

JUN 12 1984

License No. 07-01173-03
Docket No. 030-14700
Control No. 16383

Lehigh Testing Laboratories, Inc.
ATTN: Leonard A. Weston
Vice President & General Manager
4029 New Castle Avenue
Wilmington, Delaware 19899

Gentlemen:

This is in reference to your application dated November 30, 1983 to renew License No. 07-01173-03. In order to continue our review, we need the following additional information:

1. Regarding your permanent radiographic facility;
 - A. During our recent inspection you indicated that you were constructing a new permanent radiographic facility, if so, submit the following information.
 1. An annotated sketch or drawing of the facility and its surroundings which show:
 - a. The scale to which the sketch or drawing is made (the same scale should be used for all sketches and drawings). The recommended scale is $\frac{1}{4}$ inch = 1 foot. The facility lay-out should include a maze at the entrance (see Attachment C).
 - b. The type, thickness, and density of shielding materials on all sides, including the floor and roof.
 - c. The locations of entranceways and other points of access into the facility, if applicable.
 - d. A description of the nature of areas adjacent to the facility and distance to these areas. The information should include areas adjacent to, above, and below the facility.
 2. A description of the audible-visible signal system, its location, and a description of how it meets the requirements in Section 34.29 of 10 CFR Part 34.

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3. The results of calculations or actual radiation measurements adjacent to, above, and below the facility. The type of source (isotope), amount of radioactive material in the source, and the position of the source within the facility should be clearly identified for the calculations or measurements.
4. Limitations, if needed, on positioning of sources or type (isotope) and amount of radioactive material which may be used in the facility to assure that areas adjacent to, above, and below the facilities will be unrestricted areas during performance of radiography.

The radiation levels around the facility in all directions including the roof should be an unrestricted area. The radiation level in all directions around the facility should not exceed 2 milliroentgens per hour.

Every effort should be made to limit the radiation level on the roof to a radiation level of 2 milliroentgens per hour. However, construction requirements may preclude shielding the roof to meet the 2 milliroentgens per hour radiation level. Variances will be considered if the following information is provided:

1. Means of access to the roof.
2. Procedures for assuring that no individual is on the roof or could gain access to the roof during performance of radiography.
3. A commitment that the roof will be posted with "Caution (or Danger) Radiation Area" signs.
4. The steps taken to minimize radiation on the roof.

A radiation level which exceeds 100 milliroentgens per hour will not be considered acceptable since such a radiation level constitutes a high radiation area which requires special precautions such as the visible-audible signal system required by Section 34.29 of 10 CFR Part 34.

For a permanent facility, Section 34.29 of 10 CFR Part 34 requires that each entrance into the high radiation area in the facility shall have both visible and audible warning signals to warn personnel of the presence of radiation. The visible signal must be activated by radiation whenever the source is exposed and the audible signal must be activated when an attempt is made to enter the facility when the source is exposed. The requirement for the visible-audible signal system is in addition to other measures which may be taken to prevent access into the facility such as locked doors and direct surveillance.

B. The NRC's calculation of exposure rates surrounding the current X-ray exposure room and areas outside the permanent radiographic facility used the following parameters:

1. 100 Ci of Ir 192
2. No shielding (collimator) on source in end of guide tube
3. Exposure rate for Ir 192 equalled 5.2 R/hr/Ci at 1 foot.
4. Concrete block is 16 inches thick
5. No shielding was placed in doorway
6. HVL for Ir 192 in concrete = 1.75 inches
7. Contributions of build-up, scatter radiation and "sky shine" were not included in calculations

Our results (see Attachment B) indicate that radiation levels up to 936 mR/hr are possible in areas (see Attachment A) that should be unrestricted; additionally using our parameters the roof at a point 30 feet from the source had calculated radiation levels of 578 mR/hr. With the use of your Model 714, 654 or 799 collimators with the beam pointed at the floor, you could reduce this level to 8.25, 2.9 and 3.6 mR/hr respectively.

Based on the results of our calculations, please submit, the following information for your current facility.

1. Please submit, the results of calculations or actual radiation measurements made during operations with your Iridium-192 source in your x-ray exposure room. The calculations or surveys should indicate the activity of the source, the position of the source in the room, the distance of the source from each wall of the room, whether a collimator was used on the source stop point of the guide tube, the model No. of the collimator, if any, and in which direction the open beam was pointed if a collimator was used.
2. Based on the NRC's calculations please indicate how you maintain constant surveillance and control access in the Body Shop Parking Area the Machine Shop, the roof and the Driveway and Parking Area as required by 10 CFR 34.32 (c).
3. In light of the NRC's calculations, please indicate, how you will limit the radiation level to 2 mR in any one hour in the unrestricted areas surrounding your radiographic facility such as the machine shop, the body shop parking area, the roof of your building, and the driveway and parking area. Please note,

that occupancy factors can not be used to achieve the 2 mR/hr limit as you have stated on page 1 of 3, Section 1. 9. 2 (B) 4. of your radiation safety manual.

4. In our recent inspection it was observed that an individual could enter the x-ray exposure room without setting off an audible alarm if he entered the doorway at the end of wall A (see Attachment A). Please indicate, how you will correct this problem to comply with NRC regulations.
5. Please indicate the type, thickness and density of shielding materials used in the doorway, roof and floor of the x-ray exposure room, if any.
6. Please submit, any step by step instructions you will impose on radiographic operations in your current facility to assure radiation levels of 2mR/hr in unrestricted areas (e.g. always use the model 654 collimator with beam directed at the floor with source at least 4 feet from the walls in the corners abutting the machine shop).

2. Regarding personnel monitoring;

Section 1.5.1.2 states persons under 18 years of age will be restricted to 5% of the applicable limits specified in Section 1.4.2, however, Section 1.4.3 indicates persons under 18 years of age will be restricted to 10 percent of limit specified in Section 1.4.2.

Please modify your statements in either Sections 1.5.1.2 or 1.4.3 in order that they reflect the same percent restriction.

NPC regulations in 10 CFR 20.104 restricts persons under 18 years of age to 10 percent of the dose limits specified in the table in paragraph (a) of 10 CFR 20.101.

3. Regarding your Operating and Emergency procedures;

- A. Operating procedures for the performance of radiography should be step by step instruction to provide radiography personnel with clear and specific guidance for all operations which they will perform.

Your procedures as stated in Sections 2.2.3 and 2.2.4 are not clear, as to at what point, in the step by step instruction that; 1) the radiation and high radiation area are established and posted; 2) a survey is performed of the restricted area boundary to assure radiation levels do not exceed 2 mR/hr; and 3) the individual should start maintaining continuous surveillance over the restricted area to keep all persons from entering.

Since your procedures in Section 2.2.4 (H) and (I) do point out that surveys need to be performed at those points, we suggest for consistency, that points 1), 2), and 3) also be in your procedures in Sections 2.2.3 and 2.2.4 as specific instructions; even though they may be stated separately in Sections 1.6.2. and 1.9.

- B. Please clarify, the statement in Section 1.6.2 (A) which allows 2mR/hr per Curie of Ir-192 on the surface of the guide tube to determine that the source has returned to the safe storage position. The guide tube surface may be 7 to 21 feet or more in length. The allowable radiation levels you state for the guide tube would indicate that the source is not in the safe storage position or that the source is leaking and has contaminated the guide tube. Please note, that regulations in 10 CFR 34.21 allow maximum radiation levels of 200 mR/hr at the surface of the exposure device and 10 mR/hr at 1 meter from any exterior surface. Levels of 60 mR/hr or less should not be found on the surface of the guide tube unless the survey is taken at a point less than 1 meter from the exposure device.
- C. In Section 1.6.2 (c) you indicate a survey at the external surface of the lab storage vault must be performed after placing licensed material inside and record the survey on the utilization log. Please clarify, if it is Company policy to return to the lab from the temporary (field) job site at the end of the day. If an individual cannot return to the lab at the end of the day because the field site is a great distance from the lab, please specify, what survey would be recorded on the utilization log for the storage area.
- D. 10 CFR 71 and DOT regulations were recently changed so that radiation levels from surfaces of packages and transportation index are measured at 1 meter rather than at 3 feet. You should change your references from 3 feet to 1 meter in Sections 1.2.0 (page 6 of 6, Transport Index), 1.6.2 (E), 2.3.2 (C), 2.3.2 (D), 2.4.2 (A), 2.4.2 (P), 2.6.2 (F) 3. and two points in question R52 on the submitted examination.
- E. Section 1.6.3 indicates, if survey readings are higher than the maximum allowed the individual should call the R. S. O. Please clarify, if Section 1.6.3 could be considered an emergency condition; if so, you should restate this instruction in Section 2.5.0.
- F. Section 1.9.2 (B) 4 allows an occupancy factor to be considered for the radiation level in the unrestricted area. Please be advised that 10 CFR 20.105 (b) does not allow for an occupancy factor other than unity(1). Please delete Item 4 from Section 1.9.2 (B).
- G. Section 1.9.1 indicates direct continuous surveillance to protect against unauthorized entry into the Radiation Area is required, except when the High Radiation Area is either equipped with an alarm system or where the area is locked to prevent entry.

Our calculations show that radiation levels as high as 578 mR/hr can exist on your roof (30 feet from floor/100 Ci source/no collimator used/beam panoramic) and at points 6 feet into the driveway and parking area from the garage door (30 feet from 100 Ci source to unrestricted area with no shielding on source or in doorway of x-ray exposure room). Additionally dose rates of up to 936 mR/hr can exist in the machine shop, the body shop parking area or at any point along the 16 inch wall of concrete surrounding your x-ray exposure room under specific conditions, e.g. 100 Ci source placed against wall/no shielding of source.

Therefore until you have improved the shielding and design layout in your x-ray exposure room or provided surveys to show the radiation levels in the unrestricted areas near your permanent radiographic facility meet the 2mR/hr level, please confirm, that continuous surveillance will occur in the occupied and other unrestricted areas surrounding your x-ray exposure room and radiographic facility and a 2 mR/hr line will be established and properly rested.

- H. Please confirm, that when a device is locked in a room for storage at a field site as indicated in Section 1.9.1 (B) that the key to the room will be kept by the radiographer and that a survey will be made and recorded of the unrestricted area surrounding the storage room.
- I. Section 2.5.4., instructions on notifying the NRC, should be amended to "....notify the Regional Administrator, USNRC Region I, King of Prussia, PA, (215) 337-5000. The appendix referred to in Section 2.5.4 does not contain Region I's telephone number and due to reorganization of the NRC, titles and the office designation has changed.
- J. Section 2.6.1 (F) indicates that operation of selector ring, odometer, lock assembly and control crank should be checked during the first exposure of the shift. The NRC believes that those checks should be performed prior to the first exposure of the shift. Additionally your daily inspection does not include checking the control cable for cuts and breaks. You should amend your procedures to allow for the inspection prior to use.
- K. Section 2.6.1. provides for recording the results of daily equipment inspection but provides to instruction on reporting defects as indicated in Section 3.3. Since Section 1.1.1 indicates the radiographer and assistant radiographer are only trained in Parts 1 and 2 of your Radiation Safety Manual, how do they become aware of reporting defects as stated in Section 3.3 ?

You should amend Section 2.6.1 to include instructions to 1) Report all defects to the RSO immediately and 2) Do not attempt to use defective equipment.

- L. Section 2.6.2 (F) 2. states; "reload the source in the exposure device". Since instructions in Section 2.6.2 (A) through (F) 1, do not indicate that the source was removed from the exposure device, please clarify, if an instruction on source removed is missing from these procedures on "Final Inspection of Equipment."

Your "Quarterly Inspection and Maintenance Report (Form 200) indicates you may perform a source change, however, this is not reflected in Section 2.6.2.

4. Regarding your Training Program;

- A. You indicate in Section 3.1.1 (A) that initial classroom instruction will be a minimum of 4 hours including instruction in the use of radiographic equipment. The NRC has determined that class room instruction, excluding the use of radiographic equipment, should be approximately 4 to 6 hours, with instruction in the use of radiographic equipment allotted another 2-4 hours. You should increase your minimum training for the subjects covered in Section 3.1.1 (A) to a minimum of 6 hours.
- B. We have reviewed your sample examination. The purpose of an examination is to test basic understanding of radiation safety as needed in radiographic operations. Therefore, practical questions rather than questions on radiation theory should be in the examination. Both the topics in Appendix A of 10 CFR 34 and your operating and emergency procedures should be covered comprehensively in the examination.

Your examination for individuals to become assistant radiographers should have the majority of its questions regarding your operating and emergency procedures. Your examination for radiographers should have at least 50% of the questions dealing with practical problems and operating and emergency procedures.

The review of your sample examination indicates:

1. Questions 5, 10, 33, and 40 have the wrong answers given.
2. In question R52 change 3 ft from same surface to be 1 meter from same surface.
3. Question 25 and R49 are the same.
4. Questions R20, 36 and 37 are redundant.
5. Questions 10, 11, 28, 29, 30, 31 and 32 all deal with radiation exposure variables and are redundant.

6. Questions R8 and R9 deal with biological and effective half-life. Since it is unlikely that radiographers would be involved with internal deposition of radioactive material because sealed sources are used, you should delete these questions. Questions on inverse square law, time, distance and shielding, survey meter readings, what to do in accident situations, other questions on practical operations would be better questions than R8 and R9.

7. Of the 54 questions submitted it appears that only 11 are of a practical nature.

Please revise your examination and present questions that eliminate wrong answers redundant questions, and have a more practical application.

We suggest you may want to consult NUREG/BR-0024, "Working Safely in Gamma Radiography," which is available through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for examples of practical test questions which are found at the end of each of the eleven chapters in the document.

C. Please submit the 20 check points covered in your practical examination.

5. Regarding your internal inspection and management controls;

A. Section 3.2.2 (A) 3. indicates the General Manager will perform audits once every six months. These audits will evaluate the performance of the R.S.O.

Please clarify, if your R.S.O. also performs radiography, if so, then he must be audited performing radiographic operations as required by 10 CFR 34.11 (d).

B. There may be situations where a particular radiographer or assistant radiographer will not participate in radiographic operations for a period exceeding 3 months. Please indicate when such an individual would be inspected.

C. Concerning your Management Audit of Radiographic Operations (Form 208)

Your audit form has no line items to identify the following:

- a. Radioisotope
- b. Activity
- c. Serial number of source
- d. Serial number of projector
- e. Model number of projector
- f. Survey meter model number
- g. Survey meter serial number
- h. Calibration due date

The above information should be included in your audit form. Please amend your form to allow for identification of the above items.

Additionally on Form 208, Item K of the checklist should include a check to see if survey meter was operating properly.

6. Regarding your leak test procedures;

- A. Section 2.6.4 (F) contains wording which appears to be in error.
".....move the swab in its plastic envelope toward the swab (not the swab to the meter), does not make sense. Should this be
".....move the swab in its plastic envelope toward the probe of the survey meter?"

We will continue our review upon receipt of this information. Please reply in duplicate to my attention at the Region I office and refer to Mail Control No. 16383.

Sincerely,

Original Signed By
Jenny M. Johansen

Jenny M. Johansen, M.S.
Nuclear Materials Section B
Division of Engineering and
Technical Programs

Enclosures: Attachments A, B, and C

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Lehigh Testing
Laboratories, Inc.

ATTACHMENT A

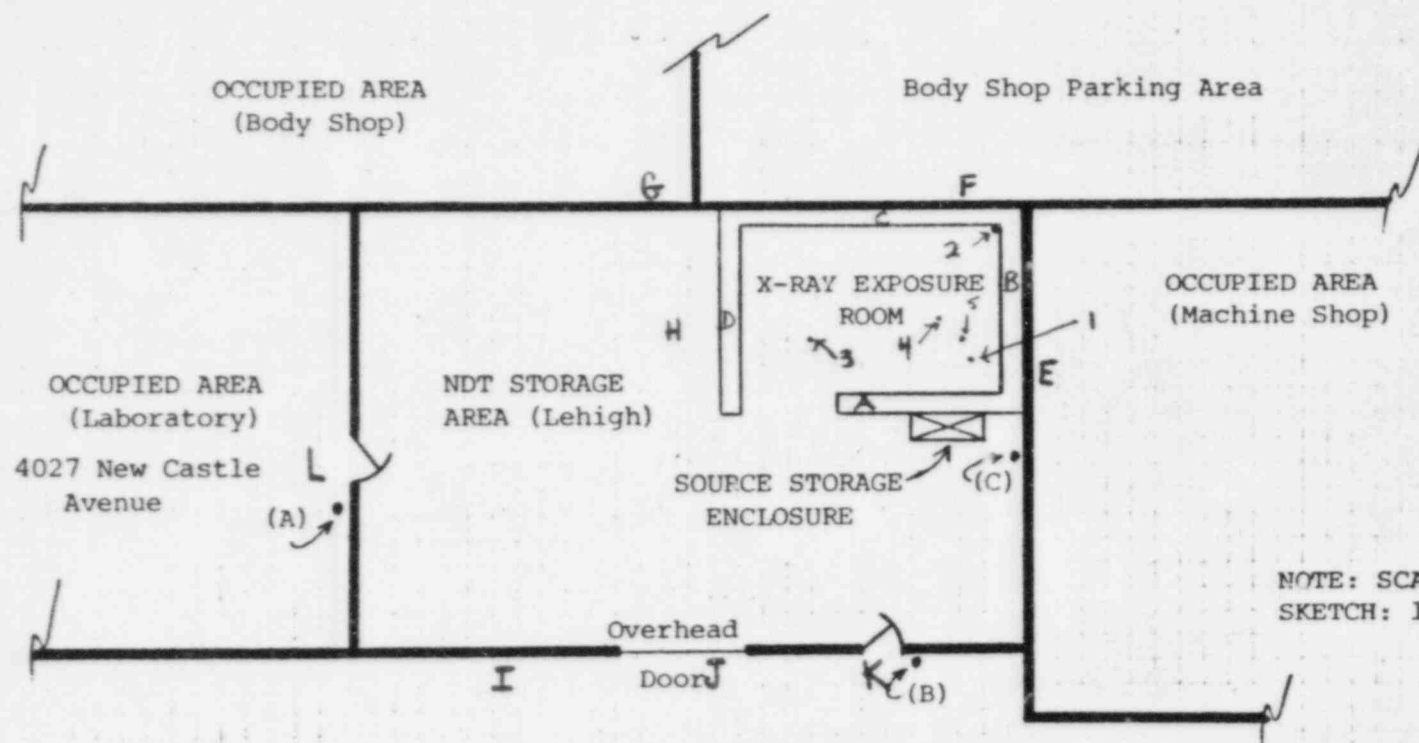
RADIATION SAFETY MANUAL

SECTION: 1.7

PAGE: 2 OF 2

REVISION: 1

DATE: November 30, 1983



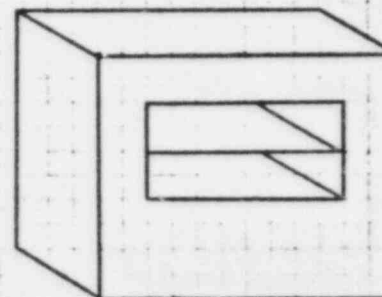
M = 8 ft above source (top of wall)
N = 30 ft above source (roof height at inst)

LEHIGH TESTING LABS - MAIN BLDG.
4029 New Castle Avenue

Outside Dimensions: 6'W x 5'H x 2'D
Inside Dimensions: 4'W x 2'H x 2'D

(shown without
hinged front
doors)

SKETCH OF SOURCE
STORAGE ENCLOSURE
Scale: 1 block=6"

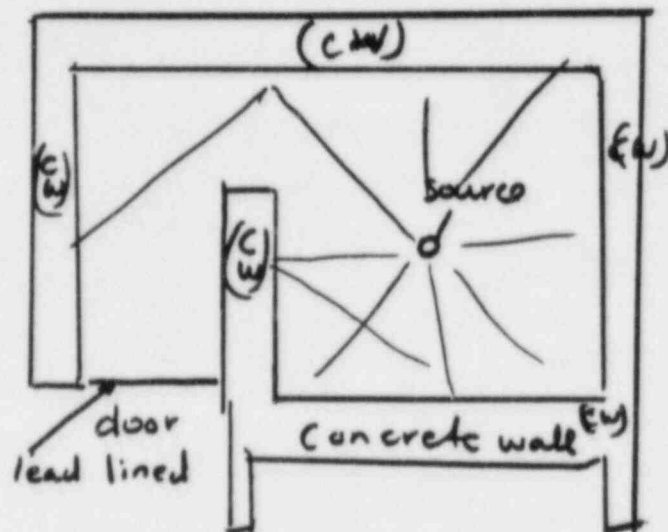


ATTACHMENT B

Calculation of Exposure Rates (mR/hr) from points 1,2,3,4,5 as a location of the source using parameters stated in question 1.b.

	1	2	3	4	5
E	104	0	2.8	14.6	37.4
F	4.8	936	2.9	11.6	5.6
G	1.0	0	2.34	1.4	1.0
H	2.4	1.2	7.7	1.9	1.6
I	0.4	192	450	246	0.4
J	0.9	0.5	663	0.7	0.9
K	1.4	0.7	663	1.0	1.4
L	0.3	0.3	0.6	0.4	0.4
M	8,125	8,125	8,125	8,125	8,125
N	578	578	578	578	578

ATTACHMENT C



No scale