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THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT OPERATIONS MANUAL

TITLE: EXTERNAL EXPOSURE CONTROL

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External Exposure Control

PAP-0514

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SCOPE OF REVISION:

EXTERNAL EXPOSURE CONTROL

1.0 PURPOSE

This procedure shall establish the external exposure controls and dosimetry issue to be used at the Perry Nuclear Power Plant (PNPP).

2.0 SCOPE

This procedure shall apply to all personnel requiring the use of dosimetry.

3.0 RESPONSIBILITY

- 3.1 The Managers, Perry Plant Technical Department (PPTD) and Perry Plant Operations Department (PPOD) are responsible for ensuring all personnel at PNPP adhere to this procedure.
- 3.2 The Plant Health Physicist is responsible for ensuring exposures are maintained within the federal limits.
- 3.3 The individual is responsible for ensuring that his dosimetry is worn and stored in the proper designated locations. The individual shall maintain his Radiation Exposure Card up to date so as not to exceed any administrative exposure guides. The individual shall maintain his exposure as low as reasonably achievable (ALARA).

4.0 REFERENCES

- 4.1 10CFR19, Notices, Instructions, and Reports to Workers; Inspections.
- 4.2 10CFR20, Standards for Protection Against Radiation.
- 4.3 NCRP 39, Basic Radiation Protection Criteria.
- 4.4 Regulatory Guide 8.13, Instructions concerning Prenatal Exposure.
- 4.5 The Cleveland Electric Illuminating Company Policy for Maintaining Personnel Exposure to Radiation As Low As Reasonably Achievable (ALARA).

5.0 DEFINITIONS

5.1 Radiation Worker

Radiation workers are all PPTD/PPOD personnel and company or contract personnel having specific work or supervisory work assignments within the radiological controlled areas of PNPP.

5.2 Visitor

A visitor is any individual entering a radiological control area for reasons other than doing specific work, i.e., visiting dignitaries or public officials, tour groups, public media, etc.

5.3 Radiological Controlled Area (RCA)

Any area to which access is controlled by PNPP for the purposes of protection of individuals from exposure to radiation and radioactive materials.

5.4 Whole Body

The whole body shall include the head and trunk, lens of the eye, gonads, or active blood forming organs.

5.5 Skin of the Whole Body

The skin of the whole body shall include all skin covering the whole body.

5.6 Extremities

The extremities shall include the forearms and hands, or feet and ankles of the body.

5.7 Calendar Quarter

The calendar quarter shall be as follows: first quarter, January 1 through March 31; second quarter, April 1 through June 30; third quarter, July 1 through September 30; fourth quarter, October 1 through December 31.

6.0 DETAILS

6.1 Exposure Control

6.1.1 Federal Limits

1. The maximum permissible occupational radiation exposure

for individuals 18 years of age or older shall be limited to the following:

- a. 1,250 mrem/calendar quarter to the whole body.
 - b. 7,500 mrem/calendar quarter to the skin of the whole body.
 - c. 18,750 mrem/calendar quarter to each extremity.
 - d. If an individual's lifetime exposure history is known, the whole body limit is 3000 mrem/calendar quarter provided that the dose to the whole body when added to the accumulated lifetime occupational dose as determined on a form NRC-4 (Attachment 3, Form: PAP-0514-2), does not exceed $5(N-18)$ where N is the age in years at his last birthday.
2. The maximum permissible occupational radiation exposure for individuals 18 years or older, for whom quarterly exposure is not known, shall be 25% of the limits specified in step 6.1.1, 1.
 3. The maximum permissible radiation exposure for individuals under 18 years of age shall be limited to 10 percent of the limits specified in step 6.1.1, 1.

6.1.2 PNPP Administrative External Exposure Guides

The flow of administrative whole body exposure guides is shown in Attachment 1. Attachment 2, Form: PAP-0514-1, Radiation Exposure History Questionnaire, is used to initially document personnel data. Further explanation is provided as follows:

1. For individuals less than 18 years of age, if the current quarterly exposure is known and authorization has been obtained from the Plant Health Physicist, or alternate, the exposure guide shall be 100 mrem/calendar quarter. Without the current quarterly exposure data and the Plant Health Physicist's authorization, no radiation exposure shall be permitted.
2. Radiation workers having undocumented exposure during the current calendar quarter shall have an initial exposure guide of 300 mrem/calendar quarter unless the individual can supply a record of his current quarterly exposure or a written signed statement of his current quarterly exposure. However, an official record of current quarterly exposure is preferred.
3. Females shall disclose to their immediate supervisor if they are or may be pregnant. The immediate supervisor

shall inform the Plant Health Physicist, who shall take the following actions:

- a. Reduce the exposure guide to 125 mrem/calendar quarter and not exceed 500 mrem for the entire gestation period.
 - b. Restrict access to the RCA if the quarterly exposure exceeds 125 mrem for the current calendar quarter.
4. Personnel having exposure records for the current calendar quarter or having a complete NRC-4 shall have an initial exposure guide of 1,000 mrem/calendar quarter. The Plant Health Physicist or his alternate, may authorize an initial exposure guide up to 2000 mrem for high exposure work provided a complete NRC-4 is on file and an increased Exposure Guide Authorization (Attachment 5, Form: PAP-0514-4) has been completed.
 5. Personnel with a complete NRC-4 may exceed their initial quarterly exposure guide upon approval by the Plant Health Physicist or his alternate.
 6. The next maximum exposure guide beyond 1000 mrem should be 2000 mrem/calendar quarter. This would not apply to personnel authorized a higher initial exposure guide per 6.1.1, 5.
 7. Increased Exposure Guide Authorizations exceeding 2000 mrem/calendar quarter require the approval of the Plant Health Physicist or his alternate and the Manager, Perry Plant Technical Department or his alternate.
 8. A separate Increased Exposure Guide Authorization shall be completed for each exposure guide increase. The maximum exposure guide of 2500 mrem/calendar quarter should not be exceeded. The maximum quarterly exposure guide may be exceeded if necessary by using the exposure guide formula: 1500 plus one-half the quarterly permanent dosimetry results ($1500 + 0.5 \text{ P.D.}$). In no case shall the limits set forth in 6.1.1 be exceeded.
 9. The Company's ALARA exposure guideline of 5000 mrem/ year for all facilities shall be considered in establishing the quarterly exposure guides. The Company's ALARA guideline may be exceeded in certain situations (all alternate methods are exhausted) by completing an Increased Exposure Guide Authorization and obtaining the approvals of the Plant Health Physicist or his alternate, the Manager, Perry Plant Technical Department or his alternate and the Vice President, Nuclear Operations Division or his alternate.

10. The exposure guides shall include exposure received off-site.
11. Neutron exposures shall be calculated based on staytime in accordance with HPI-B5, Neutron Dose Assessment. The neutron exposures shall be limited to 300 mrem/calendar quarter and included in the preceding exposure guides.
12. Beta dose assessment is normally accomplished with TLDs. However, on occasion in areas of high beta exposure, beta dose may be estimated in accordance with HPI-D1 to ensure the limits of Section 6.1.1,1.b. are not exceeded.
13. Extremity dosimetry shall be required if an individual is likely to receive an exposure to his extremities five times his whole body exposure.

6.1.3 PNPP Emergency Exposure Guides

Normally, planned exposures during an emergency should be controlled to within 10CFR20 limits; however, under emergency circumstances these limits may be waived by the Perry Plant Operations Manager to allow personnel to perform valuable emergency actions. Although specific exposure limits cannot be specified, the exposures should be commensurate with the significance of the objective and held to the lowest practicable level that the emergency permits. The following should be considered as general guidance.

1. A planned emergency dose to prevent serious injury or to prevent destruction of equipment which could result in serious injury should not exceed 12 rems Whole Body dose.
2. Under emergency conditions where immediate action is necessary to prevent serious injury, dose to the Whole Body should not exceed 25 rems and dose to the extremities should not exceed 100 rems.
3. For life-saving actions, dose to the Whole Body should not exceed 100 rems and dose to the extremities should not exceed 300 rems.
4. Personnel performing the planned actions shall be volunteers who are aware of the potential exposure consequences. Personnel shall be in good health, preferably 45 years of age or older and not planning to procreate.
5. Women capable of childbearing shall not be permitted to participate in planned actions.

6. Respiratory protective equipment and protective clothing shall be utilized, when possible, to minimize internal radiation exposure.
7. Personnel exposed under these conditions to a significant fraction of emergency exposure guidelines shall be removed from work duty and placed under medical observation. The emergency exposure shall be added to the individual's current occupational exposure history and added to the 5(N-18) lifetime calculation. If the emergency exposure causes the individual to exceed the routine exposure guides in 6.1.2, the individual shall be restricted from receiving any additional exposure for the current calendar quarter. The individual's exposure shall be restricted in subsequent calendar quarters to 1000 mrem/calendar quarter until the 5(N-18) formula allows the individual to exceed 1000 mrem/calendar quarter.

6.2 Dosimetry

6.2.1 Radiation Worker Dosimetry Issue and Training

1. Radiation Workers are all PPTD/PPOD Personnel and company or contract personnel having specific work or supervisory duties within the radiological controlled areas of PNPP.
2. Prior to dosimetry issue the radiation worker shall:
 - a. Have successfully completed General Employee Training (GET) and Radiological Controls Training (RCT).

NOTE: Individuals on short term work assignments at PNPP may be waived from RCT requirements providing they are escorted at all times while within an RCA by a trained radiation worker and approval has been obtained from the Plant Health Physicist or his alternate. PPTD or PPOD clerical and office employees who do not work in an RCA are exempted from the RCT requirement and will be issued TLDs as per 4.a of this subsection.

- b. Have completed a Radiation Exposure History Questionnaire (Attachment 2).
 - c. Have had a whole body count. (The Plant Health Physicist may waive this requirement).
3. Radiation worker dosimetry issue shall be in accordance with HPI-B3, Processing of Personnel Dosimetry and will normally consist of 1) one TLD and low range self-reading

pocket dosimeter and 2) a Radiation Exposure Card (Attachment 4, Form: PAP-0514-3). If multiple dosimetry or extremity dosimetry is issued, then the currently assigned single TLD will be replaced with "new" TLDs. The need for multiple or extremity TLDs will be determined by Health Physics.

4. All PPTD/PPOD personnel shall be issued permanent dosimetry. All other personnel shall be issued dosimetry as needed or as deemed necessary by Health Physics.
 - a. TLDs shall be changed out at least quarterly, normally the TLDs will be changed out on a monthly frequency. Unique colors may be used by Health Physics to aid in the change out and identify individuals requiring escorts within an RCA.

6.2.2 Visitor Dosimetry Issue and Training

1. A visitor shall be given a training handout which the visitor must read and acknowledge understanding.
2. Female visitors who have not attended the General Employee Training Radiation Safety module shall receive oral and written instructions on the potential hazard of radiation exposure to the unborn child (Regulatory Guide 8.13). The female visitor shall inform Health Physics if she is or may be pregnant. The pregnant female visitor's exposure guide shall be set in accordance with Section 6.1.2,3 as appropriate.
3. The visitor shall be issued a TLD, low range self-reading pocket dosimeter and a Radiation Exposure Card in accordance with HPI-B3, Processing of Personnel Dosimetry.
4. The visitor shall be escorted by a radiation worker at all times while within an RCA.
5. Visitors shall not be authorized to work on a Radiation Work Permit (RWP).

6.2.3 Use and Placement of Dosimetry

1. Normally, TLDs and pocket dosimeters shall be worn on the front trunk of the body between the waist and the shoulders unless otherwise directed by Health Physics. The TLD and pocket dosimeter should be worn within two inches of each other. Pocket dosimetry should be read frequently, and if the reading is three quarters of full scale, the individual should leave the area. Either

Health Physics or the individual will re-zero the pocket dosimeter and enter the reading on the Radiation Exposure Card.

NOTE: Pocket dosimeters are read to nearest 5 mrem.

2. Multiple or extremity dosimetry shall be placed on the body as directed by Health Physics. These alternate locations may include (but are not limited to) the head, hands or feet, just above the knee etc. These body locations are determined on a case by case basis depending on the location of the radiation source, field strength etc.
3. Lost, damaged or off-scale dosimetry shall be reported to Health Physics immediately. Health Physics shall take action in accordance with HPI-B4, Lost, Damaged or Off-Scale Dosimetry and Exposure Calculations. No attempt on the part of the individual shall be made to find lost dosimetry. Health Physics shall investigate the situation and take appropriate actions to determine if additional exposure was received by the individual.

6.2.4 Radiation Exposure Card (Attachment 4, Form: PAP-0514-3)

1. The Radiation Exposure Card (REC) is maintained by the individual and contains the following information: name, date card issued, ID number of the employee, TLD number, quarterly exposure limit, quarterly exposure, radiation work permit numbers for exposure received, date exposure received and a running total of exposure accumulated. When multiple pocket dosimeters are used on the same body location, the low range reading shall be recorded, unless it is off-scale in which case the high range pocket dosimeter reading shall be recorded.
2. Radiation Exposure Cards shall be completed as follows:
 - a. Blocks 1 through 6 will be completed by Health Physics.
 - b. The card is divided into four exposure columns. The exposure columns shall be completed consecutively starting with column 1 and ending with column 4. The initial quarter to date exposure block for column 1 will be the same as the quarterly exposure to date (Block 6).
 - c. Individuals entering an RWP area shall enter the exposure received on each entry on the REC. The RWP number would be placed in Block 7 and the date in Block 8. The exposure received on the entry would

be placed in Block 9. Block 9 is added to the initial quarter to date exposure for column 1 and the sum is placed in Block 10. Subsequent entries are placed in the remaining blocks until column 1 is completed. The quarter to date exposure at bottom of column 1 is written in the initial quarter to date exposure block for column 2. The same is done for columns 3 and 4 until the REC is completed. The individual shall return the completed REC to Health Physics and a new one will be issued to the individual.

- d. Individuals working on General RWPs will complete the REC at the end of each working shift.

3. Lost or damaged RECs shall be reported to Health Physics.

6.2.5 Abnormal Radiation Exposures/Discrepancies

1. Whenever a situation occurs involving the suspected or known unauthorized exposure of personnel to ionizing radiation in excess of the guides specified in this procedure, the incident shall be promptly investigated. Every reasonable attempt should be made to determine the legitimacy and possible consequences of the exposure, and to determine methods for preventing a recurrence of the event. The results of the investigation should be used to complete Form: PAP-0124-1, "Radiological Occurrence Report", and a copy shall be filed with the involved person's dosimetry records.
2. A Radiological Occurrence Report shall be prepared as per OMIA: PAP-0124, Radiological Occurrence Reporting, when the TLD exposure determination differs by more than 25% from the PD determination for the same time period for exposures greater than 100 mrem by TLD.

7.0 ATTACHMENTS

- 7.1 Attachment 1 - Administrative Exposure Guides.
- 7.2 Attachment 2 - Form: PAP-0514-1, Radiation Exposure History Questionnaire.
- 7.3 Attachment 3 - Form: PAP-0514-2, NRC-4, Occupational External Radiation Exposure History.

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7.4 Attachment 4 - Form: PAP-0514-3, Radiation Exposure Card.

7.5 Attachment 5 - Form: PAP-0514-4, Increased Exposure Guide Authorization.

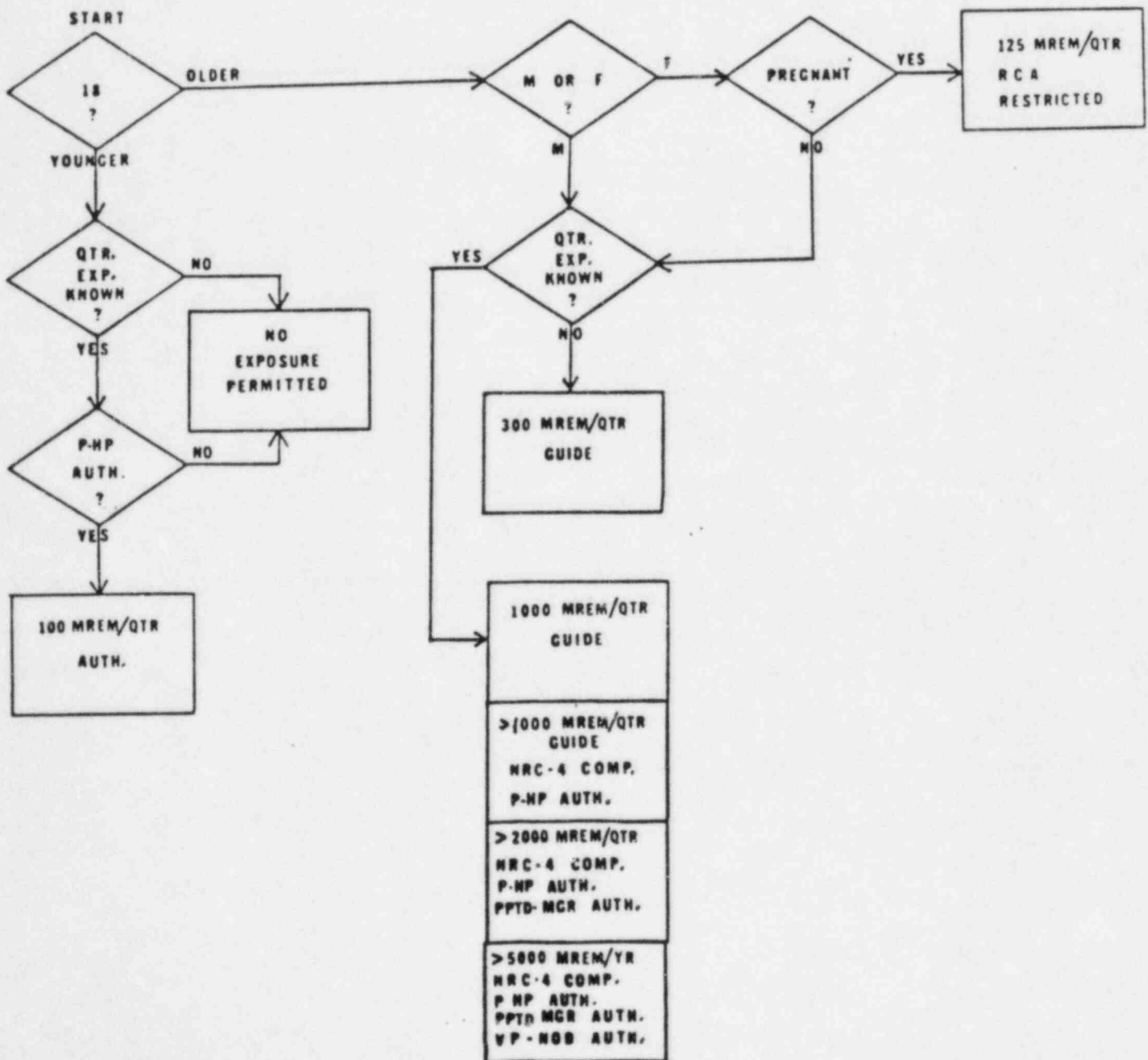
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Attachment 1

Administrative Exposure Guides



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Attachment 2
Form: PAP-0514-1

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RADIATION EXPOSURE HISTORY QUESTIONNAIRE

Name: _____ SSN: _____ Sex: M / F
Last First Middle

Mailing Address: _____ Date of Birth: _____
Street Apt. # Mo/Day/Yr
City/State Zip Monitored at
Perry Before: Yes / No

Employer _____ Dept/Unit _____ Supervisor _____

Current Quarter Exposure Employer	Period of Exp.	Period of Exp.	Type of Exp.	Amount
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Previous Exposure History/Employer	Period of Exp.	Period of Exp.	Type of Exp.	Amount
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(Continue on back)

Have you received internal medical diagnostic or therapeutic treatment with radionuclides within the last 90 days? Yes / No

Is there any reason to limit your exposure to ionizing radiation? Yes / No
If yes, why? _____

This information has been requested in order to prepare radiation exposure history records in accordance with 10 CFR 20.102.

The above information is correct to the best of my knowledge.

Signature Date
HP Use Only

Employment Date: _____ Mo/Day/Yr	Last HP Training: _____ Mo/Day/Yr	Last Whole Body Count: _____ Mo/Day/Yr
Last Resp. Test: _____ Mo/Day/Yr	Last Med. Exam: _____ Mo/Day/Yr	

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Attachment 3

Form: PAP-0514-2

NRC-4, Occupational External Radiation Exposure History

Form NRC-4
Rev. 11-77
NRC-4-77

U. S. NUCLEAR REGULATORY COMMISSION

Form NRC-4
Rev. 11-77
NRC-4-77

OCCUPATIONAL EXTERNAL RADIATION EXPOSURE HISTORY

See Instructions on the Back

IDENTIFICATION				
1. NAME (PRINT - LAST, FIRST, AND MIDDLE)	2. SOCIAL SECURITY NO.			
3. DATE OF BIRTH (MONTH, DAY, YEAR)	4. AGE IN FULL YEARS (N)			
OCCUPATIONAL EXPOSURE - PREVIOUS HISTORY				
5. PREVIOUS EMPLOYMENTS INVOLVING RADIATION EXPOSURE - LIST NAME AND ADDRESS OF EMPLOYER	6. DATES OF EMPLOYMENT (FROM-TO)	7. PERIODS OF EXPOSURE	8. BODY	9. RECORD OR CALCULATED (INSERT ONE)
SAMPLE				
10. REMARKS		11. ACCUMULATED OCCUPATIONAL DOSE - TOTAL		

13. CALCULATIONS - PERMISSIBLE DOSE WHOLE BODY:

(A) PERMISSIBLE ACCUMULATED DOSE (50-100) REM _____ REM
(B) TOTAL EXPOSURE TO DATE (FROM ITEM 11) _____ REM
(C) UNUSED PART OF PERMISSIBLE ACCUMULATED DOSE (A-B) _____ REM

12. CERTIFICATION: I CERTIFY THAT THE EXPOSURE HISTORY LISTED IN COLUMNS 5, 6, AND 7 IS CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

EMPLOYEE'S SIGNATURE _____

DATE _____

14. NAME OF LICEN-SEE _____

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Attachment 4

Form: PAP-0514-3

RADIATION EXPOSURE CARD

[illegible]

FRONT

[illegible]

BACK

- (1) Self Explanatory
- (2) Date Card Issued
- (3) Assigned by Health Physics
- (4) Assigned by Health Physics
- (5) Obtained from Health Physics
- (6) Obtained from Health Physics
- (7) RWP # for Exposure Received
- (8) Date Exposure Received
- (9) Exposure Received for RWP on Date Indicated
- (10) Running Total of Exposure
- (11) Total for Card

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Attachment 5
Form: PAP-0514-4

Form: PAP-0514-4
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INCREASED EXPOSURE GUIDE AUTHORIZATION

Name _____ ID# _____

Dept./Unit _____ Ext. _____

Increased Exposure Guide Requested _____

Reason for Increase: _____

Were other similarly qualified personnel considered? ☐ Yes ☐ No If no, why? _____

Supervisor Signature _____

GS/GSE Signature _____
(For more than 2000 mrem/yr., _____ mrem/yr.)

Completed by Health Physicist _____

Current Quarterly Exposure _____ + _____ = _____ / _____ / _____
Date Init.

Current Annual Exposure _____ / _____ / _____
Date Init.

NRC Form-4 Completed _____ / _____ / _____
(Yes or No) Date Init.

Comments:
(1500 + 0.5 P.D.)

Exposure Guide of _____ Recommended / Not Recommended

Approvals:

1,2,3 Plant Health Physicist (Approved/Disapproved) _____ / _____
Circle One Signature Date

2,3 Manager, PPTD (Approved/Disapproved) _____ / _____
Circle One Signature Date

3 Vice President, N.O.D. (Approved/Disapproved) _____ / _____
Circle One Signature Date

- 1 Required for up to 2000 mrem/qtr.
2 Required for greater than 2000 mrem/qtr.
3 Required for greater than 5000 mrem/yr.