning recommendations should be based on the ALARA planning checklist found on the ALARA Management Worksheet. Additional guidance is found in the ALARA Training section of the *WHC Occupational ALARA Program* manual, WHC-IP-1043. Guidance for incorporating radiological controls in technical work documents is also available (see reference 7).

7.0 References

- (1) INPO 91-014, *Guidelines for Radiological Protection at Nuclear Power Stations*, Chapter V, December 1991
- (2) *System ALARA Manual*, Duke Power Company, 1996
- (3) HSRCM-1, Revision 2, *Hanford Site Radiological Control Manual*
- (4) WHC-CM-1-8, *Work Management*
- (5) HNF-CM-4-27, *Radiological Control Practices and Procedures*
- (6) WHC-IP-1043, *WHC Occupational ALARA Program*
- (7) WHC-IP-1217, *Work Management Guidance*
- (8) Letter No. 9656444, L.K. Trent, FDH, to P. W. Kruger, RL, "EA 96-02 Implementation Actions: Enforcement Action Response," dated December 17, 1996.
- (9) Internal Memo No. 33680-LOW-95-006, ALARA/CCIP Program Office to Facility Operations Managers, "Recommendations on Incorporating Radiological Controls into Technical Work Documents for Radiological Work", dated June 14, 1995.

Fundamental Work Planning Process

Figure 1

Fundamental Work Planning Process (Enhanced for Radiological Planning)

Figure 2

RadCon Screening Process

Actions taken on the basis of RadCon recommendations will tend to lower job risk levels.

Figure 3