

A GUIDE
for the
INVESTIGATION
OF
EXCESSIVE EXPOSURES
IN
X-RAY DEPARTMENTS

1995

INTRODUCTION

420-3-26-.03(53) of Alabama Regulations for Control of Radiation requires the reporting and investigation of excessive exposures to ionizing radiation. It is clearly management's responsibility to assure that these reports and investigations are properly completed. It is clearly the responsibility of each individual working with radiation to assure the proper monitoring of radiation by any personnel monitoring provided. The improper or fraudulent use of such equipment is a violation of Alabama Regulations for Control of Radiation, and may compromise other legal rights of the individual.

Related to 420-3-26-.03(53) are the requirements of 420-3-26-.03(6) and 420-3-26-.03(5). 420-3-26-.03(6) sets the limit of permissible exposure. Further, it requires management to remove individuals from work with any radiation, for the year these limits are exceeded. 420-3-26-.03(5) further requires that exposures be kept as far below the limits set in 420-3-26-.03(6) as practicable.

This guide is prepared to assist in the investigations of excessive exposures as may be reported to x-ray departments by film badge companies. X-ray departments generally find their excessive exposures when they review their film badge (or TLD) reports or the film badge company notifies the departments by telephone, telegram or facsimile.

The Agency has noted that a great amount of confusion exists about what to do from this point on. This guide is to assist in the systematic investigation, correction, and reporting of excessive exposures.

What is Your Calendar Quarter?

Most film badge companies solve this by listing the calendar quarter exposure of each report. Sometimes it will be necessary to determine your facility's calendar quarters. Your first quarter starts on the day in January you first wear a film badge (or TLD), new film, in the new year. Each calendar quarter is three consecutive months (or 13 weeks) starting, as indicated, in January.

What is an Excessive Exposure?

420-3-26-.03(6) specifies 5 rem as the maximum annually permitted, whole body exposure. An individual may receive all of this the first day of a year and still not have an excessive exposure provided the individual does not receive any other radiation exposure from his work. Note: This includes all of his work. Any second or part time work in which he may receive radiation exposure must be included, and it is the facility's responsibility to obtain these exposures.

Many facilities use the 400 mrem per month guide. While exceeding 400 mrem in a month alone does not create an excessive exposure, it is well to investigate the causes since you may be able to prevent an actual excessive exposure. Special reports are required if the exposure exceeds 5,000 mrem or 25,000 mrem.

Consider requiring film badge supplier to provide immediate notification of exposures exceeding 400 mrem.

The Investigation.

Once you have determined that the exposure needs investigating determine the cause. A systematic approach will help you to, (1) get all of the facts and (2) probably prevent overlooking of some important aspect of the investigation.

Rule 1. Do not reach your conclusions until the investigation is complete.

The order of investigation presented here is certainly not the only way to do it, but one should try to cover all of the points mentioned.

1. The Film Badge (TLD) Report.

From the report determine:

- A. Is the exposure whole body or extremity? This information is usually obtained by the film badge type. The standard badge is usually whole body. Whole body also would include lens of the eyes and head.
- B. The energy of the radiation. This is usually a code letter in one of the columns or listed as penetrating or non-penetrating (beta).
- C. Any special notes such as
 - (1) Exposed through back of badge
 - (2) Partially shielded.
 - (3) May have light or heat exposure.

These all provide suggestions of where to proceed with the investigation.

For example:

- A. If this is an extremity or ring badge report, different limits apply. The hands may receive 50 rem in a year.
- B. The reporting of beta or non-penetrating radiation may be caused by (1) the improper placing of the film in the holder portion of the film badge, or (2) heat or (3) other nonspecific.

- C. The reporting of high or medium energy radiation when working around diagnostic x-ray is almost always caused by not placing the film in the holder, or the special filters in the holder have been lost. Errors of 1,000% are possible.
 - D. Codes indicating heat damage or light damage give clues to improper use of the film badge.
 - E. Codes indicating partial shielding may cause the badge to be evaluated using improper energy information. This may also be a clue as to the improper location of the individual during certain procedures.
 - F. Codes indicating exposures to the back of the badge may indicate a serious under estimation of the actual exposure dose. It may only represent a careless placement of the badge.
 - G. Review several past reports for patterns. For example, if higher exposures seem to rotate among staff, check for a particular room or unit that is used on a rotating basis.
2. Actions to be taken as a result of the review of the film badge report.
- A. Contact the badge supplier and resolve any of the following which apply.
 - 1. If beta is reported for an x-ray exposure ask for a review for heat, pressure, or other artifact.
 - 2. If the improper energy is reported ask the supplier to confirm the energy evaluation and also to supply an estimate based upon the proper (low) energy.
 - 3. If special codes appear, ask for a special evaluation, for example, the supplier may be able to identify keys, coins, etc., which indicate how the badge is based.

If you must contact the supplier then also ask if the badge has a single or multiple or moving exposure pattern.

- B. For those codes which indicates exposure through the back or partial shielding, note to ask the individual about how and where the badge was worn.
- C. For those codes indicating heat or light damage, or improper film placement, ask the individual about how and where the film badge is used and/or stored.

3. Discussion with individual exposed.
 - A. A straight forward approach in asking questions of the individual should be utilized. Remember the main object is to correct mistakes. Also in many cases, the individual is afraid of the effects of radiation overexposure and must be reassured by telling the facts. Ascertain if the individual can remember any specific event or item that may have led to an exposure. If the individual has worked for sometime doing the same basic duties without an exposure, ascertain what, if any, changes in techniques, work load, work station, etc., which may have led to an exposure.
 - B. Have the individual demonstrate suspect techniques or positions. It may be that by moving 2 or 3 inches the exposures may be prevented. Note and discuss where and how the film badge is being worn, where they stand during certain exams, and items that may have been noted during the film badge report review. It may be helpful to compare the positions, techniques, etc., with those of other individuals in the department.
4. Discussion with other individuals in the department may help develop areas needing investigation.
5. Have all equipment, and room, checked to see that the shielding is in place. Simple tests using film on suspect equipment can determine if the collimation is working properly or tubehead leakage may exist at various tube angles.
6. Remember the most frequent cause of excessive exposures in-x-ray departments is holding patients. Although forbidden by regulations, many individuals get lax and unconsciously begin to hold patients. Facilities failing to provide adequate restraint devices are particularly prone to this problem.
7. If, after trying everything you can think of and/or suggested in this guide, you still cannot identify the cause do not be disturbed. A small percentage of the overexposures are never explained.
8. You may find that you can prove the exposure did not occur. In this case, the individual who supposedly received the exposure may request a change of their record and if the Agency review confirms the conclusion a change will be authorized by the Agency.

APPENDIX A

What, When, Who and How to Report an Excessive Exposure

When

<u>Exposure</u>	<u>Reports Required</u>	<u>When Required</u>
25,000 mrad or greater	1. Telephone and Telegraph Notifications Appendix B. 2. Full investigation, Appendix C	1. Immediately 2. Within 30 days
5,000 mrad or greater but less than 25,000 mrad	1. Telephone and Telegraph Notification Appendix B. 2. Full Investigation Appendix C	1. Within 24 hours 2. Within 30 days

APPENDIX B

Prompt Reports as Required by
420-3-26-.03(52)

A. What is to be Reported.

1. Name of Registrant
2. Address of Registrant
3. Amount of Exposure
4. Name of Exposed.
5. Date(s) of Exposure.
6. Any other appropriate, available information.

B. How This Report is Made

This is to be reported by telephone, telegram, mailgram or facsimile to:

Division of Radiation Control
Bureau of Health Care Standards
Alabama Department of Public Health
Montgomery, Alabama 36130-1701

Telephone (334) 613-5391

Fax (334) 613-5387

APPENDIX C

30 Day Full Investigation

(Example of Individual Report)

March 30, 1995

Mr. J.J. Jones
123456 Seventh Street
Eight City, Alabama 36999-9999

Re: Overexposure Report

Dear Mr. Jones:

On March 23, 1995, we were informed by XYZ Company that your February, 1995 film bag indicated you received 5070 mrad of exposure. Since that was over the annual limit you were not to perform the duties which may expose you to additional radiation after March 23, 1995.

Our investigation is complete and we now believe that you received most of this exposure while working in room 39. We discovered that a portion of the shielding had been modified while certain emergency procedures were performed. It also indicated that you may have received additional radiation exposure before we were aware that you may have exceeded the annual limit. Therefore, when we received additional information from XYZ Company in April, we will provide you an additional written report with your total exposure.

This report is furnished to you under Chapter 420-3-26, Radiation Control, Rule 420-3-26-.10. You should preserve this report for future reference.

Sincerely,

B. R. Jones

APPENDIX C

30 Day Full Investigation Report

Submit to:

Division of Radiation Control
Alabama Department of Public Health
Montgomery, Alabama 36130-3017

Date: _____

Name of Registrant or Licensee _____

Address of Registrant or Licensee _____

Individual (Code as A,B,C, etc.) _____, See page 2.

Exposure _____ Date(s) when exposure occurred _____

Date when Registrant or Licensee Received Report _____

Date when Registrant or Licensee notified individual of overexposure _____

(Attach a copy of report on this report. See example of a letter as your guide).

Cause of excessive exposure _____

(To support your conclusions you may wish to attach a copy of Appendix D if you used it to guide your investigation. In any case use additional pages as necessary).

Corrective Actions: (Describe fully).

Submitted by: _____

Title: _____

APPENDIX C

30 Day Full Investigation Report

Date _____

Individual _____ is (name) _____.

His/Her Social Security Number is _____.

His/Her Date of Birth is _____.

From: Name of Registrant or Licensee _____.

Address of Registrant or Licensee _____.

_____.

Submitted by: _____

APPENDIX D

CHECK LIST

EXCESSIVE EXPOSURE INVESTIGATION

Date Complete _____.

Name of Registrant or Licensee _____.

Address of Registrant or Licensee _____

Individual (Code as A, B, C, etc.) _____ Reported Exposure ____.

1. Film Badge Report Review.

a. Energy of Radiation according to report _____.

b. Badge was for recording whole body _____
or other _____ exposure.

c. Describe meaning of Codes on Report. _____

_____.

d. Supplier's comments regarding the exposure _____

_____.

e. Comments on review of past year records _____

_____.

2. A. Statements of individual (Attach a signed written statement if appropriate). _____

_____.

B. Results of individual demonstrating various techniques _____

_____.

C. Statements of fellow workers. _____

_____.

3. Equipment Test.

- A. All collimators work and are used _____.
- B. No tube head leaks _____.
- C. Condenser discharge units not leaking _____.
- D. Filtration replaced _____.
- E. Shielding complete and adequate _____.
- F. Aprons have no holes or leaks _____.
- G. Patient restraints usable, complete and used _____.

4. Individual Technique Positions

- A. When and how does individual hold patients? _____.
_____.
- B. Where does individual stand during Cysto procedures? _____

Arteriograms _____.

5. Conclusions of Investigator.

SIGNED: _____ DATE: _____
(Investigator)