

MATERIALS LICENSE

Amendment No. 02

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 39, 40 and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee

1. TGM Detectors, Inc.

2. 160 Bear Hill Road
Waltham, Massachusetts 02154In accordance with application dated
April 5, 1991,3. License number 20-14079-02 is amended in
its entirety to read as follows:

4. Expiration date November 30, 1997

5. Docket or
Reference No 030-291526. Byproduct, source, and/or
special nuclear material7. Chemical and/or physical
form8. Maximum amount that licensee
may possess at any one time
under this license

A. Krypton-85

A. Sealed source
(General Nucleonics,
Inc. Model No. 0000750)A. Not to exceed 250 mCi per
source and 500 mCi total

B. Californium-252

B. Sealed source
(Isotope Products Model
No. N252)B. Not to exceed 50 uCi per
source and 150 uCi total

C. Americium-241

C. Sealed source
(Amersham Model No. AMC
63)C. Not to exceed 1.0 uCi per
source and 1.0 uCi total

9. Authorized use

A. For use as a constancy check source for the testing of radiation detectors.

B. and C. For use in testing of radiation detectors.

CONDITIONS

10. Licensed material may be used only at the licensee's facilities at 160 Bear Hill Road, Waltham, Massachusetts.

11. A. Licensed material shall be used by, or under the supervision of, Christian Doyle, Gerald O'Shea and Gareth Jones.

B. The Radiation Safety Officer for this license is Kyriakos M. Tsorbatzoglou.

12. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders or detector cells by the licensee.

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MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

20-14079-02

Docket or Reference number

030-29152

Amendment No. 02

(Continued)

CONDITIONS

13. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as are specified by the certificate of registration referred to in 10 CFR 32.210, not to exceed 3 years.
- B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.
- C. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.
- D. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.
- E. Sealed sources and detector cells need not be leak tested if:
- (i) they contain only hydrogen 3; or
 - (ii) they contain only a gas; or
 - (iii) the half-life of the isotope is 30 days or less; or
 - (iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or
 - (v) they are not designed to emit alpha particles, are in storage, and are not being used. However, when they are removed from storage for use or transfer to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.
- F. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission and the source shall be removed from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within 5 days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406. The report shall specify the source involved, the test results, and corrective action taken.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

20-14077-02

Docket or Reference number

030-29152

Amendment No. 02

(13. Continued)

CONDITIONS

- G. The licensee is authorized to collect leak test samples for analysis by the licensee. Alternatively, tests for leakage and/or contamination may be performed by persons specifically licensed by the Commission or an Agreement State to perform such services.
14. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 5 years from the date of each inventory.
15. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Application dated April 2, 1986
 - B. Letter dated February 12, 1990
 - C. Letter dated March 12, 1990
 - D. Application dated April 5, 1991
 - E. Letter dated January 23, 1992
 - F. Letter dated November 18, 1991
 - G. Letter dated September 25, 1992
 - H. Letter dated October 17, 1992

Date NOV 10 1992

For the U.S. Nuclear Regulatory Commission

Original Signed By:

Elizabeth Ullrich

By

Nuclear Materials Safety Branch
Region I

King of Prussia, Pennsylvania 19406

NOV 10 1992

License No. 20-14079-02
Docket No. 030-29152
Control No. 114561

TGM Detectors, Inc.
ATTN: B. W. Jameson, President
160 Bear Hill Road
Waltham, Massachusetts 02154

Dear Mr. Jameson:

Please find enclosed the renewal of your NRC Material License.

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify the Region I Material Licensing Section, (215) 337-5093, so that we can provide appropriate corrections and answers.

Please be advised that you must conduct your program involving licensed radioactive materials in accordance with the conditions of your NRC license, representations made in your license application, and NRC regulations. In particular, please note the items in the enclosed, "Requirements for Materials Licensees."

Since serious consequences to employees and the public can result from failure to comply with NRC requirements, the NRC expects licensees to pay meticulous attention to detail and to achieve the high standard of compliance which the NRC expects of its licensees.

You will be periodically inspected by NRC. A fee may be charged for inspections in accordance with 10 CFR Part 170. Failure to conduct your program safely and in accordance with NRC regulations, license conditions, and representations made in your license application and supplemental correspondence with NRC will result in prompt and vigorous enforcement action against you. This could include issuance of a notice of violation, or in case of serious violations, an imposition of a civil penalty or an order suspending, modifying or revoking your license as specified in the General Policy and Procedures for NRC Enforcement Actions, 10 CFR Part 2, Appendix C.

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ML 10

TGM Detectors, Inc.

-2-

We wish you success in operating a safe and effective licensed program.

Sincerely,

Original Signed By:
Elizabeth Ullrich

Elizabeth Ullrich
Nuclear Materials Safety Branch
Division of Radiation Safety
and Safeguards

Enclosures:

1. Requirements for Materials Licensees
2. NRC Forms 3 and 313
3. Regulatory Guide 10.10

DRSS:RI
Shaffer/cmm

S.W.B.
10/27/92

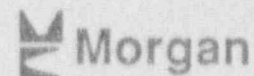
ELU
DRSS:RI
Ullrich

10/27/92



TGM DETECTORS, Inc.

160 BEAR HILL ROAD, WALTHAM, MA 02154
TEL: (617) 890-2090 FAX: (617) 890-4711



MS 16

J-5

October 17, 1992

Steve Shaffer
Licence Reviewer
Nuclear Regulatory Commission
Region 1
475 Allendale Road
Mail Control No. 114561
King of Prussia, PA 19406-1415

Dear Steve:

In response to your telephone call last week regarding TGM Detectors' license renewal application number 20-14079-02 (Control No. 114561), TGM has prepared a response to your following verbal questions:

1. What type of wipe do we use for leak testing our sealed sources?
2. What surfaces will be wiped on the sealed sources.
3. What is the total counting time used in our MDA equation.
4. Provide a diagram of the geometry of the pancake GM tube and the wipe being sampled.
5. Do we calibrate our radiation survey meters in-house?

TGM's response to the above questions are as follows:

Question #1: TGM uses "Whatman" brand filter paper (4.25 cm circles) dampened with tap water for wipe test samples.

Question #2: The entire outside surface of the sealed source is wipe tested.

Question #3: TGM takes 1 minute counts on the wipe samples. If any activity is suspected, a 5 minute or greater count is taken to improve statistics and get a more accurate determination of activity.

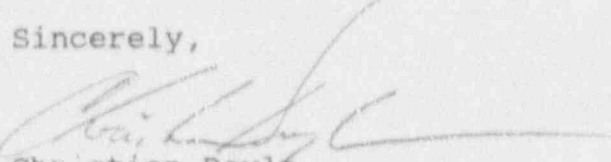
Question #4: The smear is placed on a flat surface and the GM tube is placed directly over it (also resting on the flat surface) such that the Mica window is "looking" at the smear. Distance between the GM tube's concave window and the smear is less than 4 millimeters. Diagram attached.

114561

Question #5: All radiation survey meters are sent back to the manufacturer once per year for calibration. No calibrations are performed in-house.

I hope this finalizes our renewal application. Thank you for your assistance.

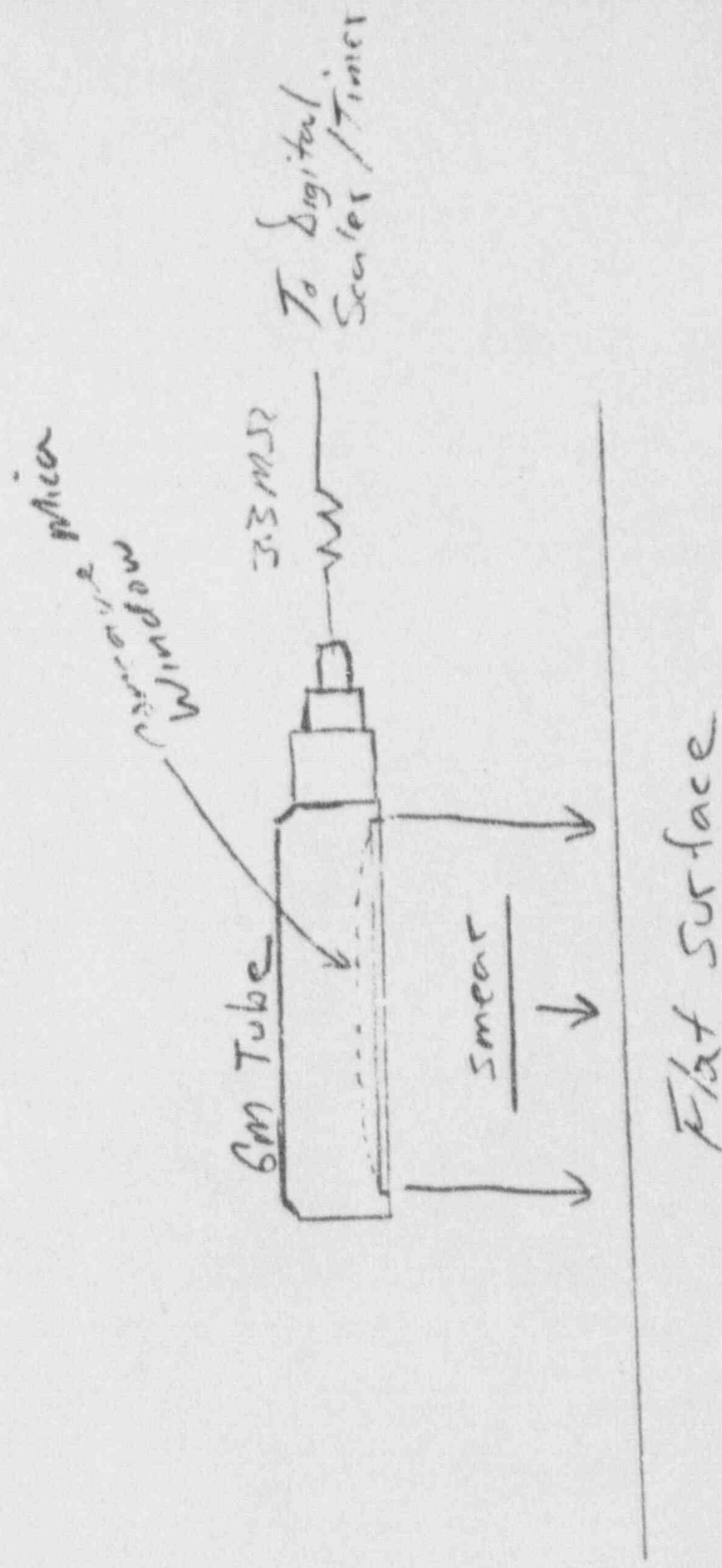
Sincerely,



Christian Doyle
Sales Manager + RSO

cc: Kyriakos Tsoarbatzoglou

Diagram 1 : GM tube and smear geometry.

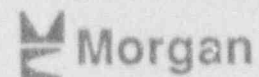


NRC FORM 218 (4-76) NRCM 8240		U.S. NUCLEAR REGULATORY COMMISSION	
TELEPHONE OR VERBAL CONVERSATION RECORD		DATE 10-8-92	
		TIME 9:30	
<input type="checkbox"/> INCOMING CALL		<input checked="" type="checkbox"/> OUTGOING CALL	
<input type="checkbox"/> VISIT			
PERSON CALLING Steve W. Shaffer	OFFICE/ADDRESS Region I	PHONE NUMBER 215- 337-5313	EXTENSION 617-890-2090
PERSON CALLED Christian Doyle	OFFICE/ADDRESS TGM Detectors	PHONE NUMBER 617-890-2090	EXTENSION 617-890-2090
CONVERSATION			
SUBJECT MC # 114561			
SUMMARY <div style="margin-left: 40px;"> <ol style="list-style-type: none"> 1. Please state the type of wipe that you will be using. 2. Please state what surfaces will be wiped. 3. Please submit the count times you will be using for your wipe tests. 4. Please submit your procedure for ensuring the reproducibility of the geometry of your wipe test counts. 5. Please state who will be doing your survey meter calibrations for you. </div>			
REFERRED TO:		<input type="checkbox"/> ADVISE ME OF ACTION TAKEN.	
ACTION REQUESTED			
		INITIALS	
		DATE	
ACTION TAKEN		INITIALS	
		DATE	



TGM DETECTORS, Inc.

160 BEAR HILL ROAD, WALTHAM, MA 02154
TEL: (617) 890-2090 FAX: (617) 890-4711



MS 16

J-5

9/25/92

Steve Shaffer
Licence Reviewer
Nuclear Regulatory Commission
Region 1
475 Allendale Road
Mail Control No. 114561
King of Prussia, PA 19406-1415

Dear Steve:

Please reference the following License No. 20-14079-02
Docket No. 030-29152
Control No. 114561
Letter of 6/18/92 - Betsy Ullrich

Thank you for the extra time needed to respond to Betsy Ullrich's letter of 6/18/92 (attached). As I mentioned to you in our phone conversation, TGM added the J.L. Shepard Irradiator to our License Renewal Application back in May of 1991 because we had plans to purchase one in the future. As it turns out, our engineering people have recently decided not to buy the Shepard unit, but to build their own irradiator for the purpose of testing TGM products.

We thought we could put forth a design as well as an operating and monitoring procedure for NRC License approval, but it is taking much longer than we thought. So as not to delay our License Renewal any further, I have removed the Shepard Irradiator containing the 150 mCi Cs-137 source as well as the 2.5 mCi Americium-241 source from our application (noted in Addendum A). When TGM is ready with its irradiator design, we will apply for a License Amendment for whatever new sources we will need to obtain. No new sources have been or will be purchased that are not covered by our current NRC License. We would however like to purchase some smaller Americium-241 sources and I have listed them in Addendum B to our Licence Renewal Application.

I also mentioned in our phone conversation that we have a new employee at TGM who is better qualified to be the Radiation Safety Officer. Therefore, in Addendum C of our Licence Renewal Application, I have written my name off as the R.S.O. and replaced myself with Dr. Kyriakos M. Tsorbatzoglou.

I apologize for all the changes, but a lot of time has gone by since we first submitted the application. With the changes I've made in addendums A thru C, paragraph numbers 1,2,3,4,6,7 and 9, in Betsy Ullrich's letter of 6/18/92, no longer need to be addressed. Paragraph 5 and 8 are addressed in Addendums D and E respectively.

114561

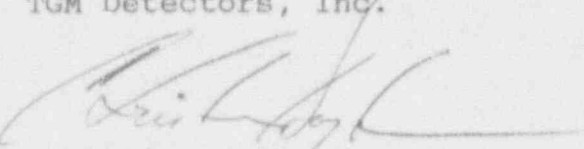
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SEP 30 1992

Thank you for your attention in this matter. I trust we've answered all open items. Please feel free to call me if you have any questions.

Sincerely,

TGM Detectors, Inc.



Christian Doyle

cc: Betsy Ullrich

TGM DETECTORS, INC., NRC LICENSE RENEWAL NUMBER 20-14079

TGM Detectors, Inc. wishes to remove the 150 mCi Cs-137 and the 2.5 mCi Americium-241 from our License Renewal Application submitted 4/5/91. Although TGM had plans to obtain these two sources back in 1991, the situation has changed. The above mentioned radiation sources were never in TGM possession.

Therefore, please delete the following from Form 313:

Delete Item 5, paragraph "C"

"Cesium-137 Sealed source (J.L. Shepherd & Assoc.
Model No. 28-5); Not to exceed 150 mCi
per source and 150 mCi total."

Delete Item 5, paragraph "D"

"Americium-241 Sealed source (Amersham Model No. AMC
63); Not to exceed 2.5 mCi per source
and 2.5 mCi total."

Delete Item 9, paragraph 3

"The proposed Cesium-137 Shepherd irradiator will be used for testing various gamma responding detectors. In that the estimated exposure rate at the port is about 7 R/hr, this source will only be used under the direct supervision of Mr. Doyle or Mr. O'Shea. Permanent whole body and extremity dosimetry will be required when using this source. Additionally, all individuals will be required to use a pocket quartz fiber dosimeter or electronic digital dosimeter such that exposure may be tracked on the continuous basis. This will assure exposures are maintained ALARA. The source will be used in a remote location of the facility, perhaps the Gas Tank Room, with the beam directed away from occupied areas. Surveys will be performed to assure compliance with all NRC regulations."

ADDENDUM A TO NRC FORM 313 (page 2 of 2)

Delete Item 9, paragraph 4

"The proposed Americium-241 sealed source will be used for testing X-Ray proportional counters and other gamma responding detectors. Exposure rates near the source are estimated to be about 100 mR/hr, but shielding is easy and effective. Thus, an irradiator geometry will be set up similar to the above Shepherd system. This source will be used in the Proportional Counter Room. It will only be used by trained individuals, and they will be required to have whole body, extremity dosimeters with an additional quartz fiber or electronic dosimeter. Again, the source beam will be directed away from occupied areas and surveys will be performed to assure compliance with all NRC regulations and exposures are kept ALARA."

TGM DETECTORS, INC., NRC LICENSE RENEWAL NUMBER 20-14079

TGM Detectors, Inc. would like to add another source to Item 5 "Radioactive Material" of Form 313. Please add the following:

"Americium-241	Sealed source for gamma emissions only. Not to exceed 1 microcurie per source and 1 microcurie total."
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Please add to Item 9, the following paragraph.

The proposed 1 microcurie Americium-241 sealed source(s) will be used for testing X-Ray Proportional Counters and other gamma responding detectors. The source(s) will be kept inside a lead pig when not in use and stored in the Proportional Counter Room. Since the alpha component is not of interest, the Am-241 will be sealed as a gamma source. Exposure rates are minimal and training, noted in Item 8, will be used to ensure exposures are kept ALARA.

TGM DETECTORS, INC., NRC LICENSE RENEWAL NUMBER 20-14079

TGM Detectors, has changed personnel in the Radiation Safety Officer position. Please delete Item 7 "Responsible Individuals", paragraph 1, and replace it with the following:

"The Radiation Safety Officer (RSO) for the Waltham facility will be Dr. Kyriakos Tsorbatzoglou. Dr. Tsorbatzoglou's background is as follows:

EDUCATION

- 1979 Graduate of the Institute of Physics, North Staffordshire U.K. Relevant Class Work: Classical Physics, Quantum Mechanics, Nuclear Physics.
- 1980 Master of Science in Applied Nuclear Physics, South Bank Polytechnic, London U.K. Relevant class work: Radiation Physics, Dosimetry, Accelerator Design and Operation.
- 1984 Ph.D Nuclear Physics, City University, London U.K. The topic of research was the mathematical modeling of the interactions of Beta Particle beams with matter and the applications of the models as an analytical instrument.

WORK EXPERIENCE

Worked as Research Fellow and Lecturer of Applied Nuclear Physics at the City University and Brunel University in London U.K.

Directed research projects at Brunel University in the field of Radiation Detection and Measurement

Consultant for 5 years to Centronic, Ltd., Philips Components, Ltd. and Fisher Controls. Consultancy involved the Research and Development of radiation detectors and systems. Designed a 50 Curie test facility at Centronic where the shielding was based upon exposure rates inside and outside the irradiator. Outside wall was a factor of 10 below legal limits.

Worked very closely with Centronic and the National Radiation Protection Board (N.R.P.B.), U.K. for the design and calibration of personal digital dosimeters in order to meet new ICRP recommendations.

ADDENDUM C TO NRC FORM 313 (page 2 of 2)

The first assistant RSO for the facility will be Mr. Gerald O'Shea. Prior to joining TGM in 1988, Mr. O'Shea was employed for over 25 years by Centronic, Ltd., where he directed the use of various radiation sources over the years while testing radiation detectors. The second assistant RSO for the facility will be Mr. Gareth Jones. Mr. Jones is a staff engineer. He has a B.S. in Physics from Manchester University in England. Prior to joining TGM, Mr. Jones was a staff member at Centronic Ltd. for a year. There he studied detector design and manufacture and used various gamma and neutron sources. Mr. Jones has been with TGM since 1988, constructing and testing various detectors with TGM's various licensed and exempt sources."

Please delete Item 10, paragraph "A"

"A. "Christian Doyle has been designated as the Company Radiation Safety Officer. He and Mr. O'Shea and Mr. Jones will assume duties and responsibilities which include the following:"

and replace Item 10, paragraph "A" with the following:

"Dr. Kyriakos Tsorbatzoglou has been designated as the Company Radiation Safety Officer. He and Mr. O'Shea and Mr. Jones will assume duties and responsibilities which include the following:"

TGM DETECTORS, INC., NRC LICENSE RENEWAL NUMBER 20-14079

Question 8 in Betsy Ulrich's letter of 6/18/92 asks for a description of our leak test procedures used on our sealed sources. TGM performs the entire leak-test sequence ourselves. The RSO takes the smears and performs the measurements using a Geiger-Mueller Tube and a digital scaler and timer. The tests are performed once every 6 months.

Smears are tested with a pancake style Geiger-Mueller tube, TGM part number N1002/8767 (data sheet attached). Smears are placed directly under the tube. This particular GM tube is adequate because of the following reasons:

Typical Background is 45 cpm
C-14 Efficiency is 7.3%
Th-230 Efficiency is 17 %

$$MDA (uCi) = \frac{1.645 \left[\frac{R_B}{t_B} \left(1 + \frac{t_B}{t_{S+B}} \right) \right]^{1/2}}{E_D (2.22 \times 10^6 \frac{dpm}{uCi})}$$

Where

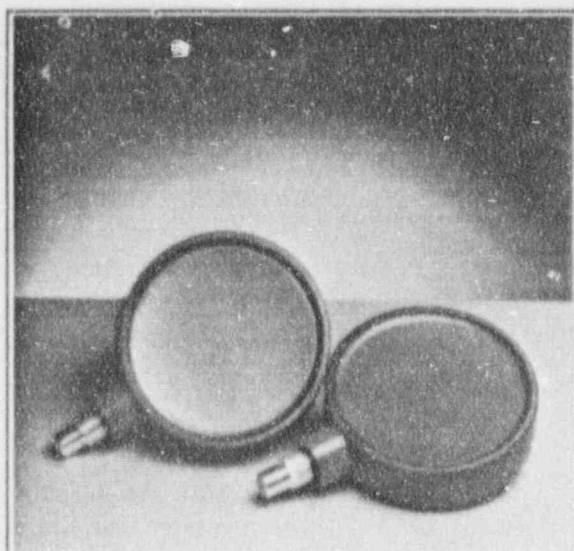
R_B is the background rate

t_B is the background counting time

t_{S+B} is the background + source counting time

E_D is Detector Efficiency

Using the above information, the minimal detectable activity for C-14 low energy beta is less than 0.0003 microcuries.

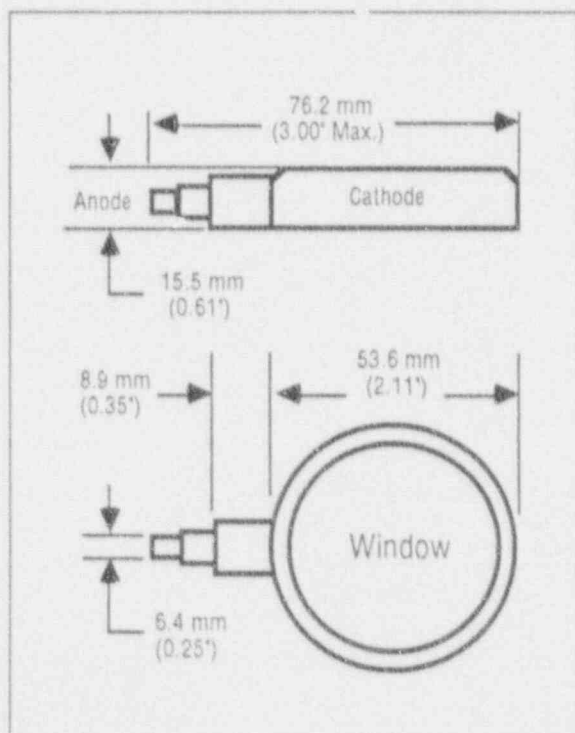


N1002/8767

"Pancake" Geiger-Mueller Tube

Replacement GM Tube for All Types of Pancake Frisking Probes - Refer to TGM's GM Tube "Cross Reference" List. TGM's N1002 is Registered on the U.S. Government's "Qualified Products List" (QPL) as the 8767 and meets all requirements of MIL-E-1/1647A(EC).

Electrophysical Characteristics



*Note: Response to ionizing radiation, whenever listed is nominal and measured in a 1 mR/hr Cs-137 field with the tube's longitudinal axis perpendicular to the source of radiation.

Shielded Background	(V=900) < 25 cpm
Response to Ionizing Radiation *	(V=900) 3500 cpm
Anode Resistor	$R_s \geq 3.3 \text{ M}\Omega$
Plateau Length	850 - 950 V ¹
Plateau Slope (%/100 volts)	< 10%
Maximum Dead Time	(V=900) 100 μsec
Maximum Temperature	55 °C
Maximum Altitude	5000 ft. ²
Window	Mica, 1.8 - 2.0 mg/sq.cm
Window Diameter	44.5 mm (1.75")
Gas Filling	Neon & Halogen
Cathode Wall Material	28% Cr, 72% Fe
Cathode Wall Thickness	4.6 mm (0.18")
Cathode Wall O.D.	53.6 mm (2.11")
Effective Length	10.7 mm (0.42")
Termination	Anode Pin
Options	1. 500 Volt Operation Available as N1002 (500V) 2. 15,000 ft. High Altitude Available as N1002-3

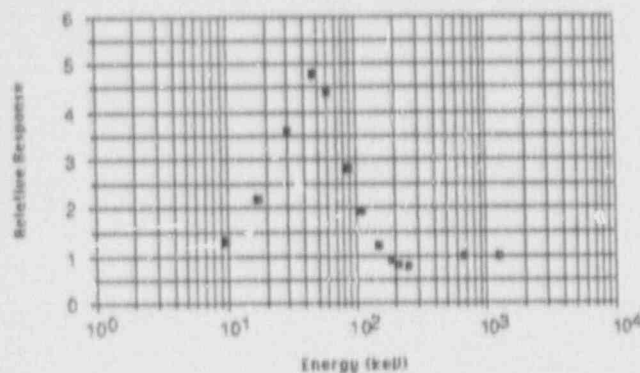
TGM DETECTORS, Inc.
Call now and upgrade your equipment today!

160 Bear Hill Road
Waltham, MA 02154-1075

Tel. 617. 890-2090
Fax. 617. 890-4711

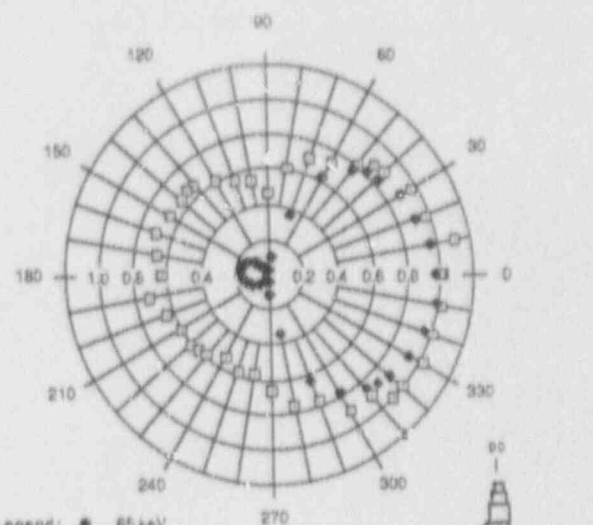
Response Data for the N1002/8767 "Pancake" GM Tube

Tested at N.R.P.B. (UK), June 1987



Legend: ■ Beam perpendicular to detector window (with a 2 mm plastic cap for Cs-137 and Co-60).

Figure: Photon Energy Response of N1002/8767 "pancake" GM, normalized to 662 keV.



Legend: ■ 65 keV
□ 662 keV

Figure: Polar Response of N1002/8767 "pancake" GM, normalized to unity at zero degrees.

N1002/8767 "PANCAKE" GM BETA RESPONSE AT 7 mg/sq.cm DEPTH IN SKIN

NUCLIDE	GEOM.	cps/μGy/hr
Sr-90/Y-90	30 cm	9.2
Tl-204	30 cm	4.5
Pm-147	20 cm	4.1

N1002/8767 "Pancake" GM BETA CONTAMINATION RESPONSE

NUCLIDE	GEOM.	RESPONSE
Sr-90/Y-90	Contact	6.6 cps/Bq/sq.cm
C-14	Contact	3.0 cps/Bq/sq.cm
Sr-90/Y-90	1.0 cm	0.44 cps/Bq

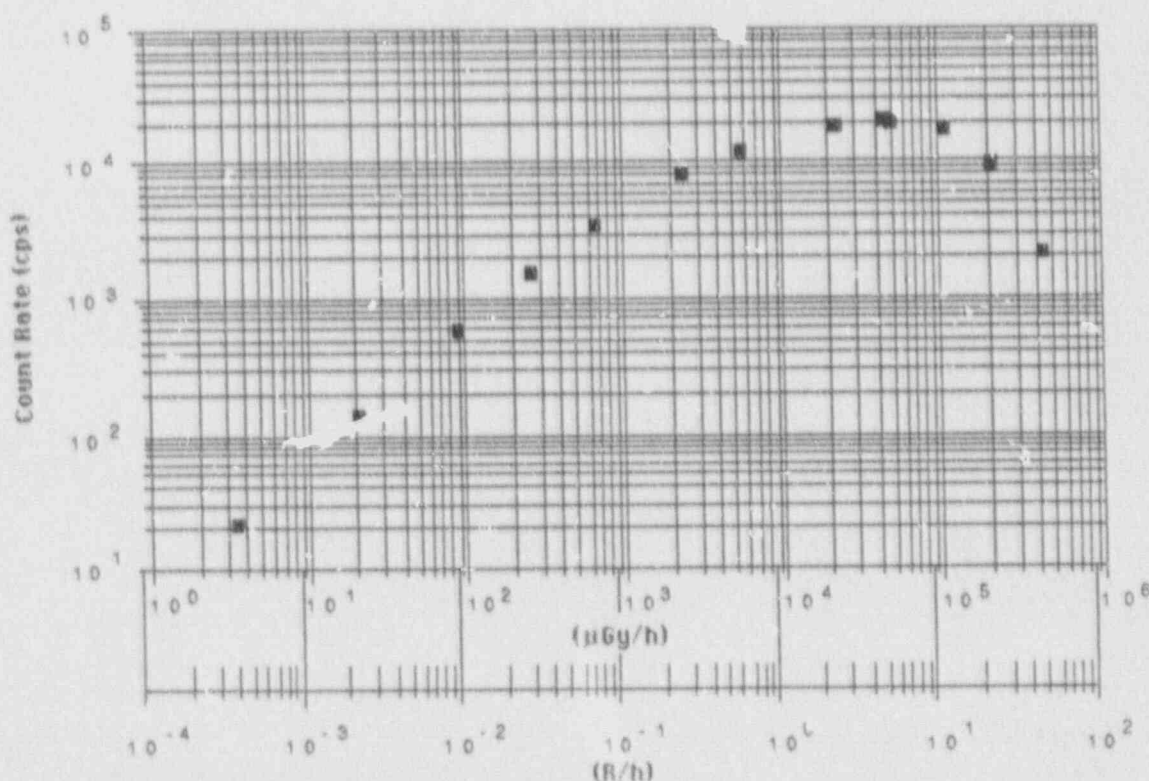


Figure: Dose Rate (air) vs. Count Rate for the N1002/8767 "pancake" GM.

ADDENDUM E TO NRC FORM 313 (page 1 of 1)

TGM DETECTORS, INC., NRC LICENSE RENEWAL NUMBER 20-14079

Paragraph number 5 in Betsy Ullrich's letter of 6/18/92 asks if TGM has a survey meter capable of reading up to 1 R/hr. TGM Detectors has a Dosimeter Corporation Model 3500 Geiger-Mueller end window survey meter capable of measuring up to 3 R/hr. This Survey meter is calibrated once every year.



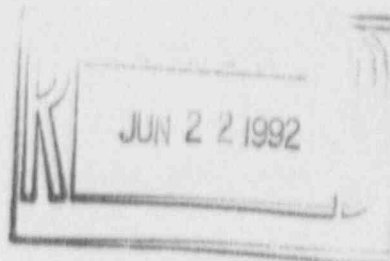
UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

COPY

JUN 18 1992

License No. 20-14079-02
Docket No. 030-29152
Control No. 114561

TGM Detectors, Incorporated
ATTN: B. W. Jameson
President
160 Bear Hill Road
Waltham, Massachusetts 02154



Dear Mr. Jameson:

This is in reference to your application dated April 5, 1991 to renew License No. 20-14079-02. In order to continue our review, we need the following additional information:

1. Please specify the permanent location of the J. L. Shepard irradiator. Please include a diagram of the room and adjacent areas. The diagram may be hand drawn. Please state any other use(s) of the room and the adjacent areas, if any.
2. Please indicate what radiation levels are present in your facility while the irradiator is in use. Radiation levels in unrestricted areas must be such that no individual could receive a dose of 2 mR in any one hour or such that an individual could receive a dose of 100 mR in any seven (7) consecutive days. Please describe the surveys that you will perform so that the aforementioned limits will not be exceeded in unrestricted areas.
3. Please describe all controls that will be implemented to ensure that only authorized personnel will enter restricted areas; only authorized personnel will use the device and the device is secured from unauthorized removal from its place of storage and use.
4. Please submit step by step procedures for use of the Shepard irradiator including emergency procedures.
5. In Item 10 of your application, you did not specify that you have an operable, and calibrated survey meter. Please confirm that you have a meter and it is calibrated as indicated in Regulatory Guide 10.9 (enclosed). Please confirm that you will have available at all times a calibrated, operable survey meter that can measure up to 1R/hr and specify the frequency of calibrations.
6. In Item 10 of your application, you did not specify what personnel monitoring equipment will be used by individuals operating the irradiator. Please confirm that

film badges or TLD will be used, and specify the frequency of exchange and supplier of this equipment.

7. Please provide procedures for the calibration of your pocket dosimeters, including:

- a. the training of the individual who will do the calibrating of the pocket dosimeters.
- b. the radioactive source that will be used.
- c. where the calibration will take place.
- d. calculations to determine time of exposure.
- e. step by step procedures to perform the calibration.

8. Please describe your leak test procedures. The options for leak-testing are:

- a. Engage the services of a consultant or commercial facility to take samples, evaluate the samples, and report the results to you.
- b. Use a commercial leak-test kit. You take the smears and send them to the kit supplier, who reports the results to you.
- c. Perform the entire leak-test sequence yourself, including taking the smears and their measurement.

For Option 1, specify the name, address, and license number of the consultant or commercial organization.

For Option 2, specify the kit model and the name, address, and license number of the kit supplier. You should state that the test samples will be taken by the individual specified in Item 7 of your application, who is responsible for the program.

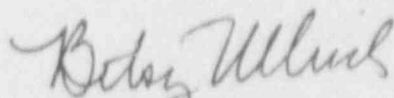
→ For Option 3, specify how the test sample will be taken and the instrumentation that will be used for measurement. An instrument capable of making quantitative measurements should be used; hand-held survey meters will not normally be considered adequate for measurements. Include a sample calculation for conversion of the measurement data to microcuries and show how that this system is capable of detecting at least 0.005 microcuries. You should also specify the individual who will make the measurement and his or her qualifications. The individual should have prior experience in making quantitative measurements, and this experience should be documented in your application.

9. The individual who will operate the irradiator under the supervision of a responsible individual need not be designated by name. However, the following information should be provided:

- a. An outline of the training program, including the topics which will be covered and the time which will be spent on each topic. The topics which should be covered are (1) the principles and fundamentals of radiation safety, (2) the use of radiation detection instruments, (3) your operating and emergency procedures, and (4) the design and operation of the irradiator.
- b. The training program should include an examination to test the understanding and knowledge of the individuals who have completed the training program. This examination should include questions that cover all aspects of the training program. Please submit a copy of the examination, the correct answers, the passing grade and a discussion of additional instructions for individuals who are found to be deficient.
- c. Provide a description of the on-the-job training which will be given to each user.
- d. Submit the names of training program instructors. If the instructors are not one of the responsible individuals whose names were submitted above, please submit the training of each individual.
- e. Please confirm that all records documenting the training of each user will be maintained for a period of three (3) years.

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. 114561. The reviewer for this licensing action is Steve Shaffer. If you have any technical questions regarding this deficiency letter, please call the reviewer at (215) 337-5313. If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,



Betsy Ullrich
Nuclear Materials Safety Branch
Division of Radiation Safety
and Safeguards

Enclosures:

1. 10 CFR Parts 2, 19, and 20
2. Regulatory Guide 403-4
3. Regulatory Guide 10.9

JUN 18 1992

License No. 20-14079-02
Docket No. 030-29152
Control No. 114561

TGM Detectors, Incorporated
ATTN: B. W. Jameson
President
160 Bear Hill Road
Waltham, Massachusetts 02154

Dear Mr. Jameson:

This is in reference to your application dated April 5, 1991 to renew License No. 20-14079-02. In order to continue our review, we need the following additional information:

1. Please specify the permanent location of the J. L. Shepard irradiator. Please include a diagram of the room and adjacent areas. The diagram may be hand drawn. Please state any other use(s) of the room and the adjacent areas, if any.
2. Please indicate what radiation levels are present in your facility while the irradiator is in use. Radiation levels in unrestricted areas must be such that no individual could receive a dose of 2 mR in any one hour or such that an individual could receive a dose of 100 mR in any seven (7) consecutive days. Please describe the surveys that you will perform so that the aforementioned limits will not be exceeded in unrestricted areas.
3. Please describe all controls that will be implemented to ensure that only authorized personnel will enter restricted areas; only authorized personnel will use the device and the device is secured from unauthorized removal from its place of storage and use.
4. Please submit step by step procedures for use of the Shepard irradiator including emergency procedures.
5. In Item 10 of your application, you did not specify that you have an operable, and calibrated survey meter. Please confirm that you have a meter and it is calibrated as indicated in Regulatory Guide 10.9 (enclosed). Please confirm that you will have available at all times a calibrated, operable survey meter that can measure up to 1R/hr and specify the frequency of calibrations.

6. In Item 10 of your application, you did not specify what personnel monitoring equipment will be used by individuals operating the irradiator. Please confirm that film badges or TLD will be used, and specify the frequency of exchange and supplier of this equipment.
7. Please provide procedures for the calibration of your pocket dosimeters, including:
 - a. the training of the individual who will do the calibrating of the pocket dosimeters.
 - b. the radioactive source that will be used.
 - c. where the calibration will take place.
 - d. calculations to determine time of exposure.
 - e. step by step procedures to perform the calibration.
8. Please describe your leak test procedures. The options for leak-testing are:
 - a. Engage the services of a consultant or commercial facility to take samples, evaluate the samples, and report the results to you.
 - b. Use a commercial leak-test kit. You take the smears and send them to the kit supplier, who reports the results to you.
 - c. Perform the entire leak-test sequence yourself, including taking the smears and their measurement.

For Option 1, specify the name, address, and license number of the consultant or commercial organization.

For Option 2, specify the kit model and the name, address, and license number of the kit supplier. You should state that the test samples will be taken by the individual specified in Item 7 of your application, who is responsible for the program.

For Option 3, specify how the test sample will be taken and the instrumentation that will be used for measurement. An instrument capable of making quantitative measurements should be used; hand-held survey meters will not normally be considered adequate for measurements. Include a sample calculation for conversion of the measurement data to microcuries and show how that this system is capable of detecting at least 0.005 microcuries. You should also specify the individual who will make the measurement and his or her qualifications. The individual should have prior experience in making quantitative measurements, and this experience should be documented in your application.

9. The individual who will operate the irradiator under the supervision of a responsible individual need not be designated by name. However, the following information should be provided:
 - a. An outline of the training program, including the topics which will be covered and the time which will be spent on each topic. The topics which should be covered are (1) the principles and fundamentals of radiation safety, (2) the use of radiation detection instruments, (3) your operating and emergency procedures, and (4) the design and operation of the irradiator.
 - b. The training program should include an examination to test the understanding and knowledge of the individuals who have completed the training program. This examination should include questions that cover all aspects of the training program. Please submit a copy of the examination, the correct answers, the passing grade and a discussion of additional instructions for individuals who are found to be deficient.
 - c. Provide a description of the on-the-job training which will be given to each user.
 - d. Submit the names of training program instructors. If the instructors are not one of the responsible individuals whose names were submitted above, please submit the training of each individual.
 - e. Please confirm that all records documenting the training of each user will be maintained for a period of three (3) years.

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. 114561. The reviewer for this licensing action is Steve Shaffer. If you have any technical questions regarding this deficiency letter, please call the reviewer at (215) 337-5313. If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,

Original Signed By:
Elizabeth Ullrich

Betsy Ullrich
Nuclear Materials Safety Branch
Division of Radiation Safety
and Safeguards

Enclosures:

1. 10 CFR Parts 2, 19, and 20
2. Regulatory Guide 403-4
3. Regulatory Guide 10.9

DRSS:RI
Sharfer/men

06/ /92

DRSS/RI
Ullrich

06/17/92



TGM DETECTORS, Inc.

160 BEAR HILL ROAD, WALTHAM, MA 02154
TEL: (617) 890-2090 FAX: (617) 890-4711



14516

J5

1/23/92

030-29152

Mr. John D. Kinneman
U.S. Nuclear Regulatory Comm.
Region 1 office
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Mr. Kinneman,

In reference to our license application No. 20-14079-02 and in response to your letter dated 12/30/91 requesting information pertaining to the formal training of Mr. Gareth Jones and Mr. Gerry O'Shea, the information you requested follows:

Gareth Jones

Mr. Gareth Jones has been a Physicist at TGM since April 1988. Mr. Jones is responsible for design of TGM's Neutron and X-ray Proportional Counters. His work involves the use of TGM's 5 & 50 μ Ci Cf-252 sources in a source range, and the use of TGM's 100 μ Ci Fe-55 X-ray source. Prior to his employment at TGM, he was employed as an Engineer at Centronic Nuclear, Ltd. for one year. During his time at Centronic, he worked with a 10 Ci Co-60 source range and a 1 Ci Am/Be neutron source.

Gareth Jones graduated with a BSc. with honors from the Victoria University of Manchester, Manchester U.K., in Physics. He took advanced courses in Nuclear Physics as well as general courses in statistics and math. Other courses included material on Radiation Theory, Detection Theory, Dose Rates, Biological Effects of Radiation as well as detailed statistical analysis of counting systems and radioactive decay.

Gerry O'Shea

Mr. Gerry O'Shea has been actively involved in radiation detector design, development and manufacture at Centronic Nuclear, Ltd. and TGM Detectors, Inc. since 1955. He has been employed the last 4 years at TGM. During his 30 plus years of experience, he has worked with the following devices and radiation sources:

1. At Centronic Nuclear, Gerry O'Shea worked in a "Hot Lab" environment manufacturing Fission Chambers coated with U-235, U-238 and Pu-239. He used safety monitoring equipment inside the Hot Lab for bench monitoring and for body frisking before exiting from the lab area.

OFFICIAL RECORD COPY

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1/27/92

2. Also at Centronic, Gerry has used sealed Am-241 and Cf-252 for testing surface barrier solid state silicon alpha detectors.
3. Gerry O'Shea has worked with a 10 Ci sealed Co-60 source for calibration of Centronic Ion Chambers.
4. During his time at Centronic, Gerry O'Shea had the leading role in designing and constructing an automated test facility utilizing a sealed 10 Ci Cs-137 source. This test facility required extensive shielding to meet government regulation and meet with the U.K.A.E.A. recommendations.
5. While at Centronic, Mr. O'Shea designed and built a soft X-ray generator for testing X-ray detectors in conjunction with the European Space Agency.
6. Mr. O'Shea currently works with all of the sealed sources listed on TGM's Source Inventory Sheet (attached).

I trust the above information answers all of your questions. If you have any further questions, please feel free to call me.

Sincerely,

TGM Detectors, Inc.



Christian Doyle
Sales Manager & RSO



TGM DETECTORS, Inc.

160 BEAR HILL ROAD, WALTHAM, MASS. 02154-1075 U.S.A.
TEL (617) 890-2090 TWX 5101002056 FAX (617) 890-4711

To: The Record
Date: 24 January 1992
Subject: Source Inventory

Below is an inventory of sealed sources used throughout TGM Detectors for testing GM tubes.

<u>TGM Source</u> <u>No.</u>	<u>Isotope</u>	<u>Activity</u>	<u>Comments</u>
1	Ra-226	15 μ Ci	Test Dept., Lucite Rod
2	Ra-226	7 μ Ci	Test Dept., Lucite Rod
3	Cs-137	9.4 μ Ci	Test Dept., Lucite Rod
4	C-14	100 μ Ci	Locker, Point Source
5	Sr-90	0.045 μ Ci	Locker, DESC Planchet
6	Sr-90	0.045 μ Ci	Locker, 3 discs in jig
7	Kr-85	35 mCi	Locker, blue gauge
8	Cs-137	10 μ Ci	Pump Dept., yellow rod
9	Ra-226	15 μ Ci	Pump Dept., Lucite Rod
10	Sr-90	0.11 μ Ci	Test Dept., planchet/mylar
11	C-14	0.161 μ Ci	Test Dept., planchet/mylar
12	Bi-210	0.015 μ Ci	Locker, planchet/mylar
13	Fe-55	1.2 μ Ci	Locker, planchet
14	Cs-137	9.9 μ Ci	Locker, Al rod
15	Cs-137	10 μ Ci	Locker, Al rod
16	Cs-137	9.7 μ Ci	Locker, in Pb pig
17	Cs-137	9.5 μ Ci	Locker, in Pb pig
18	Cs-137	5 μ Ci	Test Oven, S/N 0005 AC
19	Cs-137	5 μ Ci	Test Oven, S/N 0006 AC
20	Tc-99	450 nCi	Test Dept., DESC planchet
21	U-238	0.02 μ Ci	Test Dept., Pb brick
22	U-238	0.03 μ Ci	Test Dept., Pb brick
23	Cs-137	10 μ Ci	Locker, in Pb pig
24	Cf-252	5 μ Ci	He-3 PC Clean Room
25	Cf-252	50 μ Ci	He-3 PC Clean Room
26	Co-60	1 μ Ci	Locker, in Pb pig



TGM DETECTORS, Inc.

160 BEAR HILL ROAD, WALTHAM, MA 02154
TEL: (617) 890-2090 FAX: (617) 890-4711



J: The Record

Page 2

Date: 24 January 1992

Subject: Source Inventory

TGM Source

<u>No.</u>	<u>Isotope</u>	<u>Activity</u>	<u>Comments</u>
27	C-14	0.172 μ Ci	Test Dept. Planchet
28	Tc-99	0.043 μ Ci	Test Dept. Planchet
29	Tc-99	0.040 μ Ci	Test Dept. In Autotester
30	Tc-99	0.040 μ Ci	Test Dept. In Autotester
31	Tc-99	0.040 μ Ci	Test Dept. In Autotester
32	Pm-147	0.098 μ Ci	Test Dept. Planchet
33	Sr-90	0.019 μ Ci	Test Dept. Planchet
34	Tc-99	0.038 μ Ci	Test Dept. Planchet
35	Bi-210	0.027 μ Ci	Test Dept. Planchet
36	Cl-36	0.0179 μ Ci	Test Dept. Planchet
37	Cs-137	6.8 μ Ci	Locker, in storage
38	Am-241	0.01 μ Ci	Locker, In storage
39	Fe-55	100 μ Ci	He-3 PC Clean Room



TGM DETECTORS, Inc.

160 BEAR HILL ROAD, WALTHAM, MA 02154
TEL: (617) 890-2090 FAX: (617) 890-4711



11/18/91

MS #16
J5
030-29152

Mr. John D. Kinnernan, Chief
Nuclear Materials Safety Section B
Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Mr. Kinnernan,

In reference to our "Application for Material License" to renew our License No. 20-14079-02 and in response to your letter of 10/18/91, below is a summary of my background and experience:

- a. Principles and practices of radiation protection - BA Physics, State University New York at Plattsburgh. "Radiation Safety & Control I" (one semester), University of Lowell, Lowell Mass., Dr. Clayton French.
- b. Radioactivity measurements standardization and monitoring techniques and instruments - 5 year experience at TGM Detectors, Waltham, Mass. (manufacturer of gas filled radiation detectors) as David Allard's assistant.
- c. Mathematics and calculations basic to the use of measurement of radioactivity - "Radiation Statistics" (1 semester), University of Lowell, Lowell Mass., Dr. Ken Scrable.
- d. Biological effects of radiation - "Radiation Safety & Control I" (one semester), University of Lowell, Lowell Mass., Dr. Clayton French.

My background in handling radioactive materials comes from work experience at TGM Detectors where we use only sealed sources to test our various Gas Filled Radiation Detectors. Currently, most all sources are exempt gamma and beta quantities with the exception of 35 mCi Krypton-85 and 55µCi Cf-252. As the ones responsible for radiation safety, myself, Gerry O'Shea, and Gareth Jones supervise the use of all radioactive sources. TGM individuals working with the sealed sources are trained in handling procedures and radiation safety by myself.

I hope this information clarifies our License renewal request. If you have any further questions, please feel free to ask.

Sincerely,

TGM Detectors, Inc.

Christian Doyle
Sales Manager & RSO

"SECTION COPY"

114561

11/25/91



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1412

OCT 18 1991

License No. 20-14079-02
Docket No. 030-29152
Control No. 114561

OCT 2 1991
COPY

TGM Detectors, Incorporated
ATTN: B. W. Jameson
President
160 Bear Hill Road
Waltham, Massachusetts 02154

Dear Mr. Jameson:

This is in reference to your request in a letter dated April 5, 1991 to renew License No. 20-14079-02. In order to continue our review, we need the following additional information:

1. In your application, you identify Christian Doyle as your Radiation Safety Officer. Please describe this individual's formal training in the following areas:
 - a. principles and practices of radiation protection.
 - b. radioactivity measurements standardization and monitoring techniques and instruments.
 - c. mathematics and calculations basic to the use and measurement of radioactivity.
 - d. biological effects of radiation.

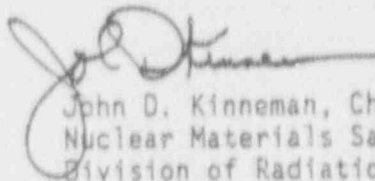
In addition, describe the specific isotopes the individual has handled, the maximum quantities of materials handled, where the experience was gained, the duration of the experience and the type of use.

2. Please provide a brief resume of the training and experience of each person who will directly supervise the use of material, who will use material without supervision, or who will have responsibility for radiological safety. The resume should include the type (on-the-job or formal course work), location, and duration of the training. Training should cover (a) principles and practices of radiation protection, (b) radioactivity measurements, standardization, and monitoring techniques and instruments, (c) mathematics and calculations basic to the use and measurement of radioactivity, and (d) biological effects of radiation. The description of the use of radioactive materials should include the specific isotopes handled, the maximum quantities of materials handled, where the experience was gained, the duration of experience, and the type of use.

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. 114561.

In order to continue prompt review of your application, we request that you submit your response to this letter within 30 calendar days from the date of this letter.

Sincerely,



John D. Kinneman, Chief
Nuclear Materials Safety Section B
Division of Radiation Safety
and Safeguards

DEC 3 0 1991

License No. 20-14079-02
Docket No. 30-29152
Control No. 114561

TGM Detectors, Inc.
ATTN: B. W. Jameson, President
160 Bear Hill Road
Waltham, Massachusetts 02154

Dear Mr. Jameson:

This is in reference to your application dated April 5, 1991 to renew License No. 20-14079-02. In order to continue our review, we need the following additional information:

In your application, you identify Gerry O'Shea and Gareth Jones as authorized users. Please describe their formal training in the following areas:

- a. principles and practices of radiation protection
- b. radioactivity measurements standardization and monitoring techniques and instruments
- c. mathematics and calculations basic to the use and measurement of radioactivity
- d. biological effects of radiation

In addition, describe the specific isotopes these individuals have handled, the maximum quantities of materials handled where the experience was gained, the duration of the experience, and the type of use.

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. 114561. The reviewer for this licensing action is Mr. Steve Shaffer. If you have questions regarding this action please call the reviewer at (215) 337-5313.

Sincerely,

Original Signed By:

John D. Kinneman
John D. Kinneman, Chief
Research, Development &
Decommissioning Section
Division of Radiation Safety
and Safeguards

RI:DRSS
Shaffer/gc

12/9/91

RI:DRSS
Kinneman

12/30/91

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ML 523 SHAFFER - 0002.0.0
12/04/91



TGM DETECTORS, Inc.

160 BEAR HILL ROAD, WALTHAM, MA 02154
TEL: (617) 890-2090 FAX: (617) 890-4711



11/18/91

MS #16
J5
030-29152

Mr. John D. Kinneman, Chief
Nuclear Materials Safety Section B
Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Mr. Kinneman,

In reference to our "Application for Material License" to renew our License No. 20-14079-02 and in response to your letter of 10/18/91, below is a summary of my background and experience:

- a. Principles and practices of radiation protection - BA Physics, State University New York at Plattsburgh. "Radiation Safety & Control I" (one semester), University of Lowell, Lowell Mass., Dr. Clayton French.
- b. Radioactivity measurements standardization and monitoring techniques and instruments - 5 year experience at TGM Detectors, Waltham, Mass. (manufacturer of gas filled radiation detectors) as David Allard's assistant.
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My background in handling radioactive materials comes from work experience at TGM Detectors where we use only sealed sources to test our various Gas Filled Radiation Detectors. Currently, most all sources are exempt gamma and beta quantities with the exception of 35 mCi Krypton-85 and 55µCi Cf-252. As the ones responsible for radiation safety, myself, Gerry O'Shea, and Gareth Jones supervise the use of all radioactive sources. TGM individuals working with the sealed sources are trained in handling procedures and radiation safety by myself.

I hope this information clarifies our License renewal request. If you have any further questions, please feel free to ask.

Sincerely,

TGM Detectors, Inc.

Christian Doyle
Sales Manager & RSO

OFFICIAL RECORD COPY ML 10

114561

11/25/91



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

OCT 18 1991

License No. 20-14079-02
Docket No. 030-29152
Control No. 114561

COPY
OCT 21 1991

TGM Detectors, Incorporated
ATTN: B. W. Jameson
President
160 Bear Hill Road
Waltham, Massachusetts 02154

Dear Mr. Jameson:

This is in reference to your request in a letter dated April 5, 1991 to renew License No. 20-14079-02. In order to continue our review, we need the following additional information:

1. In your application, you identify Christian Doyle as your Radiation Safety Officer. Please describe this individual's formal training in the following areas:
 - a. principles and practices of radiation protection.
 - b. radioactivity measurements standardization and monitoring techniques and instruments.
 - c. mathematics and calculations basic to the use and measurement of radioactivity.
 - d. biological effects of radiation.

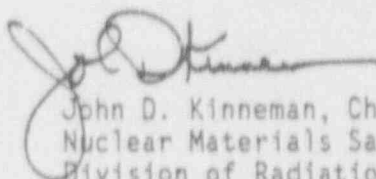
In addition, describe the specific isotopes the individual has handled, the maximum quantities of materials handled, where the experience was gained, the duration of the experience and the type of use.

2. Please provide a brief resume of the training and experience of each person who will directly supervise the use of material, who will use material without supervision, or who will have responsibility for radiological safety. The resume should include the type (on-the-job or formal course work), location, and duration of the training. Training should cover (a) principles and practices of radiation protection, (b) radioactivity measurements, standardization, and monitoring techniques and instruments, (c) mathematics and calculations basic to the use and measurement of radioactivity, and (d) biological effects of radiation. The description of the use of radioactive materials should include the specific isotopes handled, the maximum quantities of materials handled, where the experience was gained, the duration of experience, and the type of use.

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. 114561.

In order to continue prompt review of your application, we request that you submit your response to this letter within 30 calendar days from the date of this letter.

Sincerely,



John D. Kinneman, Chief
Nuclear Materials Safety Section B
Division of Radiation Safety
and Safeguards

OCT 18 1991

License No. 20-14079-02
Docket No. 030-29152
Control No. 114561

TGM Detectors, Incorporated
ATTN: B. W. Jameson
President
160 Bear Hill Road
Waltham, Massachusetts 02154

Dear Mr. Jameson:

This is in reference to your request in a letter dated April 5, 1991 to renew License No. 20-14079-02. In order to continue our review, we need the following additional information:

1. In your application, you identify Christian Doyle as your Radiation Safety Officer. Please describe this individual's formal training in the following areas:
 - a. principles and practices of radiation protection.
 - b. radioactivity measurements standardization and monitoring techniques and instruments.
 - c. mathematics and calculations basic to the use and measurement of radioactivity.
 - d. biological effects of radiation.

In addition, describe the specific isotopes the individual has handled, the maximum quantities of materials handled, where the experience was gained, the duration of the experience and the type of use.

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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. 114561.

In order to continue prompt review of your application, we request that you submit your response to this letter within 30 calendar days from the date of this letter.

Sincerely,

Original Signed By:
John D. Kinneman

John D. Kinneman, Chief
Nuclear Materials Safety Section B
Division of Radiation Safety
and Safeguards

RL DRSS
Shaffer/eb

10/10 /91

RL DRSS
Kinneman

10/11 /91

OFFICIAL RECORD COPY

ML 390 SHAFFER - 0002.0.0
08/26/91



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
476 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406

MAY 28 1991

Docket No. 030-29152

License No. 20-14079-02

Control No. 114561

TGM Detectors, Incorporated
ATTN: B. W. Jameson, President
160 Bear Hill Road
Waltham, Massachusetts 02154

Gentlemen:

SUBJECT: LICENSE RENEWAL APPLICATION

This is to acknowledge receipt of your application for renewal of material(s) license identified above. Your application is deemed timely filed, and accordingly, the license will not expire until final action has been taken by this office.

Any correspondence regarding the renewal application should reference the control number specified above.

Sincerely,

Original Signed By:
Cheryl K. Buraker

Sheryl Villar, Chief
Licensing Assistant Section
Division of Radiation Safety and
Safeguards

pit
5/27/91

CRS
5/28/91

OFFICIAL RECORD COPY ML 10

APPLICATION FOR MATERIAL LICENSE

03D 29152
U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB
3150-0120
Expires: 6-30-90

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF INDUSTRIAL AND MATERIAL NUCLEAR SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS, IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND,
MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA,
RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIALS SAFETY SECTION B
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA,
PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR
WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
NUCLEAR MATERIALS SAFETY SECTION
101 MARIETTA STREET, SUITE 2000
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR
WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLEN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA,
NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH,
OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON,
AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS
TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
NUCLEAR MATERIALS SAFETY SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

1. THIS IS AN APPLICATION FOR (Check appropriate item):

- ☐ A. NEW LICENSE
☐ B. AMENDMENT TO LICENSE NUMBER _____
☒ C. RENEWAL OF LICENSE NUMBER 20-14079-02

2. NAME AND MAILING ADDRESS OF APPLICANT (Include Zip Code)

TGM Detectors, Inc.
160 Bear Hill Road
Waltham, MA 02154

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED:

(Same)

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Mr. B W Jameson

TELEPHONE NUMBER

617/890-2090

SUBMIT ITEMS 5 THROUGH 11 ON 8 1/2 x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL:

a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED:

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE:

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS:

9. FACILITIES AND EQUIPMENT:

10. RADIATION SAFETY PROGRAM:

11. WASTE MANAGEMENT:

12. LICENSEE FEES (See 10 CFR 170 and Section 170.31)

FEE CATEGORY 3E AMOUNT ENCLOSED \$ 380.00

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE—CERTIFYING OFFICER

TYPED/PRINTED NAME

TITLE

DATE

B.W. Jameson

President

04/05/91

FOR NRC USE ONLY

TYPE OF FEE FEE LOG FEE CATEGORY COMMENTS

REN May 14 3P

AMOUNT RECEIVED \$380.00/20 CHECK NUMBER 6401/6425

APPROVED BY

DATE

AK

4/13/91

5. Radioactive Material

- | | |
|--------------------|---|
| A. Krypton-85 | Sealed source (General Nucleonics, Inc. Model No. 0000750); Not to exceed 250 mCi per source and 500 mCi total. |
| B. Californium-252 | Sealed source (Isotope Products Model No. N252) Not to exceed 50 uCi per source and 150 uCi total. |
| C. Cesium-137 | Sealed source (J.L. Shepherd & Assoc. Model No. 28-5); Not to exceed 150 mCi per source and 150 mCi total. |
| D. Americium-241 | Sealed source (Amersham Model No. AMC 63); Not to exceed 2.5 mCi per source and 2.5 mCi total. |

Note: Source A & B are now on license, but C & D are being included at this time for possible future use.

6.) Purpose

Above sources will be used for testing various gas-filled radiation detectors built and sold by TGM Detectors, Inc. These devices include Geiger-Mueller tubes and probes; Helium-3, Borontrifluoride and X-Ray proportional counters; Neutron REM counters; Fission and Gamma Ion Chambers. The testing to be performed may include detector sensitivity, resolution and electrical characteristics (such as pulse height, gain, relative energy response, plateau, dead time, etc.).

7.) Responsible Individuals

The radiation safety officer (RSO) for the facility will be Mr. Christian Doyle. Mr. Doyle has a B.S. in Physics from SUNY Plattsburg and has taken several graduate radiation protection courses at the University of Lowell. He has been employed by TGM since July 1986 as the assistant RSO, to David J. Allard. Mr. Allard is will leave TGM as of 04/08/91. Mr. Doyle has used and directed the use of all TGM's sources while performing various detector evaluations. The first assistant RSO for the facility will be Mr. Gerald O'Shea. Mr. O'Shea is the Plant Manager and Senior Detector Engineer for TGM. Prior to joining TGM he was employed for over 25 years in a similar capacity by Centronic, Ltd. in Croydon, England. Mr. O'Shea has used and directed the use of various radiation sources over the years while testing radiation detectors. The second assistant RSO for the facility will be Mr. Gareth Jones. Mr. Jones is a staff engineer. He has a B.S. in Physics from Manchester University in England. Prior to joining TGM, Mr. Jones was a staff member at Centronic Ltd. for a year. There he studied detector design and manufacture and used various gamma and neutron sources. Mr. Jones has been with TGM for the past 3 years designing, constructing and testing various detectors with TGM's various licensed and exempt sources.

8.) Training

Individuals utilizing the byproduct material or within areas where the material is being used will receive in house radiation protection training. This training will include, but not be limited to the following:

- TGM Test Equipment Operation
- Radiation Physics and Instrumentation
- Principles and Practice of Radiation Protection
- Math pertaining to the Use and Measurement of Radioactivity
- Biological Effects of Radiation
- Scientific Experience with Radiation

9.) Facilities and Equipment

Refer to attached facility sketch. The Krypton-85 source is contained within the original General Nucleonics shielded gauge style housing. Maximum exposure rate from the bottom of the device is 10 mR/hr. It is stored in a locker with pad lock, and is used in the test department for evaluating GM tube characteristics. Surveys around test equipment show minimal exposure levels while in use.

The Californium-252 source(s) are kept in a shielded cave within the Proportional Counter Room. Neutron detectors are placed on or inside the cave for testing. Dose equivalent rates are less than 0.5 mREM/hr on the moderator top portion of the cave. An "area" neutron dosimeter is kept on the back wall just over the cave. This room is kept locked and is only used by trained staff.

The proposed Cesium-137 Shepherd Irradiator will be used for testing various gamma responding detectors. In that the estimated exposure rate at the port is about 7 R/hr, this source will only be used under the direct supervision of Mr. Doyie or Mr. O'Shea. Permanent whole body and extremity dosimetry will be required when using this source. Additionally, all individuals will be required to use a pocket quartz fiber dosimeter or electronic digital dosimeter such that exposure may be tracked on a continuous basis. This will assure exposures are maintained ALARA. The source will be used in a remote location of the facility, perhaps the Gas Tank Room, with the beam directed away from occupied areas. Surveys will be performed to assure compliance with all N.R.C. regulations.

The proposed Americium-241 sealed source will be used for testing X-Ray proportional counters and other gamma responding detectors. Exposure rates near the source are estimated to be about 100 mR/hr, but shielding is easy and effective. Thus, an irradiator geometry will be set up similar to the above Shepherd system. This source will be used in the Proportional Counter Room. It will only be used by trained individuals, and they will be required to have whole body, extremity dosimeters with an additional quartz fiber or electronic dosimeter. Again, the source beam will be directed away from occupied areas and surveys will be performed to assure compliance with all N.R.C. regulations and exposures are kept ALARA.

Instrumentation available to the Staff are:

- R.A. Stephen Model 4200 digital dosimeter; two units high range and low range type.
- Dosimeter Corp. (DCA) Model 3500 GM survey meter calibrated for exposure.
- Centronic Ltd. Spherical REM with Mini-Instrument 6-90 scaler rate meter calibrated for dose equivalent.
- Vendor supplied (NAVLAP accredited) quarterly beta/gamma dosimeters for whole body and, if required, extremity and neutron dosimetry.
- Various electronic scalars, HV supplies etc. used in production testing. This equipment is used for source leak test counting with an NEN Model 200 beta source set for calibration.
- Quartz Fiber dosimeters and a charger will be obtained from DCA or R.A. Stephen if sources C and/or D are acquired.

10.)

1 Radiation Safety Officer

A. Christian Doyle has been designated as the Company Radiation Safety Officer. He and Mr. O'Shea and Mr. Jones will assume duties and responsibilities which include the following:

1. Ensure compliance with all terms and conditions of the license and that information contained in the license is current.
2. Ensure the equipment has been leak tested every six (6) months at a minimum and, that the leak test is performed in the manner prescribed by the equipment manufacturer.
3. Ensure that the equipment is used only by individuals authorized by the Radiation Safety Officer and that all users wear personnel monitoring devices, if required, when utilizing the equipment.
4. Maintain records of personnel exposure, leak testing and training certificates of all users.
5. Ensure that the equipment/source is properly secured against unauthorized removal at all time when not in use.
6. Serve as the contact person and provide assistance in the case of emergencies such as equipment damage or theft. Also provide notification to the proper authorities in case of such emergencies.
7. Ensure that all users have read and understand the radiation safety, operating, and emergency procedures.

II Operating Procedures

A. Specific individuals will be designated and trained by the Radiation Safety Officer to utilize the licensed sources.

1. When a source is in use, authorized users will maintain control over at all times.
2. When the material is not in use, it will be placed in a fully shielded position within a source holder and locked away. The material will be used for its intended purpose only and by doing so, all radiation exposures will be maintained As Low As Reasonably Achievable (ALARA).
3. If required, through measurements and/or operational experience, all personnel utilizing a source or frequenting adjacent environs will wear personnel monitoring devices. When the equipment/source is not in use, monitoring devices will be stored in a designated typical background radiation area. All precautions to limit radiation exposure will be employed.

B. Leak Test Procedures.

1. The leak test will be performed per the manufacturer's specifications. Analysis of these samples will be quantitative and the instrumentation used sufficiently sensitive to detect 0.005 microcurie of radioactivity.
2. The leak test counting may be performed in-house or sent to an appropriate lab for sample analysis. The sources will be leak tested at intervals not to exceed six (6) months.

III. Emergency Procedures

A. For the event of physical damage to a sealed source, the following will be performed:

1. The room in which the source is located will be evacuated and secured.
2. The Radiation Safety Officer will be contacted and his instructions followed.
3. A visual inspection of the source will be made to determine if the source housing and/or shielding has been damaged. If any damage to the source is suspected, a leak test shall be performed and prudent subsequent action taken.

B. In the event that the source is lost or stolen the Radiation Safety Officer will be notified immediately.

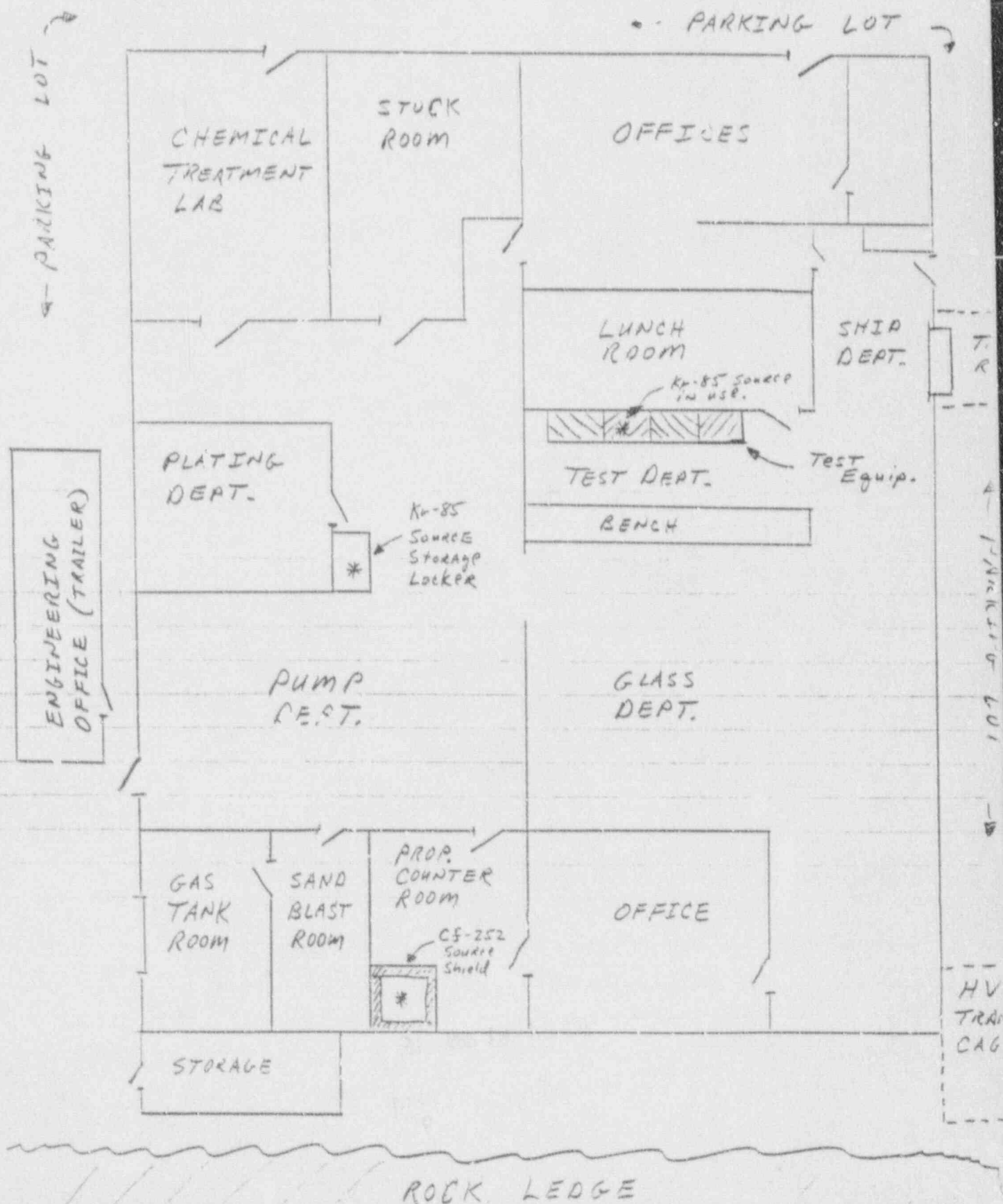
11 WASTE MANAGEMENT

A commercial waste disposal service will not be employed. The sealed sources will be returned to the manufacturer or another authorized licensee when use is discontinued.

• Rev. 4/91
(Not to scale.)

TGM DETECTORS, INC.

160 Bear Hill Road, Waltham, MA 02154-1075, U.S.A



TGM Detectors, Inc.
ATTN: B. W. Jameson, President
160 Bear Hill Road
Waltham, MA 02154

MAY 06 1991

Gentlemen:

This refers to your application dated April 5, 1991, for renewal of Materials License 20-14079-02.

We received your check for \$380. Your request, however, is subject to a renewal fee of \$400 as specified in fee Category 3P of \$170.31 of revised 10 CFR 170, which went into effect July 2, 1990. A copy of the May 23, 1990, Federal Register notice regarding the revision to the Commission's fee regulations is enclosed. Payment of the additional \$20 fee should be made to the U.S. Nuclear Regulatory Commission and mailed to the following address:

U.S. Nuclear Regulatory Commission
ATTN: Sandra Kimberley
License Fee and Debt Collection
Branch, OC/DAF
Mail Stop MNBB 4503
Washington, DC 20555

Your application will be processed by the Region 1 Licensing staff located at 470 Allendale Road, King of Prussia, Pennsylvania 19406. The fee, however, is required prior to issuance of the renewal. When submitting the additional fee, please refer to CONTROL NUMBER 114561.

If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application and will void this action.

Sincerely,

/s/

Sandra Kimberley
License Fee and Debt Collection Branch
Division of Accounting and Finance
Office of the Controller

Enclosure:
May 23, 1990 Federal Register notice

cc: Region I

DISTRIBUTION:
Pending Fee File
OC/DAF R/F
LFDCB R/F (2)
DW/RI/TGM

OFFICE: OC/LFDCB *h*
SURNAME: SKimberley:ab
DATE: 5/3/91

OC/LFDCB *h*
GJackson
5/3/91

ms-7

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03122
STATUS CODE: 2
FEE CATEGORY: 3P
EXP. DATE: 19910531
FEE COMMENTS:

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

APPLICANT/LICENSEE: TGM DETECTORS, INC.
RECEIVED DATE: 910418
DOCKEY NO: 3029152
CONTROL NO.: 114561
LICENSE NO.: 20-14079-02
ACTION TYPE: RENEWAL

2. FEE ATTACHED

AMOUNT: 80.00
CHECK NO.: 12901

3. COMMENTS

SIGNED
DATE

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED ☒)

1. FEE CATEGORY AND AMOUNT: 3P 400

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:

AMENDMENT _____
RENEWAL _____
LICENSE _____

3. OTHER _____

SIGNED
DATE

