39.1 ALARA Program: Pre-Job Considerations (Ontario Hydro)

APPENDIX A-2

ALARA PROGRAM

PRE-JOB CONSIDERATIONS

The following paragraphs provide the details to support the Pre-Job Checklist. These considerations are not all-inclusive.

1.0 PROCEDURE PREPARATION

1.1 Job Procedure Prepared

Comprehensive and detailed work procedures usually result in more efficient work performance and lower personnel radiation exposures. The radiological protection staff should review the procedure for radiological protection considerations.

1.2 Unnecessary Work Deleted

The job procedure should be evaluated on a step-by-step basis to ensure that it proceeds in a logical manner, that no steps are missed, and that redundant or unnecessary steps are deleted.

1.3 Personnel

A list of the personnel needed on the job should be provided identifying the qualification required. In making the list, the need to achieve an equitable distribution of dose within the work group should be considered.

1.4 Radiation Hold Points Identified

It may be advantageous to include radiation monitoring steps or hold points, particularly if there is a potential for a change in radiological conditions such as breaking a line or disassembly of contaminated equipment.

1.5 Tool List Developed

A list of tools known to be needed on the job should be provided. Consideration should be given to the use of previously contaminated tools stored in the radiological zone.

1.6 Special Tools Considered

For certain jobs, special tools have a major effect on exposure reduction through simplification, reduction in time, or reduction in mistakes. Tools should be designed, built, and tested on full-scale models to ensure proper function prior to work in a radiation area. Special tools currently in use include remotely Controlled steam generator tube inspection devices, reactor vessel head tensioner/ detensioner, robotic in-service inspection tools, steam generator tube lancers, various other mechanical tools.

1.7 Prefabrication Considered

Prefabrication should be considered to minimize the work done in a radiation area. For example some welds may be done in the shop, and temporary shielding may be prefabricated to reduce installation time.

1.8 Removal of Component to Low Dose Area Considered

When practical, components may be removed from a system in order to perform maintenance in a low radiation area. Provisions for decontamination or setting up a contaminated working should be considered.

1.9 'Lessons-Learned' Reviewed

The objective of planning is to apply knowledge and past experience to the maximum extent possible to avoid repeating mistakes and to perfect the execution of the required task. Hence, the problems encountered during previous performance of this or similar jobs should be reviewed and necessary improvements included in the performance of the job.

1.10 Prerequisite Work

Other work which must be completed before the main work assignment commences, must be scheduled for completion by predetermined times in a safe manner (eg, system preparation by means of a guaranteed drainage, transfer or collection of tritiated D_2O).

1.11 Backout Provisions Identified

For jobs having the potential for changing radiological conditions and/or high exposure conditions, the workers should know the conditions, which if they develop, should cause them to cease work and leave the work area, eg, dose, dose rate, breakdown in communications, work related situation, time duration, etc.

3320S65

APPENDIX A-2 (Cont)

2.0 SET-UP PREPARATION

2.1 Access to and Exit from Work Area Planned

Planning the access and exit to a radiological control area can minimize the radiation exposure in transit. Consideration should be given to the protection of other workers who may be working in the same general work area on other work assignments. Plans should consider areas for donning and removing anticontamination clothing, briefing workers prior to entry, and frisking workers for contamination when exiting work areas. Additionally, the plans must emphasize the proper removal of radioactive wastes from the work area.

2.2 Service Lines Provided

Plan in advance, when feasible, for service lines including lines for lighting, breathing air, instrument air, welding, electricity, and ventilation. Installation of these services should avoid interference with worker access and be performed with minimum radiation exposure.

2.3 Staging/Set Up in Accessible Area

Consideration should be given to establishing a staging or set-up location in a low radiation area near or adjacent to the radiation work area. Preparation of tools or calibration of equipment can then be performed in a low dose area which is readily accessible to the job site.

2.4 Communication Provided

Provisions for sound-powered telephone headsets, walkie-talkies, or a phone system can reduce radiation exposure by reducing the time required to make decisions on matters not foreseen in written work procedures or to wait for inspectors or radiological control technicians. Communication also allows supervisors to maintain effective control of a job when visual observation is impractical due to high radiation levels. TV systems may be used to monitor work and therefore reduce exposures of both the supervisors and workers.

TV systems should be able to operate under the environmental and lighting conditions at the job site and be remotely operated.

2.5 Radiological Controls

Anticipation of radiological conditions during a job and identification of controls should be provided.

APPENDIX A-2 (Cont)

2.5.1 Radiological dose rate, surface contamination, and airborne contamination surveys should be performed. Hot spots and low dose rate waiting areas should be identified and posted. If it is determined that the planned work may involve loose contamination, a rubber area and/or a rubber change area should be considered.

2.5.2 Surface contamination may be controlled through flushing, draining, decontamination, or the use of absorbent paper, glove boxes, or tents.

2.5.3 Airborne contamination may be controlled by the use of auxiliary ventilation or by maintaining contaminated surfaces wet.

2.5.4 Dose rates may be controlled by the use of shielding, removal of the source, or by working in the lowest radiation area practical. Filling coolant systems may result in lower radiation levels from water shielding. Shielding close to the source will usually require less shielding by weight than shielding away from the source. Shadow shields may be used to shield work areas or waiting areas. The use of shielding should be balanced against exposure received during installation. As a first approximation, two inches of lead should reduce the radiation levels by a factor of ten; one inch of lead will reduce the level by a factor of more than three. Engineering approval should be obtained prior to installation of shielding directly on any plant systems or equipment. In some cases, the use of a mock-up can reduce the exposure received during installation by cutting and designing the shielding outside the radiation area and by allowing installation practice in advance.

2.5.5 Dosimetry location should be reviewed to ensure accurate recording of exposure. Extremity dosimeters are to be issued when it is likely an extremity dose will significantly exceed the whole body or skin dose and when the extremity dose is likely to exceed 60 mrem per day. If radioactive work is performed in open channels or beams, special precautions should be taken for appropriate dosimetry, ie, head and waist packs, etc.

2.5.6 Remote monitoring equipment and integrated digital dosimeters should be incorporated into applicable radiological work activities, when possible.

2.6 Protective Equipment

Protective equipment required will depend on the nature of the work to be performed and the radiological and environmental conditions in the area. Respiratory protection equipment may be required if a significant potential for airborne contamination exists. Plastic suits may be used also in very hot or humid environments. It is important to provide a comfortable working environment to maintain worker efficiency. Minimize beta radiation exposure when performing maintenance inside components by using safety glasses for eye protection, face shields and thick protective clothing for skin protection. Consideration should be given to the need of changing gloves to control extremity exposures from contaminated gloves or the use of shielded gloves. Also, depending on the anticipated radiological conditions, other protective clothing such as disposable plastics, double disposable tyvec coveralls, shoe covers, etc, should be considered.

3.0 WORKER PREPARATION

3.1 Experienced Workers Selected

A successful ALARA program rests heavily on the ability and experience of the radiation workers. Workers who are familiar and practiced at a task can perform the work more efficiently and accurately.

3.2 Special Training

Special training is appropriate for high radiation jobs to improve workers technical skills and broaden their understanding and practice of ALARA techniques. Personnel provided special training for particular work should be used for that work. Photos or video tapes are often useful in training, rehearsal, and briefing of workers to reduce the time needed to become oriented at the job location.

3.3 Rehearsal

Rehearsals are essential for satisfactory performance of complicated or difficult tasks. For maximum effectiveness, rehearsals should be conducted in conditions similar to the actual work. Simulating conditions might include the use of protective clothing and respirators. As part of the review process, the ALARA Coordinator should observe in the rehearsal facilities and approve the rehearsal plan for those actual work activities with high dose consequences.

APPENDIX A-2 (Cont)

3.4 Mock-up Training

Mock-ups are useful for training, rehearsals, and final briefings, as well as proof-testing details of a work procedure, worker proficiency, tool performance, and work interferences. The degree of worker preparation necessary depends on the level of radiation dose rates, the level of difficulty in performing the task, and the frequency of performing the task. Consideration should also be given to the cost of building a mock-up and its utilization. As a general guideline, a mock-up may be warranted if it can be used often, if it is effective in reducing the time required to perform a task, and if the work is in a high radiation area.

3.5 Briefing Workers

Prior to work in a radiation area, a worker should be briefed. Radiological survey data on an area arrangement drawing can be very useful for informing workers about high and low radiation levels in the work area. Briefing should also include verifying that the worker has been adequately trained, has the necessary tools, knows what he is assigned to do, and where and how to do it. Workers and supervisors should be aware of their radiation exposure status and exposure goals for the job.

3.6 Evaluate Use of Fewer Workers

In some cases, using fewer workers on a job will reduce the total exposure for the job. Using a minimum number of workers avoids having part of the team standing around. Once a job is started, the same workers should complete the job and avoid inefficiencies associated with substituting other workers in the middle of the job if exposure conditions permit.

3.7 Radiation Protection Assistants Identified

APPENDIX A-3

ALARA PROGRAM

PRE-JOB REVIEW RECORD

JOB: _____

TASKS: _____

JOB FOREMAN: _____ EXT. EXPOSURE: _____

RWP NO.: _____ ALARA NO.: _____

MEETING DATE: _____

ATTENDEES: _____ _____

_____ _____

_____ _____

ITEMS DISCUSSED

_____

_____

_____

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_____

INSTRUCTIONS TO BE IMPLEMENTED

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Prepared by: _____ Date: _____

ALARA Coordinator

3320S65

APPENDIX A-4

ALARA PROGRAM

JOB EXPOSURE ESTIMATE FORM

JOB TITLE: _____

REASON FOR JOB: _____

ALARA NO.: _____

1. List any concurrent work or future work in areas that may be coordinated with this job to prevent conflicting conditions and/or duplication of job tasks.

   a.
   b.
   c.

2. List the job breakdown by expected tasks and subtasks to be performed including on-the-job (RWP) man-hours.

TASK	TITLE	(OPTIONAL) SYS/COMP/JOB/FUNC	RWP(1) MAN-HOURS	ESTIMATED MAN-REM(2)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
		TOTAL		

Prepared by: _____ _____ Reviewed by: _____ _____
Job Planner Date ALARA Coordinator Date

(1) Completed by Job Planner
(2) Completed by Job Planner with data supplied by radiological protection staff

Original: ALARA Coordinator
cc: Job Planner

3320S65

APPENDIX A-5

ALARA PROGRAM

POST-JOB REVIEW RECORD

JOB: _____ PROCESS NO.: _____

ALARA NO.: _____ JOB STATE DATE: _____ JOB END DATE: _____

TASK	TASK TITLE	ESTIMATED MAN-HRS	ACTUAL MAN-HRS	ESTIMATED MAN-REM	ACTUAL MAN-REM	MAN-REM DIFF (%)*
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
	TOTALS					

CONCLUSIONS:

POST-JOB REVIEW MEETING HELD: _____ (Date)

REVIEW PERFORMED BY: _____ / _____ (ALARA Engr. / Date)

* % Difference = $\frac{\text{Actual-Estimated}}{\text{Estimated}} \times 100$

3320S65