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Report No. 80-07 Health Physics Appraisal Program

Docket No. 50-298

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Licensee: Nebraska Public Power District (NPPD)
Post Office Box 499
Columbus, Nebraska 68601

Facility Name: Cooper Nuclear Station (CNS)

Appraisal at: CNS, Brownville, Nebraska and NPPD Corporate Offices in Columbus, Nebraska

Appraisal conducted: May 5-16, 1980

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Regulatory Guide 8.15 states, in part, Paragraph C.2., "Respiratory protective equipment is to be selected to provide a protection factor greater than the multiple by which peak concentrations of radioactive material are expected to expected to exceed the values specified in Table 1, Column 1 of Appendix B to 10 CFR Part 20."

Contrary to the above requirements, on April 22, 1980, a painter performing experimental grinding in the torus was provided a respiratory protective device with a protection factor of 50 during a period in which the peak concentration of a mixture of airborne radionuclides exceeded the concentration specified in Table 1, Column 1 of Appendix B to 10 CFR Part 20, by a factor of approximately 143.

Inspection Summary

Appraisal on May 5-16, 1980 (Report No. 50-298/80-07)

Areas Appraised: Announced appraisal of health physics program, including organization and management, personnel selection, qualification and training, internal and external exposure controls, surveys and access controls, radioactive waste, ALARA, facilities and equipment, and emergency response capabilities. The appraisal involved 426 appraiser-hours on-site by two NRC Radiation Specialists and two NRC contract Health Physicists.

Results: Several significant weaknesses in the health physics program were identified. These weaknesses are in the areas of personnel selection qualification and training (Section 2.0), internal radiation exposure control (Section 3.2), and personnel contamination surveys (Section 3.3). Three apparent items of noncompliance were found (infraction-qualification of staff not in accordance with Technical Specifications-Section 2.2; infraction-High Radiation Area access not in accordance with Technical Specifications-Section 3.4; infraction - 10 CFR 20.103(c) and Regulatory Guide 8.15, Improper selection of respiratory protection equipment - Section 3.2.4)

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SUMMARY

The special Health Physics Appraisal was conducted during the period May 5-16, 1980, to evaluate the adequacy and effectiveness of Cooper Nuclear Station's (CNS) overall health physics program. At the time of the appraisal, CNS was in the last phases of a refueling and major maintenance outage which included removal and replacement of feedwater spargers, torus modifications, maintenance of control rod drives and inspection and repair of turbine disc cracks. Appraisal during this period enabled the appraisal team to observe the health physics staff performing a wide range of activities under stressful conditions and provided an opportunity to review the effectiveness of implementation of the radiation protection program.

The Appraisal Team consisted of two inspectors from the NRC Region IV office and two contractor personnel provided by Battelle-Pacific Northwest Laboratories. The appraisal included observation of work practices, review of selected procedures and representative records, together with interviews with Nebraska Public Power District (NPPD) personnel. The scope of the appraisal included:

A. Radiation Protection Organization and Management

B. Personnel Selection, Qualification and Training

C. Internal and External Exposure Controls

D. Surveys and Access Controls

E. Radioactive Waste Management

F. ALARA Program

G. Facilities and Equipment

H. Emergency Response Capabilities

Weaknesses in the CNS health physics program were identified in several areas. Items identified which are considered to be significant weaknesses are as follows:

1. Lack of personnel selection, qualification and training criteria which are adequate to ensure appointment of health physics staff who meet industry standards and regulatory requirements.

2. Omissions in the internal exposure controls program relative to establishing and evaluating airborne radioactivity areas, and developing internal dosimetry procedures for evaluation of personnel intakes of radioactive materials.

3. Poor practice in personnel contamination monitoring techniques for workers exiting the reactor buiding airlock.

Additional weaknesses which are considered to be less significant but important to the implementation of a quality health physics program are identified and discussed in the respective report areas.

In addition to the weaknesses described above, three apparent items of non-compliance with NRC requirements were identified as follows:

1. Appointment of two health physics technicians to responsible positions who did not fully meet the qualification requirements of Technical Specification 6.1.4.

2. Failure to control access to a high radiation area in accordance with requirements established in Technical Specification 6.3.5.

3. Failure to select the proper respiratory protective device for an individual in an airborne radioactivity area as required by 10 CFR 20.103(c) and Regulatory Guide 8.15.

1.0 Radiation Protection Organization and Management

1.1 Description

The Cooper Nuclear Station (CNS) organization is described in CNS Administrative Procedure 1.2. The organization in place at the time of the appraisal is depicted by the chart in Figure 1., which is essentially the same as that in Figure 6.1.2 of the CNS Technical Specifications with the exception of the newly designated Technical Assistant to the Station Superintendent. The radiation protection organization is directed by the Chemistry and Health Physics Supervisor (CHPS), who reports directly to the Station Superintendent. The CHPS functions as the "Radiation Protection Manager" (RPM) but this position title is not in use at CNS. Reporting to the CHPS are a Chemist and a Health Physicist who respectively supervise the activities of four Chemistry Technicians and six Health Physics Technicians. Each of the technician groups have a designated Lead Technician position which coordinates technician activities. There are no other organizational units onsite or offsite that have radiation protection program responsibilities. Nebraska Public Power District (NPPD) does not have a radiation protection organization or individual at the corporate level designated to provide health physics or radiological engineering support to the onsite program.

The CNS organizational structure places the RPM function at the same reporting level as operations and maintenance. The Appraisal Team considers this to be good practice from the standpoint of establishing effective communication channels between Station divisions and with the Station Superintendent, together with providing the necessary level of responsibility and authority to administer the radiation protection program. There is some concern that the dual responsibility for Chemistry and Health Physics could dilute the health physics effort and/or confuse the chemistry production-oriented function with the health physics safety-related function. No apparent problems relative to this dual responsibility were identified by the Appraisal Team but this is considered to be strongly dependent on the individuals involved and should be re-evaluated if personnel changes are made.

The Appraisers noted that there is no corporate radiation protection organization although there are some personnel in the General Office environmental organization that have health physics backgrounds, including the former CNS RPM. These personnel presently are involved in radiation protection to the extent of performing an audit function (See Section 1.4). The Appraisal Team does not consider this to be a major cause for concern but feels that NPPD should look into the feasibility of designating such a staff function at the corporate level. In order to be effective, the Team feels that at least one individual in this function should be fully RPM qualified in accordance with NRC Regulatory Guide 1.8 and should have the major portion of his time dedicated to radiation protection. The

individual should be capable of providing a high level of technical assistance to the Station and serve as a backup RPM during periods of extended absence of the onsite RPM.

1.2 Scope of Responsibilities

The scope of responsibilities for the radiation protection program is defined in Administrative Procedure 1.2 "Station Organization and Responsibility" and Health Physics procedure 9.1.1.1 "Radiation Protection at CNS." HP Procedure 9.1.1.1 specifies that the Station Superintendent has primary managerial responsibility and the CHPS is responsible for administering the radiation protection program. The Health Physics Procedure also establishes responsibilities for the health physics personnel, shift supervisors, Station supervisors and individuals working at CNS.

Authority delegated to the CHPS include, without prior notice to the Station Superintendent, the restriction of further exposure to personnel if the accumulated exposure is near the limit and the termination of any or all operations involving radiological hazards as necessary to avoid personnel exposures in excess of regulatory limits. The health physics staff under the CHPS are not delegated authority to stop work but are assigned responsibility for identifying radiological hazards and recommending such action to the CHPS.

The following job descriptions were found to be documented for the Chemistry and Health Physics staff positions:

Chemistry and Health Physics Supervisor

Health Physicist

Chemist

Lead HP Technician

Lead Chemistry Technician

HP Technician

Chemistry Technician

These job descriptions described the duties or principal activities of each position, number and type of personnel reporting to the position, duties of the position and education, training and experience required. A statement of responsibility is included but it is very general in comparison to the functional responsibilities described in HP procedure 9.1.1.1. The Health Physics and Chemistry personnel are divided in responsibilities according to their separate specialties and there is no rotation of assignments between

the two groups, although Chemistry technicians do assist Health Physics in outages. Within the Health Physics group there are no special assignments to technical specialties, such as internal dosimetry, ALARA, respiratory protection, training or counting. Each Health Physics staff member is considered to be qualified in all these areas.

1.3 Staffing

The health physics staff under the CHPS consists of one Health Physicist, one Lead HP Technician, five HP Technicians and one Clerk. The total Station staff is approximately 140. During normal operations the Technicians, in addition to their general duties, rotate monthly through assignments to one of the following areas: Reactor Building, Radwaste, and Turbine Building coverage; environmental surveillance support, or counting room/instrument calibration. There is no back shift HP Technician coverage under normal operating conditions. This routine coverage is provided by operators who are considered to be adequately trained to meet the Technical Specification requirement for personnel qualified in radiation protection procedures.

During refueling and/or major maintenance outages, 24 hour health physics coverage is provided by HP Technicians rotating through each shift on an assigned basis. In general, no outside HP personnel are brought in to assist in radiation protection coverage unless there are special circumstances involved. For example, during this outage the feedwater sparger change out contract included the services of six general electric HP Technicians together with an exposure records clerk. Supplemental assistance in routine health physics functions may also be provided by HP personnel from other utilities with units under construction. During this outage three Public Service of Oklahoma HP personnel were observed working in the Health Physics area.

The Appraisal Team did not observe any apparent problems in staffing to meet the current outage workload at the supervisor or technician levels. Because of this it appears that the routine operational workload should be no problem. The Team noted that one of the factors that enables CNS to provide adequate health physics coverage for outages without bringing in additional HP technicians is the relatively small number of outage personnel utilized at the Station. The Station Superintendent stated that a routine refueling/maintenance outage requires only about an additional 70 maintenance personnel and 30 vendor representatives at the Station. During the current refueling and extensive maintenance outage only about 130 additional outside personnel were utilized. However, the Team noted that additional health physics staffing would be required if 24-hour, seven-days a week HP technician coverage was implemented for normal or significant off-normal conditions.

1.4 Review and Audit

NPPD quality assurance (QA) audit and surveillance requirements related to health physics programs are set forth in the NPPD QA Manual and CNS Technical

Specification 6.2.1. Biennial audits of health physics, chemistry and environmental programs are performed by corporate office staff under the NPPD Safety Review and Audit Board (SRAB) cognizance to satisfy the Technical Specification requirements. Technical expertise in the areas audited is generally provided by corporate environmental staff members who have appropriate prior experience at the Station or outside facilities. An onsite QA group, which reports to the corporate QA Manager, performs surveillances of chemistry, health physics, environmental monitoring, radioactive waste treatment and disposal, instrument calibration and emergency plans annually in accordance with QA Plan procedures (QAP). There are no audits or program reviews by outside organizations except the annual American Nuclear Insurers review. An appraiser reviewed reports of surveillances of each health physics related area conducted during the previous twelve months and the previous three SRAB audits. It was noted that the surveillances were primarily concerned with determining conformance with the requirements of Technical Specifications, NRC regulations or Station procedures, but comments on elements of good practice did appear in reports. In reviewing the SRAB audits reports since 1975, it appeared that the audits have become gradually restricted in scope and depth to the point of being a limited surveillance of the areas audited. Because of this, it appeared that the SRAB audit is not an effective review of the performance of the overall program.

1.5 Communications

Communication within the health physics staff is effected through several means. The small staff facilitates frequent daily contact between the CHPS, Health Physicist and technicians. Daily shift turnover meetings are held to pass operational information on and a health physics log is generated which documents daily activities as well as routine and nonroutine occurrences. A copy of the daily health physics log is routed to the CHPS and he maintains a copy in his files. New or revised Station procedures are reviewed by the CHPS in his role as a member of the Station Operations Review Committee (SORC) and the change information passed on to the health physics staff when indicated. The CHPS has radiation protection input into design changes through the SORC review process. He attends routine operations and maintenance planning meetings, and participates in preplanning meetings for outages and provides input to post outage critiques. Planning schedules developed are routed to the CHPS and the Health Physics staff. No apparent problems in communications either within the Health Physics staff or with other Station organizational units were identified by the Appraisal Team.

1.6 Conclusions

Based on the findings reported above, this portion of the licensee's program appears to be acceptable but the following should be considered for improvement in the program:

1. Establishing an offsite radiation protection function at the corporate level with a minimum of one individual fully RPM qualified in accordance with NRC Regulatory Guide 1.8.

2. Obtaining additional health physics staff as necessary to provide routine backshift coverage by ANSI 18.1 qualified HP technicians.

3. Utilizing the biennial SRAB audit for a thorough evaluation of the radiation protection program compliance and performance.

2.0 Personnel Selection, Qualification and Training

2.1 Selection Criteria

Cooper Station has no formal, written selection criteria for new employees. CNS representatives expressed several times their philosphy of maintaining a small well qualified staff which would experience a minimum of turnover. J. Sayer, Chemistry and Health Physics Supervisor, did list some of the informal criteria which are considered when a position is being filled. The first item is the desire for degreed people. The degree need not be in Health Physics but in a science field such as Chemistry, Mathematics, or Physics. This goal seems to be borne out in that of the 13 total staff in Chemistry and Health Physics, 10 have B.S. degrees. The next criterion mentioned was nuclear experience, especially Navy nuclear. CNS does have two people without degrees who have Navy backgrounds, one in the nuclear Navy.

If a person with nuclear experience is not available CNS looks for power plant experience and in all selections they consider the area of the country the applicant comes from. They feel that their relative isolation and typical weather cause many people from other parts of the country to leave after a short time. CNS does seem to maintain a small turnover rate in employees, only two technicians had less than 2 years at the plant.

The appraiser found this area deficient, in that selection criteria are not geared to the qualifications listed in ANSI N18.1 or NRC Regulatory Guide 1.8.

2.2 Qualification Criteria

Cooper Station has no formal written qualification criteria and procedures except for a general requirement in the Technical Specifications that ANSI N18.1 will be followed. Some minimum qualifications are listed in the FSAR which are not up to date and which do not fulfill N18.1. CNS also seem to consider experience in the Chemistry section of the department as health physics experience and qualification for health physics supervisory positions. The two top positions, Chemistry and Health Physics Supervisor (RPM) and Health Physicist (Supervisory) were filled

with people with primarily chemistry experience. It should be said, however, that the Chemistry technicians do cross-over into health physics to help out, especially during outages.

Qualifications of each of the HP technicians were reviewed to determine if Station requirements in this regard were being met. CNS Technical Specification 6.1.4 states that personnel appointed to an active position must meet the requirements described in ANSI N18.1-1971, "Selection and Training of Personnel for Nuclear Power Plants." Section 4.5.2 of the referenced standard establishes a minimum two years of working experience for technicians in responsible positions. The qualifications review showed that two HP technicians possesing approximately six and ten months of working experience in their speciality, respectively, had been appointed to responsible positions on the Health Physics staff. This situation was identified to the licensee as apparent noncompliance with the Technical Specification requirement stated above.

2.3 Training

2.3.1 General Employee Training

Health physics training at Cooper Station appears to be done well at most levels but is not well documented and controlled. Training seems to fall into three catagories aimed at the appropriate regulatory requirements. They are: initial or introductory radiation protection training given to all new personnel, training of health physics technicians for job performance, and training of other persons to be "radiation protection qualified" such as chemistry technicians and licensed operators. The Educational Specialist (Training Coordinator) keeps records of training received by employees in all areas including health physics but the records tend to list the number of hours spent only without any indication of subjects covered or job functions for which qualified.

The initial or introductory training for all new personnel was observed in its entirety, approximately three hours, including NUS tapes on radiation protection and about one hour of interspersed plant specific information. The tapes are well done and the plant specific information is appropriate. Cooper Station emphasizes personal responsibilities for radiation protection of all personnel. Each person reads, records, and xeros his own pocket ionization chamber and is responsible for reporting his exposure to his supervisor. This was stressed in the training session and shown on the NUS tape but no charger was brought into the training room for demonstration. Personal responsibility for protective clothing and decontamination of tools was also stressed and shown in the tapes but no demonstrations were used during training. No one is badged for unescorted entrance into radiation areas or contaminated areas without first receiving the initial health physics training.

Supervision stated that all HP technicians were qualified to conduct the initial training program.

2.3.2 Operator Training

Health physics training of licensed operators is given during the operator training period. The Educational Specialist gives 10-20 hours of basic health physics and sends each trainee to Health Physics for hands-on training for specific instruments and survey procedures. No records are kept of which instruments and which procedures each individual operator has been qualified for, but all licensed operators are considered to be "radiation protection qualified" as defined by the NRC position statement. This is considered a weak area and could be strengthened by documenting HP training and qualification of operators or putting a qualified HP technician on the back shift.

2.3.3 Health Physics Staff Training

Each HP technician has an extensive training check list which covers virtually all of the job functions in the Health Physics department. The same approach is taken as with Chemistry technician, when a new man is qualified for a particular job or procedure that fact is noted on the list by date and person doing the training. The checklist is very comprehensive and provides a good record for qualification at each stage of training. Again maintenance of records is rather lax and not kept up to date. Also ANSI N18.1 requirements for two years experience are not followed.

All Chemistry technicians have a training check list covering all the areas of their job responsibilities. As they become qualified for a specific job that fact is recorded on the check list by date and person doing the training. The last page of the check list is for health physics training. Chemistry technicians do not have routine health physics duties but they help out when it is needed, especially during outages. The basic training concept is considered good but recording of training and check-off of qualification is rather lax and not kept up to date.

2.4 Conclusions

Based on the appraisal findings in this area, personnel selection and qualification criteria must be established as necessary to ensure that appointments to the health physics staff meet industry standards and comply with regulatory requirements to achieve a fully acceptable program. Training is considered adequate but could be improved in recording of topics covered and job functions for which the person trained is qualified.

3.0 Exposure Control

3.1 External Exposure Control

3.1.1 Dosimetry Program

The licensee uses an Eberline thermoluminescent dosimeter (TLD) system and direct-reading pocket dosimeters to evaluate external exposure at Cooper Nuclear Station. The Eberline System consists of two LiF chips. One chip is located behind a mylar "window" and is used together with the first chip to evaluate the dose from beta particles. The TLD badge is exchanged on a monthly basis and the results form the basis for the official assignment of dose equivalent from external radiation.

The TLD badges are used almost exclusively for whole body dose measurement. Extremity monitoring devices are not generally used and calculations are not performed to determine if the extremity dose might be limiting rather than the whole body dose for personnel working in areas where high local beta/gamma fields could be encountered.

Direct-reading (0-200 mR) pocket chamber dosimeters are used at CNS to evaluate the exposure from gamma radiation on a daily basis. Workers at CNS are charged with the responsibility of reading their pocket chambers at the beginning and end of each day, and recording the results. These results are transferred on a daily basis to the health physics area, where the exposure of all monitored individuals is tracked.

In addition to the Eberline TLD system and the direct-reading pocket chambers, a third external dosimetry system is available at CNS. This system consists of a Teledyne TLD badge and TLD reader. Although the licensee does not use the system on a routine basis, it was the method used prior to adopting the Eberline TLD system, and is unofficially used occasionally, particularly during outages.

The licensee employs an Eberline TLD system to evaluate neutron dose. Approximately 20 individuals are provided with the TLD-100 badges which are exchanged monthly.

It is not clear whether the Eberline TLD system is sufficiently responsive to beta radiation to provide an adequate evaluation of beta dose. As mentioned earlier, the Teledyne TLD badges are sometimes used during outages. At the time of the appraisal, CNS was in a scheduled refueling outage. One of the jobs performed prior to the appraisal was the replacement of the feedwater spargers. The worker was performed by GE personnel who wore not only an Eberline TLD and a direct-reading pocket chamber, but also

a Teledyne TLD. The results from Eberline were compared to those the licensee obtained after reading out the Teledyne TLD. The response to gamma radiation as measured by the two systems for 10 randomly selected workers agreed to within 10%. The response to beta radiation was less encouraging. The Teledyne TLD readings indicated that all 10 workers received a beta dose of at least 30 mrad and that one worker received 231 mrad. The Eberline results indicate that only two workers received any beta dose. The results are seen in the following table:

	Eberline TLD (mrem)		Teledyne TLD (mrem)	
Worker Number	Beta	Gamma	Beta	Gamma
1	0	965	132	1293
2	0	1728	30	1000
3	0	905	125	943
4	260	1731	231	2323
5	0	1768	68	1621
6	0	1820	223	1876
7	0	607	37	617
8	0	1708	132	2391
9	113	895	61	834
10	0	1660	155	1426

Further information is necessary in order to evaluate the adequacy of the Eberline neutron TLD system. The licensee has conducted some preliminary work, including taking measurements with the PNR-4 "rem-ball" and placing Eberline neutron TLD badges in front of, and behind, a one gallon water jug. Unfortunately the data have not yet been analyzed to yield more information regarding the neutron spectrum that the TLD system is expected to respond to.

3.1.2 Exposure Review

Pocket chambers are read daily by workers and the results entered on dosimeter logs posted at the security control station; and also upon entry and exit from SWP areas. Health Physics reviews the dosimeter readings to estimate the accumulated doses prior to receipt of the TLD results from Eberline. During outages, the pocket chamber readings are maintained on a chart posted outside the health physics office and are used to keep track of accumulated doses in relation to the Station administrative limits. The estimated doses from pocket chambers are replaced with TLD results when available. The use of dosimeters or survey information for evaluation of personnel extremity exposures is infrequent at CNS. It was noted that there are no guidelines or standard procedures in effect for determining when and how potential extremity exposures should be evaluated and documented.

The licensee's program also appears to be deficient in that procedures do not exist for comparing the results of pocket chambers to TLD results. It was observed that station personnel maintain the information necessary to perform this analysis and apparently informally review the information. An independent review which was performed during the appraisal indicated that the pocket chamber readings were an average of 25% higher than the TLD results.

3.1.3 Exposure Limitations

A well-defined set of administrative exposure limits has been established at CNS. The limits are in general not exceeded by radiation workers. In the event that the worker must exceed the limits an effective exposure extension system is in operation. Exposure records are kept manually and appear to be up-to-date, with timely and accurate dissemination.

3.1.4 Quality Assurance/Quality Control

The question of beta response of the Eberline TLD is further complicated by the licensee's quality control (QC) program. Formal QC procedures have not been established at CNS with respect to external exposure control, although four QC checks on the Eberline TLD system have been performed since June 1979. The last such QC check was performed in December 1979. These checks consisted of exposing some 10 Eberline TLD badges to varying amounts of radiation from the licensee's Cs-137 instrument calibrator. No beta exposures were performed, nor were acceptance criteria developed for the gamma response of the TLD badge.

Draft ANSI Standard N13.11, "Criteria for Testing Personnel Dosimetry Performance," contains recommendations for testing the performance of external dosimetry devices. In addition the University of Michigan performed an intercalibration study sponsored by the NRC, designed to evaluate the response of dosimetry devices with respect to the recommendations contained in ANSI N13.11. Although Eberline participated in the University of Michigan study, it is not known whether Eberline tested the particular TLD system which is used at CNS.

Two of the tests contained in the ANSI standard involve exposing the dosimetry system to gamma radiation and to beta radiation. It is noted that the results of the licensee's informal QC checks as mentioned earlier would satisfy the acceptance criteria contained in ANSI N13.11 for response to gamma radiation.

3.1.5 Conclusions

Based on the above findings, the licensee's external exposure control program appears to be acceptable but could be improved by investigating the beta response characteristics of the Eberline TLD system and development of a formal quality control procedure for dosimeters. In addition, more emphasis needs to be placed on evaluating potential ex :emity exposure at CNS.

3.2. Internal Exposure Control

3.2.1 Dosimetry Program

Health Physics Procedure 9.1.8, "Bio-assay-Whole Body Counting," details the licensee's biosurveillance program. The primary biosurveillance capability possessed by the licensee is an on-site whole body counting system. A Helgeson "do-it-yourself" casket-type arrangement is used, in which the individual being counted lies down under the detector and the detector traverses the length of the body. The count takes approximately eight minutes. An eight inch in diameter by four inch thick NaI (TL) detector is used, with a resolution of approximately 8.5%. Literature which the licensee has received from Helgeson indicates that the whole body counting system is sufficiently sensitive to detect and evaluate less than 1% of a body burden for radioisotopes of concern. A digital computer in the counting system performs a continuous background count and stores the information from a whole body count. A dedicated telephone line is used to call Helgeson, with the resultant transfer of data to Helgeson. A return phone call is received from Helgeson if 5% of the maximum permissible body burden (MPBB) is exceeded. Periodically a written report is received f. m Helgeson containing the results of all whole body counting.

Thyroid counting can be accomplished in either of two ways. As the detector traverses the body, information on counts observed as a function of portion of the body being scanned is recorded. In analyzing the data it is possible to observe a concentration of material in one area of the body-the thyroid, for example. The second method of analysis involves positioning the detector above the thyroid and shielding the remainder of the body.

The ability of the Helgeson whole body counting system to adequately evaluate thyroid burdens is unknown. A neck phantom has not been used, nor has an NBS-traceable iodine "burden" been used to evaluate the response of the detector.

The licensee's procedures call for an annual whole body counting frequency for station personnel and a frequency as determined by the Chemistry and Health Physics Supervisor, for non-CNS employees as they terminate work at the site.

A quarterly control check is performed on the whole body counter. The licensee possesses a masonite phantom which was fabricated by Helgeson. NBS-traceable ^{60}Co and ^{137}Cs sources are placed in the chest region of the phantom and the phantom is counted in the same manner as a worker would be. The information is phoned to Helgeson and a followup call is made to obtain the results of the count. Acceptance criteria have been developed in Health Physics Procedure 9.1.8. Helgeson periodically provides calibration of the counter. This calibration is not formally scheduled but occurs approximately annually. The last calibration was performed shortly before the current outage began.

3.2.2 Exposure Review

The licensee depends heavily on Helgeson for expertise in internal dosimetry. While Helgeson is accepted to be technically qualified and the whole body counting system appears to be operating properly and with sufficient sensitivity, expertise in the area of internal dosimetry needs to be present among CNS employees as well. ANSI N343-1978, "Internal Dosimetry for Mixed Mission and Activation Products," recommends that in addition to an appropriate measuring device (bioassay), an internal dosimetry program should include the necessary biological models and calculational techniques. It was observed that certain station personnel are familiar with the basic models and calculational techniques of ICRP-2; however, formal procedures or guidance in the use of these models have not been developed. For example, guidance does not exist on how to convert MPC hours to a MPBB, or a MPBB to an internal dose.

Procedures have not been established for increased surveillance upon positive (greater than 10% of the MPBB) whole body counting results.

ANSI N343-1978 also recommends that procedures be developed for obtaining urinary, fecal, or other samples and also for handling and packaging these samples prior to analysis. Health Physics Procedure 9.1.8 spells out the collection method for urine samples, but agreements with an appropriate analytical laboratory for analysis of the same have apparently not been made. No action points have been established for the initiation, continuation, and termination of urinalysis or other bioassay techniques. Procedures have not been developed for fecal or nasal analyses.

3.2.3 Exposure Limitations

CNS administrative controls for internal exposures are established in HP Procedure 9.1.2.1, "Radiation, Contamination, and Airborne Radioactivity Limits" and 9.1.3, "Radiation Safety Standards." These procedures define a maximum permissible concentration (MPC) for unidentified radionuclides in air of 3×10^{-9} uCi/ml, based on Note 3.b to Appendix B

of Part 20, and 40 hours per 7 days exposure period. There are no provisions for implementing the controls in airborne radioactivity areas as defined by 10 CFR 20.103 (b) and 10 CFR 20.203 (d)(1)(ii). The 40 MPC-hour control measure of 10 CFR 20.10? (b)(2) is implied but not stated, and no provisions for evaluating exposure which exceed this control measure and assuring against recurrence have been established. Because of this it appears that the licensee has not established procedures to fully implement the requirements of 10 CFR 20.103.

3.2.4 Respiratory Protection

The licensee's respiratory protection program is described in Health Physics Procedure 9.1.5, "Respiratory Program" A formally established program is in place, and the licensee is taking credit for protection factors as contained in NUREG-0041, "Manual of Respiratory Protection Against Airborne Radioactive Materials." Respiratory protection equipment is maintained under the control of the Health Physics group and issued from a locked storage and control area. Individual workers are responsible for returning the used respiratory protection equipment to the decon area, and the Health Physics group disinfects and decontaminates the equipment, as necessary. The equipment is surveyed and upon meeting the contamination and direct radiation acceptance criteria contained in Procedure 9.1.5, is returned to service.

Health Physics Procedure 9.1.5 contains provisions for a monthly quality control check of the SCBA equipment and a quarterly check of the equipment at the respirator issue area. Included is an inspection of the equipment's condition, number of units inspected and its location, and number of respirators that are not usable. The quality control program also applies to the supply of serivce air, which is used at CNS when air-supplied respiratory equipment other than SCBA is used. Service air is continuously monitored for carbon monoxide in the control room. The functioning of the carbon monoxide monitor is checked daily.

The licensee does not use a compressor to supply air for the SCBA's, but rather contracts out to have bottled air provided. This supply is maintained in the fire services building.

The licensee performs a qualitative fit test on users of respiratory protective equipment. A challenge atmosphere consisting of irritant smoke is used. NUREG-0041, "Manual of Respiratory Protection Against Airborne Radioactive Materials," recommends that quantitative tests be used for selecting the best-performing respiratory protective equipment for each individual, and that qualitative tests should be used prior to each entrance into hazardous atmospheres. Quantiative tests as defined in NUREG-0041 employ a challenge atmosphere, at a known concentration, in a fitting chamber of some type. The

licensee does not possess equipment for performing quantitative fit tests.

The American National Standards Institute's "Standard Practices for Respiratory Protection," recommends that breathing air used in conjunction with airline respirators meet at least the requirements for the specification for Grade D air, as described in Compressed Gas Association (CGA) "Commodity Specification for Air," G-7-1966. One of the requirements of Grade D air is that the maximum concentration of carbon monoxide in the air not exceed 20 parts per million (ppm). It was noted during the appraisal that the alarm set point on the service air carbon monoxide monitor was approximately 30 ppm. Thus the licensee cannot assure that workers in air-line respirators supplied by service air are breathing air that meets Grade D requirements.

Portions of Health Physics Procedure 9.1.5, "Respiratory Program," dealing with cleaning and decontamination of masks, were observed to be posted in the mask decontamination area. While this is certainly a good practice, it was noted that the excerpts were from Revision 3 to the applicable procedure, while the current revision is number 7.

The respiratory protection program is supported by an air sampling program to ensure the detection and evaluation of airborne radioactivity. As a result of this sampling program an MPC-hour log is kept to evaluate potential internal dose. The respiratory protection program is also supported by the bioassay (whole body counting) program described elsewhere in this report.

Training in the use of respiratory protection equipment is provided to new hires and contractor personnel upon arrival at the site. In addition, requalification training is provided every two years by a qualified health physics technician. The training includes a policy statement on respiratory protection; discussion of conditions requiring such protection; a review of available respiratory protection equipment; how to determine what equipment to use; a demonstration and discussion of how the equipment is used, including a qualitative fit test using irritant smoke; a discussion of the MPC-hour concept and the function and operation of the whole body counter; and instructions in emergency action to be taken in the event of malfunction of the respiratory protective device. NUS and MSA videotapes on respiratory protection are also used at CNS as part of the respirator training program.

The licensee's records indicate that on April 22, 1980, a painter by the name of John Schlicker was in the torus performing some experimental grinding work preparatory to painting. Health Physics provided coverage and a five minute air sample was taken

while grinding operations were being performed. Before performing the grinding the individual was supplied with a full face respiratory with air-purifying cartridges, which he wore during the grinding. Subsequently upon taking the air sample, operations were halted and the individual left the torus. At the time of the work, no other individuals were in the torus. Analysis of the air sample indicated the air concentration to be 143 times the maximum permissible concentration (MPC) as specified in Table 1, Column 1 of Appendix B, to 10 CFR Part 20. Of the 143 MPC's, 109 MPC's were attributable to ^{60}Co. The respiratory protection device the individual was wearing has a protection factor of 50. Thus the peak concentration exceeded the protection factor by a factor of 2 ~. This appears to be an item of noncompliance against 10 CFR 20.103(c), which states that the licensee may take credit for protection offered by respiratory protection equipment provided that such equipment is used as stipulated in Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection." Regulatory Guide 8.15 C.2 states that respiratory protective equipment is to be selected to provide a protection factor greater than the multiple by which peak concentrations of radioactive materials are expected to exceed the values specified in Table 1, Column 1 of Appendix B to 10 CFR Part 20. Clearly this was not the case. Regulatory Guide 8.15 also states that the respiratory protective equipment is to be used so that the average concentration of radioactive material in the inhaled air during any period of uninterrupted use will not exceed the values specified in Table 1, Column 1 of Appendix B to 10 CFR Part 20.

An analysis of the air concentrations, protection factors, and stay time as performed by the licensee indicates that individual received less than 0.5 MPC-hour of exposure. The individual did not receive a whole body count until the evening of May 13, 1980. The results indicate a deposition of approximately 4% of the maximum permissible body burden (MPBB) of ^{60}Co. If the individual received this deposition as a result of the grinding operation, he was subject to an exposure of approximately 30 MPC-hours. Further whole body counting and analysis of work patterns is necessary in order to resolve this apparent discrepancy.

3.2.5 Conclusions

Based on the appraisal findings in this area, internal dosimetry procedures for evaluatings intakes of radioactive materials need to be developed and procedures for establishing and evaluating airborne radioactivity areas require improvement to achieve a fully acceptable program. In addition, the following should be considered for improvement of the internal exposure control program:

1. Obtaining a neck phantom and NBS-traceable iodine 131 source to evaluate and periodically check the whole body counter capability to measure iodine thyroid burdens.

2. Providing quantitative fit equipment for evaluating and documenting the initial fit of personnel respiratory protection equipment.

3. Assure that service air used for breathing purposes meets Grade D requirements for carbon monoxide.

3.3 Radiation Protection Surveys and Access Controls

3.3.1 Scope of Program

3.3.1.1 Procedures and Basis

Cooper Nuclear Station's (CNS) routine surveillance program is documented in Section 9.2, of the Health Physics Procedures. Surveillance activities are under the direction of the Chemistry and Health Physics Supervisor. Radiation and contamination survey frequencies in various areas of the plant have been established and documented in Health Physics Procedure 9.2.1. Procedures for taking and documenting radiation and contamination surveys are found in Health Physics Procedures 9.2.2 and 9.2.3. Special surveys are conducted as the need arises or as directed by the plant Health Physicist.

During the appraisal, radiation and contamination surveys taken on the refueling floor were observed and personnel contamination checks using the friskers and portal monitors were observed. The types and ranges of semifixed and portable survey instrumetation available for use in the plant and sampling media in use with portable air samplers were reviewed for adequacy in support of the radiation protection survey program. In addition, all Health Physics procedures related to radiation surveillance were reviewed and conformance to the procedures determined by records reviews and observations of survey practices.

The CNS access control program, which includes methods and procedures for controlling access to restricted areas, radiation areas, high radiation areas, contamination areas and controlled areas was also reviewed for conformance to regulatory requirements and standards of good practice.

3.3.1.2 Responsibility

Routine surveys (daily, weekly and monthly) consisting of direct radiation measurements, direct and indirect contamination measurements, and air sampling for particulates and iodine are conducted by the Health Physics staff, primarily on the swing shift. Special

surveys are conducted by the staff as directed by the Health Physicist. Offsite and/or consultant personnel are not used in the survey program. The CHPS reviews the routine survey program periodicaly and makes changes and modifies the program as necessary based upon feedback and recommendations from the Health Physics staff. CNS has instituted a peer review system on all completed survey reports. Each survey report is reviewed by another member of the Health Physics staff for accuracy and completeness. Any surveys which reveal levels approaching administrative limits are brought to the attention of the Health Physicist.

3.3.1.3 Types of Surveys

The licensee utilizes eight continuous air monitors (CAM) in certain locations in the plant where continuous surveillance of airborne radioactivity is indicated. Use and calibration of the CAMs is described in Health Physics Procedure 9.3.5. One CAM, the AM-33-I, has in addition to the typical airborne particulate channel, another channel for iodine monitoring. CAM locations are as follows:

1001' reactor building refueling floor
903' reactor building
laundry area
compactor area
903' augumented rad waste building
basement - augumented off gas building
turbine deck
off-gas filter building

High and low volume air samples are taken to support SWP recommendations and to evaluate new areas with a potential for airborne contaminants. The use and calibration of portable air samplers is documented in Section 9.3.6 of the Health Physics Procedures.

On May 6, 1980, an appraiser observed the operation of the continuous air monitor on the refueling floor. Both channels of instrumentation were contaminated to a level of 10,000 CPM and no alarm set point was indicated on the iodine channel. The licensee stated that the particulate channel alarm point of 17,000 CPM was valid and had not been changed due to increased in background. Further, any iodine activity is always accompanied by particulate activity therefore an alarm point on the iodine channel was not necessary. It was apparent that the Health Physics staff considers the CAM to be only rough estimators of the airborne activity. A CAM alarm indicates to the staff a situation exists that should be evaluated by additional air sampling and laboratory measurement.

The appraiser also reviewed air particulate activity results which indicated typical gross alpha concentrations of about 10^{-10} uCi/ml. Since this value is several orders of magnitude greater than applicable alpha limits, the appraiser reviewed the licensee's sample collection, counting and evaluation techniques. It was determined that alpha activity measurements are made on gas flow proportional counters using the same air filters used for beta/gamma measurements. Filter media is typically glass fiber/ cellulose. When the wide-beta proportional counter is used a two inch diameter circle must be cut from the four inch diameter high volume filter in order to fit the sample holder. The alpha standard is an electroplated source with metal base. Alpha measurements are made as soon as possible after sample collection. It was apparent that the relatively large alpha concentrations in air being reported and documented were due to naturally occurring, short lived activity. Any alpha activity due to Station operations would probably be obscured by this high natural activity background under the present counting procedures.

The appraiser stated that although the presence of alpha contamination in the plant is not indicated, the licensee's alpha measurement procedure would not provide a good measurement of any plant related alpha airborne activity if it were present. Specifically, deficiencies were identified as follows: (1) the filter media used would result in high alpha absorption, (2) the alpha standard is not the same matrix as the samples being counted, (3) the procedure does not allow sufficient time delay in counting, to allow for decay of natural radon daughter activities, (4) the cutting of filter papers to a reduced size could result in considerable error and (5) there appears to be no evaluation of the alpha concentrations being reported. For alpha contamination surveys using swipe techniques, the only deficiencies applicable are one and two.

The licensee stated that beta dose rate surveys are made with Eberline Model Pic-6A and the Eberline Model RO-1 survey instruments. The appraisers questioned the use of the Pic-6A for this purpose since the beta window at the bottom of the instrument is designed only to detect energetic betas. A beta correction factor of 20, recommended in the vendors' manual, indicates a low beta efficiency for even energetic betas. The predominant nuclide being measured at the plant is cobalt-60 with an average beta energy of about 100 Kev. These factors plus a small diameter beta window does not give confidence that beta dose rates can be detected and measured.

CNS Health Physics Procedure 9.1.2.1 specifies that loose and fixed contamination on personnel and materials in uncontrolled areas are to be kept below 100 dpm per 100 cm^2 beta/gamma (smearable) and 0.1 mrad per hour beta/gamma (fixed). The licensee provides portal monitors and friskers (Eberline RM-14/HP-210) at various locations for surveys to determine if control limits are met. Monitoring practices at the Station require use of the portal monitors when exiting controlled areas but there are no requirements to use the friskers, and the appraisers noted that most workers do not use a frisker when exiting a controlled area such as the reactor building. Beta detection using the portal monitors appears unlikely due to the relatively low beta energies expected and to the low sensitivity of this type of monitor. It was noted that portal monitor sensitivity had been further lowered by reinforcing the base with aluminium plate. GM detector window thickness on the side frames is about 30 mg/cm^2.

An appraiser used a 10^5 dpm cesium-137 source on a filter paper to determine the sensivity and alarm points of a frisker and portal monitor at the decomtamination and first aid area. The frisker alarmed at 10^4 cpm with a background of about 100 cpm and the portal monitor did not alarm when the source was placed in contract with the base plate and the side panel detectors. This response was considered to be typical of the capabilities of this type of monitoring instrumentation. The alarm point for the frisker was set considerably higher than expected. Health Physics Procedure 9.3.4.3 specifies 50 cpm above background as the control value for personnel and clothing exiting controlled areas. At the control level, personnel are expected to notify Health Physics for decontamination. The Appraisal Team felt that the alarm points on Station friskers should be set near control values specified in Station procedures.

Because of the insensitivity of the portal monitors and limited use of the friskers at CNS, the appraisers took smears for contamination at several locations outside of controlled areas and at selected locations near control points to determine if significant undetected contamination was being tracked out of the controlled areas. No significant contamination was found. In addition to the above findings, it was observed that the persons who did use the friskers were generally not using them properly. Limited coverage of the body and fast scanning speeds precluded detection of significant activity. ANSI N13.12 recommends a scanning speed of no more than five cemtimeters per

second for efficient beta monitoring. The standard also recommends that the probe be stationary for measurement when contamination is detected. Some friskers are in areas of no use and some are in high background areas where effective surveying for low levels of contamination would be difficult. In summary, it was concluded that the portal monitors at CNS are insensitive instruments capable of detecting relatively gross amounts of contamination compared to the CNS administrative limits. The portial monitor at the egress from the reactor building is of primary concern since significant contamination could pass through without detection. The background at this area also reduces its effectiveness in detecting significant activity. The friskers in use probably cannot detect radioactivity at the 100 dpm per 100 cm^2 level under conditions of use; however, proper use of these instruments can detect significant low levels of beta/gamma contamination. The Team felt that either CNS should require proper use of friskers at exit points from potentially contaminated areas and/or obtain sensitive hand and foot monitors for use at high potential areas. The Team also feels that monitor alarm points should be set consistent with Station administrative procedures when possible.

Routine neutron surveys are not conducted. Special neutron surveys were made in 1977 and 1978 of areas outside the drywell where personnel could gain access. Two areas were identified that have significant neutron levels. Using the Eberline PNR-4 portable neutron survey meter with a nine inch moderating sphere, levels of about 5 mrem/hour and 100 mrem/hour were measured in these areas. The areas are controlled as radiation and high radiation areas, respectively. Using a water moderator, Eberline TLDs and the neutron survey meter, attempts have been made to determine the approximate neutron energy spectrum. One area appears to have low energy neutrons and the other a much harder spectrum. This evaluation and others of the neutron spectra need to be completed in order to evaluate the 20 or so neutron measuring TLD (TLD-100) badges being used at CNS by certain personnel.

3.3.1.4 Records

The results of radiation protection surveys are recorded on radiation survey sheets, which serve as the permanent record. The sheets (35) contain sketches of each area that is on the routine survey program. Survey data are also recorded on large survey maps which are posted outside the Health Physics office. These maps contain survey data for each level of the reactor building and other areas of interest. Special work permits (SWP)

are also posted at this location as well as each controlled access point. Personnel planning to enter controlled areas can review survey data and SWP requirements at one central location. A selected portion of the survey sheets and completed SWPs were reviewed and it was noted that the sheets contained the required information and the SWPs appeared to correctly reflect work conditions and appropriate personnel protection in controlled areas.

3.3.2 Instrument Suitability and Use

Station instrumentation was reviewed as to adequacy of inventory and calibration and check procedures.

3.3.2.1 Inventory

The supply of portable survey meters is not large but appeared to be adequate. Other types of instruments such as friskers, portal monitors, air monitors, and area radiation monitors seemed to be in adequate supply also. The one shortage noted was that only one high range extendable probe meter (a Teletector) was on hand and it had a history of being out of service much of the time.

3.3.2.2 Instrument Check Procedures

Functional checks are called for in the use of Portal Monitors, Friskers, and Portable Survey Meters. These checks, however, are only to see if the instrument responds to radiation and give no evidence that it is still in calibration. The check source used for portable survey meters is considered inadequate since it does not fulfill ANSI-N323 by providing checks on all ranges normally used. In fact some portable meters used at the station show almost no discernible response to the eight microcurie cesium-137 check source. Also, there is no listing at the source or on the meter of expected readings for each type of meter.

3.3.2.3 Portable Survey Meters

Portable survey meters are calibrated using an Eberline Model 1000 Calibrator with several cesium-137 sources in drawers. The dose rate as a function of distance from the source is graphed and available to the person doing calibrations. Procedures are available for all instruments calibrated. The procedures are very detailed and well written. Calibration of portable meters is considered adequate. In addition to reviewing procedures, data, and instrument histories, a Battelle RO-3B which had recently been calibrated was com-

pared with the CNS calibration. There was agreement within acceptable limits on all ranges (+10-15%). This was in spite of the fact that the Battelle meter did not fit into any of the Station's jigs and had to be placed by hand and eyeball. The instrument of choice at CNS for making dose rate measurements is the Eberline PIC-6A. This is based only on the expressed preference of the HP Technicians and in spite of the meter's relative insensitivity to beta radiation. No calibration for beta dose rate measurements is available at CNS. The conversion factors used are those given in the manuals and no check for accuracy has been made. Station personnel expressed objections to the more beta sensitive instruments available because of slow response times. Beta monitoring appears to be an area of weakness.

3.3.2.4 Friskers

Pancake type thin window GM tubes are used as friskers at a access control points along with the portal monitors and sometimes in laundry surveys. They are the only really beta sensitive meters in general use but they are not calibrated for beta. They are calibrated to the count rate which corresponds to 0.1 mR/hr with a cesium-137 source. That number is posted on each instrument at the time of calibration. In reviewing the calibration histories it was observed that the indicated count rate corresponding to 0.1 mR/hr fluctuated by as much as 50 - 100% from one calibration date to another. This seems excessive even though standard calibration sources are not used and only one range is calibrated. No definite reason for the wide flucuations was found but it could be related to a similar observation in Constant Air Monitor (CAM) calibrations which will be discussed in that Section.

In addition to being posted with the count rate corresponding to 0.1 mR/hr, each frisker has a sign indicating that anything reading above 50 cpm is considered contaminated and Health Physics should be called. The meter alarm set points are not, however, at 50 cpm above background. They are usually at several hundred cpm or at the 0.1 mR/hr count rate. As previously stated, the Team felt that instrument alarm points should be consistent with administrative control limits.

3.3.2.5 Portal monitors

Portal monitors are placed at several locations as described below. These monitors are the last stage of contamination control for personnel. The detectors are glass wall GM

tubes surrounding a person standing in the portal. They are calibrated to alarm when exposed to 0.1mR/hr at contact with a detector, not at some position in the portal such as the center line. The detectors for foot contamination are covered with rubber or aluminum and so are not sensitive to beta.

Portal monitor locations are as follows:

903' reactor building entrance
918' machine shop
918' outside hot change room
932' control room
security (plant access)
reactor building 976' from 1001'

3.3.2.6 Constant Air Monitors

CNS appears to have a sufficient number of CAMs in the facility and calibration procedures are very detailed and well written. Calibration appears adequate but it was noted that the count rate corresponding to MPC fluctuated by 50-100% from one calibration period to another. This seems to be excessive just as the fluctuations in frisker calibrations. No definite cause for these fluctuations was identified but there is one thing in common for both types of monitors; before they are calibrated for radiation response both instruments are given an electronic linearity check and adjustment by the Instrument and Control (I&C) department. The calibration and check procedures should be examined by CNS to determine if the cause(s) of these fluctuations are related to the methods used.

Each CAM has a copy of the calibration curve attached to it and the count rate corresponding to MPC noted. The alarm set-point is then put at MPC rather than some fraction of MPC for early warning of airborne activity. Station personnel stated that they place little trust in the CAMs and use them only as indicators that further measurements are called for.

3.3.2.7 Area Radiation Monitors

Area radiation monitoring at Cooper Station is done with 30 halogen quenched GM detectors placed around the plant according to expected or observed radiation levels. Calibration and electronic linearity checks are done by I & C. Calibration is performed using a portable calibration source. The maximum radiation level available from the portable calibrator is 120 mR/hr and acceptable limits are from 0.5 to 2.0 times the expected reading. The calibration procedures are in a great deal of detail and the I & C technicians appeared to be capable of performing the procedures adequately. Area monitor locations and ranges are as follows:

STATION No.	SENSOR AND CONVERTER LOCATION	RANGE MR/HR
1	Rx. Bldg. Fuel Pool Area	10^{2}-10^{6}
2	Rx. Bldg. Fuel Pool Area	10^{-2} - 10^{2}
3	Rx. Bldg. New Fuel Area	10^{-2} - 10^{2}
4	Rx. Bldg. Rx. Water Cleanup Demineralizer Area	10^{-1} - 10^{3}
5	Rx. Bldg. Sludge and Decant Pump Area	10^{-1} - 10^{3}
6	Rx. Bldg. Neutron Monitor System Index Area	10^{-1} - 10^{3}
7	Rx. Bldg. Neutron Monitor System Drive Mech. Area	10^{-2} - 10^{2}
8	Rx. Bldg. Control Rod Hydr. Equip. Area (South)	10^{-2} - 10^{2}
9	Rx. Bldg Control Rod Hydr. Equip. Area (North)	10^{-2} - 10^{2}
10	Rx. Bldg. HPCI Pump Room	10^{-2} - 10^{2}
11	Rx. Bldg. RHR Pump Room (Southwest)	10^{-2} - 10^{2}
12	Rx. Bldg. RHR Pump Room (Northwest)	10^{-2} - 10^{2}
13	Rx. Bldg. RCIC/Core Spray Pump Room (Northeast)	10^{-2} - 10^{2}
14	Rx. Bldg. Core Spray Pump Room (Southeast)	10^{-2} - 10^{2}
15	Turbine Bldg. Turbine Front Standard	10^{-1} - 10^{3}
16	Turbine Bldg. Turbine Bldg. Mezz. Control Corridor	10^{-2} - 10^{2}
17	Turbine Bldg. Turbine Bldg. Basement Control Corridor	10^{-2} - 10^{2}
18	Turbine Bldg. Turbine Bldg. Rx. Feed Pump Area	10^{0} - 10^{4}
19	Turbine Bldg. Turbine Bldg. Condensate Pump Area	10^{-2} - 10^{2}
20	Control Room Main Control Room	10^{-2} - 10^{2}
21	Grade Level Control Corridor	10^{-2} - 10^{2}
22	Radwaste Bldg. Radwaste Control Room	10^{-2} - 10^{2}

23	Radwaste Bldg. Radwaste Pump Room	10^{-2} - 10^{2}
24	Radwaste Bldg. Radwaste Basement Equip. Area	10^{-2} - 10^{2}
25	Radwaste Bldg. Radwaste Demineralizer Valve Room	10^{-1} - 10^{3}
26	Radwaste Bldg. Radwaste Aisle Operating Area	10^{-1} - 10^{3}
*27	Radwaste Bldg. Radwaste Conveyor Unloading Area	10^{-1} - 10^{3}
28	Radwaste Bldg. Radwaste Laboratory	10^{-2} - 10^{2}
29	Radwaste Bldg. Radwaste Centrifuge Area (North)	10^{-1} - 10^{3}
30	Radwaste Bldg. Radwaste Centrifuge Area (South)	10^{-1} - 10^{3}

* Not installed - used as spare

3.3.2.8 Laboratory Counters

Laboratory counters available to Health Physics consist of two sample changers with thin window proportional detectors for counting of smears, one Beckman Wide Beta low background alpha-beta counter for air samples, one NaI(TI) gamma spectrometer, and one NaI(T1) gross gamma counter. A computer based GeLi gamma spectrometer is available in the Chemistry laboratory. Calibration of all the laboratory counters is traceable to NBS standards and done according to well written procedures. This is considered adequate with one point of possible improvement. The counting standard for alpha measurement is plated on a metal disc. The efficiency obtained is used for alpha counting of a paper filter from portable air samplers. No correction is made for penetration into the paper and subsequent self absorption reducing the actual counting efficiency.

3.3.3 Conclusions

Based on the appraisal findings in this area, improvement in personnel contamination monitoring practices is required to achieve a fully acceptable program. In addition, the following matters should be considered for improvement of this part of the program:

1. Improve the measurement and evaluation of potential airborne alpha contaminants.

2. Complete neutron energy spectra and personnel neutron dosimetry system evaluations.

3. Supplement the survey instrumentation with several high range portable instruments with extendable probes, and several beta sensitive survey instruments to evaluate beta dose rates.

4. Investigate and resolve the wide fluctuations in calibration of the constant air monitors and friskers.

3.4. Access Controls

CNS identifies the restricted area to be the area enclosed by the station security fence. Areas within the restricted area for which controls are required are controlled by a variety of methods described below. Access to the restricted area requires plant security clearance and issuance of a personnel monitoring device(s). Access to radiation areas is locally controlled by posting and/or barricades as indicated. Posting of radiation areas inplant were observed to be generally good. However, some descrepancies were noted in posting the condensate storage tank and wooden boxes containing contaminated components stored temporarly outside the turbine building and

in front of the rail car airlock. These descrepancies were promptly corrected when brought to the licensee's attention.

High radiation areas are posted and each entrance is through a locked door or a barricade. Entrance also requires a SWP and notification and permission of the shift supervisor. Each individual or group of individuals entering such areas are to be provided a radiation dose rate monitoring device. These controls are in lieu of the control devices specified in 10 CFR 20.203(C)(2), as authorized in Technical Specification 6.3.5. High radiation area controls appeared to be generally well implemented with the following observed exceptions. On May 6, an appraiser accompanied a health physics technician in performing a radiation survey of the refueling floor. In the course of the survey the technician discovered a plastic bag containing dry filter material which measured about 300 mrem per hour at 18 inches from the bag. The bag was located against the north wall in an area readily accessible to personnel. The bag was promptly moved to an isolated area, placed inside a barricaded area and properly posted. Since the bag was discovered by the health physics staff and proper corrective action taken, this was not considered to be an apparent item of noncompliance with regulatory requirements. In another instance on May 10, the appraisers entered the drywell for a tour with the CHPS. Other CNS and contractor personnel were also observed entering the drywell. The entire drywell was identified as a high radiation area and entry controlled by a SWP. It was noted that after reading and signing the SWP, the drywell could be entered without notifying the shift supervisor and obtaining his permission. It was also noted that workers were in various local high radiation areas without dose rate measuring instruments. A CNS representative stated that a dose rate instrument is available to workers at the entry to the drywell and is not issued to each individual or groups of individuals that enter the drywell. During the tour, radiation levels in several areas were measured in excess of 100 mrem per hour and some hot spots in excess of 300 mrem per hour. The failure to notify and obtain the approval of the shift supervisor prior to entry into the high radiation area is considered to constitute apparent noncompliance with CNS Technical Specification 6.3.5, and the licensee's practice in supplying a dose rate instrument is considered to be inconsistent with the intent of the Technical Specification requirement.

Airborne radioactivity areas are controlled by posting the areas and compliance with SWP requirements for protective equipment and precautions, such as respiratory protection and air sampling. Contaminated areas are posted and the requirements for protective clothing, monitoring devices, etc., are noted on the SWP. In general, the licensee's control of contamination and airborne radioactivity areas was observed to be effective. However, as previously described in Sections (3.2.3 and 3.2.4), CNS does not have Station procedures to implement the designation of an airborne radioactivity area in accordance with 10 CFR 20.203 (d)(1)(ii), or assure the proper selection of respiratory protection devices in anticipation of peak concentrations that may be experienced.

The licensee's use of signs, tags and labels to identify radioactive materials was generally found to be adequate. One exception noted was failure to label drums containing dry waste in the hallway outside the waste compacting area. This was corrected during the appraisal.

4.0 Radioactive Waste Management System

4.1 Program Responsibility

The plant systems designed to store, process and dispose of gaseous, liquid and solid radioactive waste are described in Volume IV, Section IX of the CNS Safety Analysis report. Augmented off-gas and augmented liquid treatment systems have been installed in order to further reduce radioactive releases. Plant procedures have been written to cover areas concerned with radwaste processing and control. These procedures and other documents reviewed in the appraisal are listed in Annex C. The operation of radwaste systems is the responsibility of the operations supervisor. The radwaste operator (J. Mehser) works the day shift and has lead responsibility for waste treatment. He has many years direct experience with these systems. Off-shift processing is accomplished by Station operators who have been trained to handle routine processing. Detailed processing procedures are available to these Station operators. An appraiser reviewed the major components, the operating history and total releases of the liquid and gaseous processing systems. The effluent monitors, standby gas treatment system, control room and building vent filtration systems and emergency sampling capability were also reviewed and are included in this section.

4.2 Waste Processing Systems

4.2.1 Gaseous Waste Processing System

The licensee stated that the operating history of the gaseous waste and augmented gaseous waste systems has been good and no significant changes have been made to either system. Earlier problems with hydrogen detonations appear to be resolved with the removal of the hydrogen monitor from the inlet to the augmented system (AOG). The system involves 30 minute delay, dilution, recombination, dehumidification and long term delay. The system is in continuous operation when the plant is operating. The appraiser noted tritium and noble gas releases are a few percent of Technical Specifications and iodine and particulates less than 1% of Technical Specifications. The gaseous waste system appears to be operating satisfactory and within design objectives.

4.2.2 Liquid Waste Processing System

Based upon discussions with the radwaste operator and observations during the appraisal period, the liquid waste system appears to have sufficient capacity to handle normal rad waste volumes. The system

was designed to process liquid waste from a two unit plant. The operators have the capability of moving liquids from one subsystem to another and thus handle large volumes of waste if necessary. The number of disposals is about 2-5 per month. Liquid releases are limited to Appendix B, table II, 10 CFR 20 values on a instantaneous basis. Releases over the past two years have been a few percent or less of the applicable limits. An augumented liquid waste system has been installed and was designed to meet Appendix I, 10 CFR 50 objectives and limit releases of radioactivity to the lowest practical level. The licensee stated that the augumented system is operational but is not being used. The licensee contends that the originally installed radwaste system meets as low as practical levels and the increased costs in using the augmented system make its use unwarranted. The appraiser stated that the augmented system is described in Volume IV, Section IX of the SAR condition and is therefore a licensee commitment to use the system. The appraiser stated that this issued would remain open pending discussions with NRC effluent systems personnel.

4.2.3 Solid Waste Processing and Shipment

Dry solid waste at Cooper Station is compacted into 55 gallon drums or packed in large heavy wooden boxes. Procedures provide for control measures to assure that permissible radiation levels are not exceeded. Extensive procedures cover preparation and shipment of these wastes to disposal sites. The staff appears to have spent a great deal of time reviewing regulations on packaging and shipping requirements. Records are extensive and up to date. Ventilation is provided for the compactors and a CAM is placed close to the compactor.

Wet solid waste is processed remotely all the way from filling, capping, and cleaning of drums to loading onto trucks. The radwaste processing control room is separated from the drumming area by a lead glass window extending about 6.5 feet from the floor. There is an open window area above the lead glass and the appraiser measured a dose rate of about 8 mR/hr at eye level. Radiation levels above the window were about 30 mR/hr and the drumming area is designated a high radiation area.

Drums are filled with the wet solid waste mixed with cement and vermiculite for solidification. Radiation levels at the drum surface and at three feet are measured remotely in the drumming area. The three foot measurement is made while the drum is moving slowly toward the detector and that measured value is used as the recorded value for shipment. Drum radioactivity content is determined by the operator climbing over the lead glass window, taking a two milliliter sample and sending to Chemistry for gamma analysis. No gross beta measurement is done nor a specific determination for $^{90}Sr/Y$.

A drum content limit of three curies of Transport Group III nuclides was noted but CNS did not limit the drum to the 1 R/hr at three feet limit specified in the Department of Transportation (DOT) regulations. Station personnel said this requirement is met by shipping the drums in a shielded cask. This is not, however, a Type B container, which would be required since the total curie content of the cask exceeds type A quantities.

At the conclusion of the appraisal visit, it was not clear which container constituted the "package" as defined in the DOT regulations and therefore which container needed to be labeled and proper application of curie content and dose rate restrictions. The issue has been resolved in a letter to the licensee on May 30, 1980, from Mr. James H. Sniezek, Director, Division of Fuel Facility and Materials Safety Inspection, USNRC, Washington, D.C. IE Inspection Report Nos. 50-298/79-20; 80-05, 80-10 describe two items of noncompliance which occurred as a result of improper shipments from CNS. The licensee has satisfactorily responded to these items in letters of June 23 and July 10, 1980.

Solid Waste handling, packaging and shipping procedures are now considered acceptable.

4.3 Process and Effluent Monitors

The following monitoring systems were reviewed as to characteristics, locations, set points, functional tests and calibrations:

- main steam
- air ejector off gas
- main stack
- liquid process
- reactor building ventilation
- augmented radwaste building exhaust
- augmented radwaste building off gas

The characteristics of these monitors are described in Volume III, Section VII, of the CNS FSAR. Other monitoring systems reviewed included the turbine building vent monitor, the liquid effluent release monitor and the drywell atmospheric monitor. Surveillance procedures have been written to cover required tests and calibrations.

In reviewing calibration data, an appraiser noted that the noble gas main stack monitor (GE) is calibrated indirectly by the analysis of air ejector offgas activity and a calculation of the expected activity at the monitor. The appraiser stated that this approach should be evaluated by the use of a standard noble gas activity. The licensee stated they had experienced difficulty i obtaining standard gas concentrations. The Chemistry staff performs monitor

calibrations and draws curves relating monitor readings with activity release rates. These curves along with recommended monitor alarm prints are provided to the operating staff. The acceptance of these alarm points for the operating staff appears to be optional. The curves are displayed in the control room but there appears to be no procedure available whereby one could determine release rates from the curves.

4.4 High Efficiency Filtration

The appraiser reviewed the standby gas treatment system and the main control room ventilation filtration system as to required tests on high efficiency filters and laboratory tests on activated carbon. These tests are covered in Technical Specification requirements. No problems were identified. High efficiency filtering trains are also installed in the rad waste building vent plenum and in the augmented radwaste vent plenum. There appears to be no testing, inspection and maintenance program for these units. A licensee representative stated that the criteria for replacement of the HEPA units was a differential pressure drop greater than six inches of water across each unit.

4.5 Conclusions

Based upon the above findings, this portion of the licensee's program appears to be acceptable, but the following matters should be considered for improvement.

1. Calibration of noble gas monitors using NBS-traceable gas standards.

2. Procedures to cover the use of vent monitor calibration curves to predict radioactivity release rates, and procedures to cover the use of alarm point settings recommended by the Chemistry staff.

3. Program to inspect, test, and maintain high efficiency filtering systems installed in the radwaste and augmented radwaste buildings.

5.0 ALARA Program

The Appraisal Team reviewed the licensee's administrative policies and implementation of measures to maintain occupational radiation doses as low as reasonably achievable (ALARA) at CNS. It was noted that there were no written administrative or HP procedures defining the management policy and commitment to principles of ALARA except for a brief statements of program objectives in procedures such as HP Procedure 9.1.1.1, "Radiation Protection at CNS." In addition, the Team found that no one individual or group at the Station or corporate office had been designated to develop the ALARA programs and goals, ensure their implementation and measure the degree of progress in achieving program objectives. Discussions with the Station Superintendent, CHPS and

other NPPD personnel indicated a pervasive commitment to ALARA efforts although there was not a formal, documented ALARA program. The CNS good record of past performance in controlling individual doses and Station man-rem was cited as objective evidence of the application of ALARA principles at CNS. The Appraisal Team feels that the apparent good performance in this area is strongly dependent on people presently in key positions and could change with the appointment of new people. In addition the Team feels that under the present operation it is difficult to demonstrate that doses are, in fact, ALARA and could not be reasonably further reduced.

From discussions with CNS personnel and observations of work in progress, it was noted that many other elements of an ALARA program as recommended in NRC Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will be as Low as Reasonable Achievable," are present at the Station. Good communications, review of design changes and Station procedures together with participation in maintenance and outage preplanning by the RPM all contribute to potential dose savings. Other practices noted include the use of temporary supplemental shielding in the torus and drywell, limiting workers in controlled areas to the minimum necessary, reducing crud formation by maintaining good reactor water chemistry parameters, special shielding and work area for control rod drive handling, and the use of engineering controls to reduce concentrations of air contaminantes and radioactivity such as temporary special ventilation for the torus modification work.

Based on the appraisal findings reported above, this portion of the licensee's program appears acceptable but consideration should be given to establishing a formal ALARA program using the recommendations contained in NRC Regulatory Guide 8.8 as bases for the program.

6.0 Health Physics Facilities and Equipment

6.1 Facilities

6.1.1 Radiation Protection

The Appraisal Team examined the licensee's facilities for personnel decontamination and first aid, equipment decontamination, cleaning and maintainance of respiratory protection equipment, protective clothing laundry, personnel change areas, instrument calibration, counting of smears and air samples, and work areas for the Health Physics staff. In addition, facilities for reactor coolant and containment air sampling were observed. In general, the radiation protection facilities were observed to be less than optimal, reflecting the original design parameters based on a smaller staff and relatively simpler health physics activities.

The Team also reviewed the licensee's emergency sampling facilities. CNS has responded to lessons learned requirements as detailed in their

letter (Pilant to Denton of January 11, 1980), and have developed an interim emergency sampling procedure (Chemistry 8.4.1) until studies and recommendations have been completed. The licensee stated that radiation levels in the reactor building could be extreme during a major incident and the use of shielded facilities or modifications are being investigated. Present plans call for collection of primary coolant samples at either of two locations in the reactor building and movement of the samples to sample prep areas for dilution and disposition. Some emergency supplies have been collected and stored in the chemistry laboratory. Criteria for movement of samples into the laboratory have been established. The location of the laboratory appears to be acceptable based upon the CNS review. The licensee has the capability to purge noble gas activities from charcoal samples prior to transfer to the laboratory for gamma isotopic measurement. Since the drywell atmospheric sampler would likely be inaccessible in a major incident, present plans call for collect of noble gas, particulate and iodine activities from the Nuclear Measurements Corporation (NMC) vent monitors. Estimation of release rate can be made based upon direct measurement with a survey instrument. These samples can also be moved to sample preparation areas for dilution and disposition. Equipment design for high range monitors in vents and in the drywell have been contracted to General Electric. Since the licensee emergency sampling program and facilities are still being developed, no judgements as to adequacy can be made at this time.

An appraiser also visted primary coolant sampling locations in the reactor building and noted that no evidence or program exists in the plant to verify hood exhausts have the proper flow rate and are properly vented.

6.1.2 Radiochemistry

The appraisers visited the radiochemistry laboratory on numerous occassions during the appraisal period. The laboratory area, sampling station enclosures and storage appear adequate. The air flow in the sampling enclosure appeared low, as pointed out in Section (6.1.1) the licensee does not have a hood air flow surveillance program. An area of concern is the location of the hot machine shop immediately above the radiochemistry laboratory. Radiation levels at the laboratory doorway require the frisker to be used on the X10 scale. This fact prevents effective monitoring of low level contamination. The substantial shielding of the counting room and radiation detectors inside appear to prevent a serious background problem from the machine shop above, although laboratory personnel stated that movements in the hot shop can be detected by changes in counter backgrounds.

6.2 Protective Equipment

6.2.1 Respiratory Protective Equipment

All of the respiratory protection equipment on hand is manufactured by MSA. A review of the equipment on hand indicated that approximately 85% of the masks are of the full-face type. The licensee is using full-face Ultra-Twin masks with air-purifying filter cartridges, Clear Vue full-face constant-flow and Comfo half-face masks with air-purifying filters. In addition to the above types of respiratory protection equipment which is located at the respiratory issue area, self-contained breathing apparatus (SCBA) units are located at various areas throughout the plant. The supply of respiratory protective equipment appears to be adequate for routine and anticipated off-normal operations.

6.2.2 Anti-Contamination Clothing

Inventory control records and supply on hand of the pertinent protective clothing items were reviewed. Procedures for procurement and supplies on hand appeared to be adequate. Two months into their longest outage there appeared to be no shortages. Much of the supply of new protective clothing was stored in a building separate from the reactor building and so would be available in emergencies.

Much of the inventory of protective coveralls consists of laundered and reused items. They looked dirty and had fixed contamination sometimes reading several mrem per hour gamma. This did not exceed the written guidelines for reuse but no effort was evident to control in which radiation areas these coveralls were worn. A Team member measured significant beta dose rates on a random sample of coveralls prompting the licensee to begin removing the higher exposure rate coveralls from service.

Protective clothing was not available at the entrances to the SWP areas but at two supply points only. A worker has to be familiar with what clothing is required in a particular area or return to the supply point for items missed.

6.3 Conclusions

Based on the findings reported above, this portion of the licensee's program appears to be acceptable; however, additional consideration should be given to improved surveys of protective clothing and better control of issuance of protective clothing based on survey results. Also exhaust hood flow rates should be verified and the proper sash position identified.

7.0 Emergency Response/Re-Entry

An appraiser reviewed the NPPD health physics preparedness for responding to an accident and apparent capabilities for re-entry. The review in this area did not duplicate other NRC emergency planning program evaluation in progress.

The licensee's interim capabilities for management and technical support in the event of a Three Mile Island type occurrence have been documented in a letter to the NRC (NRR) dated July 30, 1980. Offsite technical support for environmental surveillance, radiochemistry and health physics is available at the corporate level through the environmental organization in the Power Operations Group. Agreements with outside firms for technical support, including environmental sampling and analysis, and meteorological monitoring have been made. In addition to these agreements, CNS has contacted their personnel dosimetry supplier and made arraingements for supplemental TLD's in case of an occurrence requiring expanded personnel monitoring. No arrangements have been made for augmenting the health physics staff during a re-entry or recovery phase following an accident.

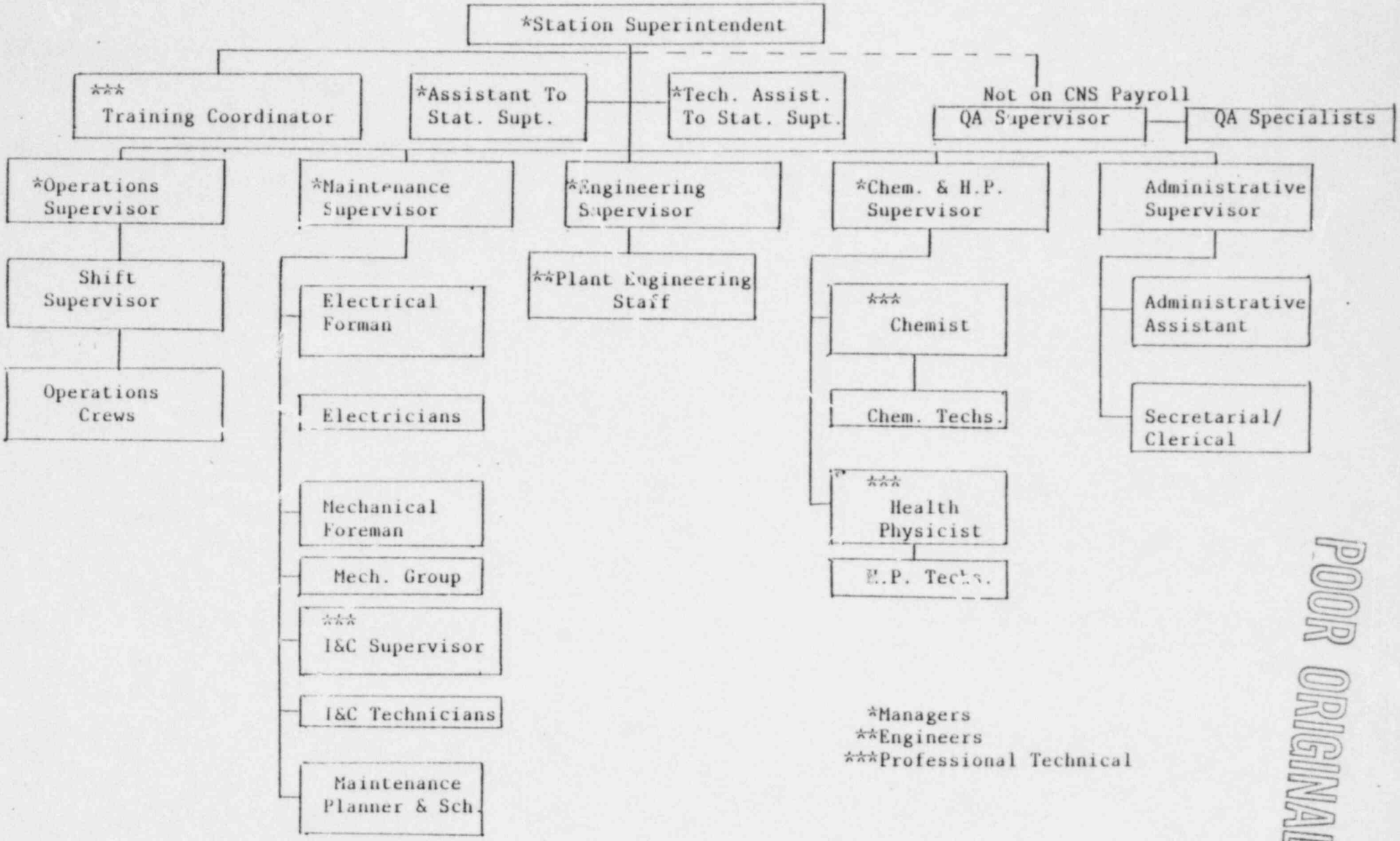
The licensee has portable survey instrumentation capable of measuring radiation exposure levels up to 1000 roentgens per hour; however, only one high range instrument is available that has an extendable probe. The Team feels that high range instruments with extendable probes are necessary to prevent unnecessary exposures to surveying personnel in high dose rate areas under accident conditions (See Section 3.3.2).

Preparations for re-entry were discussed with licensee representatives. It was stated that P&ID and Station layout drawings are readily available for emergency operations. An appraiser inquired about re-entry and recovery aids such as models and photographs of areas and components. The Station Superintendent stated that some photographs had been made and consideration would be given to expanding this further.

The NRC is conducting a separate nuclear reactor emergency planning evaluation program. The emergency planning evaluation for CNS has been initiated but was not complete at the time of the appraisal. Because of this, the Health Physics Appraisal Team will not make conclusions of adequacy in this area except to recommend that an agreement for supplemental health physics personnel be entered into, and that emergency instrumentation include several high range extendable probe survey meters.

FIGURE 1

COOPER NUCLEAR STATION



POOR ORIGINAL

ANNEX A

EXIT INTERVIEW

The Appraisal Team and Region IV Fuel Facility and Material Safety Branch Chief met with licensee representatives (identified in Annex B) onsite at the conclusion of the appraisal on May 16, 1980. The appraisers summarized the scope and major findings of the appraisal. The findings are classified into three categories:

A. Significant appraisal findings are described in Appendix A to the letter forwarding this report and are summarized at the conclusion of applicable sections of this report. Written responses to these findings will be required to be submitted by the licensee. Actions taken on these findings will be reviewed during subsequent inspections.

B. Findings of lesser significance but which are considered important in implementing a quality health physics program are also summarized at the end of applicable sections. No written response to these findings will be required and progress in improvement in these areas will be observed during routine inspections.

C. Apparent noncompliance items identified during the appraisal are specified in Appendix B to the letter forwarding this report. The licensee is required to respond to these findings in writing and the response will be reviewed and verified during subsequent inspections.

ANNEX B

PERSONS CONTACTED

*L. Lessor, Station Superintendent
*J. Sayer, Chemistry and Health Physics Supervisor
R. McDonald, Health Physicist
J. Kuttler, Lead HP Technician
R. Windham, HP Technician
J. Hinz, HP Technician
T. Chard, HP Technician
J. Morris, HP Technician
M. Garver, HP Secretary
S. Ferguson, HP Technician (Public Service of Oklahoma)
J. Warren, Chemist
G. Ketner, Lead Chemistry Technician
M. Wright, Chemistry Technician
D. Snyder, Chemistry Technician
W. Gilbert, Education Specialist
P. Borer, Operations Supervisor
B. Brumsardt, Surveillance and Testing Coordinator
J. Mehser, Radioactive Waste Operator
V. Wolstenholm, Quality Assurance Supervisor
*R. Buntain, Director of Power Supply
*J. Pilant, Director of Licensing and Quality Assurance
*E. Sloth, Ph.D., Director of Environmental Affairs
L. J. Cooper, Environmental Manager
J. Weaver, Licensing Manager
F. Williams, Quality Assurance Manager
J. Larson, Quality Assurance Engineer

*Denotes those present at exit interview on May 16, 1980.

ANNEX C

DOCUMENTS REVIEWED

CNS FSAR
CNS Technical Specifications
CNS Health Physics Procedure 9.1.1.3, Personnel Dosimetry Program
CNS Health Physics Procedure 9.1.2.1, Radiation Contamination, and Airborne Radioactivity Limits
CNS Health Physics Procedure 9.1.5, Respiratory Program
CNS Health Physics Procedure 9.1.8, Bio-assay-Whole Body Counting
CNS Health Physics Procedure 9.3.3.2, TLD Program
CNS Health Physics Procedure 9.1.1.1, Radiation Protection at CNS
CNS Health Physics Procedure 9.2.1, Radiation and Contamination Survey Frequency
CNS Health Physics Procedures 9.2.2, Radiation Surveys
CNS Health Physics Procecure 9.2.3, Contamination Surveys
CNS Health Physics Procedure 9.3.5, Constant Air Monitors (CAM)
CNS Health Physics Procedure 9.3.6.1, Low and High Volume Air Sampler Operation and Calibration
CNS Health Physics Procedure 9.3.6.2, Air Samplers - Emergency Box
CNS Health Physics Procedure 9.3.6.3, Monitaire Sample - Model S Operation and Calibration
CNS Health Physics Procedure 9.1.1.4, Special Work Permit
CNS Health Physics Procedure 9.1.2.1, Radiation, Contamination and Airborne Radioactivity Limits
CNS Health Physics Procedure 9.3.4.3, Portal Monitors
CNS Health Physics Procedure 9.3.4.3, Frishers
CNS Health Physics Procedure 8.4.1, Emergency Sampling
CNS Procedure 2.2.5.8, Augmented Off-gas
CNS Chemistry Procedure 8.2.1, Chemistry Analysis and Instrument Calibration Schedule
CNS Chemistry Procedure 8.2.3, Table of Liquid and Gas Sample Points
CNS Chemistry Procedure 8.6.1, Air Ejector Off-gas Radiation Monitor
CNS Chemistry Procedure 8.6.2, ERP (GE) Radiation Monitor and Vent (NMC) Monitor
CNS Chemistry Procedure 8.6.4, Liquid Process Radiation Monitor-Radwaste
CNS Chemistry Procedure 8.8.6, Determination of off-gas Hold-up Time
CNS Surveillance Procedure 6.4.19.1 thru 6.3.19.5, SBGT Test Procedures
CNS Suveillance Procedure 6.3.7.7, Liquid Radwaste System Calibration and Function
CNS Semi-Annual Operating Report - Radioactive Effluents January, 1978 to June 30, 1979
CNS Supervillance Procedure 6.4.9.1, RMA System Calibration and Functional test
CNS Health Physics Training Outline Checklist
CNS Chemistry Training Outline Checklist
CNS Outlines of Radiation Protection Training for Plant Employees

CNS On-Site Training Records
CNS Emergency Box and Ambulance Inventory-Emergency Procedure 5.7
CNS Protective Clothing and Supplies Inventory Record
CNS Health Physics Instrument Calibration Procedures and Records
CNS Rad/Waste Measurements and Shipment Procedures and Records

American Nuclear Insurers Reports for November 1976, December 1977, December 1978 and August 1979.

CNS Audit 79-13, QAP-900 Health Physics Audit
CNS Audit 80-03, QAP-200 Training Audit
CNS Audit 79-21, QAP-1200 Radwaste Audit
QAP-1404-2 QA Checklist Qualifications of Supplies and Contractors: Helgeson Nuclear Services and Eberline Instrument Corporation.
CNS Administrative Procedure 1.2, Station Organization and Responsibility
CNS Administrative Procedure 1.18, Station Operations Review Committee
CNS Administrative Procedure 1.23, Offshift Audits