U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION I

Report No. 50-220/79-20

Docket No. 50-220

License No. DPR-63 Priority -- Category C

Licensee: Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, New York 13202

Facility Name: Nine Mile Point Nuclear Station

Inspection At: Scriba, New York

Inspection Conducted: June 21-22, 1979 and September 25-28, 1979

Inspectors: L. H. Thomas, Radiation Specialist — 11/6/79 date

For F. M. Costello, Radiation Specialist — 11/7/79 date

G. P. Yuhas, Radiation Specialist — 11/6/79 date

Approved by: J. P. Stohr, Chief, Radiation Support Section, FF&MS Branch — 11/13/79 date

Inspection Summary: Inspection on June 21-22 and September 25-28, 1979 (Report No. 50-220/79-20)

Areas Inspected: Special, announced inspection by regional based inspectors of the Radiation Protection Program, particularly as it relates to the personnel overexposure during April and May of 1979. The inspection consisted of interviews with personnel, review of exposure control, procedures and radiation work permits, surveys, training, and radiographic operations. The inspection involved 60 inspector-hours onsite by three NRC regional based inspectors.

Results: Of the five areas inspected one item of noncompliance was identified in each of three areas; (Infraction - failure to limit quarterly whole body dose to 3 rem as required by 10 CFR 20.101b, Paragraph 2), (Infraction - failure to instruct workers as required by 10 CFR 19.12, Paragraph 4), and (Infraction - failure to adhere to radiation protection procedures as required by Technical Specification 6.11, Paragraph 5).

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Region I Form 167
(August 1979)

DETAILS

1. Persons Contacted

V. Auclair, Station Shift Supervisor
*J. Duell, Assistant Chemistry and Radiation Protection Supervisor
*M. Hendrick, Assistant Chemistry and Radiation Protection Supervisor
**E. Leach, Chemistry and Radiation Protection Supervisor
**T. Lempges, General Superintendent, Nuclear Generation
**T. Perkins, Station Superintendent
**M. Sillman, Superintendent Results-Nuclear

* denotes those persons present at the exit interview on June 22, 1979.
** denotes those persons present at the exit interview on September 28, 1979.

The inspector interviewed several other licensee employees, including members of radiation protection staff and administrative staff.

In addition the inspector interviewed six employees of the Hartford Steam Boiler and Inspection Company.

2. Background

During the period of April and May 1979 a team of 15 nondestructive testing technicians were contracted to conduct inservice inspections of various systems and components located in several areas of the facility. These inspections involved; visual, liquid penetrant, and radiographic examinations. The radiographic operations involved the utilization of radiographic exposure devices containing up to 100 curies of Iridium 192.

The work was performed in three general areas of the facility. Radiation Work Permits (RWP) were prepared by the licensee for each period of work. The RWPs indicate that welder qualification radiography was performed in the New Off Gas Building, an area of low radiation levels due to facility sources. The majority of work was performed in the Reactor Building, on the reactor water cleanup system and in the drywell, on the emergency condenser system modifications. These areas presented whole body general area exposure rates up to 200 mr/hr and localized exposure rates up to 6000 mr/hr from facility sources.

The licensees exposure control system is based on a vendor film badge service. Exposures are estimated by self-reading pocket dosimeters (SRD) and thermoluminescent dosimeters (TLD) and updated when film badge (FB) results are available.

The licensee's exposure control procedures require that SRD data be recorded on radiation work permits and that this data be subsequently transcribed to a computer which keeps a running total of exposure. TLD data is also entered into the computer which uses the higher of the TLD and SRD results for the running total. The running total is used to

generate a delta authorized exposure (the remaining allowable exposure under the licensees administrative limits) The delta authorized exposure is used to control exposures on a daily basis.

The following table shows the correlation between one worker's (Individual A) dosimetry devices as he accumulated dose during his work assignment.

Comparison of Individual A's Accoumulated Dose by various Dosimetry Devices

Period of Exposure	SRD Results mrem	TLD Results mrem	FB Results mrem
4/12-4/14	200	81	110
4/15-4/18	1055	470	840
4/19-4/30	735	486	740
5/1-5/1	100	--	--
5/2-5/14	480	2331	2100

At the end of the May 1 thru May 15 badge period, the individual was within the 10 CFR 20.101(b)(1) quarterly limit of 3000 mrem and the licensees quarterly administrative limit of 2500 mrem for the second quarter of 1979 based upon SRD estimates.

When Individual A's TLD was read, it resulted in a dose that when added to his previous quarterly dose indicated the individual had received a total second quarter exposure in excess of 3000 mrem.

The licensee then had the film badge processed. The film badge results indicated a total second quarter whole body dose of 3790 mrem. This was reported to NRC Region I by telephone on May 17, 1979.

10 CFR 20.101(b)(1) allows occupational exposure of individuals to a maximum of 3 rem in a calendar quarter. Exposure resulting in a dose of 3.79 rem to Individual A during the second calendar quarter of 1979 represents noncompliance with 10 CFR 20.201(b)(1). (50-220/79-20-01)

Region I Inspectors contacted the Hartford Steam Boiler and Inspection Company by telephone on May 21, 1979 and performed an unannounced inspection at their offices on May 31, 1979. On June 14, 1979 Niagara Mohawk Power Corporation submitted Licensee Event Report (LER) 79-11 and on June 15 a report of the exposure required pursuant to 10 CFR 20.405 was submitted. On June 18, 1979 the Harford Steam Boiler and Inspection Company submitted a report pursuant to 10 CFR 20.405 indicating that five of its employees had received doses of radiation in excess of the values specified in 10 CFR 20.101(b) while working at the Nine Mile Point Nuclear Station during the second calendar quarter of 1979. On June 20, 1979 a NRC Region I

inspector was dispatched to Nine Mile Point Nuclear Station to examine the circumstances surrounding these exposures. On July 25, 1979 another NRC Region I inspector completed the onsite inspection at Harford Steam Boiler and Inspection Company (Inspection Report No. 30-12281/79-01).

Comparison of the information from these two independent inspection visits resulted in interviews of each of the five individuals involved during the week of September 17 through 21, 1979. During these interviews information was presented to warrant an additional inspection at Nine Mile Point Nuclear Station. This inspection was performed by NRC Region I inspectors on September 25 through 28, 1979.

3. Dosimetry

All of the individuals involved were required to wear self-reading pocket dosimeters, thermoluminescent dosimeters and film badges by the licensee. The workers employer, Hartford Steam Boiler and Inspection Company (HSB) also required each of their employees to wear an additional film badge issued by HSB.

Each worker stated that they wore both film badges, TLD and SRD together on the upper portion of the body at all time.

The licensee's TLD system is operated in accordance with procedure S-RTP-8, "Operation and Calibration of the TLD System". This procedure requires a quarterly calibration and monthly functional check of the system. During the month of April the licensee experienced a calibration problem with the TLD system which caused it to read low by one third. The probelm was identified by the licensee and by May a new calibration factor was being used so that the system would produce correct exposure measurements. The TLD system error had no effect on the overall dose accumulation tracking.

Noted in the table below is the cumulative sum of dose received for each individual as measured by the dosimetry devices worn during April and May 1979.

April and May 1979 Total Dose (mrem)

Individual	Niagara Mohawk		Hartford Steam Boiler
	SRD	FB	FB
A	2210	3790	3320
B	2575	2690	3520
C	2725	2380	4290
D	2370	2340	3290
E	2005	2620	3180

Review of the above data indicates reasonable agreement between the licensee's SRD and FB results except for Individual A.

The licensee issues self-reading pocket dosimeters (SRD) to individuals by serial number. The licensee's evaluation of the two SRD's issued to Individual A was reviewed. The individual had been issued SRDs No. 328492 from April 12 to May 6, and 319459 from May 6 to May 16. The following table list the results of licensee calibration and drift check.

SRD Calibration and Drift Check

SRD. No.	328492	328492	319459	319459
Date	4-5-79	5-18-79	2-18-79	5-18-79
Exposure	350 mrem	300 mrem	375 mrem	300 mrem
Reading	340 mrem	320 mrem	370 mrem	300 mrem
24 hr. drift	< 2%	< 2%	< 2%	< 2%

As the table indicates the SRDs read within 10% of the calculated exposure and drift was less than 2% per day in all cases.

The film badges supplied by the licensee and Hartford Steam Boiler are from the same dosimetry vendor. All the individuals stated during their interviews that both FBs were worn and stored together on and off the site. All stated that no exposure was received during the April, May period except at the licensee's facility.

The inspector noted that neither the licensee nor Hartford Steam Boiler presently have an independent quality assurance program that routinely demonstrates the accuracy of the vendor film badge results.

In the absence of facts to discredit the accuracy of Hartford Steam Boiler and Insurance Company's film badge results and since the possiblity of exposure existed due to radioactive materials processed by Hartford Steam Boiler the five individuals were considered exposed in excess of the values stated in 10 CFR 20.101b and a Notice of Violation was issued to Hartford Steam Boiler and Inspection Company on September 13, 1979. However, since there is acceptable agreement between the licensee SRD and FB results for four of the five individuals involved and since a review of this relationship for 30 other individuals selected from those exposed to a similar range of dose (1100-2800 mrem) during the second calendar quarter of 1979 does not indicate bias or unacceptable disagreement between the licensee's dosimetry devices, the licensee's FB results were accepted as the dose of record for exposure received at the Nine Mile Point facility. In addition in the case of Individual A, his FB result was in agreement with his TLD result for the May 2-14, 1979 period of exposure.

The licensees investigation into the unauthorized exposure of Individual A did not precisely determine the exact time this individual exceeded the allowable dose limits.

Review of dosimetry data indicated that the exposure of concern occurred in the period May 1 to May 15, 1979.

The licensee concluded that, although no specific instance was discovered to explain the individual's accumulated dose for that period, this individual and his coworker's general inability to adhere to the Radiation Work Permit and procedure requirements may have contributed to the exposure.

4. Training

10 CFR 19.12, "Instructions to Workers," requires that all individuals working in any portion of a restricted area be instructed in the health protection problems associated with expsoure to radioactive materials or radiation and in the precautions or procedures to minimize exposure and to observe, to the extent within the worker's control, the applicable provisions of Commission regulations and licenses for the protection of personnel from exposures to radiation or radioactive materials.

To ensure that individuals receive appropriate training the licensee developed procedure RP-1, "Access and Radiological Control". This procedure requires that, in order for an individual to be permitted unescorted access within the station buildings housing radioactive materials a person must be qualified in radiation protection. In order to qualify in radiation protection, the person must have passed a comprehensive examination based on site radiation protection procedures or he must have demonstrated his knowledge of these procedures to the satisfaction of the Radiochemistry and Radiation Protection Supervisor. Persons qualified in radiation protection wear a picture identification badge with either an orange-yellow or blue background. Visitors (escort required, non-picture badges), and individuals with either white or green background identification badges have not been qualified in radiation protection and must be escorted when in the turbine, reactor or waste buildings. All escorts, according to this procedure, must be qualified in radiation protection.

Of the five individuals involved (A, B, C, D, E), individuals A, B, and C participated in the licensee radiation protection training program and passed a written examination with scores of 86%, 98% and 95% according to licensee records. Individual E did not participate in the training program but was briefed by a Radiation Protection Supervisor and issued a white background picture identification badge. Individual E stated that he had never worked at a commercial nuclear power reactor prior to Nine Mile Point. Individual D stated that upon his arrival on April 21, 1979, he was not provided any training and was not briefed by a Radiation Protection Supervisor. Review of training records indicate Individual D did not receive training or a briefing by the Radiochemistry and Radiation Protection Supervisor. The Entrance Registration Log indicates Individual D was

issued a visitor's badge for his entire period of work during the second quarter of 1979.

Individual D worked the drywell and other portions of the restricted area at times alone and frequently escorted by Individual E.

These individuals stated that they had never received instruction in the RWP procedure or other licensee exposure control procedures.

When questioned by the inspector, these individuals were unaware of health protection problems associated with exposure to loose surface contamination, nonpenetrating radiation and other radiological hazards associated with non-encapsulated radioactive materials.

Failure to instruct workers represents noncompliance with 10 CFR 19.12 (50-220/79-20-02).

Review of records for 20 other contract workers who frequented the restricted area during the second calendar of 1979 indicates that they had been instructed as required by 10 CFR 19.12.

5. Procedures and Radiation Work Permits

Technical Specification 6.11 requires that procedures for personnel radiation protection be prepared consistent with the requirements of 10 CFR 20 and that these procedures be approved, maintained and adhered to for all operations involving personnel radiation exposure. Procedure RP-2, "Radiation Work Permit Procedure" requires that the "leadman" on each job ensure that personnel sign out on the Radiation Work Permit (RWP) each time they leave the job site and that each person list the exposure received on the RWP.

Procedure RP-1, "Access and Radiological Control" states in Section 5.6.6 that, "Dosimeter readings recorded on RWPs, dosimeter logs, and High Radiation Area Entry Logs are entered in the computer and compared with TLD readings to account for radiation exposure since the latest film badge result."

The inspector compared RWP entries with the computer printout of the individual's SRD and TLD readings to determine whether a significant exposure received after May 1, 1979 had been "lost" from the SRD totals. RWP's numbered and issued serially from 3061 to 3824, dating from April 29 thru May 15 were examined (a total of 764 RWP's).

Exposures are assigned based upon the film badge number logged beside an individual's name. Although the Individual A recorded the wrong film badge number on a few occasions (either by transposing digits or using the number from the previous badge period), these errors were caught by the dosimetry technicians (who assigned the exposures to the correct name and badge number). The inspector did not find "lost" SRD exposures which

could explain the discrepancy between the 580 mrem SRD total and 2100 mrem FB reading for the May 1-14, time period.

Several comparisons of SRD readings were made with doses received by individual A and other radiographers working in the same area under the same RWP and with other groups working in the same area under different RWP's. The exposures were generally consistent and what anomalies existed could not account for more than 10 to 15% of the SRD versus FB discrepancy.

RWP conditions including radiation, contamination, and airborne activity surveys; protective clothing requirements; respiratory protection requirements; dosimetry; and special instruction were reviewed for a selected group of approximately 50 RWP's. These RWP's covered radiography and other work, principally in the drywell and Reactor Water Cleanup (RWCU) cubicles.

The results of this review are noted below:

a. Procedure RP-2, "Radiation Work Permit Procedure," states in Section 4.41) that, "The leadman must be qualified in Radiation Protection."

   Individual E was not qualified in Radiation Protection as defined in licensee procedures and was the "leadman" on the following Radiation Work Permits (RWP).

RWP Number	Date
2649	April 20, 1979
2681	April 21, 1979
2702	April 23, 1979
2823	April 24, 1979

b. Procedure RP-2, "Radiation Work Permit Procedure," states in Sections 4.7 that:

   "The leadman then reviews each Δ Authorized Exposure to ensure that this remaining Quarterly Authroization is large enough to allow receiving the exposure anticipated on the job. If it is not, then an increased authorization must be obtained, a different person must be selected for the job, or the person must leave the job site when he receives the remaining authorized exposure.", and Section 5.9 states that, "It is the responsibility of each individual to ensure, by frequently reading his dosimeter, that he does not exceed the Δ Authorized Exposure entered on the RWP."

Individual D exceeded his Δ Authorized exposure on April 24, 1979 while working under RWP 2822. The individual entered the drywell at 7:30 PM with a Δ Authorized Exposure of 55 mrem. He exited the drywell at 10:30 PM and recorded a pocket dosimeter exposure of 160 mrem. Individual D was permitted to reenter the drywell an hour and a half later and worked until 2:50 AM, April 25, 1979. During this entry, this individual accumulated an additional 200 mrem without first obtaining an increased authorization.

c. Procedure RP-2, "Radiation Work Permit Procedure," states in Section 5.4, that, "...the leadman is responsible for familiarizing personnel with all the instructions on the permit, and insuring that these instructions are strictly followed...."

The inspector noted from a review of records the following instructions that appeared on the RWPs listed below were not followed.

"Respiratory mask-fit test and results required"

RWP	Date	Number of individuals for which no results recorded
2495	4/18/79	5
2603	4/20/79	24
2647	4/20/79	15
2685	4/22/79	27
2687	4/22/79	5
2692	4/22/79	6
2696	4/22/79	4
2912	4/22/79	14

"Nasal Smears at end of shift"

RWP	Date	Number of individuals with no results of nasal smear
2495	4/18/79	5
2531	4/18/79	2
2432	4/18/79	17
2647	4/20/79	5

"Finger Rings" (extremity dosimeters)

RWP	Date	Number of individuals that were not issued finger ring dosimeters
2521	4/18/79	2
2587	4/19/79	4

d. Several other discrepancies were noted by the licensee and reported in their 10 CFR 20.405 report dated June 15, 1979. For Individual A these included:

1) RWP #3416, 5/7/79, for work in the Reactor Building Cleanup corridor, was not returned. After repeated follow up, it was finally recognized as lost. A co-worker estimated exposure to be entered for this period.

2) Δ Auth. Exp. entered on RWP's did not always correspond to that calculated from current total and authorized exposure.

3) One RWP, requiring a TLD, was worked by him without wearing the required TLD.

4) One RWP, requiring the TLD to be returned at the end of the shift, was worked by him without turning in the TLD at the end of the shift."

e. The dose received by SRD is recorded on each RWP. Several RWPs had dose for a single entry into the drywell recorded in excess of 500 mrem up to a maximum of 700 mrem. The licensee only issued 0-500 mR SRD for drywell entries. From discussion with the individuals involved and licensee representatives, the inspector learned that a SRD charger was located inside the drywell controlled area during the outage. This permitted an individual to receive a dose of up to 500 mrem by SRD, rezero the SRD and continue to work without leaving the drywell or recording the fact that a dose of up to 500 mrem had been received. It was the responsibility of each individual to record the dose received on his exit from the drywell controlled area.

Individual A when questioned by the inspector stated that he did not recall any instance when either his SRD went full scale or when he may have forgotten to record the dose received during a drywell entry.

Examples a., b. and c. above represent noncompliance with Technical Specification 6.11 in that individuals failed to adhere to the RWP procedure (50-220/79-20-03).

On September 27, 1979 the inspector and a licensee representative toured the restricted area to observe general condition of the facility and worker compliance with RWP work in progress.

f. The inspector noted workers picking up anti-contamination clothing for use as required by RWP work in progress in the Auxiliary building.

"Radiation Protection Procedure" states in Section III.F.3.1.b1 that, "After laundry: To be returned to use, clothing must be less than 4000 c/m as detected with a count rate meter or a portable gm detector."

The inspector in the presence of the licensee's representative, using the licensee instrument (Victoreen Model 49, Serial No. 822 calibration due 12/20/79) observed that, of five pairs of anti-contamination coveralls returned to issue bins for use, each indicated levels of contamination from 5000 to 15000 c/m.

The licensee representative returned theses coveralls to the laundry and stated the matter would be investigated.

g. Procedure RP-1, "Access and Radiological Controls," states, in Section 4.3.3 that, ...Radiation areas should be entered only when necessary to perform a specific job. When entered, time spent in the area should be kept to a minimum...."

During the tour of the Reactor Building an individual was found resting in the prone position on what appeared to be a makeshift bed located on the 261' elevation of the Reactor Building, a posted radiation area. The exposure rate measured in this location was 0.5 to 1 mrem/hr. Since the individual was not engaged in the performance of a specific job, he was directed by the licensee representative to leave the Reactor Building.

Examples f and g also represent noncompliance with Technical Specification 6.11 (50-220/79-20-03).

6. <u>Surveys and Independent Measurements</u>

Licensee radiation, contamination and airborne activity surveys taken in the principal areas where Individual A worked were reviewed. The surveys examined were from the period April thru May 15, 1979 and included the drywell, Reactor Water Cleanup (RWCU) cubicles, and off gas area.

Independent measurements were made by the inspector on June 21, 1979, in the RWCU cubicles and off gas area. A staging area, used by radiographers, in the northwest corner room on the 298 ft. elevation of the reactor building was also surveyed. No radiation fields were located which had not previously been measured and documented by the licensee.

No items on noncompliance were identified.

7. Radiographic Operations

During the refueling outage a considerable amount of radiography had been performed. This included welder qualifications, examination of new installed equipment, and examination of existing equipment. There was one instance of a stuck radiography source. This did not involve individual A; the persons involved did not receive any excess or unusual exposure.

Notifications to the control room of the commencement and completion of radiography was also reviewed.

No items of noncompliance were identified.

8. Conclusion

Individual A received a dose of radiation during the period May 2 through May 15, 1979 which when added to his previous second quarter dose resulted in a total second quarter 1979 dose of 3.79 rem.

Circumstances surrounding the exposure indicate that this individual and his co-workers had not been adequately trained and were not required to adhere to the licensees procedures for exposure control. Additionally, the licensee's method for self-reading dosimeter control and RWP dose input data for the drywell area may have been conducive to human error and loss of dose accumulation data.

9. Exit Interview

The inspector met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on June 22, and September 28, 1979. The inspector summarized the purpose and scope of the inspection and the inspection findings.

The inspector expressed concern with the apparent lack of radiation protection control over the activities of these contractor personnel during the outage period.

The licensee's representative stated that the normal measure of control had been degraded during this outage due to a loss of contractor supplied radiation protection technicians to the Three Mile Island effort.