INTRODUCTION
RADIATION PROTECTION PLAN

The intergranular stress corrosion cracking (IGSCC) project will involve the removal of the existing recirculation piping and installation of new pipe at the Cooper Nuclear Station (CNS). Since the project requires a large manpower force and many of the work areas are located in high radiation areas, a practical organized commitment must be made to keep exposures to a minimum. For this reason, this Radiation Protection Plan for the IGSCC outage at CNS was developed. It encompasses the ALARA and Health Physics requirements necessary to insure that exposures incurred during the IGSCC outage are as low as reasonably achievable. The IGSCC Project Radiation Protection Plan is divided into seven separate chapters. Each chapter is devoted to a particular aspect on how exposures will be kept to a minimum. The chapters of the Radiation Protection Plan are:

I. Organization
II. ALARA
III. Exposure Control
IV. Facilities and Equipment
V. Training
VI. Implementation of Radiation Protection Plan
VII. Radioactive Waste Disposal

Each chapter explains in detail its particular subject matter and how it relates to the overall ALARA concept. The Radiation Protection Plan is written to utilize existing CNS procedures whenever possible. However, when existing procedures do not adequately cover the specialized requirements of the IGSCC project, supplementary procedures are stipulated. These "new" procedures shall be written and approved prior to the beginning of the outage whenever possible, but if the need occurs, procedures may be developed during the outage.

Cooper Nuclear Station Management is committed to insuring that all operations and activities within its boundaries will be performed in a manner that will not jeopardize the public health and safety or its employees. Included in this obligation is the commitment to keep radiation exposures ALARA to occupationally exposed personnel and the general public, and are in accordance with 10 CFR 20, Regulatory Guides 8.8 and 8.10 and all other applicable commitments listed in the Final Safety Analysis Report. This will be met by strict adherence to the IGSCC Project Radiation Protection Plan, approved CNS procedures and CNS approved procedures written by the contractor.

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CHAPTER I - ORGANIZATION

The organizational structure for the IGSCC outage at CNS is separated into two main divisions; Nebraska Public Power District (NPPD) and Chicago Bridge and Iron (CBI or referred to as Contractor). These two separate entities will have distinct responsibilities in the overall management of the outage. In this section, the organizational structure, responsibilities and interfacing will be explained in detail. Some responsibilities listed in this section may only impact the ALARA program indirectly but are included for completeness.

Section A will identify the various ALARA responsibilities assigned in general but not to specific individuals. Individual responsibilities will be presented in Section B.

A. GROUP RESPONSIBILITIES

1. NPPD

a. Health Physics Functions

Radiation exposure control - The NPPD group will be responsible for the tracking of all personnel exposure received at Cooper Nuclear Station. In addition, the plant, with cooperation of the contractor, is responsible for insuring that all exposures will be kept within limits in accordance with CNS Procedure 9.1.2.1.

Dosimetry Control - NPPD will be responsible for the issuance and control of all dosimetry used on site. The TLD's* issued by NPPD will be considered the exposure of record for all personnel. Dosimetry control will be in accordance with CNS Procedure 9.1.1.3.

Posting of Radiological Areas - NPPD will be responsible for the determination and posting of radiological areas within the plant boundaries as specified by CNS Procedure 9.1.2.2.

Access Control - NPPD will have the authority to refuse entrance to radiological areas within the plant to those individuals who do not meet the requirements determined by the Special Work Permit (SWP) in accordance with CNS Procedure 9.1.1.4.

Radiation and Contamination Monitoring - NPPD will be responsible for the monitoring of the plant to identify radiation and contamination areas as specified by CNS Procedures 9.1.2.1 and 9.2.2.2.

SWP Generation and Supervision - NPPD will develop and supervise all special work permits for the outage. SWPs will be written in accordance with CNS Procedure 9.1.1.4.

*Thermoluminescent dosimeter

Respiratory Protection - NPPD will determine the necessity of respiratory equipment according to the requirements of CNS Procedures 9.3.6.1 and 9.1.5. NPPD will also be responsible for the issuance, maintenance and cleaning of respiratory equipment in accordance with Procedure 9.1.5.

Bioassay of Personnel - NPPD will be responsible for bioassay of personnel on site which will be done in accordance with CNS Procedure 9.1.8.

Drywell Control - NPPD Health Physics personnel will have the authority to stop activity in the drywell if radiological control of an area is determined to be insufficient.

Disposal and Shipment of Radioactive Waste - NPPD will be responsible for the disposal and removal of radioactive wastes from the site. All packaging and shipping will be in accordance with CNS Procedures 7.9.2 and 9.5.3.

Airborne Contamination Monitoring - NPPD will monitor for airborne contamination to determine respiratory requirements. Airborne monitoring frequency will be based on requirements in CNS Procedure 9.2.3 or whenever activity in a work area requires monitoring.

b. ALARA Responsibilities

Dose Tracking of Personnel - NPPD will keep track of the exposure received by all personnel on site, including all Contractor personnel. In addition to normal tracking of exposures in accordance with CNS Procedure 9.1.1.3, a special dose tracking system will be set up to keep personnel doses ALARA.

Dose Mitigation By Task - Personnel exposure will also be tracked by NPPD. NPPD will track all major activities for the outage with special emphasis placed on the IGSCC project.

An ALARA Committee will be set up to review ALARA concepts during the IGSCC project. The Committee will be chaired by a CNS senior staff member qualified as Radiation Protection Manager in accordance with Regulatory Guide 1.8.

In addition to the chairman, selected NPPD staff will be members of the ALARA Committee.

NPPD will review and approve all task work packages for ALARA considerations.

NPPD will review and approve all man-Rem estimates submitted by the Contractor for that IGSCC project.

NPPD will review all work in progress to insure ALARA requirements are being met. NPPD shall have the authority to stop work if ALARA practices are inadequate.

NPPD will review and approve shielding designs proposed by the Contractor to keep exposures ALARA.

This radiation protection plan will remain in effect throughout this outage with NPPD responsible for its enforcement.

c. Security

NPPD will be responsible for maintaining security at Cooper Nuclear Station in accordance with Cooper Nuclear Station Safeguards Plan.

d. Training

CNS will be responsible for general employee training of all personnel on site in accordance with CNS Procedure 1.5. This training also includes basic ALARA and radiological safety practices.

e. Other Outage Functions Related to ALARA

NPPD will be responsible for the location of clean and contaminated equipment storage locations.

NPPD will review and approve all rigging paths submitted by the Contractor.

NPPD will be responsible to insure that shielding is installed properly and will review and approve shielding proposals submitted by CBI.

NPPD will approve and control all procedures and work packages submitted by the Contractor for ALARA and technical considerations.

NPPD will be responsible for final Quality Assurance (QA) of all documentation and construction in the outage in accordance with the NPPD Quality Assurance Manual.

NPPD will be responsible for engineering and construction control of all items in the outage. NPPD will have the final authority on all engineering and construction decisions.

2. CBI Group

CBI was contracted by Nebraska Public Power District to perform the actual pipe removal and installation for the IGSCC project. They will be responsible for the following items:

a. ALARA

CBI will develop the initial man-Rem and man-hour estimate for the IGSCC project. This will be the official initial estimate once approved by NPPD.

CBI will assign the particular jobs to craft personnel. CBI will be responsible for keeping exposures for craft of similar skill as low and as equalized as reasonably achievable.

CBI will be responsible for reporting any significant exposure overruns of task estimates to the ALARA Committee for review.

CBI will be required to participate on the ALARA Committee.

CBI will submit updated man-Rem estimates when required.

CBI will perform initial analysis for all shielding requirements.

CBI will be responsible for the training of craft personnel on specialized equipment required for the outage.

CBI will be responsible for the training of craft personnel on a mock-up simulating the actual work areas following the procedure.

CBI will be responsible for training craft personnel on the ALARA practices used for this outage not covered in General Employee Training.

b. Other Responsibilities not Directly Related to ALARA

CBI will be responsible for the development of work packages used in the outage. All work packages developed must conform to the ALARA practices used at CNS.

CBI will be responsible for direct supervision of the work crews and insure they are following ALARA practices at all times.

CBI will be responsible for keeping the work areas clean during times of inactivity. This includes removing all unused tools and placing them in their appropriate storage area. This will not only include general housekeeping, but also decontamination of areas at the discretion and direction of the Health Physics Department.

B. INDIVIDUAL RESPONSIBILITIES

In this section the responsibilities of individuals for the IGSCC outage will be assigned. The NPPD staff will be listed first, then the CBI staff will be listed. The job descriptions identified pertain only to IGSCC Health Physics ALARA outage responsibilities and is not meant as an all inclusive list of all individual's responsibility at the plant or includes everyone associated with the outage. Also, only job titles will be identified in this section. These positions are listed on the organizational charts (Figures 1.1 and 1.2) at the back of the chapter.

1. NPPD Personnel

Construction Manager - The Construction Manager is responsible for overall management of IGSCC outage project, supervises Contractor and CNS personnel assigned to IGSCC project. Member of ALARA Committee.

Technical Supervisor - The Technical Supervisor provides technical assistance to Construction Manager for all Engineering/Construction concerns related to IGSCC project. Member of ALARA Committee.

ALARA Consultant - The ALARA Consultant will provide assistance to Construction Manager on ALARA/Health Physics concerns and is responsible for dose tracking for the IGSCC project. Member of ALARA Committee.

Civil Engineer - The Civil Engineer provides assistance to Construction Manager to insure all rigging systems and movement of equipment will be done safely and in the most efficient manner without unacceptable loading conditions.

Division Manager of Nuclear Operations - The Division Manager of Nuclear Operations has the responsibility of assuring the safe, effective and economical operation of Cooper Nuclear Station. Also the Station Operating Review Committee (SORC) Chairman. SORC approval of all procedures relating to the IGSCC project is required.

Technical Staff Manager - The Technical Staff Manager assists the Division Manager of Nuclear Operations in the safe, effective and economical operation of Cooper Nuclear Station and serves as a member of the SORC.

Technical Manager - The Technical Manager is responsible for providing technical support in all aspects of operation and maintenance of CNS. The Technical Manager provides technical support for radiation protection (health physics), ALARA program and plant chemistry. The Technical Manager serves as a member of the SORC.

Operations Manager - The Operations Manager has the overall responsibility for the in-plant direction of the safe, efficient operation and effective maintenance of CNS. The Operations Manager is a member of the SORC.

Training Manager - The Training Manager is responsible for the CNS training program, training staff qualifications, quality of training conducted and content of the training program

Outage Coordinator - The Outage Coordinator plans all maintenance and refueling outage activities and coordinates the activities of all departments. In addition, he will coordinate the necessary manpower for all work taking into consideration the type of work needed, experience required, radiation levels and total number of man-hours involved. The Outage Coordinator prepares the CNS outage schedule.

Operations Supervisor - The Operations Supervisor is responsible for the safe, efficient operation of the reactor and plant equipment. The Operations Supervisor is a member of the SORC Committee.

Technical Staff Assistant - The Technical Staff Assistant is responsible for providing coordination and assistance to the Technical Manager in accomplishing the goals and directives of the technical support group relative to Plant Engineering, Reactor Engineering, Chemistry and Health Physics. The Technical Staff Assistant supports the chemistry and radiation protection functions. The Technical Staff Assistant provides guidance for maintaining the chemistry and radiochemistry control program plus provides guidance for maintaining radiation protection and ALARA programs. The Technical Staff Assistant supports radioactive waste operation and radioactive waste shipping efforts. The Technical Staff Assistant is the Chairman of the ALARA Committee.

Plant Engineering Supervisor - The Plant Engineering Supervisor is responsible for providing plant engineering support in all aspects of operation and maintenance of the Cooper Nuclear Station. The Plant Engineering Supervisor reviews design change documentation to ensure personnel exposures are maintained ALARA. The Plant Engineering Supervisor serves as a member of the SORC.

Chemistry and Health Physics Supervisor - The Chemistry and Health Physics Supervisor is responsible for maintaining a radiation protection program to fulfill requirements set forth by the Nuclear Regulatory Commission. The Chemistry and Health Physics Supervisor reviews personnel radiation exposure and works to keep this exposure ALARA. The Chemistry and Health Physics Supervisor evaluates problems related to Health Physics and Chemistry and offers remedies to these problems. The Chemistry and Health Physics Supervisor directs the efforts of the Chemistry and Health Physics groups. The Chemistry and Health Physics Supervisor is a member of the SORC and the ALARA Committee.

Assistant to the Chemistry and Health Physics Supervisor - The Assistant to the Chemistry and Health Physics Supervisor assists the Chemistry and Health Physics Supervisor in maintaining a radiation protection program to fulfill requirements set by the Nuclear Regulatory Commission. The Assistant to the Chemistry and Health Physics Supervisor is a qualified Radiation Protection Manager at CNS.

Health Physicist - The Health Physicist assists the Chemistry Health Physics Supervisor in keeping radiation exposures ALARA for all personnel on site at Cooper Nuclear Station. The Health Physicist determines the protective clothing, protective equipment and protective actions required while working in a radiation or contaminated area. The Health Physicist verifies that all radioactive waste shipments are packaged and transported in accordance with applicable regulations. The Health Physicist schedules radiological safety coverage during outages for a larger than normal work force. The Health Physicist evaluates special work permits as required.

ALARA Coordinator - The ALARA Coordinator oversees the occupational exposure of CNS and Contractor personnel by investigating the use of engineering controls, limiting workers stay time, use of shielding and other methods as necessary. The ALARA Coordinator will review work packages for ALARA concern. The ALARA Coordinator will perform the necessary shielding calculations to determine the appropriate amount required. The ALARA Coordinator is a member of the ALARA Committee.

Lead Health Physics Technician - The Lead Health Physics Technician insures that radiation and contamination surveys are performed as scheduled. The Lead Health Physics Technician also insures that work activities are performed with proper radiological considerations. The Lead Health Physics Technician maintains the respiratory protection program as well as the Environmental Sampling Program and keeps all monitoring equipment in good repair. The Lead Technician will verify SWPs required for each job. The Lead Health Physics Technician prepares some of the Special Work Permits. The Lead H.P. Technician helps to insure ALARA practices are followed in work areas.

Health Physics Technician - The Health Physics Technician performs all radiation and contamination surveys. The Health Physics Technician monitors work activities to maintain good radiological controls. Operation and calibration of the radiation detection and counting equipment are done by the Health Physics Technicians. Assisting the Lead Health Physics in maintaining the Respiratory Protection Program is another job function. The Health Physics Technician assists the Lead Health Physics Technician in the writing of Special Work Permits. The Health Physics Technician helps to insure that ALARA practices are followed in work areas.

Auxiliary Equipment Supervisor - The Auxiliary Equipment Supervisor supervises all operations of the liquid and solid radioactive waste systems, water treatment systems and ventilation units. The Auxiliary Equipment Supervisor supervises and trains operators to run the auxiliary equipment. The Auxiliary Equipment Supervisor also compiles all the records of radioactive waste and water treatment.

General Employee Instructor - The General Employee Instructor is responsible for preparing training materials and insuring that each worker is properly indoctrinated in general plant practices The General Employee Instructor instructs employees in Industrial Safety, Radiological Protection Training, Emergency Plan, Quality Assurance plus others required by the Nuclear Regulatory Commission and other regulatory agencies.

2. CBI Personnel

Project Manager - The Project Manager serves as the focal point for communication for the Contractor with CNS for all operation and technical matters. The Project Manager leads the project in planning, organizing, executing and controlling the job activities that are essential for the timely and satisfactory completion of the project. The Project Manager is ultimately responsible for seeing that the CBI ALARA program is maintained.

Site Manager - The Site Manager assists the Project Manager in the detailed planning and organization of the project. The Site Manager implements and maintains the CBI ALARA program and insures all Contractor personnel follow it.

Lead Engineer - The Lead Engineer will be responsible for field engineering on the project. The Lead Engineer insures that field changes are correct and will not cause undue delay or compromise safety.

ALARA Staff Supervisor - The CBI ALARA Staff Supervisor is responsible to assure that CBI's ALARA program is followed by all CBI employees on site. The CBI ALARA Staff Supervisor will also be responsible for reviewing CBI personnel exposure reports, assist the site manager in keeping worker exposures ALARA with the dose being distributed reasonably equal within a trade (welder, pipe fitter, etc.). The CBI ALARA Staff Supervisor will continually be aware of radiation levels in work areas and work to keep doses ALARA in these work areas. The CBI ALARA Staff Supervisor will advise CNS on shielding requirements to keep dose rates to a minimum in all the work areas. The ALARA Staff Supervisor will serve as the liaison between Contractor and CNS on all ALARA concerns and problems. The ALARA Staff Supervisor will assure that workers are following ALARA work practices at all times while in radiation areas. The ALARA Staff Supervisor will assist in mock up training to see that workers are trained in ALARA practices. The CBI ALARA Staff Supervisor is a member of the ALARA Committee.

ALARA Staff - The ALARA Staff will assist the CBI ALARA Staff Supervisor in carrying out his functions in insuring the project is being accomplished with ALARA practices in mind. These individuals will evaluate and recommend work practices to maintain exposures ALARA. Some of the ALARA Staff are members of the ALARA Committee.

Project Superintendents - The Project Superintendents will be directly responsible for directing the craft labor work force at the site. The Project Superintendents are also responsible for developing rigging procedures and supervise the installation of special fixtures to insure all equipment is transported safely in the drywell and other areas in a minimum amount of time.

Mock-Up & Training Coordinator - The Mock-Up and Training Coordinator is responsible for insuring that all craft operating specialized equipment in the drywell are trained on the equipment, and in addition, trained in the mock-up if their work involves them in the nozzle areas. He will work closely with the ALARA Staff Supervisor to see that ALARA practices are taught along with the operational aspects during training. The Mock-Up Training Coordinator will implement a training procedure that will be used during the training phase.

The preceding job descriptions do not include all CBI personnel who will have ALARA responsibilities. CBI will be staffed to insure that the Contractor principals will be able to meet these basic requirements.

C. <u>ORGANIZATIONAL ALARA INTERFACE</u>

The need for effective communication and interface is imperative whenever ALARA problems arise. The following presents the paths that will be taken whenever ALARA concerns arise:

<u>Mitigation of Routine Health Physics Concerns</u> - If routine Health Physics problems arise during the outage, the CBI ALARA Staff Supervisor will confer with the NPPD Health Physicist and resolve the problem.

<u>Mitigation of ALARA Concerns</u> - If a problem develops where a significant exposure could occur or a significant delay in a task completion (where additional exposure might result), it will be considered an ALARA concern.

The NPPD ALARA Coordinator, CBI ALARA Staff Supervisor, appropriate Health Physics Personnel, and the NPPD ALARA Consultant shall meet and, if possible, resolve the concern at that time. Their collective resolution will be documented along with the concern, and presented to the ALARA Committee at the next scheduled ALARA Committee meeting.

If a resolution is not reached or if the ALARA concern is of major magnitude, a request for resolution will be written to the ALARA Committee Chairman within twelve (12) hours and copies of the report sent to the Construction Manager. At this time the chairman will assign a subcommittee to prepare a detailed report describing the ALARA concern and distribute the report to all concerned parties. (Including the Construction Manager.) Within an appropriate time, the concerned parties will respond, in writing, with a report describing their options and capabilities for resolution of the concern. The subcommittee will then prepare a proposed resolution to the ALARA Committee at either the next scheduled or special meeting. At this meeting, the final resolution will be approved and documented in the minutes of the meeting.

FIGURE I.1 NPPD ORGANIZATIONAL CHART FOR IGSCC OUTAGE

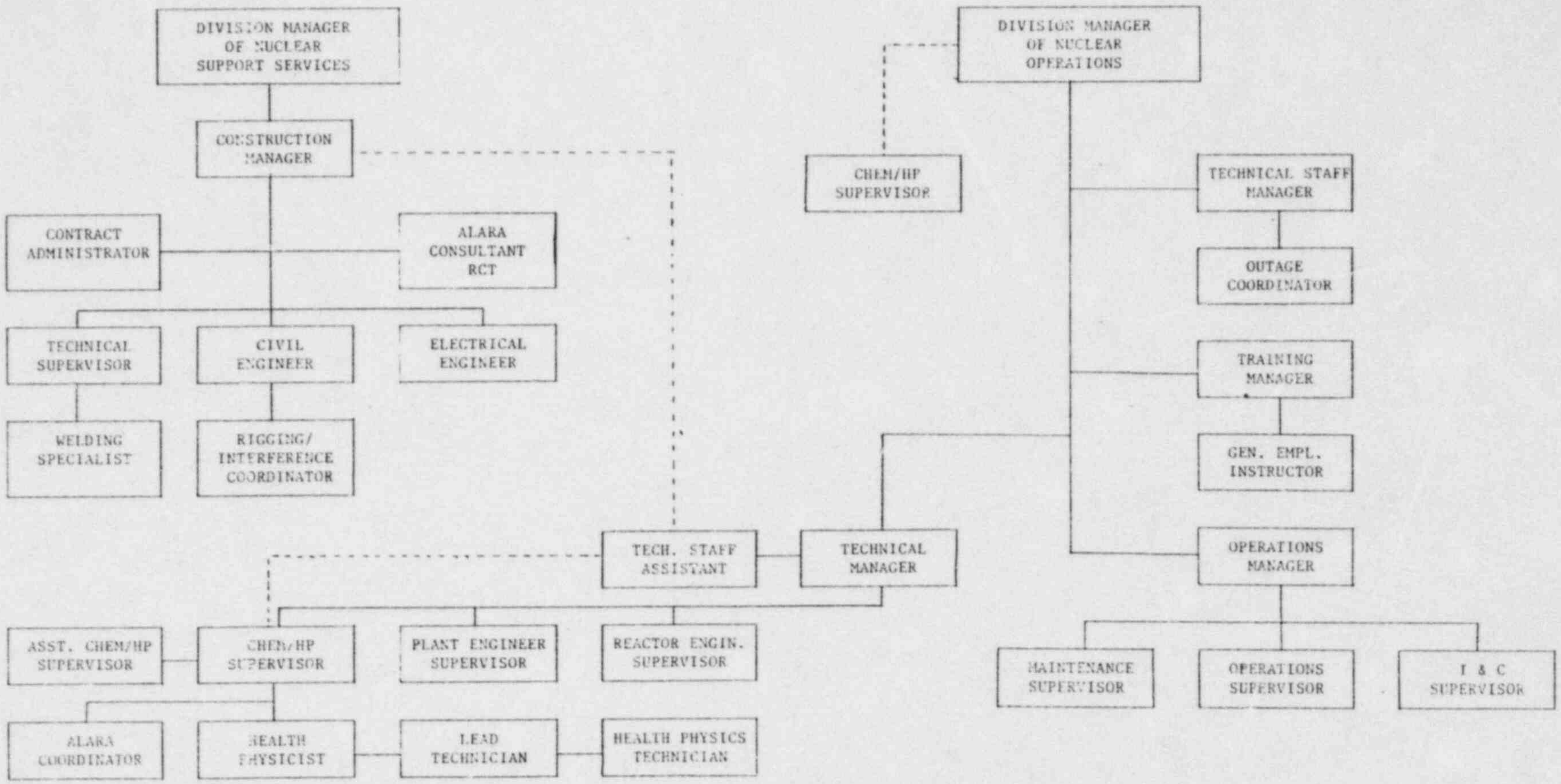

Figure I.1

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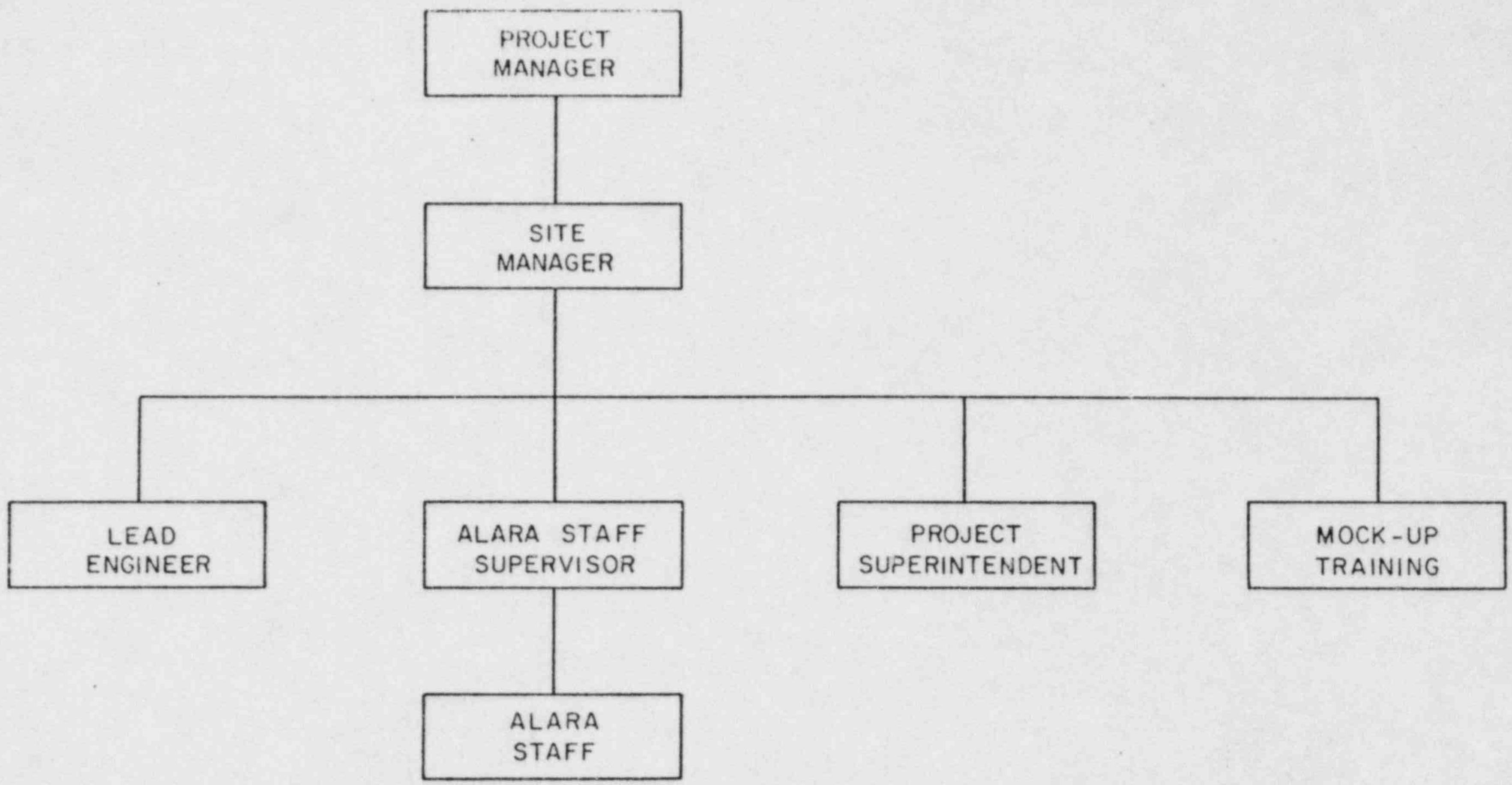
FIGURE I.2. CB&I ORGANIZATION CHART FOR IGSCC OUTAGE



CHAPTER II - ALARA

A. INTRODUCTION

The ALARA (As Low As Reasonably Achievable) concept was developed to insure that all possible efforts are made to reduce occupational exposures to a minimum. In a major outage like the IGSCC outage at the Cooper Nuclear Station, with its large influx of personnel, a formal ALARA program must be implemented to maintain good radiological controls and minimize exposures.

This chapter explains Cooper Nuclear Station's ALARA program as structured for the IGSCC outage. The main parts of the ALARA program are:

1. Function and charter of the ALARA Committee.
2. Presentation of the initial man-Rem estimate.
3. Pre-project planning of the IGSCC project.
4. Job performance tracking.
5. Post project review.

This ALARA program supplements Health Physics Procedure 9.1.1.2 "ALARA Program" at the time of shutdown for IGSCC Related Activities.

B. ALARA COMMITTEE

1. ALARA Committee Charter

The ALARA Committee will be responsible for the implementation of the Radiation Protection Plan and to insure that ALARA practices are maintained for the duration of the IGSCC Outage at Cooper Nuclear Station.

2. ALARA Committee Responsibilities

An ALARA Committee will be set up specifically for the Cooper Nuclear Station IGSCC Outage. Its overall responsibility will be to enforce the Radiation Protection Plan developed for the IGSCC Outage and insure that ALARA practices are maintained throughout the outage. The ALARA Committee will accomplish this by:

a. Reviewing Task Work Procedures prior to project start - The CNS ALARA Committee members will review all Task Work Procedures submitted by the contractor.

b. Reviewing Man-Rem Estimates - The ALARA Committee will review the initial and revised man-Rem estimates submitted by the contractor. The ALARA Committee must approve the man-Rem estimate before it becomes official.

c. Reviewing Man-Rem Totals During the Project - The ALARA Committee will review the man-Rem accumulated for the outage on at least a weekly basis. The ALARA Committee will investigate any items which are considered to be exposure problems or not meeting ALARA objectives.

d. Providing a means where NPPD and the Contractor can openly discuss ALARA concerns - Whenever significant ALARA or radiological problems arise, the ALARA Committee will convene to find a solution. Since both NPPD and Contractor personnel are members of the ALARA Committee, the Committee meeting provides an open round table discussion for these problems.

e. Providing a means where personnel, other than ALARA Committee members, can offer suggestions to save exposures - The ALARA Committee will accept and discuss suggestions from any personnel not a member of the ALARA Committee on exposure saving techniques. This allows anybody associated with the project to have an impact on saving exposures.

f. The ALARA Committee shall be vested with the authority to stop work in the drywell if the Committee feels ALARA practices or radiological controls are not being followed. The stop work order will be presented to the Construction Manager or Division Manager of Operations. The Committee also can require workers possess certain skills before the worker will be allowed to enter the drywell.

3. <u>ALARA Committee Members</u>

The ALARA Committee will be made up of NPPD and Contractor personnel. All members intimately involved in the outage are listed below. The Chairman of the Committee shall be the CNS Technical Staff ssistant who is a senior station staff member qualified as a Radiation Protection Manager per Regulatory Guide 1.8.

NPPD Staff	CBI Staff
Technical Staff Assistant (Chairman)	Project Manager
Construction Manager/ Technical Supervisor	ALARA Staff Supervisor
ALARA Consultant	Contractor ALARA Consultant
CHEM/HP Supervisor/ Asst. CHEM/HP Supervisor*	
ALARA Coordinator	

*Substitutes as Chairman in Chairman's absence.

ALARA Committee members can be added to this list if required.

4. <u>ALARA Committee Meeting Times</u>

The ALARA Committee will meet at least twice monthly prior to the beginning of the outage. Once the outage starts, ALARA Committee Meetings shall be held at least once a week. Special ALARA Committee Meetings can be held any time with the approval of the ALARA Committee Chairman.

C. MAN-REM ESTIMATE

1. Introduction

In order to measure the effectiveness of any program, a reference point needs to be established. In terms of ALARA, this reference point is the man-Rem estimate. The man-Rem estimate for the IGSCC outage, developed by the contractor and approved by NPPD, will be used as the indicator of the success of the ALARA program. As exposures gathered from a job are collected, they will be continually compared to the estimate for that job. Following good ALARA practices should result in accumulating man-Rem totals below the estimate. However, if the actual totals exceed the estimated totals, then one of three possibilities is occurring:

a. ALARA practices are not being followed causing excessive exposures to be accumulated for a particular task.

b. The scope of work has changed making the initial estimate obsolete. This could be caused by an unanticipated problem in the project, unforeseen changes in the work scope or unanticipated manpower requirements.

c. Dose rates were under estimated in the man-Rem estimate.

If the actual man-Rem exceeds the estimated man-Rem by a significant amount, the task will be investigated by the ALARA Committee to determine the reason. If the reason is determined that poor ALARA practices are being utilized, the practices will be changed so that personnel exposures are again at ALARA levels. If necessary, personnel will be retrained in certain skills if the investigation determines personnel training is deficient. If the scope of work has changed or the dose rates were under estimated, then the man-Rem estimate may be modified.

2. Initial Man-Rem Estimate

The following is the initial man-Rem estimate for the IGSCC project at Cooper Nuclear Station as approved by NPPD. In the estimate presented here, many of the jobs (144 total) have been grouped together for ease in comprehension of the total scope.

	Estimated Man-Hours	Man-Rem
a. Supervision. Supervision includes all supervisory functions, fire watches, etc.	14,200	176.3
b. Decontamination. Primary system decon- decontamination system cutting and tapping, and analyses.	1,159	79.4
c. In-Core Work. Work in-core to unload and load fuel, install shield curtains and remove vessel internals.	1,649	21.5

		Estimated Man-Hours	Man-Rem
d.	Pipe dimensioning. Obtain as-built data data for drawings.	91	12.3
e.	CNS Support. Drywell Health Physics coverage and video equipment installation.	5,340	66.3
f.	Equipment Transport. Moving welding and cutting equipment into and out of the drywell. Includes recirculation pump motor transportation.	863	9.0
g.	Small Bore Piping. Remove and reconnect small bore piping.	2,034	31.7
h.	Shielding. Install and remove temporary and permanent shielding.	1,926	104.2
i.	Housekeeping and Area Decontamination Maintaining the drywell throughout the outage.	4,980	74.1
j.	Lighting and Power. Install and remove drywell lighting required during outage. Route cabling for cutting and welding equipment, and video equipment.	350	10.1
k.	Insulation. Removal and installation of recirculation system insulation.	1,050	30.3
l.	Supports and Protection. Install and remove all temporary equipment supports. Install and remove protective devices on vital drywell equipment.	5,298	83.4
m.	Ductwork. Remove and install drywell ductwork and chillers.	2,286	31.9
n.	Electrical. Disconnect and reconnect all electrical components required for outage work.	4,132	46.9
o.	Rigging. Install and remove rigging for moving pipe and equipment.	872	24.9
p.	Scaffolding. Install and remove scaffolding as required throughout the outage.	452	12.7
q.	Pipe Packaging. Cut and wrap the removed recirculation pipe.	89	1.3

		Estimated Man-Hours	Man-Rem
r.	Pipe Cut-Out. Removal of Loop A and B recirculation pipe.	4,234	157.7
s.	Auxiliary System. Cutting and welding of core spray, clean-up and instrumentation piping.	2,968	167.1
t.	Weld Preparation. All field weld preparations for the recirculation and auxiliary piping systems.	854	16.6
u.	Pipe Installation. Installation of Loop A and B recirculation pipe.	8,254	234.8
v.	Tool Decontamination. Decontamination of tools and equipment used in the drywell.	480	3.8
w.	Miscellaneous. Work performed in April, 1984, outage.	482	16.4
x.	Pre-Operational Testing	3,000	3.0

The above items total 67,043 man-hours and 1,415.7 man-Rem expected for the overall project.

3. Revisions to the Man-Rem Estimate

As the outage progresses, expected dose rates in the drywell and the time required to do certain tasks will become better defined. If the man-Rem estimate is to be the ALARA program reference point, then it should be updated periodically with the latest available information. If it is determined by the ALARA Committee that the existing man-Rem estimate is now obsolete, a new man-Rem estimate will be developed.

The revised man-Rem estimate, when approved by the ALARA Committee, will be sent to the Nuclear Regulatory Commission with an explanation for the required changes.

D. PRE-PROJECT PLANNING

Pre-project planning is an important aspect of the CNS ALARA program. The key to good job planning is insuring that the work packages used to complete the work for the outage are carefully reviewed. For ALARA purposes, the work packages should include the necessary ALARA considerations plus contain the necessary radiological hold points to maintain radiological safety at all times. (The Work Instructions will also be reviewed to determine if other alternatives to the procedure will yield the same results but save man-Rem.)

The following is a brief description of what will be looked for in the ALARA review. The ALARA review does not include any engineering/ construction reviews that will also be required of the procedures. (Note that this is a description of the ALARA review sequence, not an approval cycle. See Chapter VI for the approved sequence.)

1. Contractor ALARA Review

Before the work packages are written, the individual jobs that make up the work packages need to be identified. Each job identified will be assigned an initial man-Rem estimate by the CBI ALARA Job Planner (part of the CBI ALARA Staff). The jobs will then be grouped into three major categories: Less than 1 man-Rem, 1-25 man-Rem, greater than 25 man-Rem. Each category has a different review cycle which is explained below.

Less Than 1 Man-Rem - If the initial exposure estimate of the job is less than 1 man-Rem, then pre-planning will be limited to what would normally be performed for Special Work Permits. In cases where the nature of the job indicates that similar activities will be performed often, a review of the entire process will be made.

1-25 Man-Rem - If the exposure estimate for a job is between 1-25 man-Rem then the ALARA Job Planner and Construction Supervisor will draw up a checklist of considerations that may be required to help in reducing exposures. These considerations would include:

(a) Review of Work Plan - Is there any alternative method?
(b) Tooling Requirements - Are proper tools listed?
(c) Automatic Equipment - Is automatic equipment use possible?
(d) Set Up Preparation - Lighting/electrical leads in sufficient supply?
(e) Review of anticipated radiological controls - Are they sufficient?
(f) Training - Mock up training required?

Once these considerations are listed, the CBI ALARA Staff Supervisor will review and approve the considerations presented. This checklist will be copied and filed for future reference. The original checklist will then be included with the job work package.

Greater Than 25 Man-Rem - If a job is estimated at greater than 25 man-Rem, the same checklist will be developed, reviewed, and included with the job work package as in the 1-25 man-Rem category. However the CBI ALARA Staff will set up a job history record detailing the progress and problems related to the particular job. This job history record shall be maintained by the ALARA Staff during the progress of that particular job. Any job estimated to be greater than 25 man-Rem shall be reviewed in detail by the ALARA Committee. Comments of the ALARA Committee shall be included on the checklist.

When the work packages are developed, the ALARA Staff Supervisor will review and comment on the work packages for ALARA considerations using the work sheets described above as a guide. If the Work Package contains the appropriate ALARA considerations, then the CBI ALARA Staff Supervisor will approve the work procedure.

The ALARA Staff Supervisor must review and approve all initial CBI work packages before they can be released to CNS for their review and comments.

2. Work Package ALARA Review - ALARA Committee

Once the Task Work Package has been released for comments to NPPD by CBI, it will be routed to each member of the ALARA Procedure Review Committee. The ALARA Procedure Review Committee will be comprised of the ALARA Committee Chairman, the CNS ALARA Coordinator, CNS Chemistry/HP Supervisor, and the ALARA Consultant. Each ALARA Procedure Review Committee member will review the Task Work Package for ALARA and radiological considerations. Some of the considerations are listed below.

a. Alternative Methods - Would alternative methods be more efficient and save man-Rem yet still complete the work required? Can automatic processes replace manual operations?

b. Radiological Hold Points - Are hold points for contamination control, radiation monitoring, etc., at strategic points in the procedure so radiological safety is maintained?

c. Alternative Steps - Would revising the procedure step order increase efficiency or allow some steps to be performed in a lower radiation area?

d. Engineering Controls - Are steps such as shielding, decontamination, enclosures, removal of items included to assist in reducing exposures?

e. Clarity - Are the steps clear enough so that the worker understands his assignment and its location?

f. Special Requirements - Are the special tools required indicated in procedure?

These are only examples of items that will be considered by the ALARA Procedure Review Committee members.

3. Final ALARA Approval

After each ALARA Procedure Review Committee member has reviewed the procedure and written his comments, the procedure copies will be forwarded to the ALARA Committee Chairman.

The ALARA Committee Chairman will collect all the comments from the ALARA Procedure Review Committee members, determine which comments are pertinent to the procedure and include them with his own comments. These edited comments will represent the ALARA Procedure Review Committee's final comments to the procedure.

CBI may appeal these comments to the ALARA Committee Chairman, but the Chairman's decision will be final. This ALARA Committee Review is only one step in the procedure review cycle. For the complete review system, see Chapter VI.

4. Pre-Job Briefings

Pre-Job briefings will be held prior to the beginning of every job in the drywell. These briefings can range from an informal meeting between a crew and their foreman for low exposure routine jobs to formal meetings involving contractor and utility personnel for high exposure jobs. Items to be discussed at these meetings will include:

a. Job to be performed.
b. Assignment of individual responsibilities.
c. Radiological conditions at the work areas.
d. Warnings about radiological safety hazards around the area.

E. JOB PERFORMANCE TRACKING

Once all the procedures have been approved and the outage is ready to begin, the ALARA program shifts to another phase. In the job performance phase actual work practices and results will be analyzed and investigated. Job performance in terms of ALARA will be based on dose tracking by job. Every job listed in the man-Rem estimate will be tracked using a computer system. The computer will be able to compute the man-Rem accumulated per job as well as compare the actual man-Rem totals with the projected man-Rem estimate.

By comparing a job's man-Rem total to its estimate, its performance from an ALARA standpoint can be instantly assessed. A job is further divided into tasks. Since these tasks usually describe individual operations, it is impossible to assign accurate percentage completions to each individual task. However, each task in a job will be tracked for man-Rem and man-hour accumulations. If a job begins to exceed its current estimated man-Rem, the tasks will be scrutinized to determine the reason for the discrepancy.

Below is the basic procedure that will be used to collect the data from the drywell and input it into the computer for dose tracking.

At the center of the dose tracking system is the Special Work Permit (SWP). The SWP allows work to be performed in radiologically controlled areas. The SWP gives radiation and contamination survey results, clothing and respiratory requirements, and provides a log for the entry and exit of all personnel entering that area.

1. Dose Tracking Collection Procedure

Data collected for the dose tracking effort will be from the SWPs. The data collection will proceed as follows:

a. Workers entering SWP area reports to the access control desk at the control point and informs the technician at the desk of his reasons for entering.

b. The Health Physics Technician reviews the SWP and checks worker's authorized exposure, task, and task code that will be assigned to the SWP for the job to be performed.

c. Worker signs in on the SWP, recording the time entered and his initial dosimeter reading.

d. Worker proceeds to work area if authorized exposure is acceptable.

e. When work is completed, the worker exits the work area and proceeds to the access desk.

f. Worker enters his exposure and time before leaving the area.

g. At the end of the shift, all the SWP entries are collected and sent to the ALARA Consultant.

h. Health Physics Technician enters information into terminal for individual dose tracking computer program.

i. The ALARA Consultant reviews all SWP sheets to insure that tasks and task codes are correct.

j. Once verified as correct, a clerk enters the man-Rem and man-hours for each task and enters it into the computer.

k. The computer issues two printouts; one is a data bank of all entries in the computer, the other compares the jobs actual man-Rem totals to its estimated totals.

l. Clerk rechecks the computer output for errors. If correct, the clerk files both copies for reference.

2. Man-Rem Flag Criteria

A man-Rem flag is a marker signifying that the actual man-Rem accumulation for a particular task has exceeded its estimate by a predetermined amount. For the IGSCC outage, a man-Rem flag will be defined as either:

a. Whenever the actual exposure for a job exceeds its current estimate by 25% or more. This does not apply to jobs with a total estimated man-Rem of 5 or less.

b. Whenever the actual exposure exceeds its estimate by more than 2 man-Rem if the total estimated exposure is less than 5 man-Rem.

c. If the actual exposure exceeds its estimate by 100% for jobs with a total estimate of less than 1 man-Rem.

3. Task Man-Rem Flag Reviews

At least once a week, a review of the latest information comparing current man-Rem estimates and actual man-Rem totals will be done. Current man-Rem estimate is defined as the total man-Rem estimate for a job multiplied by the job's percentage completion. For example, a job with a total man-Rem estimate of 100 man-Rem that is 50% complete would have a current estimate of 50 man-Rem. The job's percentage completion will be determined by planning and scheduling and updated on a weekly basis.

The latest actual man-Rem totals and percentage completions will be input into the computer prior to the ALARA Committee meeting. Any job whose actual man-Rem totals meets the flag criteria will be identified. All jobs having man-Rem flags will be discussed at the next scheduled ALARA meeting. The job man-Rem flag review will be done as close to the scheduled ALARA meeting as possible to keep totals as current as possible.

4. Reports To The ALARA Committee

A list of the jobs having man-Rem flags and their man-Rem overrun will be presented at the ALARA Committee Meeting. At this time, the Contractor is notified of the flag and must investigate the reason for the flag. A written reason for the overrun should be prepared prior to the next ALARA Committee Meeting if the man-Rem overrun or the job flagged is minor. If the job with the flag is considered major and the exposure overrun is considerable, a special ALARA Committee meeting may be called by the Chairman to discuss the flag.

Once the flag has been resolved and if no further relative increase in the man-Rem overrun is occurring, then the flag needs no further discussion at future ALARA Committee meetings.

The Contractor will receive copies of the dose tracking data as it is generated.

5. Chronological Dose Tracking

In addition to the man-Rem tracking by dose, the total man-Rem accumulated will be given at each ALARA Committee Meeting. This "grand" total will also be compared to the estimate.

This "grand total" will also be presented at the CNS Management outage meeting which is held to discuss outage items.

6. ALARA Job Coverage

In addition to the computerized dose tracking system, Health Physics Technicians and CBI ALARA staff personnel will provide coverage for ALARA concerns for work being done in the drywell. This way, improper ALARA practices can be corrected before they become exposure problems. Although many times this will require drywell entries to observe the work, extensive use of video equipment will also be used to allow the Health Physics Technician to view the work without entering a high radiation area. Examples of items that will be looked for include:

a. <u>ALARA Concerns Addressed on the Task Work Package Are Being Followed</u> - Each Task Work Package used to identify the work will have its own set of ALARA concerns based specifically on the tasks listed in the work package. CBI ALARA staff personnel will be intimately familiar with the Task Work Package's ALARA concerns and insure they are carried out in the work areas.

b. <u>Insuring Special Work Permit Requirements Are Being Followed</u> - Health Physics Technicians touring the drywell or observing on video monitors will check to see that personnel in the drywell are following the requirements listed on the SWP. Anyone not meeting the SWP requirements will be asked to leave the drywell until the requirements are met. Further disciplinary action will be at the discretion of the Health Physics Technician.

c. <u>Insure That "Lessons Learned" From Previous Work Assignments Are Followed in Subsequent Work Assignments</u> - As experience is gained during the IGSCC outage, the "Lessons Learned" will be incorporated into work practices on a continuous basis. If possible, these corrections will be incorporated directly into Task Work Packages.

d. <u>Insure that Job Assignments or Locations are Understood</u> - Personnel wandering in the drywell will be asked their specific assignment. If vague or unclear answers are given, the individual will be asked to leave the drywell.

e. <u>Inspection of Containments</u> - Tents and glove boxes that are installed shall be inspected by the Health Physics Technician for integrity prior to being allowed for use.

7. <u>Shift "Turnover" Meetings</u>

At the beginning of each shift, shift turnover meetings will be held. These meetings will be held for two major reasons.

a. Discuss what was accomplished the previous shift. This would include specific problems with the job and radiological conditions associated with this work.

b. Discuss what is to be attempted in the next shift. This will allow personnel including Health Physics personnel to prepare for unusual or potentially radiologically hazardous situations.

If the two shifts do not physically overlap, then the preceding shift will leave a detailed report outlining what was done that shift. The following shift then will go over the report and decide their plan for the day. Contractor personnel, NPPD Construction Management personnel, and NPPD Health Physics personnel will all be involved in shift turnover meetings.

F. POST PROJECT REVIEW

At the completion of the outage, a final Post Project Report will be initiated. The report will analyze aspects of the outage from an ALARA viewpoint and give an assessment of its success. Four factors will be examined: review of man-Rem accumulated for the outage by task, review of dose rate changes that occurred during the outage, ALARA practices utilized that improved man-Rem savings and "lessons learned."

1. Review of Man-Rem Accumulated

A final computer output that includes all exposures accumulated for the outage will be generated. This output will be carefully reviewed to insure that all tasks and task codes are properly input. Once correct, each job will be reviewed to see how it compares with its total estimate. Jobs with man-Rem flags will be identified along with the reason for its flag. In addition, jobs which were significantly below their man-Rem estimate will be identified. Reasons for the man-Rem savings will be determined.

2. Review of Dose Rate Changes

In addition to man-Rem tracking, changes in the dose rates in the drywell that occurred throughout the outage will be noted along with the impact on exposure.

3. Beneficial ALARA Practices

ALARA practices utilized in the outage that significantly saved exposure will be identified. A detailed explanation of the practice plus the estimated man-Rem saved will be included.

4. "Lessons Learned"

Practices that caused unnecessary exposures in the outage will be identified along with the estimated man-Rem cost. Ways to prevent these same mistakes from occurring in future outages will be presented.

CHAPTER III - EXPOSURE CONTROLS

The exposure control portion of the Cooper Nuclear Station IGSCC Outage Radiation Protection Plan was developed with two goals in mind:

1. Keep personnel in low exposure areas at all times.

2. Establish work areas that will have low exposure rates.

The first goal will be achieved by limiting access to personnel, provide the best and most current information possible on dose rates to workers and provide the equipment necessary to reduce exposures. The second goal will be accomplished by using available means to reduce the exposure rates in the work areas.

The first part of this chapter will detail the controls that will be utilized to limit external exposure. The second part explains the controls that will be used to reduce internal exposure to personnel.

PART I. - EXTERNAL EXPOSURE CONTROLS

A. ACCESS CONTROL

The access control point is the last point before entering a radiologically controlled area. For the IGSCC Outage, the access control point will serve as the focal point for drywell activities. The latest information about radiological conditions and job status will be available here. For this reason, the access control point will provide many external exposure control functions. Some of the functions of the access control point will be:

1. Limiting Access to Personnel - No personnel will be allowed past the access control point unless all the requirements of the Special Work Permit (SWP) are met. A Health Physics Technician stationed at this point will be responsible to see that all personnel satisfy all of the SWP requirements for their particular job.

2. Determining of Stay Times - If a worker is to enter a high radiation area and/or his exposure limit is low, the Health Physics Technician may determine the length of time this worker will be allowed to stay in the controlled area. No personnel will be allowed to exceed his stay time.

3. Dose Tracking - Personnel assigned to the dose tracking program will determine the worker's job and assign the appropriate task code. All exposures on the SWP will be logged at the control point.

4. Prevention of Unnecessary Entries - By asking the worker his intended work assignment at the control access point, it prevents personnel who are unsure of their work location or their assignment from entering the controlled area. Any body unable to adequately explain their work function or location at the control point will be denied access. Once the person is able to explain and understand his duties he will be allowed access.

5. Prevention of Overcrowded Conditions - The drywell at Cooper Nuclear Station is small and contains many interference that restrict movement. Personnel at the control point will monitor drywell activity and limit personnel entry to maintain a safe and orderly work progression.

6. Issuance of Special Dosimetry - All issuance of special dosimetry (hi-range dosimeters, alarming dosimeters, etc.) not usually worn by personnel routinely will be controlled at the access point.

7. Information for Radiological Conditions - The most current radiological conditions will be known at all times at the control access point. Each worker entering the drywell will know the conditions in his work area just prior to entering. In addition, special precautions about high radiation or high contamination areas within the drywell will be posted.

8. Emergency Control Station - If any unusual occurrence (fire, injury, etc.) happens in the drywell, the access point will be notified immediately. Control point personnel will then notify the control room and other required parties.

B. SWP INITIATION

The drywell will be controlled as an "SWP area", as defined in CNS Health Physics Procedure 9.1.2.2 throughout the IGSCC outage.

Most of the SWPs will be written in advance of the work. The number of SWPs required will be based on the ALARA job reviews and work packages submitted by the contractor. The special work permits for the IGSCC outage will be grouped into major phases of the outage. The SWPs required to complete a phase of the work will be generated and implemented at the same time. The next phase of SWPs will not be written until the radiological conditions for that work are known. As of now, the major phases of the IGSCC project will be:

1. Pre-Pipe Decontamination Work.
2. Pipe Decontamination.
3. Pipe Cutting and Removal.
4. Safe End/Thermal Sleeve Removal.
5. Safe End/Thermal Sleeve Replacement.
6. Pipe Replacement Work.
7. Post Replacement Work.
8. Pipe Disposal.

These major phases are subject to change as procedures become more defined. Even though a majority of the SWPs will be written prior to the start of a phase, additional SWPs may have to be initiated when unexpected work comes up or radiological conditions change. The CNS Health Physicist or the Lead Health Physics Technician will decide if a new SWP should be initiated or whether an existing SWP will suffice. If it is determined that a new SWP needs to be initiated, CNS Health Physics Procedure 9.1.1.4 shall be followed. Jobs in the same area that fall under the same radiological requirements and have essentially the same restrictions may be grouped under the same SWP.

C. SWP COMPLIANCE

Compliance with the special work permit shall be in accordance with CNS Health Physics Procedure 9.1.1.4, Section VI, Part C. All personnel shall follow the requirements of the SWP which their job is assigned to. Under no circumstances will the requirements in the SWP be violated.

The CNS Health Physics Department shall be responsible for the termination and filing of expired Special Work Permits in accordance with Procedure 9.1.1.4, Section VI, Part D.

The "Special Work Permit Time Record Form" (CNS HP-2) will be used for signing personnel in and out of the work area covered by the SWP. All the information required in the supplementary time record form will be included. All dose tracking information for the IGSCC outage will originate from the supplementary time record form. CNS HP-2 will be filled out in accordance with CNS HP Procedure 9.1.1.4, Section II, Parts A-F, Page 3.

D. DOSIMETRY

Dosimetry will be issued to all personnel who are involved in the IGSCC outage in accordance with CNS Health Physics Procedure 9.1.1.3, "Personnel Dosimeter Program."

1. Radiation Histories

Radiation histories of personnel on site shall be required prior to issuance of dosimetry. The history shall be documented on an NRC-4, CNS HP-4 or equivalent. Incomplete documentation may be acceptable for issuance of dosimetry if approved by the Chemistry/Health Physics Supervisor. No personnel will be allowed greater than 1.00 Rem of exposure in a quarter without complete documentation of their exposure history.

2. Exposure Guidelines

CNS, in an effort to control exposures during the IGSCC outage, shall implement the following exposure guidelines. These guidelines are more restrictive than the federal limits on exposure in 10CFR 20.101(a). In no case shall the federal exposure limits in 10CFR 20.101(a) be violated.

All personnel involved in the IGSCC outage upon receiving their dosimetry will be allowed to receive 1.00 Rem of exposure for the quarter. Any occupational exposure received earlier in the same calendar quarter shall be deducted from this 1.00 Rem quarterly limit.

Health Physics may permit an individual in a restricted area to receive a dose to the whole body greater than the 1.00 Rem per quarter limit providing:

a. The individual's accumulated occupational dose to the whole body has been determined and documented on the CNS HP-4 Occupational External Radiation Exposure History form.

b. The individual is 19 years of age or older.

c. The individuals total accumulated exposure in REM does not exceed 5(n-18) where n = the age in years.

Whenever an extension in the exposure limit for an individual is needed, the following procedure will be followed.

(1) The individual's supervisor shall fill out an exposure extension request form. The form will then be forwarded to the CNS Chemistry/Health Physics supervisor.

(2) The Chemistry/Health Physics Supervisor, or designated alternate, shall review the individual's exposure history record and determine the extension allowed. The Chemistry/Health Physics Supervisor, or designated alternate, shall sign the form.

(3) The form will be sent to the Dosimetry Clerk who shall input the recommended extension into the exposure log. The individual is now allowed to receive exposure up to the new limit.

(4) This procedure shall be repeated for every exposure extension request.

(5) The Chemistry/Health Physics Supervisor or designated alternate reserves the right to deny exposure extensions to any individual.

3. <u>Monitoring Devices</u>

The following is a list of personnel dosimetry devices that will be used to monitor personnel exposures during the IGSCC outage at Cooper Nuclear Station.

a. <u>Thermoluminescent Dosimeter (TLD):</u> The TLD is the personnel monitoring device of record at Cooper Nuclear Station. The TLD is attached to the Security Badge and the individual must wear it at all times while at the CNS site. The TLD must be turned in with the Security Badge when the individual leaves the site.

All TLD badges will be changed each month on the last working day of the month or the first working day of the new month. TLDs will be read on at least a monthly interval basis.

The TLD used at Cooper Nuclear Station is an Eberline TLD which is Beta/Gamma and Gamma sensitive. The TLD is tested under the Eberline QA testing program for thermoluminescent dosimeters.

In addition, a TLD reader will be brought on site to process TLDs as quickly as possible. The operator will be a qualified technician from the Eberline Corporation.

b. Lost TLDs: Any time an individual loses his TLD, he shall notify his immediate supervisor and the Health Physics Department. Determining personnel exposure and replacing the TLD shall be in accordance with Health Physics Procedure 9.1.1.3, Section VI, Part 2C(1).

c. Chamber Dosimeters: All pocket chamber dosimeters provided by CNS are the self reading type. The 0-200 mR pocket chamber is the most common type used. This type of dosimeter is available to all personnel on site. Another available model is the 0-1R pocket chamber. These will be issued to all personnel entering the drywell.

4. Special Precautions

a. At any time an individual finds a reading of 75% of full scale on his dosimeter, he will leave the radiation area and proceed to the access control desk and inform the Health Physics Technician on duty.

b. At any time an individual finds the reading of his pocket chamber greater than full scale, he will immediately remove himself from the radiation area and report the incident to his immediate supervisor and the Health Physics Department. The Health Physics Department may read the TLD at that time to establish the dose received. The person may not return to a radiation area until his pocket chamber has been recharged to zero and his radiation dose has been evaluated by the Health Physics Department.

c. At any time an individual feels that his pocket chamber dosimeter is not functioning properly, he will return his dosimeter to the Health Physics Department for evaluation and replacement if required. If an individual loses his pocket chamber, he will report the loss to the Health Physics Department for replacement.

5. Special Use Monitoring Devices

Special use monitoring devices will be assigned by the Health Physics Department as required. The necessity of special monitoring devices will be listed on the SWP. All special use monitoring devices will be worn in addition to an individual's routinely assigned personnel monitoring devices, not in lieu of them.

Examples of special monitoring devices and their intended uses in the IGSCC outage are:

a. Finger Rings - Finger rings will be assigned as required to monitor extremity doses whenever extremity dose is expected to be significantly higher than the whole body dose.

b. Hi-range Pocket Chamber Dosimeters - Hi-range pocket dosimeters will be issued whenever deemed necessary by Health Physics. Hi-range pocket dosimeters will be distributed at the drywell access point for all drywell work.

c. Alarming Dose Rate Dosimeters - Alarming dose rate dosimeters may be utilized in the IGSCC outage to alert personnel of high dose rate areas or they have reached their exposure limit for the day. All alarming dosimeters will be controlled by CNS Health Physics personnel.

6. Posting of Exposures

Exposures for all personnel shall be updated by NPPD on a daily basis. Pocket dosimeter readings will be used as the exposure for an individual until his TLD has been read. Once an individual's TLD has been read, the TLD reading shall replace the pocket chamber reading for the same time period.

A computer printout will be made available to all supervisors at the beginning of the shift showing the remaining exposure in the quarter for their personnel. This data will also be at the drywell access point.

E. HEALTH PHYSICS FUNCTIONS

CNS shall be responsible for the establishment of all radiologically controlled areas. CNS Health Physics Technicians will be responsible for the monitoring and posting of all radiation and contaminated areas. All monitoring will be done in accordance with CNS Health Physics Procedures 9.2.2 and 9.2.3. The following is a description on how Health Physics functions will apply to the IGSCC outage.

1. NPPD Health Physics Staff and Qualifications

The qualifications for the following positions in the NPPD Health Physics Department are as follows:

a. Health Physicist - The NPPD Health Physicist shall meet the requirements of ANSI/ANS - 18.1 - 1971 as a minimum.

b. Health Physics Lead Technicians and Health Physics Technicians (Permanent) - The permanent Health Physics Lead Technicians and Health Physics Technicians shall meet all the requirements of ANSI/ANS - 18.1 - 1971 as a minimum.

c. Health Physics Technicians (Temporary) - The temporary Health Physics Technicians that will be hired exclusively for the IGSCC outage shall also meet the requirements of ANSI/ANS - 18.1 - 1971 as a minimum. In addition, all temporary Health Physics Technicians will be given specialized training concerning Health Physics Activities at Cooper Nuclear Station.

There will be adequate numbers of Health Physics Technicians available to provide continuous coverage in the drywell if necessary. The number of Health Physics Technicians assigned to the drywell will be determined by the activity and radiological concerns in the drywell.

2. Radiation Surveys

A radiation survey shall be completed by a Health Physics Technician when:

a. A new SWP is being initiated.
b. Radiological conditions have changed.
c. Requested by an individual because radiological conditions have changed due to work performed. All requests will be approved by the CNS Health Physicist.
d. Any time that the CNS Health Physics Staff deems it necessary to complete a survey.

The results of the latest radiation surveys shall be posted at the access point.

If the radiation surveys performed indicate that dose rates are increasing for unknown reasons, the following action will be taken:

(1) A check with the Operations Department will be made to determine if their actions may have caused the radiation level increase.

(2) A search for "hot" items that could be causing the high dose rates. An effort will be made to remove any of the items from the work area or shield them.

(3) Insure that shielding installed in the drywell has not shifted or been removed.

In addition to radiation surveys, area radiation monitors (ARM's) installed in the drywell will alarm when a significant increase in the local dose rate is detected. If an ARM alarms, the drywell will immediately be evacuated. An investigation by CNS Health Physics Technicians will be initiated to determine the cause of dose rate increase. Workers, other than CNS Health Physics personnel, will not be allowed in the drywell until the cause for the alarm has been found and the Health Physics Department gives their approval.

3. Contamination Surveys

a. Area Contamination Surveys

A contamination survey of areas in the drywell shall be completed by a Health Physics Technician when:

(1) A new SWP is being initiated.

(2) Contamination levels are known to have changed.

(3) Requested by an individual because contamination levels may have changed due to work performed. All requests will be approved by the Health Physicist.

(4) Any time the CNS Health Physics staff deems it necessary to conduct a contamination survey.

If the contamination levels in a certain area begin to increase above normal, immediate actions will be taken to reduce the contamination level including:

(a) Observing and correcting worker habits if practices are contributing to contamination build-up.

(b) Decontaminate areas using vacuums and other techniques to reduce loose surface contamination levels.

(c) Apply protective covers in work area to minimize contamination build-up and prevent spreading of existing contamination.

(c) Investigate use of glove boxes or other containments to contain contaminated material.

4. <u>"Hot Spot" Posting</u>

"Hot Spots" are small areas usually located in small piping and valves that are significantly greater than the ambient background. Any "hot spots" found near the work areas or along ingress and egress routes to the work areas shall be clearly identified by the Health Physics Department. A yellow and magenta sticker or sign, or other identification means, will be placed on the "hot spot" to warn personnel to stay away from the area as much as possible. The warning shall be positioned so it is in clear view.

Once a "hot spot" is identified, methods will be investigated to eliminate the "hot spot", either by flushing, draining, or by the use of shielding.

5. <u>"Low Exposure Waiting Areas"</u>

Waiting areas will be set up in the drywell for temporary use by personnel. Waiting areas will be selected in the drywell that are significantly less than the average radiation levels in the work areas.

These "waiting areas" will be temporarily used as a place for personnel while they wait for other personnel to finish a task before they can proceed with their task. For example, these areas may be utilized by quality control and inspection personnel.

Locations of "hot spot" and "waiting areas" in the drywell shall be posted in a conspicuous area near the drywell access point so personnel know their locations prior to entering.

6. <u>Work Surveillance - ALARA Considerations</u>

Health Physics Technicians and CBI ALARA staff personnel will take routine tours of the drywell work areas to insure that good Health

Physics and ALARA practices are being followed. Items that will be looked for include:

a. Personnel location - insure that personnel are not loitering in the drywell and that personnel waiting to work are positioned at the "waiting areas" and not standing near "hot spot" areas.

b. SWP requirements - insure that personnel in the drywell are following the SWP requirements, including correct dosimetry, clothing, and proper use of respiratory equipment.

c. Shielding - insure that shielding installed has not shifted, been removed or fallen off.

d. Contamination Control - insure that personnel are following methods to help prevent the unnecessary spread of contamination (using drop cloths, wrapping of highly contaminated items when moving them in the drywell, etc.).

e. Safety - Insure that all tools are being used correctly and that all equipment and tools not currently being used are out of the way and not interfering with working or movement in the drywell.

7. Beta Radiation Protection

All personnel working on recirculation piping will be required by the Special Work Permit to wear approved safety glasses while in the drywell. These glasses will give adequate protection to the lens of the eye against any Beta radiation found in the drywell.

8. Alpha Radiation Protection

Whenever a piping system is first breeched because of cutting operations, the interior of the pipe will be immediately checked for alpha contamination. An indication of alpha contamination above 1000 dpm/50cm^2 will be considered above acceptable limits and appropriate action will be taken by NPPD Health Physics.

9. Clearance of Non-Contaminated Items and Storage of Contaminated Items

All material leaving the controlled area shall be given to the Health Physics Technician at the drywell access point. The technician will survey the item in accordance with CNS HP Procedure 9.2.3, Section VI, Part B. An item with surface contamination of less than 100 dpm/100cm^2 and .1 mRem/hr will be considered clean and allowed to be moved out of the controlled area.

Any item not meeting this requirement shall be labeled with a "RADIOACTIVE MATERIAL" tag. Any other use or transfer must be performed in accordance with requirements specified by the Health Physics Department. However, contaminated equipment and tools may be stored in the contaminated tool area adjoining the drywell and may be re-used by personnel in the drywell without specific Health Physics Department approval.

Equipment and tool decontamination will occur as needed under the direction of CNS Health Physics Department. Equipment and tools not needed in the drywell will be removed as soon as possible to keep the drywell work areas clear.

F. ENGINEERING CONTROLS FOR EXTERNAL EXPOSURE CONTROL

All of the external exposure controls that have been discussed have dealt with limiting exposure by controlling access and time spent in radiation areas. The actual work areas themselves will be analyzed to determine if engineering controls can reduce the dose rates in these areas.

1. Recirculation Loop Decontamination

At the beginning of the outage, the major dose contributor in the drywell will be the recirculation piping. Decontamination factors achieved with conventional recirculation pipe decontamination systems have a significant impact on general drywell dose rates. Therefore, one of the first major items to be done in the outage will be a chemical decontamination of the recirculation system piping.

For the IGSCC outage, recirculation piping at the recirculation pumps will be severed and capped to prevent decontamination fluid from entering the pumps. In addition, a seal will be installed in the vessel suction nozzles to prevent decontamination fluid from entering the reactor vessel. Maximum level of the decontamination fluid in the discharge risers will be two (2) feet above the vessel nozzle.

Besides the obvious (and most important) reason for decontaminating the piping, there are two additional reasons that a recirculation pipe decontamination will be beneficial.

a. The potential for airborne is substantially reduced when severing and transporting the existing recirculation piping.

b. Shipping requirements for disposal of the pipe are simpler and less expensive because of the lower activity on the pipe.

2. Reactor Vessel Hydrolazing

The reactor vessel will be hydrolazed from the vessel flange downward to the top of the vessel shroud. The hydrolazing will be done in an attempt to reduce the airborne contamination while the vessel head is removed. However, a minimal dose rate reduction is expected from this effort. Hydrolazing may also be attempted to dislodge "crud" traps in the thermal sleeves after the pipe decontamination is completed.

3. Flushing/Draining of Hot Spots

Often, hot spots are drains that are rarely used or in dead legs of piping systems. Draining or flushing these lines can dislodge these hot spots and reduce the dose rate significantly. Flushing/draining procedures will be investigated before shielding is used to reduce the local dose rate.

4. Shielding

Shielding in the drywell will be installed to reduce radiation levels from identifiable sources of radiation that are significantly impacting the radiation levels in the work areas. All shielding planned for the drywell will be carefully considered for several conditions before being installed.

a. The source is identifiable and has a definite impact on local dose rates.

b. The man-Rem savings realized from shielding will be much greater than the man-Rem cost for installation and removal of the shielding.

c. Once installed, the shielding should only have to be removed when the job is completed.

d. The shielding is adequately supported and does not affect component integrity.

e. Other methods of removing the source are unacceptable.

There are three types of shielding planned for the CNS IGSCC outage in the drywell.

(1) Nozzle Shielding - As soon as access to the nozzle is possible, shielding will be installed in all nozzle openings. The shielding will be designed so that the entire cross sectional area of the nozzle will be shielded. The shielding will be sufficient to reduce the radiation coming from the vessel and remain in place until the closure pieces are ready to be welded in.

(2) "Hot Spot" Shielding - "Hot Spots" in the drywell will be shielded with lead blankets or other temporary shielding material. (Draining/flushing of the hot spot will be investigated before shielding will be installed as previously discussed.)

(3) Bioshield Opening Shielding - The bioshield openings for the recirculation nozzles may be shielded if it can be shown that shielding will significantly reduce the local dose rates. Past experience has shown that no significant change in dose rates occurs near the bioshield opening, even after the vessel is drained.

Shielding design and installation will be done in accordance to a shielding procedure currently being developed by CBI. All proposed shielding must be approved by the CNS ALARA coordinator for effectiveness and approved by CNS Engineering for structural integrity of the supports used.

5. Removal of Fuel/Control Rods From The Reactor Vessel

As soon as possible after shutdown all fuel will be removed from the reactor vessel and stored in the fuel pool. (The control rods will be positioned to minimize their effect on the drywell radiation levels). The peripheral control rod blades will be removed and stored in the fuel pool. The control rod guide tubes will remain filled with water to increase the shielding inside the reactor vessel and help reduce "shine" at the pump suction nozzles.

6. Filling of Vessel/Annulus With Water

The annulus and reactor vessel will only be drained when necessary. The jobs will be arranged so that draining and refilling of the annulus and reactor vessel will be done as little as possible.

7. Cleaning the Inside Diameter of the Nozzles

After the elbows are removed and the nozzle shielding is installed, glove bags may be installed over the nozzle openings and the pipe walls cleaned. This will remove a significant amount of radioactive material that can cause high dose rates in the nozzle areas. The glove bags will prevent the loose radioactive material from being released in the drywell. Any containments used will be designed and erected in accordance with the procedure being developed by CBI.

G. OTHER EXPOSURE CONTROLS

The controls listed here will not have a direct impact on exposure that can be readily observed but rather are indirect in nature. These controls are designed to make time spent in the drywell as efficient as possible.

1. Posting

In the drywell, orientation can often be difficult during times of intense activity. To alleviate this, signs will be strategically placed throughout the drywell identifying important areas. Areas that will be posted include:

a. Recirculation Nozzle Areas - All recirculation nozzle areas will be identified with a sign indicating its particular name and its relative location to west (in degrees).

b. Major Piping Systems - Major piping systems around the recirculation loops (such as the RHR and RWCU systems) will be clearly labeled.

c. "Hot Spot" Locations - Hot Spot locations will be identified along with a warning to keep away from the area.

d. "Waiting Areas" - Waiting areas will be clearly marked and posted in the drywell. The area identified as a "waiting area" will be outlined to show its boundaries.

e. Recirculation Pumps and Pipes - The recirculation pumps and piping will be posted as to their identity on all floor elevations.

f. Elevation Signs - Signs indicating the floor elevation will be posted in plain view by all ladder hatches in the drywell and at the entrance to the drywell by the access point.

g. Paging System - All paging address system units in the drywell will have signs indicating their location.

h. Directional Signs - Signs will be posted at the drywell entrance and at the top of the ladders on all three levels indicating the quickest path to get to a particular recirculation pipe or nozzle. This will help to prevent confusion and time wasted looking for that location.

All signs will be designed so that they will be readily visible in the drywell. CNS Health Physics Department and the CBI ALARA staff will be responsible for insuring that the signs remain in place and are in good condition throughout the outage.

2. Identification of Personnel in Drywell

Selected personnel often need to be quickly identified in the drywell. Unfortunately, the wearing of anti-contamination clothing especially caps and hoods, makes everyone look alike. Therefore, an identification system will be set up so that a person's responsibility will be known by just a glance. The personnel required to wear identification will be at a minimum:

a. Health Physics Technician
b. General Foreman
c. Construction Foreman/Leads
d. Fire Watch

This identification system will assist in locating personnel quickly who may be critical in many operations of the outage.

PART II - INTERNAL EXPOSURE CONTROLS

A critical part of any exposure control program is the minimization of the possibility of internal contamination. Although Cooper Nuclear Station has the capability to supply personnel with respiratory protection equipment, the emphasis for the IGSCC outage will be placed on the use of engineering controls to prevent the use of protective respiratory equipment.

As is well documented, the use of respiratory protection has a severe impact on worker efficiency, not to mention the reduction in safety and effective communication. Resorting to respiratory protection when engineering controls could be used is not considered a good ALARA practice.

A. CNS RESPIRATORY PROTECTION PROGRAM

The CNS Respiratory Protection Program as described in CNS Procedure 9.1.5 shall be in effect at all times during the IGSCC outage. Procedures 9.1.5, 9.1.8, and 9.2.3 describe in detail the procedure that will be used at Cooper for the following respiratory items.

1. Frequency and method of air sampling to determine airborne activity areas.

2. Issue, cleaning, decontamination, inspection and repair of respiratory equipment.

3. Maintenance of a bioassay/whole body counting program to evaluate the respiratory protection program (HP Procedure 9.1.8).

4. Provide training for individuals in the control, issuance, proper use, fitting, testing and return, of protective respiratory equipment.

5. Determination that an individual is physically able to wear respiratory equipment including a medical evaluation by a physician.

Although CNS is responsible for the majority of the respiratory protection program, the individual users will be responsible for inspection of his issued respiratory equipment prior to entry into the airborne hazard including:

a. Inspecting rubber parts for cracks, tears and holes.
b. Inspecting face piece straps.
c. Passing of the negative fit test after donning the mask.
d. Not breaking the seal during use in an airborne activity area.

If respiratory equipment becomes necessary, the following respirators are available at Cooper Nuclear Station. Enough respirators are on hand to handle anticipated demand.

RESPIRATOR TYPE	PROTECTION FACTOR
MSA Ultra Filter Full Face Respirator	50
MSA Ultra Twin Full Face Respirator	50
MSA Full Face Constant Flow Air Line Respirator	2000
MPO Supplied Air Hood Respirator	1000
MSA Battery Powered Air Purifying Full Face Respirator	1000
MSA Model 401 Pressure Demand SCBA	10000

For the IGSCC outage, the MSA ultra filter full face respirator and the MSA ultra twin full face respirators are expected to be the most common respirators used.

As stated before, the internal exposure control emphasis will be placed on engineering controls rather than the use of respiratory equipment.

B. ENGINEERING CONTROLS TO LIMIT INHALATION OF AIRBORNE RADIOACTIVE MATERIAL

Below are listed some of the engineering controls that will be used to limit inhalation of airborne radioactive material.

1. Vacuuming the Drywell

If cutting and grinding operations produce excessive levels of loose surface contamination, the drywell may be cleaned with HEPA filter fitted vacuum cleaners. The removal of this loose surface contamination will significantly decrease the chance of surface contamination becoming airborne. Vacuuming will concentrate on areas where loose surface contamination tends to collect (grating, corners, beams, etc.).

2. Ventilation

Cutting and grinding areas, depending on the method used and the surface contamination levels, may be set up with a ventilation (suction) system to remove airborne particles as they are created. This system will consist of a hood connected to a flexible duct hose which leads to a HEPA filter unit. The hood will be placed over the immediate work area and situated so that the air flow is away from the workers. The ventilation system may also be used in conjunction with containment systems.

The ventilation system to be used in the drywell to remove airborn particulate will consist of two 8000 CFM units which will be installed near the drywell access hatches. Each unit will have a manifold capable of handling several flexible hoses. Each hose will be of sufficient length so that all areas of the drywell are accessible. The ventilation system will be installed with a HEPA filtering system and can be fitted with a charcoal filtering system if necessary. A standard DOP test will be performed prior to the ventilation systems use.

In addition to the specialized ventilation system for the drywell, ventilation system on 1001' level will be used to pull a negative pressure on the reactor vessel.

3. Containments

If work is to be done on excessively contaminated items, the work area may be contained by a glove box or tent.

A glove box may be used if grinding or flapping needs to be done inside a nozzle area. The glove box could be fitted over the end of the nozzle preventing the release of airborne contaminants into the drywell.

If a larger area is to be worked on, a tent may be used to separate this area from the rest of the drywell.

In both cases, ventilation will be used to remove the contaminants.

4. Alternate Methods

If a proposed method is considered a likely candidate to create an airborne problem, alternative methods will be investigated to see if the airborne potential can be reduced.

In all cases, the CNS Health Physics Department will decide what engineering control and/or respiratory protection equipment is to be used to minimize inhalation of airborne contamination during the outage.

CHAPTER IV - FACILITIES AND EQUIPMENT

A. FACILITIES

Because of the huge manpower requirement that will be necessary for this outage, the normal facilities at Cooper Nuclear Station will be inadequate to handle the increase in personnel and equipment. The following is a description of the facilities being planned at CNS that have radiological/ALARA significance.

1. Pipe Staging Area

A staging area will be set up where the "old" recirculation piping will be prepared for disposal after being rigged out of the drywell. The staging area will be situated close to the equipment hatch where the piping will be removed but still isolated from drywell activities. A pipe staging area separate from the drywell has several benefits as indicated below.

a. Preparing the pipe for disposal at a central location away from drywell traffic increases productivity in the drywell and reduces the overall exposure because the area will be away from radiation sources other than the pipe itself.

b. Strict radiological controls can be maintained on pipe disposal operations that will not impact on drywell activities. For example, containment tents and ventilation that may be necessary for pipe disposal can be set up properly without denying space to the drywell and surrounding areas.

c. Problems encountered from pipe disposal will not cause drywell activities to be delayed.

d. Pipe can be cut, boxed and shipped out or placed in storage in one operation. All equipment and personnel required will be at the one location.

2. Contaminated Tool Storage Area

Since space is at a premium in the drywell, a contaminated tool storage area will be set up adjacent to the drywell access point. Tools and equipment not currently being used in the drywell but needed in the future will be brought out of the drywell and stored in the contaminated tool storage area. The storage area will be set up so that personnel will be able to obtain and return tools to the storage area without having to cross a step-off pad. The contractor will be responsible for the maintenance and control of the contaminated tool storage area. However, all tools and equipment being brought out of the contaminated area must be surveyed by the Health Physics Department.

3. Change Area

A central change area will be set up for all personnel to put on anti-contamination clothing for work in the drywell. The change area will be large enough to accommodate the anticipated number of personnel expected in the drywell at any one time. In addition, all protective clothing required for drywell entry will be available in adequate supply so that no shortages will occur. Miscellaneous items such as tape and shoe covers will also be available in sufficient supply. The change room will be situated in a low radiation area near the drywell access.

4. Access Control Desk

The drywell access control desk will be situated on the clean side of the drywell step-off pad(s). The control point will be designed so all personnel entering the drywell must proceed past the access control desk. Health Physics technicians will be stationed at the desk. Some of their responsibilities will include:

a. Supervise the signing in on the SWP sign-in sheet.

b. Insure the individual understands his job function and knows the task code for dose tracking purposes, insure the task code for each individual is so noted on the SWP.

c. Insure the person is meeting all the requirements of the SWP.

d. Sign out any special dosimetry issued for the drywell.

e. Observe the drywell personnel exiting the drywell and insure they remove their protective clothing properly.

As mentioned before, the access control point will be the focal point of drywell activities. A telephone and public address system unit will be installed at the access control desk for effective communications. In addition, a video monitoring station will be set up at the drywell access point so that Health Physics personnel can observe activity in the drywell without having to enter. The video system being planned will be discussed in greater detail later in this chapter.

5. Drywell Staging Area

Immediately in front of the personnel entrance to the drywell, a small staging area will be set up to allow personnel to make final preparations before entering the drywell. This area will serve several functions.

a. Provide a low radiation waiting area before entering the drywell.

b. Provide an area for Health Physics monitoring equipment that is used in the drywell.

c. Provide an area where personnel can re-check anti-contamination and respiratory equipment just before entering the drywell.

d. Provide a staging area for equipment and tools entering and leaving the drywell.

e. Provide a waiting area for Health Physics personnel assigned to the drywell.

6. Frisking Booth

A frisking booth will be set up as close as possible to the drywell access point so personnel can monitor themselves after leaving the drywell. The frisking booth will be set up in a low background area. Shielding will be used, if required, to reduce the background count rate. All personnel will be required to frisk themselves after leaving the drywell prior to donning their personal clothing. If the frisker indicates contamination, the person contaminated shall notify the nearest Health Physics Technician and wait for further instructions.

7. Training Facilities

A mock-up training facility will be constructed by the contractor to train all required personnel on the specialized equipment to be used for the IGSCC pipe replacement project.

The mock-up training facility will be divided into three major sections. The classroom, practice area, and mock-up area. Each section is discussed below.

a. Classroom - Classrooms will be built in the mock-up training facility to provide a place for the formal instruction of craft personnel in the operation of specialized equipment and ALARA practices that will be implemented for the IGSCC project. The classrooms will be adjacent to the practice area so that classroom and practice work can complement each other.

b. Practice Area - After sufficient classroom training has been given on the operation of the specialized equipment, training will shift to the practice area. In the practice area personnel will practice the installation, operation and disassembly of the specialized equipment they will be required to operate in the drywell. These operations will be repeated until complete familiarity with the machine is achieved.

c. Mock-Up Area - Mock-ups will be constructed by the contractor which will simulate, in detail, the work areas in the drywell. These mock-ups will be actual size representations of certain drywell areas. All personnel performing work in critical areas will be required to perform their duties on the mock-up in the anti-contamination clothing and protective equipment required for that job in the drywell.

B. SPECIALIZED EQUIPMENT

Specialized cutting and welding equipment will be used at Cooper Nuclear Station for the IGSCC Outage. This equipment was designed to allow the operator to receive a minimum of exposure but still obtain the required precision results. A brief description of the cutting/welding equipment and their methods of operation will be discussed here.

1. <u>Self-Centering Internally Mounted Mandrel</u>

   Because of the arrangement of the 12" safe-end/thermal sleeve, operations to remove and replace the thermal sleeve will have to be done starting at the inside wall of the thermal sleeve. To accomplish this, a self-centering internally mounted mandrel was designed to support the cutting, tack welding and welding machines that will be necessary to remove and install the thermal sleeve.

   Since the mandrel remains stationary throughout the thermal sleeve replacement, the cutting/welding operations are assured of being done in exactly the same location. If changing mandrels or changing positions of the mandrel to accommodate different machines were required, exact re-positioning would be nearly impossible and would require significantly more man-Rem to reposition it.

   The mandrel also allows a majority of the setting up of the individual inside diameter machines to be done away from the high radiation area in the nozzle. In addition, all controls of the mandrel supported equipment will be outside of the nozzle.

   An added feature of the mandrel will be the inclusion of video monitoring equipment. The video equipment will allow remote viewing of the mandrel mounted machines.

2. <u>Thermal Sleeve Cutting Machine</u>

   The cutting machine that will be used for the thermal sleeve cuts is specially designed to be mounted and operated on the mandrel described above. The cutting machine will fit inside the bore of the safe-end/thermal sleeve and cut from the inside wall out. A single point cutting tool will be used to sever the thermal sleeve thereby minimizing airborne activity that could result by using a milling or flame cutting operation. Also, the single point cutter will also cut the weld preparation necessary to install the new thermal sleeve. The cutting machine controls will be situated outside the nozzle area.

3. <u>Internal Diameter Automatic Tack Welding Machine</u>

   Once the new thermal sleeve and safe ends are ready to be reinstalled, a special welding head will be installed on the mandrel to tack weld the two pieces and the insert ring together. On all OD welds the tack welding will be done manually. However, for these ID welds, manual welding is impractical. As with the cutting machine, the tack welder will be mounted on the internal mandrel. Video cameras will be used to observe the tack welding operation.

4. Internal Diameter Automatic Welding Machine

The thermal sleeve welds will be done with an automatic welding machine mounted on the internally mounted mandrel. The welding machine uses an automatic TIG process that can be remotely controlled. Video equipment will again allow remote observation of the welding process.

5. Automatic Cutting Machine on Outside Diameter Cuts

All of the cuts required to remove the recirculation system piping, with the exception of the thermal sleeves, will be accomplished with an outside diameter mounted automatic cutting machine. Single point cutting tools will again be used to sever the pipe. Where weld preparation is also required, only a tool change is required to make the necessary preparation. No mounting assembly adjustments are necessary.

The cutting machine is hydraulically powered and can operate two cutting tools at the same time. The machine will automatically feed the cutting tool(s) at a predetermined rate so the operator can remain in a low radiation area and observe the operation.

6. Automatic Welding Machine - Outside Diameter Mount

A remotely controlled automatic TIG welding machine using an outside diameter mount will be used on all pipe welds except where internal welding is required. Using the video system and remote control, the operator is able to control the welding process from outside the drywell. However, because of the importance of some welds and to avoid extensive weld repair, many times a welding technician will be stationed at the weld joint to observe the welding process. This saves a significant amount of accumulated dose by eliminating causes of imperfect welding.

7. Video Equipment

An extensive remote controlled video system will be installed in the drywell. The main purpose of this video equipment is to allow Health Physics Technicians and supervisors to observe drywell activities without having to enter the drywell. The cameras will be remotely operated so that all major work areas can be observed. At any time, the technician observing the video monitor can instruct a drywell Health Physics Technician to go to a specific area and investigate or correct any ALARA or radiological problems.

The video equipment will be of the pan and tilt type with zoom capabilities so that the cameras will have better range with improved focus. All camera control and video monitors will be at the drywell access point.

8. Health Physics Monitoring Equipment and Capabilities

Routine Health Physics surveying and monitoring will be done throughout the outage according to CNS Procedures 9.2.1, 9.2.2, and

9.2.3. In addition, more frequent measurements of local dose rates, airborne contamination levels and general area dose rates will be made when deemed necessary. At any time a problem is evident, appropriate sampling and monitoring will be performed immediately to insure the circumstances surrounding the work activities are known.

Below is a list of the portable survey instruments that will be used in the drywell during the IGSCC outage. The number in parenthesis indicates the number of calibrated instruments that are available.

GAMMA SURVEY METERS: *Eberline Model PIC-6A Ion Chamber (11)
Extender 1000W Extended Probe (10)

BETA/GAMMA SURVEY METERS: *Eberline Model RO-2/RO-2A Ion Chamber (23)
Victoreen Model 740-F Cutie Pie (15)

ALPHA SURVEY METER: Ludlum Model 2 Portable Alpha Meter (3)

* Instrument most likely used.

In addition to the portable survey meters at the drywell, counting equipment (gross beta-gamma, alpha, discriminating sodium-iodide detectors and germanium detector systems) can be used to perform the necessary analyses.

Additional constant air monitors have been obtained to supplement the plant's current inventory and to adequately provide prompt feedback of the airborne conditions in the drywell work areas.

When determined necessary by the Health Physics Department, bioassay techniques will be performed in accordance with CNS Procedure 9.1.8 to insure that the probability of ingestion of contamination by personnel is minimized.

CHAPTER V
TRAINING

The training of personnel in proper radiological and ALARA techniques is one of the best methods to keep exposures ALARA for general work in controlled areas. Reinforcing this knowledge by training personnel for specialized work in high radiation or highly contaminated areas can create significant man-Rem savings.

Training for the IGSCC outage will consist of two major phases. The first phase is General Employee Training. All personnel granted unescorted access to CNS will receive this training. (NPPD). The second phase of training is directed at instructing personnel who will be operating the specialized equipment designed for this outage. (CBI).

A. GENERAL EMPLOYEE TRAINING

General employee training for all personnel on site will be in accordance with CNS Procedure 1.5. Included in the training is:

1. Workers' rights under appropriate federal regulations.
2. Federal and plant permissible dose limits.
3. Meanings of posted radiological warning signs.
4. Response to emergency alarms and conditions.
5. Rules in radiologically controlled areas.
6. Definition and examples of ALARA.
7. Purpose and use of the SWP.
8. Utilization of time, distance, shielding.
9. Proper use of dosimetry.
10. Donning and removal of contaminated clothing.
11. Minimization of radiological waste and spread of contamination.
12. Use and reason for respiratory equipment.

Each worker will attend the class and shall indicate understanding of the concepts listed above by passing a test in accordance with CNS Procedure 1.5. No worker shall be allowed unescorted access until this requirement has been met. CNS will be responsible for the implementation of this training.

B. IGSCC OUTAGE TRAINING

In addition to the General Employee Training given to all personnel on site, specialized training and instruction will be given to all craft involved in the IGSCC project as their job task dictates. The objective of this IGSCC outage training program is to train the required contractor personnel sufficiently so that their exposures are maintained ALARA while performing these tasks. For many craft personnel, job training may only consist of pre-job briefings about work status and conditions prior to entering the drywell. However, for craft involved in the pipe cutting and welding processes, an intensive training effort will be implemented for the installation and operation of the specialized equipment that will be used in the IGSCC outage. Mock-up training and other training techniques will be used to insure that personnel will have complete familiarity of the equipment and its operation prior to using it in the drywell. The following will cover the major points of the IGSCC training program. The training program will follow procedures currently being developed by the contractor for the IGSCC outage at Cooper Nuclear Station.

1. Specialized Equipment Training

Prior to any mock-up training, personnel will be required to complete a "specialized equipment training class" to show competence in installing and operating the specialized equipment they will be using in the drywell. For a list of the specialized equipment used, refer to Chapter IV, Section B of this plan.

The specialized equipment training class will consist of classroom training and "hands on" practice. The classroom and "hands on" training will be arranged so they will complement each other. That is, techniques of assembly and operation which are demonstrated in the classroom will be practiced by the craft personnel in the training area. This training will continue until the contractor training supervisor is satisfied that the individual understands the equipment and can competently install and operate it.

2. Mock-Up Training

Once training has been successfully completed, the training will shift to the mock-up facility. Here craft personnel will practice installation and operation procedures learned in the first phase of training in a mock-up environment simulating the nozzle areas in the drywell. This training will also include the use of anti-contamination and respiratory equipment that may be used in the drywell during that operation.

Mock-up training for the CNS IGSCC outage will be set up with these goals.

a. Familiarize workers with the physical orientation and restraints of the work area.

b. Familiarize workers with the restrictions and loss of dexterity caused by wearing anti-contamination clothing and respiratory equipment.

c. Prove that tools and equipment will function as intended and that no additional items will be required.

d. Prove that the sequence of the procedure to be used in the drywell is feasible and meets ALARA considerations.

e. Test alternative methods of accomplishing a task that may save time and exposure or improve quality.

f. Demonstrate that temporary shielding or contamination control arrangements will function as intended and will not be counter productive to ALARA objectives.

g. Train personnel in the installation and removal of shielding around the nozzle areas. Shielding sequences and techniques will be evaluated during mock-up training so that the most efficient method of shielding installation will be done in the drywell.

C. PRE-JOB BRIEFINGS

Pre-Job Briefings will be held prior to the beginning of every job in the drywell. These briefings can range from an informal meeting between a crew and their foreman for low exposure/routine jobs to formal meetings involving contractor and utility personnel for high exposure jobs. Items to be discussed at these meetings will include:

1. Job to be performed.
2. Assignment of individual responsibilities.
3. Radiological conditions at the work areas.
4. Warnings about radiological and safety hazards around the area.

CHAPTER VI
IMPLEMENTATION OF RADIATION PROTECTION PLAN

Approved procedures will be the controlling documents for all work performed in the drywell. All work performed by the contractor shall be in accordance with procedures written by the contractor and approved by NPPD. Section III of this chapter gives the sequence for reviewing and approving procedures by NPPD.

Since the procedure must be followed exactly as written, it is through these procedures that enforcement of the ALARA plan is accomplished. The following is a list of the type of procedures that will be written by the contractor prior to the start of the outage. A brief description of the procedure and the ALARA/Radiological Safety Requirements that will be contained in each procedure is also given. This is not an all inclusive list of procedures required from the contractor, only the procedures that have significance from an ALARA point of view. The organizational responsibilities and functions were described above in Chapter II.

A. TASK WORK PACKAGE

These are the step-by-step instructions detailing the removal and replacement of the CNS Recirculation piping, Core Spray piping, Reactor Water Clean-up piping, the Core Delta P nozzle, and the Jet pump Instrumentation Nozzle. The steps will be arranged so that the least amount of man-Rem will be expended to complete the job. In addition, radiological hold points will be placed in strategic locations throughout each working instruction. These radiological hold points are inserted to suspend work until the Health Physics Department is satisfied that radiological control is maintained.

B. ALARA PROCEDURE

An ALARA procedure will be written by the contractor that shall cover the following points:

1. ALARA Staff Organization - How the contractor ALARA staff will be organized and each positions specific responsibility.

2. Pre-Job Planning - This section will explain how the contractor will review specific jobs and procedures to insure ALARA practices are planned into the work.

3. Job Performance - This section will detail how the contractor will monitor the job's progress. It will explain:

    a. Responsibility for supplying the necessary data for monitoring dose tracking.

    b. The procedure for correcting man-Rem overruns based on the dose tracking program during the job's progress.

    c. The procedure for initiating and documenting "stop work" orders due to excessive man-Rem overruns or loss of radiological control.

4. Post-Job Review - This section will explain the documentation used to review and critique specific jobs in the drywell.

C. TRAINING PROCEDURE

A procedure will be developed by the contractor detailing the training program that will be used for craft personnel. The procedures will include:

1. A training schedule and agenda to be used to train craft personnel on specialized machinery.

2. Layout and design of training facility involving mock-up.

3. Training organization and qualifications of training staff.

4. Documentation to be used to signify that individual has successfully completed training.

5. Schedule and agenda for the re-training of personnel as required and the necessary documentation.

D. RIGGING PROCEDURE

A procedure will be developed by the contractor that will describe the rigging processes that will be used to transport the pipe. Items to be included in the procedure are:

1. Rigging methods to be used.
2. Supports and equipment required.
3. Process used to determine rigging paths.
4. Methods of capping and transporting highly contaminated piping in the drywell.
5. Pipe removal point from drywell plus movement of pipe to the storage/disposal area.

E. SHIELDING PROCEDURE

The shielding procedure will describe the shielding that will be used and its location in the drywell for the IGSCC outage. In addition, the procedure will give step-by-step directions for installing and removing the shielding from its designated location.

F. CONTAINMENT PROCEDURE

A procedure will be written by the contractor detailing the types of containments (glove bags, tents) that may be utilized during the outage. Details of this procedure will include:

1. Design and purpose or containments.
2. Installation and disassembly instructions.
3. Instructions on how to correctly use containments to prevent airborne and spread of contamination.

G. VENTILATION PROCEDURES

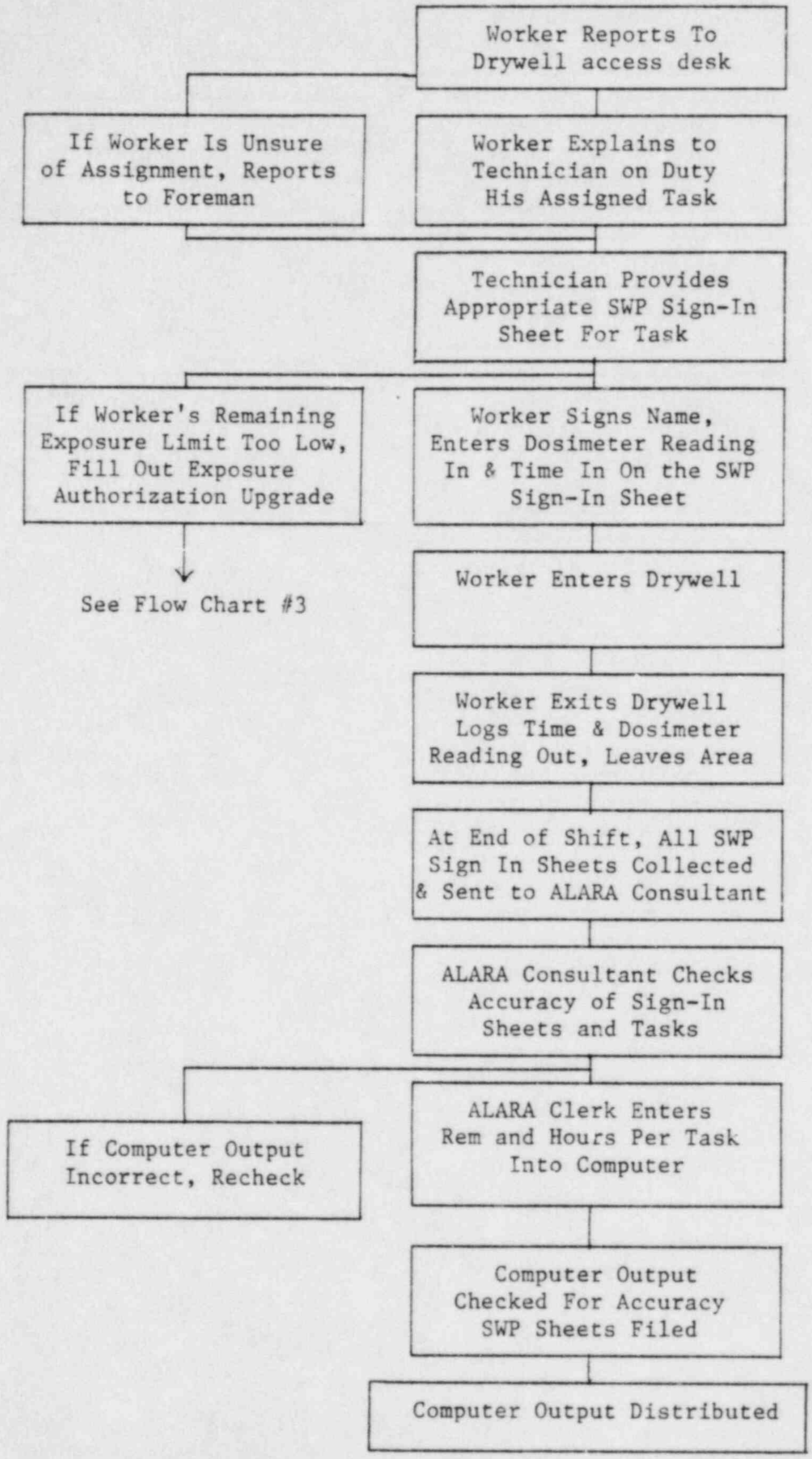
The contractor will develop procedures that will explain ventilation requirements in the drywell. Included in this procedure will be:

1. Ventilation equipment specifications necessary to adequately control airborne contamination.
2. Proposed set-ups using containments in the drywell.
3. Diagrams detailing proposed set-ups in the drywell.
4. Conditions where ventilation would be used.

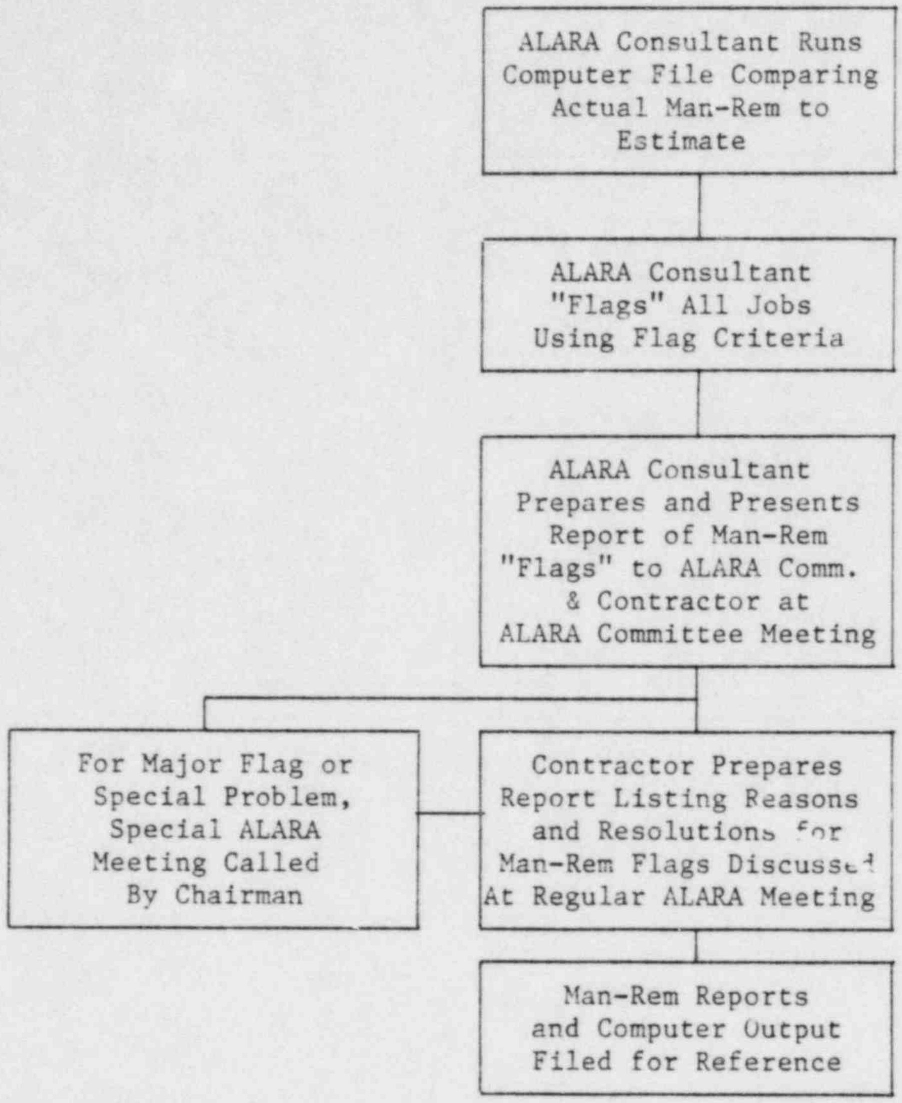
H. IMPLEMENTATION FLOW CHARTS

The following flow charts help describe the information flow for a variety of items related to radiological control and ALARA. At the top of the chart is the initiating step and the bottom being the completion step. Steps placed side-by-side can occur simultaneously.

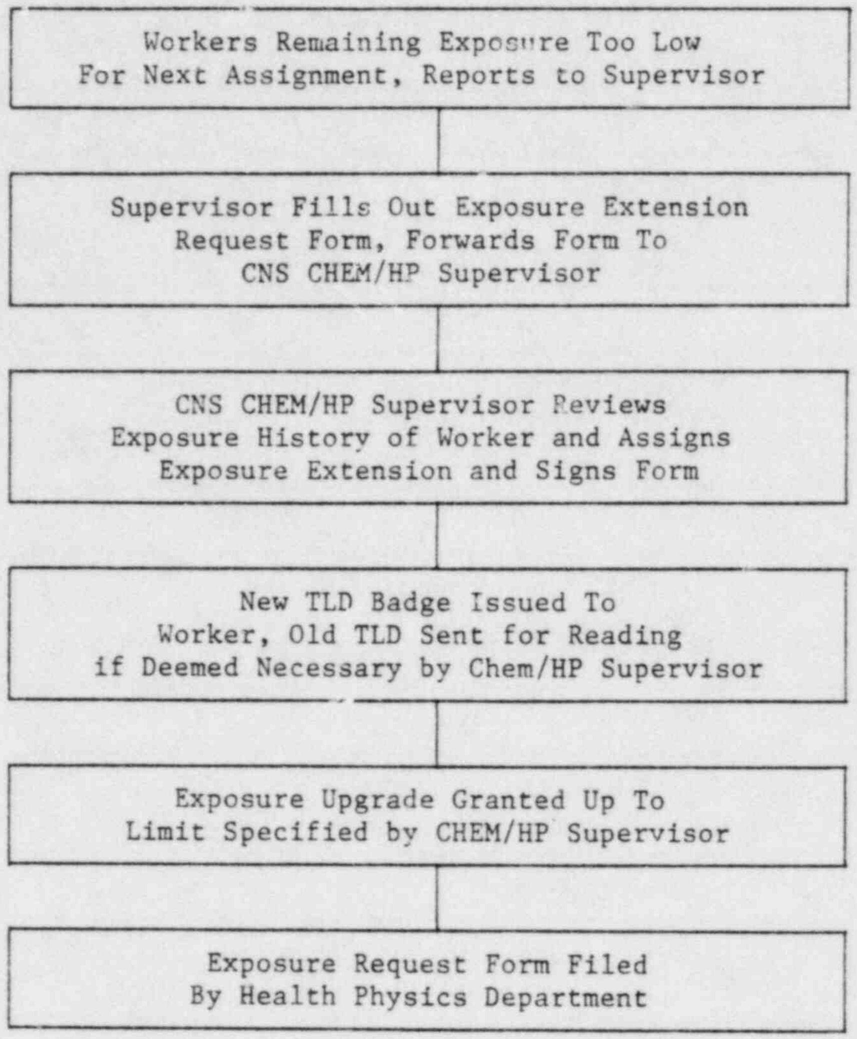
1. Dose Tracking by Task Flow Chart - This flow chart shows how man-Rem data will be collected and input into computer.



2. Dose Tracking Review Cycle Flow Chart - This flow chart shows how job and tasks will be reviewed for ALARA purposes.



3. Exposure Limit Upgrade Flow Chart - This flow chart will show how a worker's exposure limit can be upgraded.



1. PROCEDURES REVIEW AND APPROVAL

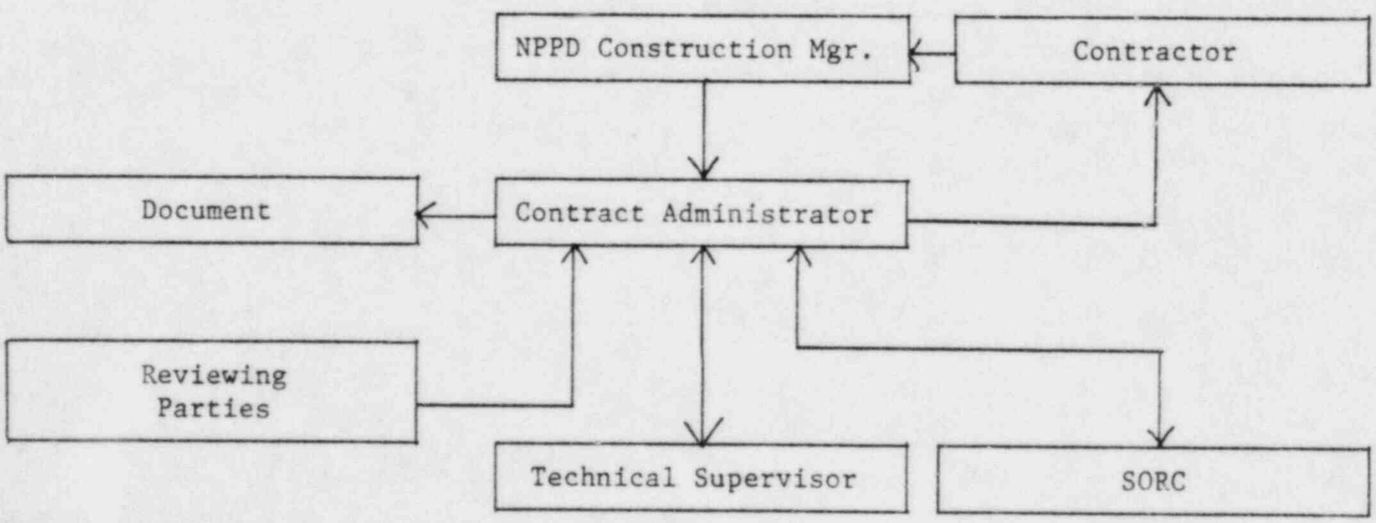
The sequence for reviewing and approving all procedures related to the IGSCC project is described below. The governing NPPD document is the Cooper Nuclear Station, Construction Management Procedure No. 4. This existing procedure was initiated to provide a means for; monitoring up-to-date and continuous records of all drawings and data, orderly processing of all Contractor submittals between Construction Management, Quality Assurance, CNS Operations and CNS Engineering, and controlled distribution of approved drawings and procedures.

All project submittals will be transmitted to the NPPD Construction Manager who will forward them to the Contract Administrator. The Contract Administrator will officially transmit the submitted documents to the appropriate persons for review. This will include the necessary ALARA reviews of appropriate documents. The Contract Administrator will also maintain an official log as per CNS-CMP-No. 4, to maintain a permanent record of the disposition of each document.

The reviewing parties are required to review and provide appropriate comment, within the time specified on the transmittal by the Contract Administrator.

The Contract Administrator will then forward all appropriate information to the Technical Supervisor for consolidation. The Technical Supervisor will either approve of disapprove the submittal and return it to the Contract Administrator. If not approved, it will be returned to the Contractor for incorporation of the data required for approval. If approved by the Technical Supervisor, the Contract Administrator will distribute the submittal to CNS SORC members for approval.

Once SORC approval is obtained, the submittal is appropriately documented by the Contract Administrator and distributed to appropriate NPPD personnel and the Contractor.



CHAPTER VII
RADIOACTIVE WASTE DISPOSAL

Waste disposal for the IGSCC outage at Cooper Nuclear Station will be divided into two major parts; standard waste disposal and large pipe disposal.

A. STANDARD WASTE DISPOSAL

Standard wastes and dry active waste (DAW), that are generated during the outage shall be handled through CNS Procedures 7.9.2, 9.5.3.1, and 9.5.3.2. Although significant amounts of this type of waste will be created during the outage, existing plant procedures and plant equipment are sufficient to process it.

Every effort will be made to minimize the generation of DAW by prudent management practices and procedures implemented at the drywell access control point.

B. RECIRCULATION PIPE DECONTAMINATION

The recirculation system at Cooper will be decontaminated, in-situ, using a commercially available process which has been proven to be highly effective in removing contamination from stainless steel with a minimum waste volume. This process, "Citrox," utilizes a high recirculation flow rate and spray system with a regenerative solvent. All chemicals and dissolved radioactivity will be removed from the system using filters and ion exchange columns.

The decontamination flow path will be through spray nozzles inserted into the 12" discharge risers, the 28" suction elbows and Residual Heat Removal System piping, with the return path being through the decontamination connections located adjacent to the recirculation pumps. Decontamination solutions will be prevented from coming in contact with reactor vessel internal surfaces by using spray nozzle adapters, suction line plugs, level control equipment, inventory control and operating procedures.

Screening tests will be performed on plant artifacts to confirm the optimum process application parameters and assessment of the decontamination factors.

Some of the key features of the process are as follows:

1. Mock-up training capabilities on all phases with all the equipment.

2. Appropriate engineering safeguards are incorporated into the equipment design and operating procedures to insure safe control and optimum benefit.

3. Continuous monitoring and sampling capabilities.

4. Continuous regeneration of the active solvent through a cation exchanger during decontamination, followed by clean-up of the residual chemicals and radioactivity with a mixed bed ion exchanger at the completion of the decontamination.

5. The systems are left full of deionized water, and portable ion exchangers contain the removed radioactive materials on the resin.

6. No highly radioactive liquid wastes are generated.

7. On-line process filters downstream of ion exchangers for maximum protection of plant equipment.

8. Skid mounted equipment designed to allow rapid installation and removal with a minimum of effort.

9. All electrical and control cables are provided with pin connectors and plugs for fast hookup.

10. All process hoses and connections are completely hydrotested after installation on site during the preoperational check-out. All hoses are of high quality and are rated to 250 psig at 350°F continuous service. Three inch and four inch diameter hoses are provided with flanged connectors. Camlock quick connects are provided for hoses 2" and smaller.

11. All process system components in contact with the solvent are of 304 or 316 stainless steel. All equipment is fabricated to acceptable Quality Assurance Standards for temporary nuclear plant use.

12. Flexible, high capacity cleaning system design which provides up to 750 gpm flow with on-line regeneration and fast heatup capability.

13. Redundant level, pressure, flow and temperature control are provided.

14. Integral shields for the cation ion exchange columns are provided to allow the columns to be transported to the Radwaste Building where the resin may then be sluiced into the plant resin system or directly into a solidification liner. This approach eliminates the spill hazards, radiation exposure, interferences and delays associated with transferring resins long distances. The ion exchangers are well shielded, easily transported (dolly or crane) and are leak tight.

15. Portable mixed bed columns utilized for solvent cleanup will not require shielding as most radioactivity will be removed by the cation column.

This in-situ decontamination affords multiple benefits. The first is that the radiation levels throughout the drywell will be significantly reduced. Secondly, during the preparation for packaging and packaging steps, the activity is greatly reduced minimizing the airborne hazard and radiation levels. Third, the total activity for shipping of the pipe is minimized without further decontamination once the pipe is removed from the drywell.

C. LARGE PIPE DISPOSAL

Packaging and disposal of the large recirculation system piping represents unique situations that are not covered completely by existing plant procedures. The contractor work instructions will provide the necessary additional procedures from initial cutting in the drywell to final packaging for shipping.

D. HANDLING AND RIGGING

Once the pipe sections are severed from the system, they will be temporarily capped for transport within the drywell to a staging area just outside the drywell. The contractor rigging procedure (work instruction) will include the necessary steps for appropriately capping the pieces of pipe.

E. TEMPORARY STAGING AREA

This staging area will be used to prepare the individual pieces of pipe for shipment off site. Any further cutting or decontamination of the pipe will be performed in this area, as well as final packaging.

Analyses for level of contamination and activity necessary for burial will be done in this area where the expected background radiation will be relatively low. The site Health Physics staff have the capability to accurately determine these levels and appropriate existing procedures for implementation. In addition, if it is determined necessary, a specific isotopic analysis can be performed to verify existing procedural analyses.

The staging area, being very close to the drywell, will be limited in size; therefore, to avoid creating a congested and hazardous radiation area, every effort will be made to perform the final cutting, analysis and packaging as efficiently as possible. Once completed, the pieces will be loaded into an appropriate low specific activity (LSA) shipping container for disposal.

Existing plant procedures will be used to prepare the necessary shipping/disposal documentation.

Nebraska Public Power District
GENERAL OFFICE
P.O. BOX 499, COLUMBUS, NEBRASKA 68601-0499
TELEPHONE (402) 564-8561

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August 15, 1984

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Recirculation Piping Replacement
Radiation Protection Program

Dear Mr. Eisenhut:

Reference: 1) Generic Letter 84-07 "Procedural Guidance for Pipe Replacement in BWRs" dated March 14, 1984

2) Letter from L. G. Kuncl to D. G. Eisenhut dated June 4, 1984, "Response to Generic Letter 84-11 (Inspection of BWR Stainless Steel Piping)"

3) Letter from E. D. Sylvester to NPPD dated July 23, 1984, "Summary of Meeting with NPPD Concerning Recirculation Pipe Replacement at CNS"

In accordance with your request of Reference 1, enclosed are five copies of the Cooper Nuclear Station Radiation Protection Plan for the Recirculation Piping Replacement Program. Additional information relating to our pipe replacement program was provided in Reference 2 and documented in Reference 3.

Should the Staff have any questions regarding this program, please contact me.

Sincerely,

Jay M. Pilant

Jay M. Pilant
Manager, Technical Staff
Nuclear Power Group

JDW:cmk
Enclosure (5)

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