

50-373

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USE OF POTASSIUM IODIDE (KI)  
AS A THYROID BLOCKING AGENT

A. PURPOSE

The purpose of this procedure is to outline the Station policy for distribution and use of potassium iodide tablets by personnel during emergency radiation conditions.

B. REFERENCES

1. Generating Stations Emergency Plan (GSEP), Section 6.4.2, 7.1.2, and 8.1.3.
2. NCRP Report No. 55, "Protection of the Thyroid Gland in the Event of Releases of Radiiodine," 1977.
3. U.S.N.R.C. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I, "Revision 1," 1977.
4. Letter to D. P. Galle from W. Harrison Mehn, dated May 24, 1983.

C. PREREQUISITES

1. None.

D. PRECAUTIONS

1. Potassium iodine should not be taken by persons who know they are allergic to iodine.
2. Taking more than the recommended doses of potassium iodide may cause undesirable side effects. Possible side effects include skin rashes, swelling of the salivary glands, and "iodism" (Metallic taste, burning mouth and throat, sore teeth and gums, symptoms of a head cold, and sometimes stomach upset and diarrhea).
3. For continuing exposure conditions, one potassium iodide tablet should be taken each day. KI should not be taken for more than 10 days unless otherwise specified by the Company Medical Director.

E. LIMITATIONS AND ACTIONS

1. Each tablet contains 130 mg of potassium iodide and is to be administered at the rate of one (1) tablet once each day to adults and children one (1) year of age or older. Babies under 1 year of age are to be given one-half tablet once a day (crush first).
2. Potassium iodide tablets are to be stored in tightly closed containers and protected from light. They should be replaced at the end of their three year shelf life.

F. PROCEDURE

1. An adequate supply of potassium iodide tablets shall be maintained at the Technical Support Center (TSC), Operational Support Center (OSC), Emergency Operations Facility (EOF), and the Environs Emergency Kits.
2. Potassium iodide should be administered as follows:
  - a. One (1) potassium iodide tablet (130mg) should be taken prior to receiving a projected calculated dose equivalent to the thyroid of 25 rem or greater, or as soon as possible upon an individual being subjected for 1 hour to an airborne concentration of I-131 of  $1.25 \times 10^{-5}$  uCi/cc or greater (Reference 4). The dose equivalent to the thyroid gland can be calculated by the use of the attached nomograms for I-131 (Attachment A), I-133 (Attachment B), and I-135 (Attachment C).
  - b. To use the nomogram the concentration of the radionuclide in uCi/cc and the duration time of the exposure in hours is needed. The dose equivalent to the thyroid is determined by connecting the radionuclide concentration in uCi/cc with the exposure time in hours. The point where the line intersects the thyroid dose equivalent line gives the dose equivalent in rem.
  - c. The committed dose equivalent to the thyroid gland can be calculated as follows:



$$H_{50}(\text{rem}) = \sum_i x_i^a B D_{IT} t$$

WHERE:  $H_{50}(\text{rem})$  = the total committed dose equivalent in rem averages throughout the thyroid tissue in the 50 years after intake of radiiodine into the body.

$x_i^a$  = Averaged concentration of a radionuclide  $i$  in air in  $\mu\text{Ci/cc}$  over the duration of exposure  $t$ . The primary nuclides of interest are I-131, I-132, I-133, I-134, and I-135.

$B$  = breathing rate in  $\text{cc/hr}$  over the duration of exposure  $1.2\text{E}06 \text{ cc/hr}$  (assumed).

$D_{IT}$  = dose conversion factor in  $\text{rem}/\mu\text{Ci}$  inhaled of radionuclide in the thyroid gland.

$t$  = duration of exposure in hours.

#### NOTE

The following values of  $D_{IT}$  may be used (from Reference 3):

$$D_{I-131} = 1.5 \text{ rem}/\mu\text{Ci}$$

$$D_{I-132} = 1.4 \times 10^{-2} \text{ rem}/\mu\text{Ci}$$

$$D_{I-133} = 2.7 \times 10^{-1} \text{ rem}/\mu\text{Ci}$$

$$D_{I-134} = 3.7 \times 10^{-3} \text{ rem}/\mu\text{Ci}$$

$$D_{I-135} = 5.6 \times 10^{-2} \text{ rem}/\mu\text{Ci}$$

- 1) An example calculation using the equation from step F.2.c. is as follows:

Assuming I-131 is the only nuclide of concern with a concentration of  $1.25\text{E}-05 \text{ } \mu\text{Ci/cc}$ , then:

$$H_{50} \text{ (rem)} = x^a B D_T t$$

WHERE:  $B = 1.2E06 \text{ cc/hr.}$

$D_T = 1.5 \text{ rem/uCi}$

$x^a = 1.0E-05 \text{ uCi/cc}$

$H_{50} \text{ (rem)} = 25 \text{ rem}$

$t = \text{duration of exposure in hours.}$

$$t = \frac{25 \text{ rem}}{(1.25E-05 \frac{\text{uCi}}{\text{cc}}) (1.2E06 \frac{\text{cc}}{\text{hr}}) (1.5 \frac{\text{rem}}{\text{uCi}})}$$

$$t = \frac{25 \text{ rem}}{(1.25E-05 \frac{\text{uCi}}{\text{cc}}) (1.2E06 \frac{\text{cc}}{\text{hr}}) (1.5 \frac{\text{rem}}{\text{uCi}})}$$

$$t = \frac{25 \text{ rem}}{18 \frac{\text{rem}}{\text{hr}}}$$

$t = 1.1 \text{ hrs.}$

Therefore, the use of KI is warranted if the exposure time is greater than 1.1 hrs.

3. The Company Medical Director is to be notified immediately for all suspected exposures described in Step F.2. Upon being notified of such an incident, offer any additional advice as necessary. Time is an important factor in any suspected radioiodine exposure situation. The effectiveness of KI as a thyroid blocking agent drops quickly as a function of time. KI taken:

- |   |                     |
|---|---------------------|
| a. Before or concurrently with exposure | 90% effective       |
| b. 3-5 hours after exposure             | 50% effective       |
| c. 12 hours after exposure              | some limited effect |

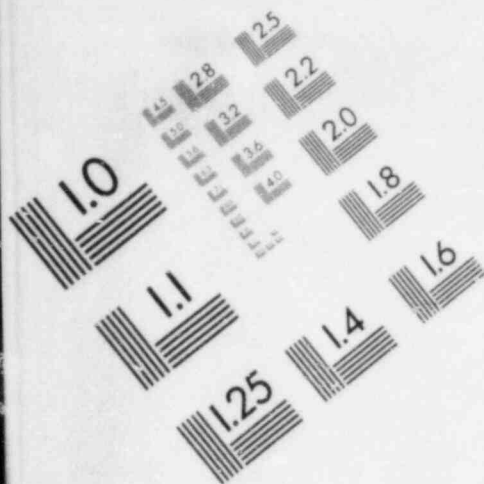
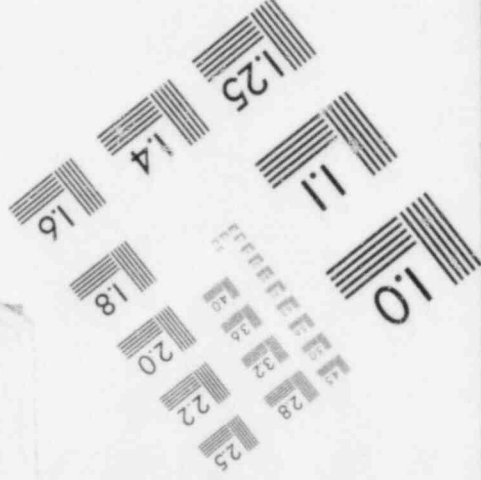
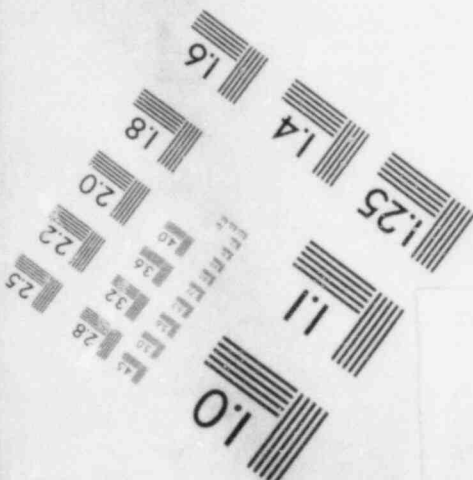
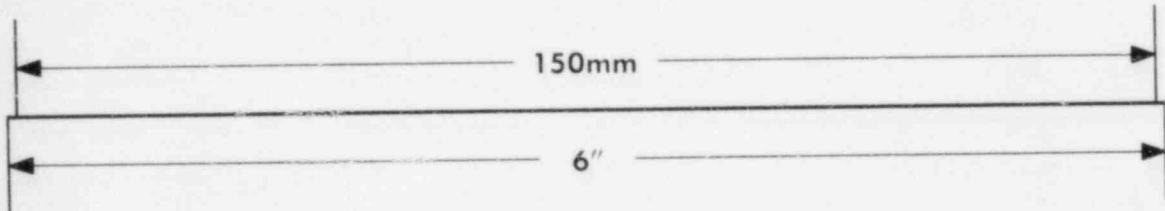
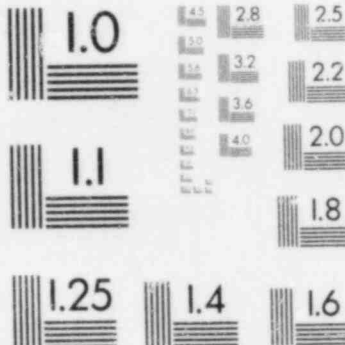
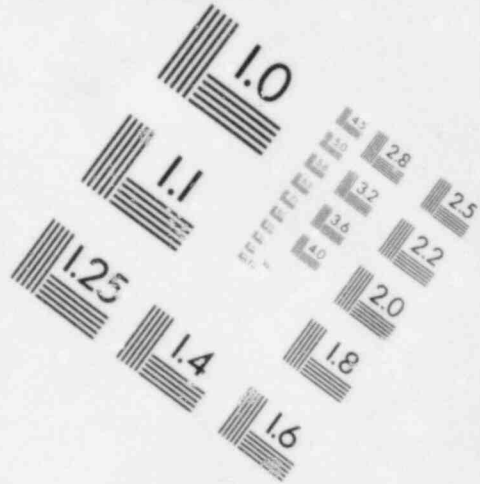


IMAGE EVALUATION  
TEST TARGET (MT-3)



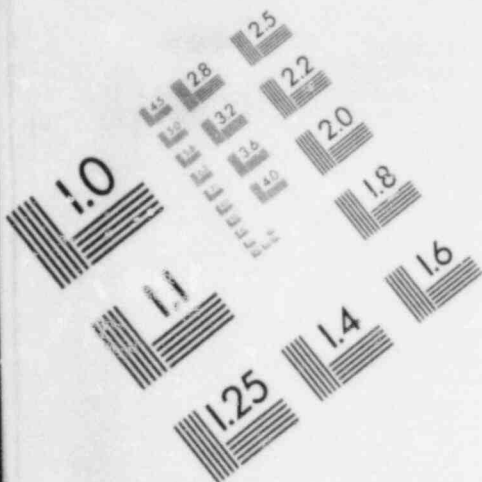
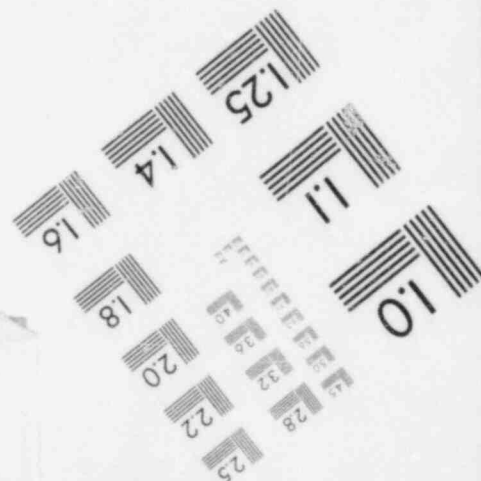
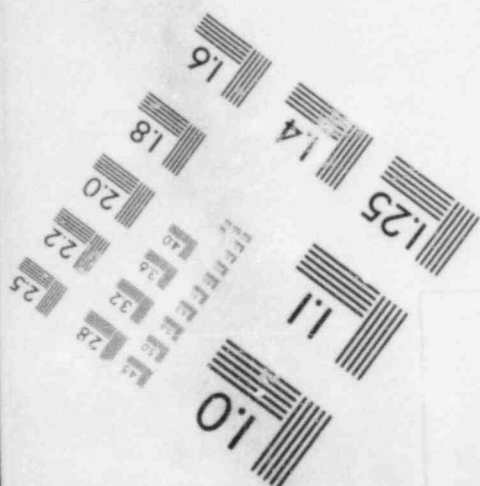
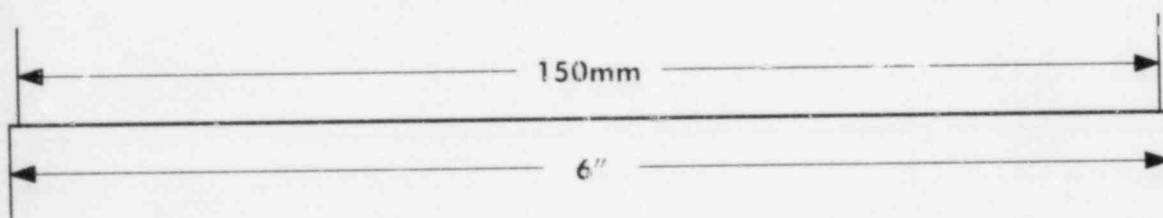
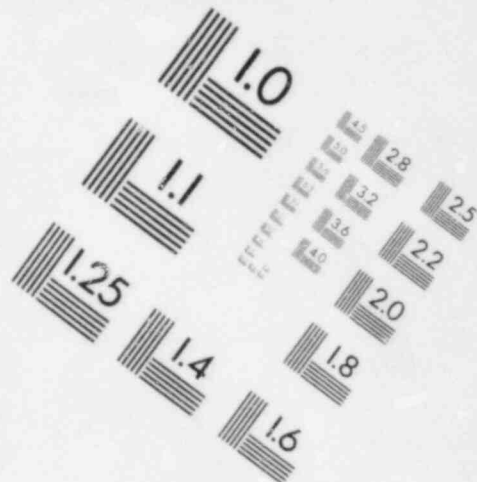


IMAGE EVALUATION  
TEST TARGET (MT-3)



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G. CHECKLISTS

1. None.

H. TECHNICAL SPECIFICATION REFERENCES

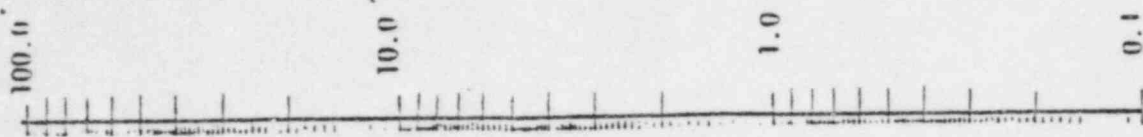
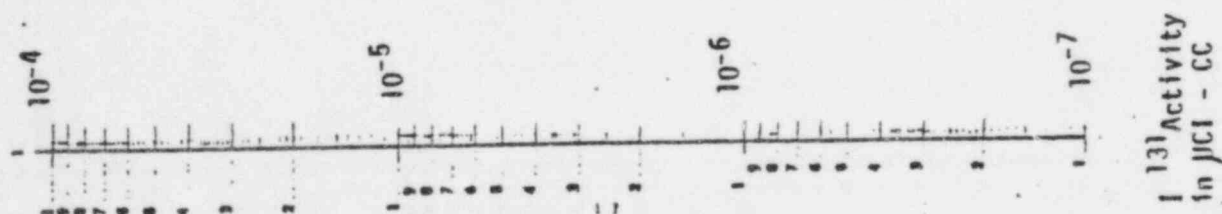
1. None.



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ATTACHMENT A

IODINE - 131 DOSE EQUIVALENT TO THYROID

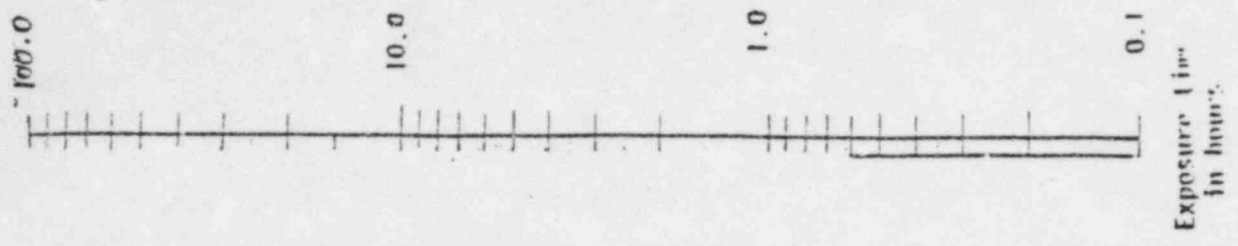
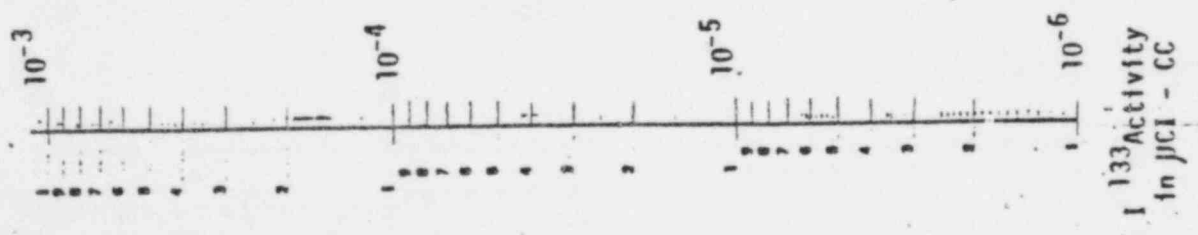


Exposure time  
 in hours

Thyroid  
 Dose Equivalent  
 in REM

ATTACHMENT B

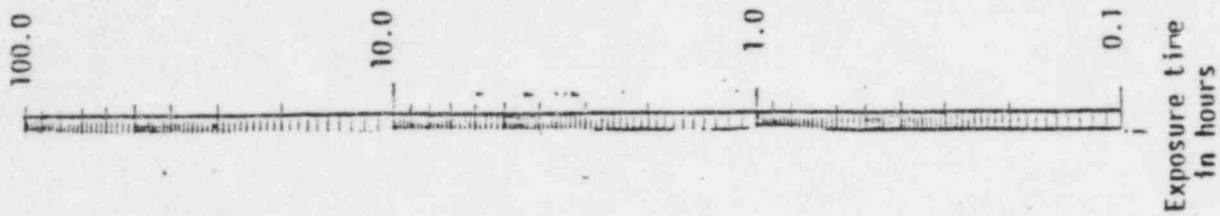
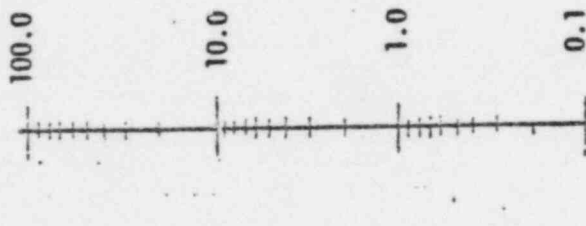
IODINE - 133 DOSE EQUIVALENT TO THYROID



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ATTACHMENT C

IODINE - 135 DOSE EQUIVALENT TO THYROID



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ATTACHMENT C

OFF-SITE PROCEDURE NOTIFICATION FORM

Dec 3  
DATE

Nuclear Waste Regulation (10)

96/97/98/99/100/101/102/103/104/105

Please REMOVE the following pages from your controlled copy of the LaSalle County Station \_\_\_\_\_ Procedures Manual. INSERT the new pages as indicated and REMOVE and DESTROY the superseded pages. SIGN this transmittal form in the space provided for Manual holder below. RETURN this signed sheet to:

Office Supervisor  
LaSalle County Station

Station Superintendent  
LaSalle County Station

MANUAL NUMBER	MANUAL HOLDER SIGNATURE (IF NEW HOLDER, PLEASE ADVISE)	DATE
DOCUMENT	REMOVE/REV.	INSERT/REV./DATE
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