

## FERMILAB FORMAL ALARA REVIEW PROCEDURE

### A. PURPOSE

The purpose of this procedure is to provide conditions, elements and instructions for documenting a formal ALARA review.

### B. TRIGGER LEVELS REQUIRING A FORMAL ALARA REVIEW

If a nonroutine or complex work activity is estimated to exceed any of the following trigger levels, a formal radiological review is required.

1. Estimated individual does greater than 200 mrem for the task
2. Collective doses estimated to be greater than 1000 person-mrem for the task
3. Work is to be done in radiation fields in excess of 1000 mrem'/hr
4. Predicted airborne radioactivity concentrations in excess of 10% of a DAC
5. Work in areas having removable contamination greater than 10 times the values in Table 2-2 of the FRCM
6. Potential radioactivity releases to the environment in excess of the limits specified by DOE 5400.5

If any of the above trigger levels are estimated, then complete Attachment A, Formal ALARA Review Worksheet.

### C. LIMITATIONS

1. Prior (oral) approval of the area RSO or designee is required before any individual undertakes work which is likely to cause his/her dose for the week to exceed 100 mrem.
2. The prior written approval of the RSO is required before any individual may undertake work which is likely to cause his/her dose for the week to exceed 200 mrem.
3. Prior Notification of the SRSO: When work is to be done in areas where the dose rate exceeds 1.0 rem/hr, and the total collective dose to all personnel can be expected to exceed 1 rem, the SRSO must be notified in advance. Continuous supervision by radiation safety personnel (or other individuals trained for such work by the RSO ) shall be provided whenever anyone is working in an area with accessible spaces having dose rates over 1 rem/hr.

### D. PHASES OF ALARA REVIEW PROCESS

The ALARA review process should include three discrete phases:

1. Pre-job Planning and Briefing

Pre-job planning should be held prior to the conduct of work and include estimates of collective dose and assessment of tasks for optimum approach for the job. These estimates should be compared to established trigger levels.

Pre-job briefings should be conducted by the cognizant work supervisor with input from Radiological Control Organization. Workers and supervisors directly participating in the job, cognizant Radiological Control personnel, and representatives from involved support organizations should attend the briefing.

A summary of topics discussed and attendance at the pre-job briefing should be documented. This documentation should be maintained as a part of the ALARA review document.

a. The pre-job briefing should include:

- 1) Source of work to be performed
- 2) Radiological conditions of the workplace
- 3) Procedural and RWP requirements
- 4) Special radiological control requirements
- 5) Radiologically limited conditions, such as contamination or radiation levels that may void the RWP
- 6) Radiological Control Hold Points
- 7) Communications and coordination with other groups
- 8) Provisions for housekeeping and final cleanup
- 9) Emergency response provisions

2. Implementation of pre-planned tasks and dose tracking

During the performance of jobs for which a pre-job dose estimate was made, the Radiological Control Organization should periodically monitor collective dose accumulation and compare it with the pre-job dose estimate. Differenced should be reviewed to identify causes and assess the need for corrective actions as well as to identify successful dose reduction techniques.

During performance of the pre-planned task, Radiological Control Technicians and their supervisors, line supervision, and any employee through his/her supervisor has the authority and responsibility to stop radiological work activities for any of the the following reasons:

- a. Inadequate radiological controls
- b. Radiological controls not being implemented
- c. Radiological Control Hold Point not being satisfied
- d. Discovery of any nonradiological hazard which renders the operation unsafe.

3. Post-job Reviews

Upon completion of radiological work, a post-job review should be conducted. The post-job review should include a comparison of the actual person-rem with that of the pre-job review estimates. It should evaluate the effectiveness of the pre-job plan and document lessons learned. Post-job reviews may be used as a guide for planning future radiological work similar in nature to the work being reviewed. This review evaluates the performance of the work and may be conducted as a critique. Critiques are meetings of the personnel knowledgeable about an event (either a success or an abnormal event) to document a chronological listing of the facts. Critique meetings should be conducted as soon as practicable after the pre-planned task has been completed.

Lessons learned from the task should be evaluated and documented as a part of the post-job review.

## **E. ELEMENTS OF ALARA REVIEW**

Formal ALARA reviews are unnecessary for most operational tasks involving radioactivity at Fermilab since individual and collective dose for most tasks are negligible and the number of these tasks is quite large.

A formal ALARA review may include decisions to expend resources to reduce dose, contamination and radioactive effluent releases. The review should include consideration of the costs and benefits in relation to social, technical, economic, practical and public policy. For cost-benefit analysis, a value of \$2000/person-rem is used, unless otherwise specified. That is, if a dose reduction of at least 1.0 person-rem can be achieved with the expenditure of \$2000 or less the reduction is reasonable and should be accomplished. If the cost exceeds \$2000/person-rem saved, a more detailed review will be required to determine if the expenditure is reasonable.

The formal ALARA review document should consider the following applicable elements:

1. Inclusion of Radiological Control Hold Points in the technical work documents or RWP
2. Elimination or reduction of radioactivity through application of shielding decontamination and (where applicable) fluid line flushing
3. Use of work processes and special tooling to reduce time in the work area
4. Use of engineered controls to minimize the spread of contamination and generation of airborne radioactivity.
5. Specification of special radiological training or monitoring requirements
6. Use of mock-ups for high exposure or complex tasks
7. Engineering, design and use of temporary shielding to reduce radiation levels
8. Walkdown or dry-run of the activity using applicable procedures
9. Staging and preparation of necessary materials and special tools
10. Maximization of prefabrication and shop work
11. Review of abnormal and emergency procedures and plans
12. Identification of points where signatures and second party or independent verifications are required
13. Establishment of success or completion criteria, with contingency plans to anticipate difficulties
14. Development of pre-job estimate of collective dose to be incurred for the job
15. Provisions for waste minimization and proper waste disposal in accord with other Fermilab policies

## ATTACHMENT A FORMAL ALARA REVIEW WORKSHEET

**Division / Section**  **Date**

**Job Description**

**Job Location**

**RWP Number (s)**

**Identify each of the following trigger levels which apply:**

- YES    NO   Estimated individual doses greater than 200 mrem for the task
- YES    NO   Collective doses estimated to be greater than 1000 person-mrem for the task
- YES    NO   Work is to be done in radiation fields in excess of 1000 mrem/hr
- YES    NO   Predicted airborne radioactivity concentrations in excess of 10% of a DAC
- YES    NO   Work in areas having removable contamination greater than 10 times the values in Table 2-2 of the FRCM
- YES    NO   Potential radioactivity releases to the environment in excess of the limits specified by DOE 5400.5

**Complete the following, as applicable:**

Maximum Individual Dose Estimate  rem

Collective Dose Estimate  person rem

Maximum Area Dose Rate  mrem/hour

Airborne Radioactivity Estimate  mCi/ml

Removable Contamination Levels  mCi/100 cm<sup>2</sup>

Radioactivity Release Estimate

Ingested Water  mCi/ml

Inhaled Air  mCi/ml



**Review the following elements to determine applicability to task. If applicable, provide explanation, as necessary.**

Applicable  NA

Inclusion of Radiological Control Hold Points in the technical work documents or RWP


Applicable  NA

Elimination or reduction of radioactivity through application of shielding, decontamination and (where applicable) fluid line flushing


Applicable  NA

Use of work processes and special tooling to reduce time in the work area


Applicable  NA

Use of engineered controls to minimize the spread of contamination and generation of airborne radioactivity


Applicable  NA

Specification of special radiological training or monitoring requirements


Applicable  NA

Use of mock-ups for high exposure or complex tasks


Applicable  NA

Engineering, design and use of temporary shielding to reduce radiation levels


Applicable  NA

Walkdown or dry-run of the activity using applicable procedures


Applicable  NA

Staging and preparation of necessary materials and special tools


Applicable  NA

Maximization of prefabrication and shop work


Applicable  NA

Review of abnormal and emergency procedures and plans


Applicable  NA

Identification of points where signatures and second party or independent verifications are required


Applicable    NA

Establishment of success or completion criteria, with contingency plans to anticipate difficulties


Applicable    NA

Development of a pre-job estimate of collective dose to be incurred for the job


Applicable    NA

Provisions for waste minimization and proper waste disposal in accord with other Fermilab policies


**Post-Job Review Lessons Learned, Recommendations, Discussions:**


Prepared by

Date

Reviewed by

Date

RSO Signature \_\_\_\_\_

Date