

Thomas Gray and Associates

LEAK TEST KIT MOD. TGA-76

LEAK TEST INSTRUCTIONS

Any leakage from a radioactive source (other than of gaseous or volatile radioactive content) will result in deposition of a radioactive film on the surface of the source or adjacent objects. Periodic wipes of these surfaces, when properly analyzed with a sensitive instrument, can ordinarily detect traces of leakage long before significant amounts of radioactive material have been released. This leak test kit may be used by a competent person trained in radioisotope maintenance procedures to make the actual wipe. The process of actually making the wipe is usually simple, although extreme care should be taken, and instructions followed closely.

The procedure is as follows:

1. Select either the stick swabs or the pads to make the wipe. If the source being wiped is emitting high levels of radiation, or if there are irregular surfaces with hard-to-reach areas, select the stick swab. If the surfaces are flat and easy to wipe, select the pad.
2. Lightly moisten the swab or the pad with the detergent in the plastic vial. Moisten only one of the two swabs or pads.
3. Wipe all accessible surfaces of the radioactive source housing, or if the source is in a holder, wipe around all flanges and openings where possible leakage could occur. Where high level sources are involved, the storage container may be wiped after the source has been removed.
4. Place the used swab or pad in its plastic envelope, and fold several times. After using the swab, the stick may be broken without harm.
5. Repeat the process, using swab or pad No. 2. Do not moisten. Then return it to the plastic envelope and fold several times.
6. Fill out the form entitled "Leak Test Information" and return it, along with the used swabs or sticks to Thomas Gray & Associates by means of the return, pre-labeled envelope. Results will be returned to the addressee within two weeks.

Item # 54

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We will analyze the wipes for presence of any radioactive material. If the analysis reveals that less than 0.005 microcuries of radioactive contamination were removed from the source or device by means of the wipe, the source or device are considered to be safe. If more than 0.005 microcuries of contamination were present, it is considered contaminated and the user will be immediately notified. Normally, excessive contamination is not present. Under these circumstances, the user will receive a completed "Leak Test Certificate" indicating that the source or device is safe. This form should be retained in the source file for future reference.

IMPORTANT: Before sending a used wipe swab or pad through the mail, they should be surveyed with a radiation detector to verify that radiation levels are less than 0.5 mr/hr. If levels exceed 0.5 mr/hr, the wipes cannot be sent via mail and the contamination would certainly exceed 0.005 microcuries. If this occurs, a report must immediately be filed with the State Dept. of Radiological Health, if you reside in an agreement state, (such as Calif.) or with the Atomic Energy Commission if you reside, and the sources are located, in a non-agreement state. In such an instance, levels of contamination would be verified through prompt analysis of the wipes.

PROCEDURE FOR COMPLETION OF LEAK TEST INFORMATION FORM

1. "Source owned by" is normally the user. If the source has been leased, the true owner as well as the user, should be indicated.
2. "Source manufactured by" is the source manufacturer, if known. If not, the holder, instrument, or device manufacturer. List both, if possible.
3. "Source model and serial numbers" - List this information if it is available. If not, the model and serial numbers of the device, instrument or holder.
4. " Isotope " is the name of the isotope. - Cobalt 60, Cesium 137, etcetera. "Activity" is the quantity of isotope contained in the capsule.
5. Any additional information thought to be relevant should be added where indicated.

We will automatically notify you shortly before your next wipe is due. If you have any questions regarding procedures, please contact us for clarification. Thank you for letting us serve you.

Thomas Gray and Associates

LEAK TEST INFORMATION

Source Data

Source Owned by _____

Source Manufactured by _____

Source Model No. _____ Source Serial No. _____

Isotope _____ Activity _____

Note: Isotope activity expressed in curies, millicuries, or microcuries

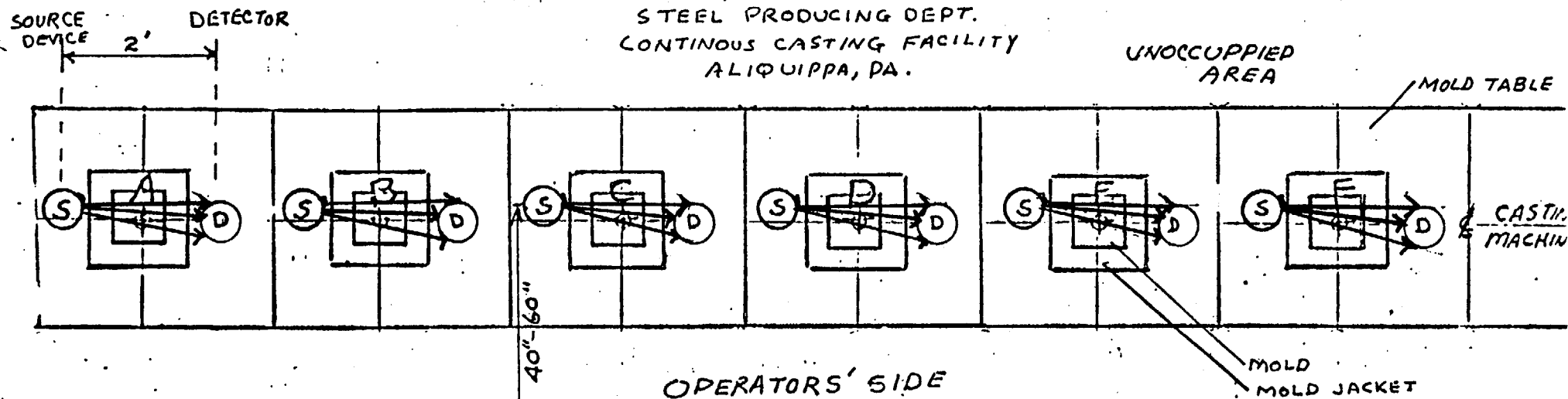
Date of Test _____

Test Data

Additional Information:

consulting · engineering · services

JONES & LAUGHLIN STEEL CORP.
ALIQUIPPA WORKS
STEEL PRODUCING DEPT.
CONTINUOUS CASTING FACILITY
ALIQUIPPA, PA.



STRAND A & MOLD
SOURCE HOLDER
UNIT NO. _____

STRAND B & MOLD
SOURCE HOLDER
UNIT NO. _____

STRAND C & MOLD
SOURCE HOLDER
UNIT NO. _____

STRAND D & MOLD
SOURCE HOLDER
UNIT NO. _____

STRAND E & MOLD
SOURCE HOLDER
UNIT NO. _____

STRAND F & MOLD
SOURCE HOLDER
UNIT NO. _____

SKETCH NO. _____ - TOP VIEW

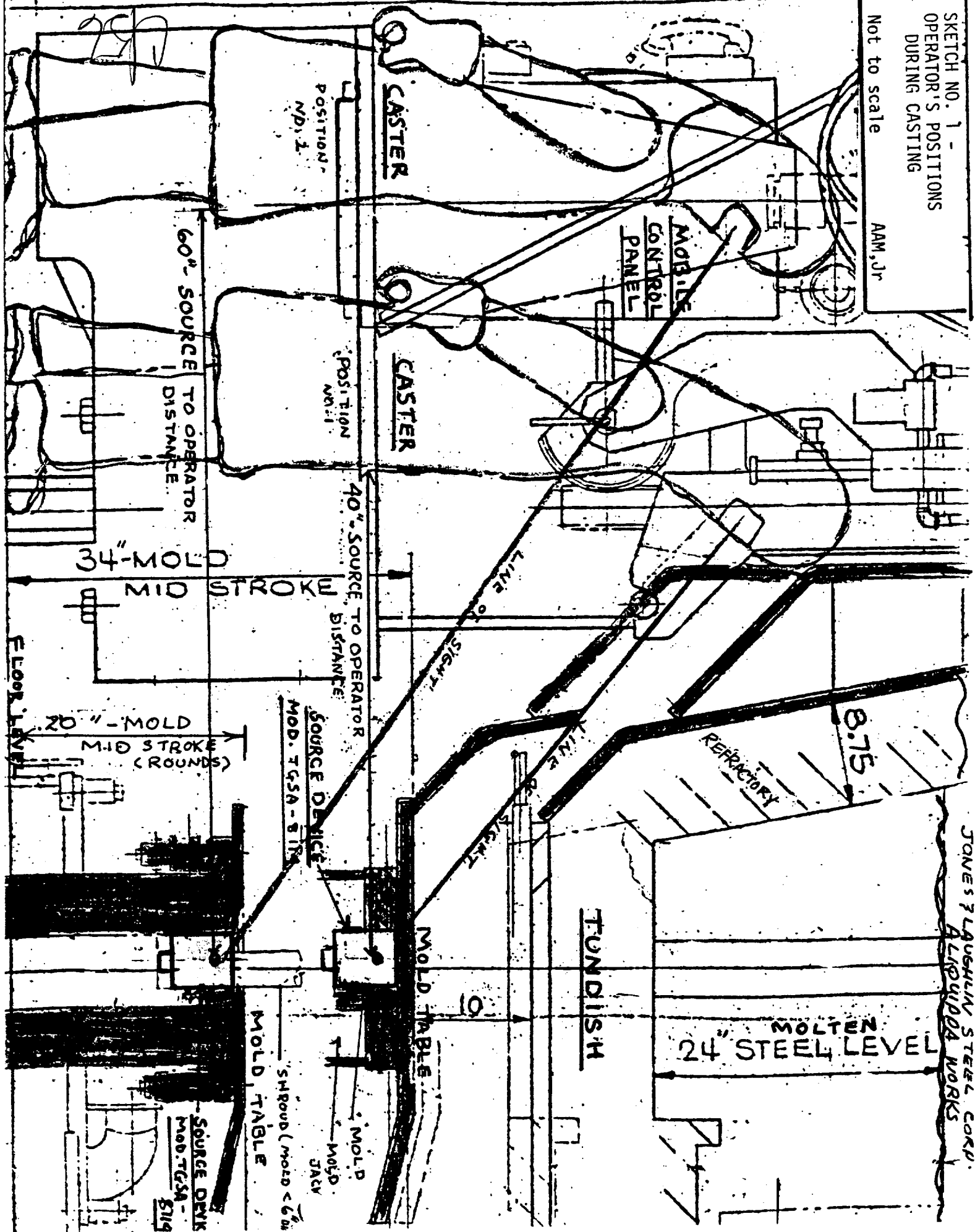
TYPICAL CASTING MACHINE LAYOUT (MOLD COVERS ON)
MOLD LEVEL GAUGES - OPERATING POSITION

KEY: (S) TGSA SOURCE DEVICE
MOD. TGSA-8114
(D) TGSA DETECTOR
A. A. MAMMARELLI JR

Not to scale

AAM, Jr

JONES & LAUGHLIN STEEL CORP.
ALQUIPPA WORKS



STATE OF CALIFORNIA
DEPARTMENT OF HEALTH

Page 1 of 5 pages

RADIOACTIVE MATERIAL LICENSE

Pursuant to the California Administrative Code, Title 17, Chapter 5, Subchapter 4, Group 2, Licensing of Radioactive Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, use, possess, transfer or dispose of radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations and orders of the Department of Health now or hereafter in effect and to any conditions specified in this license.

| | |
|---|---|
| 1. Licensee Thomas Gray and Associates | 3. License No. 2105-30 is amended in its entirety Amendment No. 20 |
| 2. Address 1205 West Barkley Orange, CA 92668 | 4. Expiration date November 18, 1984 |
| Attention: Thomas A. Gray Radiation Safety Officer | 5. Inspection agency Division of Occupational Safety & Health-S |

- | | | |
|--|---|-------------------------------|
| 6. Nuclide | 7. Form | 8. Possession limit |
| A. Any | A. Sealed source not used for medical purposes. | A. As per customer's license. |
| B. Any except: (1) source material; and (2) Special Nuclear Material. | B. Waste packaged in accordance with DOT regulations. | B. 100 curies. |
| C. Source material | C. Waste packaged in accordance with DOT regulations. | C. 5,000 pounds. |
| D. Special Nuclear Material | D. Waste packaged in accordance with DOT regulations. | D. See Condition 23 |

9. Authorized use

- A. To be used incidental to testing for leakage or contamination, as a customer service
- B. To be used for receipt, transportation, storage and transfer to authorized recipient
- C. To be used for receipt, transportation, storage and transfer to authorized recipient
- D. To be used for receipt, transportation, storage and transfer to authorized recipient

10. Radioactive material may be used only at the licensee's facilities at 1205 West Barkley, Orange, California and 815 North Main Street, Orange, California

(a) Radioactive material described in Subitem A of this license may also be used at customers' sites in areas not under exclusive Federal jurisdiction throughout the State of California.

(b) The licensee is authorized to transport, as intrastate transportation, radioactive material possessed under this license in areas not under exclusive

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57 57 4

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

Page 3 of 5 pages

RADIOACTIVE MATERIAL LICENSE

License Number 2105-30

Supplementary Sheet

Amendment Number 20

continued

13. (continued)

- (k) letter dated June 7, 1978 signed by Thomas A. Gray.
 - (l) letter dated May 23, 1979 signed by Thomas A. Gray.
 - (m) letter dated August 1, 1979 signed by Thomas A. Gray.
 - (n) letter dated March 28, 1980 signed by Thomas A. Gray.
 - (o) letter dated June 19, 1980 signed by Thomas A. Gray and attachments thereto.
 - (p) letter dated September 30, 1980 signed by Thomas A. Gray and attachments thereto.
14. (a) The radiation safety officer in this program shall be Thomas A. Gray.
- (b) The alternate radiation safety officer shall be Jeffery S. Mellon.
15. In emergencies concerning damaged devices and/or sources, when personnel of the California Department of Health Services or the Department of Occupational Safety and Health cannot be contacted, the licensee is authorized to remove gauge systems to engage persons with "hot cell" facilities to service such gauge systems. Each time the licensee has a gauge system serviced pursuant to this condition of the license, he shall so notify the California Department of Health Services, in writing seven days.
16. In connection with tests for leakage and/or contamination as a customer service, the licensee is authorized to perform the following services for sealed sources containing radioactive material, except sealed sources used for medical purposes containing Radium 226:
- (a) Collection of wipe test samples.
 - ✓(b) Furnishing leak test kits Model TGA-76, and any approved commercial leak test kit which may be used for this function, to persons authorized to use such kits for wipe testing of sealed sources.
 - (c) Analysis of wipe test samples collected by the licensee as stated in (a) above and returned by customers from leak test kits as stated in (b) above for amount of radioactivity. Each analysis shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. Reports to customers of analyses shall be in microcuries.
17. Vehicles leased by the licensee and used for transporting radioactive material shall be surveyed before release to the lessor. The licensee shall comply with all requirements of the Code of Federal Regulations, Title 49, Section 173.397(h) and the licensee shall advise the lessor in writing that his vehicle meets DOT cleanliness specifications per that section. The licensee shall maintain

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STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
RADIOACTIVE MATERIAL LICENSE

Supplementary Sheet

Page 4 of 5 page

License Number 2105-30

Amendment Number 20

continued

17. (continued)

available for inspection records of all these surveys and copies of all letters certifying cleanliness required by this condition.

18. The external surface of radioactive material containers shall bear a durable, clearly visible label. Also, the Radioactive Shipment Record, from each customer, shall be on file describing:
- (a) Total activity in millicuries, or weight of source material or special nuclear material.
 - (b) Principal radioisotopes.
 - (c) Maximum radiation level at the surface, and at three feet from the surface of the container.
 - (d) Name and address of the person or organization from which the container was received.
 - (e) Form of the radioactive material, specifically whether absorbed liquid, dry solid, animal carcasses or scintillation vials.
 - (f) Cataloging system (numbering or lettering) to be used for the accountability, and tracing of the radioactive material through the available paperwork pertaining to the specifics of each container.
19. The maximum period the licensee is authorized to store radioactive waste material is as follows:
- (a) For solid material in non-combustible containers, 24 months.
 - (b) For solid material in combustible containers, 6 months.
 - (c) For absorbed liquid material, 90 days.
20. The volume of radioactive waste material possessed under this license at any one time shall not exceed 3,000 cubic feet.
21. The licensee shall maintain available for inspection complete records of receipt, use and transfer of radioactive material.
22. The licensee is not authorized to open containers of radioactive waste received from other persons.

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RADIOACTIVE MATERIAL LICENSE

License Number 2105-30

continued

Supplementary Sheet

Amendment Number 20

23. The possession limit for special nuclear material at any one time shall not exceed the quantity specified in the following formula:

$$\begin{array}{rcl} \frac{\text{Uranium 235 (grams)}}{350 \text{ (grams)}} & + & \frac{\text{Uranium 233 (grams)}}{200 \text{ (grams)}} \\ & & \\ + \frac{\text{Plutonium (grams)}}{200 \text{ (grams)}} & \leq & / \end{array}$$

24. The licensee shall, with respect to all radioactive waste collected and packaged for disposal at licensed land burial sites, establish and maintain a training program, written operating and radiation safety procedures and quality assurance inspection and testing procedures which assure that:

- (a) all waste is properly segregated and identified with respect to those classes of waste being accepted for burial at the intended burial sites.
- (b) waste is properly packed to conform to DOT regulations and specific packaging instructions for the class of waste being packed which are supplied by the broker or intended burial site operator and which are particular to the intended burial site.
- (c) all containers are properly closed, meet DOT specifications and are acceptable at the burial site for the class of waste contained.
- (d) all containers are free of surface contamination per DOT regulations.
- (e) radiation levels conform to DOT limits.
- (f) all containers are properly labelled per DOT regulations and in addition, are labelled as to nuclides and class of waste contained.
- (g) all records, shipping papers and certificates are complete and accurate.
- (h) all steel drums are tipped to the horizontal position to test against free liquid.
- (i) Pel-E-Cel shall not be used for packaging scintillation vials, diatomaceous earth or other absorbent specifically approved by the burial site operator shall be used.

For the State Department of Health Services

Date October 28, 1980

by

C. J. [Signature]
Radiologic Health Section

714 P Street, Sacramento, CA 95814

RADIOACTIVE MATERIAL LICENSE

Pursuant to the California Administrative Code, Title 17, Chapter 5, Subchapter 4, Group 2, Licensing of Radioactive Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, use, possess, transfer or dispose of radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations and orders of the Department of Health now or hereafter in effect and to any conditions specified in this license.

| | | |
|--|--|--|
| 1. Licensee Level Link, Inc. 1205 West Barkley Avenue 2 Address Orange, CA 92668 | | 3. License No. 3719-30 Amendment No. |
| Attention: Thomas A. Gray Radiation Safety Officer | | 4. Expiration date October 28, 1987 5. Inspection agency Div. of Occupational Safety & Health - S |

| 6. Nuclide | 7. Form | 8. Possession limit |
|---|--|--|
| A. Any except: (1) Source material; and (2) special nuclear material. | A. Sealed sources | A. Not to exceed 5 Curies each; not to exceed 75 Curies total |
| B. Any except: (1) Source material; and (2) Special nuclear material | B. Sealed sources | B. As per customer's license |
| C. Any except: (1) Source material; and (2) Special nuclear material. | C. Sealed sources, including sealed sources contained within components of gauge systems. | C. No single source to exceed 5 Curies; total not to exceed 75 Curies. |
| D. Cesium 137 | D. Sealed source (3M Co. Model 4D6D) | D. 1 source not to exceed 5 millicuries |
| E. Cesium 137 | E. Sealed sources (Nuclear Chicago Model 850233, General Radioisotope Products Model 850233, Texas Nuclear Model 850233 and 3M Co. Model 4P6M) | E. 10 sources not to exceed 1 curie each. |
| F. Cobalt 60 | F. Sealed sources (AECL Model C-168, General Radioisotope Products Model 850233) | F. 10 sources not to exceed 35 millicuries each. |
| G. Cesium 137 | G. Sealed sources (3M Co. Model 4P6M and 4P6E) | G. 10 sources not to exceed 1.5 curie each. |
| H. Cobalt 60 | H. Sealed sources (AECL Model C-163) | H. 5 sources not to exceed 2.5 curies each. |

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RADIOACTIVE MATERIAL LICENSE

License Number 3719-3

continued

Supplementary Sheet

Amendment Number _____

9. Authorized use

- A. To be used for source exchange as a customer service involving any Ohmart, Robertshaw controls, Kay Ray, Texas Nuclear, Industrial Nucleonics, Ronan Equipment gauging systems and for storage of above devices.
- B. To be used incidental to service of any gauge system not involving repair, removal, replacement or disposal of sealed source of radioactive material.
- C. To be used for storage only, storage period to be left open.
- D. To be used for prototype testing of a level gauge.
- E.- F - To be used incidental to removal, installation, service, repair and source replacement of Brun Corporation gauges Model 35-0100 Series, 35-0200 Series and 35-0300 Series.
- ✓ G. and H. - To be used for manufacture of nuclear gauging devices.

- 10. Radioactive material may be used only at the licensee's address stated in Item 2 above and at temporary job sites of the licensee throughout the State of California, except areas under exclusive Federal jurisdiction.
- 11. This license is subject to an annual fee of three hundred fifty (350) dollars due and payable on the anniversary of the date of issue of this license, October 28, 1980.
- 12. Radioactive material may be used by, or under the supervision and in the physical presence of Thomas A. Gray or Eugene Murakami, except as follows:
 - (a) Sealed sources may be removed from and installed in devices only by Thomas A. Gray.
- 13. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 7, and 8 of this license in accordance with statements, representations and procedures contained in the following documents:
 - (a) the application dated June 15, 1980, signed by Thomas A. Gray and attachment thereto.
 - (b) the letter dated October 24, 1980, signed by Thomas A. Gray and attachments thereto.

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RADIOACTIVE MATERIAL LICENSE

License Number 3719-30

continued

Supplementary Sheet

Amendment Number _____

14. The radiation safety officer in this program shall be Thomas A. Gray.
15. The licensee shall not undertake maintenance of any gauge system beyond leak test and shutter check without drawings of the system adequate for the undertaking. Such drawings together with a service log or file shall be maintained subject to inspection. The service log or file entries shall include the name, address and license number of the customer and shall further specify the make and model number of the gauge system and fully describe the nature of the service undertaken.
16. The licensee shall not undertake maintenance of any gauge system involving modification of the system which will affect the radioactive material, its containment or shielding except as specifically authorized by this and the customer's license. Each time the licensee modifies a gauge system in a manner which affects the containment or shielding of a sealed source of radioactive material, he shall perform the following items:
- (a) Affix a durable, clearly visible label of metal or metal foil to the gauge system stating that: (1) the configuration of the gauge system has been modified from that of its original design; and (2) information and drawings on the modification can be obtained from Thomas Gray and Associates.
 - (b) Furnish a drawing of the modification to the customer for his retention.
17. Except for source exchange as a customer service involving Ohmart gauge systems, or as otherwise specifically authorized by this license, the licensee shall not remove sealed sources from gauge systems. The licensee is authorized to engage persons with "hot cell" facilities to remove sealed sources from gauge systems in accordance with licenses authorizing such removal.
18. The licensee is granted a waiver from that portion of Section 30275(c) of California Radiation Control Regulations which requires leak testing of sealed sources at intervals not to exceed six months under the following provisions:
- (a) the waiver applies only to sealed sources which are stored but not used.
 - (b) Each sealed source to which the waiver applies shall be tested for leakage prior to any use or transfer to another person unless: (1) It has been leak tested within six months prior to the date of use or transfer; and (2) since its last leak test, it has not been in contact with a sealed source which has not been leak tested within six months.

For the State Department of Health Services

Date October 28, 1980

by _____

[Signature]
Radiologic Health Section,
714 P Street, Sacramento, CA 95814

HEALTH AND SAFETY REVIEW INFORMATION FOR CUSTOM APPLICATION
OF
DEVICE CONTAINING RADIOACTIVE MATERIAL

(Reference attached guide of required format and content of request for evaluation of devices containing radioactive materials.)

A SCOPE

Not applicable

B REFERENCE

Not Applicable

C DEFINITIONS

Not Applicable

D GENERAL CRITERIA

1. Identification

a) Manufacturer of Device

Thomas Gray & Associates, Incorporated
1205 West Barkley
Orange, California 92668

b) Model Number

TGSA-8114

c) Maximum Load for Device

500 millicuries Cesium 137

2. Proposed Use for Device

This device has been constructed for general application, however, its specific immediate use is in steel mills as a source component for level gauging of molten metal in a continuous casting mold. On this application the source and detector are mounted approximately two feet apart on a continuous casting mold. A metal table covers both source and detector protecting it from direct contact from any molten metal that may spill over. The conditions of the environment are approximately 100 to 120 degrees under operating conditions, although operation is limited to

C/59

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an average of four hours per day or less. The source shutter is operated electrically and is controlled by push buttons on the operators panel located adjacent to the continuous casting mold. Another set of push buttons are located on the master panel in the control room. A key lock also exists on the master panel locking the source in the closed position when not in service.

The most probable type of accident that might occur would involve radiant heat from the molten metal standing on the table top, which can happen during a spill over. This theoretically could cause the lead in the source holder to soften. Since the source holder is totally steel jacketed inside and out, no molten lead can escape into the electrical section of the unit or be diverted away from its shielding purpose. The source capsule itself is contained in a tungsten alloy holder, as is shown on the drawing, which will not distort at 1500° F. In the event of a high temperature incident for a sustained period of time, it is possible that the micro switches or the electrical solenoid which operate the shutter might be damaged to the point of requiring replacement. In such an instance, the unit is removed from the line by maintenance people for ultimate repair by Thomas Gray & Associates personnel. The shutter is failsafe, so that when power is removed the shutter is in the closed position, presenting minimum levels of radiation to personnel. A carrying ring is provided on the unit to permit the unit to be carried on a pole between two people to further minimize any exposure.

3. Radioactive Material

The sealed source to be utilized in this device will be manufactured by 3M Company, St. Paul, Minnesota. The model number for the 3M source is 4P6M. Each capsule may be loaded with a maximum of 325 millicuries of Cesium 137. The maximum load to be placed in this holder is 500 mCi.

4. Construction

A construction drawing is included showing the details of construction of this unit. The unit is designed to be failsafe in the closed position to minimize any radiation hazard to personnel. The unit is electrically operated so that the shutter can only be opened by depression of a push button located on each of two control panels. The master control panel contains a key lock to lock the source closed when the unit is not in use. The lead shielding is totally enclosed by steel jacketing so that no molten lead can ever get into the operational area of the unit. The maximum load of 500 millicuries of Cesium will produce a gamma radiation field of less than 5 mr/hr at 12 inches from any surface of the unit, when the shutter is closed. The enclosed isodose curves so indicate this.

5. Human Access

A quantity of ten source assemblies are being provided to this user. Six are in use at any one time and four are in a standby condition. The six units that are installed are attached to a bracket positioning them against the side of the mold wall. When molds are changed, the source unit is pivoted back into position after the change has been made. When the unit is in service it is inaccessible to the operator.

The four units that are not in service are locked in a steel cabinet. The cabinet is only accessible to authorized maintenance personnel.

6. Useful Life

We anticipate the useful life of the source assembly to be ten years or more.

7. ANSI Classification Designation

We have been advised by the 3M Company regarding the following ANSI information.

Sealed Radioactive Sources

ANSI N-542-1977

Classification 56545

8. Labeling and Instruction for Use

I am enclosing a copy of the label that will be attached to each unit, and a copy of the relevant source information that will appear in the Instruction Manual that accompanies the system.

9. Availability of Services

The following services will be provided by Thomas Gray & Associates, Incorporated and its affiliated company Level Link, Incorporated.

- 1) Installation and relocation - Level Link, Incorporated
- 2) Initial radiation survey - Level Link, Incorporated
- 3) Leak testing - Thomas Gray & Associates, Incorporated
(either kit analysis or direct service)
- 4) Repair, periodic maintenance, and shutter checks - Level Link, Inc.
- 5) Source exchange - Thomas Gray & Associates, Incorporated
- 6) Emergency procedures - Thomas Gray & Associates & Level Link, Incorporated
- 7) Disposal - Thomas Gray & Associates, Incorporated

10) Additional information is supplied under "Prototype Evaluation".

E PROTOTYPE EVALUATION

1. This device, in a true sense of the word, is not a prototype. It has been previously licensed by NRC on two occasions as a custom device.

- 1) Laclede Steel Company, Alton, Illinois
License No. 12-04757-01, Amendment 11, September 15, 1972
- 2) Keystone Steel & Wire Company, Peoria, Illinois
License 12-11873-01, Amendment 11, September 14, 1976

These devices have been in continuous service at these facilities, and have survived rigorous and severe conditions. In view of this, we request that further testing requirements for this unit be waived.

2. Manufacturer, Assembler, or Distributor

- a) Not applicable as this deals with sealed sources.
- b) Waiver requested, see E1.
- c) We are submitting radiation profiles as requested indicating the maximum load suggested in this device. The measurements are made with an Eberline Model E-120 survey meter.
- d) Not applicable since this is not a generally licensed item.

G QUALITY CONTROL

The completed source holder is loaded with the source capsule at our licensed facility in Orange, California. The source capsule manufacturer provides leak test information when the sources are shipped to us, and this information is forwarded to the ultimate user with the shipping papers. Once the holder is loaded, and isodose pattern is run on each unit. This isodose pattern will then accompany the unit, which is referenced by model number and serial number. Opening and closing the shutter will be done electrically to verify the operation of the electrical components. Each unit will then be properly labeled and prepared for shipment to the customer.

H LABELING AND INSTRUCTIONS FOR USE OF GAUGE

1. The label enclosed illustrates the information we will include with each unit. You will note that we provide room to indicate manufacturer, model number and serial number of the source capsule as well as the device. We have found that providing this total information on the label is very useful and desirable.

2. Not applicable
3. Sample documents - each device
 - a) Supplied by the 3M Company
 - b) Supplied by the 3M Company
 - c) We are attaching an addendum entitled "Radiologic Safety Instruction Information" which will be a part of the maintenance manual to be provided with this information.

Thomas A. Gray
Thomas Gray and Associates Inc.
Level Link Division
1205 West Barkley Avenue
Orange, Calif. 92668

(714) 997-8090

RADIOLOGIC SAFETY INSTRUCTION INFORMATION

For utilization of the Thomas Gray & Associates Source Assembly, Model TGSA-8114

SAFE OPERATION

In order to utilize this source assembly in a safe manner, one should observe certain precautions. This device is fail safe, which means that the shutter is closed at all times except when electrical power is applied in the correct manner. Should power fail, the shutter will automatically close. The radiation beam port is 90 degrees to the left of the mounting bracket, when looking down from the top of the unit. Also, there is a cross indicating the position where the radiation beam exists when the shutter is open. Although the shutter is closed when the unit is inactive, there exists a level of radiation around the unit which, while not dangerous under normal conditions, should encourage you to avoid the device except when it is necessary for you to be near the unit. This should only be in the case of removing the unit to storage, or placing another unit into service. Other than these times, it is wise to stay several feet away from the unit at all times.

Since the shutter is electrically operating, the indication as to whether the source is open or closed appears on the operators remote panel, and again on the main panel. The red light indicates that the shutter is open and the green light that the shutter is closed. When the shutter is open, the primary beam of radiation exits the unit from the point previously mentioned. The only time the shutter should be in the open position is when it is mounted on the continuous casting mold and the source beam position is aimed directly at the mold. The mounting position is such that the source assembly is within inches of the mold wall, so the potential for getting any part of one's body into the radiation beam is small.

The source open and closed lights indicate the position of the shutter. If, for any reason, the source open or source closed lights do not light when the source shutter button is placed into that position, maintenance people should be notified. This symptom could indicate several things. Occasionally, it results from the shutter not opening or closing completely, and hence the switch which operate the lights did not totally close. In the event of a light failure, maintenance personnel will in all probability remove the unit to storage for later service. In the event of a failure of a "source closed" light, you should assume that the shutter is stuck in the open position. This is probably not the case, since, as I indicated, it normally is simply that the shutter is not closing completely. In this instance, when the unit is removed from service, the radiation port should be avoided and maintenance personnel will install a shield on the unit prior to moving it, in the event that the shutter is open.

We have enclosed a radiation profile of the device which indicates the radiation levels around the unit in both the "source open" and "source closed" position. Generally,

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Handwritten signature and date 60

Handwritten mark

RADIOLOGIC SAFETY INSTRUCTION INFORMATION, CONTD.

speaking, the beam of radiation from the unit is approximately 4 inches wide at the detector when the shutter is open. The radiation profile is simply to indicate to you what the radiation beam looks like. This measurement should never be attempted by unauthorized personnel and is intended only to give you further information about the operation of the unit.

The unit should never be tampered with in any way, in an attempt to open the unit for corrective reasons. The unit only is to be opened by authorized personnel, such as service people from Thomas Gray & Associates, or other authorized agencies. The bottom of the unit should never be removed. The wires going into the junction box may be connected and disconnected for removal or installation of the whole unit, but this is as far as anyone should proceed in disassembling a unit.

EMERGENCY PROCEDURE

The source holder should not be tampered with in any way. As a Licensee, you are permitted to open and close the shutter, but not to attempt to open the holder and get to the source capsule.

In the event of damage to the unit rendering it inoperable, DO NOT attempt to correct the problem. Call the Level Link representative for instruction, and he will tell you exactly what to do. If he cannot be reached, call (714) 997-8090 at any hour for instructions. If you suspect that the source material may have been separated from the source holder, such as might happen if an explosion occurred, contact your local fire department for assistance after calling the Level Link representative. They have available survey meters to check for radiation levels, if you do not, or if you wish to verify readings that you have taken. In such an instance, the suspected contaminated area should be roped off and posted as a possible hazardous area. Maintain this condition until a State official or the Level Link representative has arrived on the scene, and taken charge of the situation.

Thomas A. Gray
Thomas Gray and Associates, Inc.
Level Link Division
1205 West Barkley Avenue
Orange, Calif. 92668

(714) 997-8090

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12/1

5 cm - 11 mr/hr
30 cm - .3 mr/hr
100 cm - .03 mr/hr

5 cm - 20 mr/hr
30 cm - .55 mr/hr
100 cm - .05 mr/hr

5 cm - 5 mr/hr
30 cm - .15 mr/hr
100 cm - .05 mr/hr

5 cm - 11 mr/hr
30 cm - .3 mr/hr
100 cm - .03 mr/hr

5 cm - 2 mr/hr
30 cm - .03 mr/hr
100 cm - .005 mr/hr

11.8 in.

5 cm - 20 mr/hr
30 cm - .55 mr/hr
100 cm - .05 mr/hr

5 cm - 2 mr/hr
30 cm - .03 mr/hr
100 cm - .005 mr/hr

RADIATION BEAM

5 cm - - mr/hr
30 cm - 800 mr/hr
100 cm - 72 mr/hr

ISODOSE PATTERN

Radiation Levels in mr/hr at 5, 30, and 100 cm distances.

Source assembly TGSA-8114

500 mCi Cesium 137 - Maximum Load.

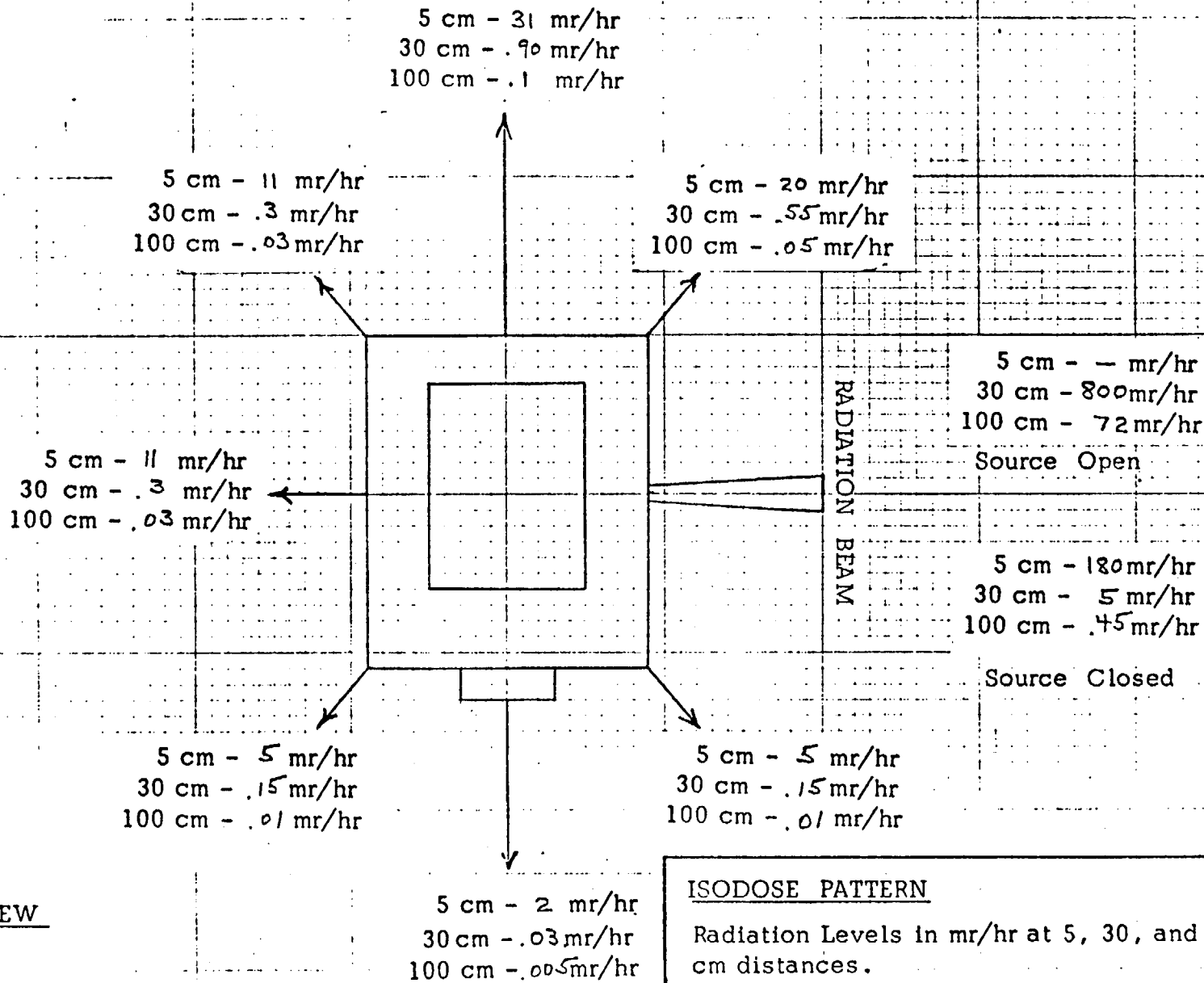
BOTTOM VIEW

Source Open

Source Closed

5 cm - 180 mr/hr
30 cm - 5 mr/hr
100 cm - .45 mr/hr

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ISODOSE PATTERN

Radiation Levels in mr/hr at 5, 30, and 100 cm distances.

Source assembly TGSA-8114

500 mCi Cesium 137 - Maximum Load

A. Scope

This guide provides a description of the required format and content of request for evaluation and registration of devices containing radioactive materials.

B. References

1. 10 CFR Part 20
2. American National Standards Institute (ANSI) N538 (Feb. 9, 1979) ←
3. HEW Publication (FDA) 77-8025

C. Definitions

1. Capsule - Protective envelope used for prevention of leakage of the radioactive material.
2. Gauge - A device designed to utilize sealed source(s) for determining or controlling thickness, density, level, interface location, radiation leakage, or qualitative or quantitative chemical composition.
3. Sealed Source - Radioactive material that is encased in a capsule designed to prevent leakage or escape of the radioactive material.
4. Source Holder - A device used to support and retain the source.
5. Source Housing - The enclosure containing or incorporating the source, source holder and means for attenuation of the radiation.

D. General Criteria

The manufacturer, assembler, or distributor, shall submit sufficient information regarding each type or model of device for the evaluation of that device. Such information shall include:

1. Identification

Identify the radioactive source(s) and the device, respectively, by type, model number, or other specific model designation.

2. Proposed Use

Describe the proposed use of the device and identify the environments and operating conditions expected during normal conditions of use.

Include descriptions of the types of users, locations of use, possibilities of use as a component in other products, and circumstances of normal use. In addition, describe probable effects of severe conditions, including accidents and fires, and possible diversion from intended use.

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3. Radioactive Material

- (a) If the sealed source is registered with NRC or an Agreement State specify the manufacturer, model number, isotope and maximum activity for each source to be incorporated into a device.
- (b) If the source design has not been registered with NRC or an Agreement State, provide the information outlined in Standard Format for Health and Safety Review and Registration of Sealed Sources, dated July 24, 1979.

4. Construction

- (a) Submit engineering drawings of the source housing, identifying all materials of construction, dimensions, methods of fabrication and means for incorporating the radioactive material.
- (b) Include a detailed description of all special design features which protect the radioactive material from abuse and minimize the radiation hazards. Describe in sufficient detail so that the nature, function, and method of operation are clearly defined.

5. Human Access

Describe the degree of access of human beings to the device during normal handling and use.

6. Useful Life

Indicate the expected useful lifetime of the device and of the source(s)

7. ANSI Classification Designation

State the American National Standards Institute (ANSI) classification designation of the device. Also state the ANSI classification designation for the source(s).

8. Labeling and Instruction for Use

Submit facsimilies of the labeling or marking to be placed on each device, and copies of the manual that will accompany the device.

9. Availability of Services

Submit information regarding the availability of the following services to the device user:

- (a) Installation and relocation;
- (b) Initial radiation survey;

- (c) Leak testing;
- (d) Repair, periodic maintenance, and shutter checks;
- (e) Source exchange;
- (f) Emergency procedures; and
- (g) Disposal.

10. Additional Information

Submit any additional information, including results of experimental studies and tests, which will facilitate a determination of the safety of the device.

E. Prototype Evaluation

1. At least one device shall be evaluated. The prototype device tested shall be of the same design and fabricated in a manner that can be duplicated in production units, especially as to materials, tolerances and methods of construction. Any change in design, or method of fabrication which could affect containment, shielding, or the safe operation of the device, requires reevaluation of the new prototype incorporating such change. The appropriateness and reproducibility of the test conditions, accuracy of the observations, and interpretation of the results, are among the points to be considered. In some cases, it may be desirable to have tests carried out by qualified independent laboratories.
2. The manufacturer, assembler, or distributor, shall submit information including:
 - (a) Results of tests performed on sources that establish the integrity of the source construction and seal under the most adverse conditions of use to which the device is likely to be subjected. These prototype tests should, insofar as possible, reflect the actual conditions of use and as a minimum shall meet the designated usage classification according to the current ANSI Standard entitled, "Classification of Sealed Radioactive Sources."
 - (b) A safety analysis based on the evaluation of the ability of the final design to withstand the normal conditions of handling, use, and storage including abrasion, corrosion, vibration, impact, puncture, compressive loads, and the probable effects on containment and shielding of abnormally severe conditions, such as explosion and fire. Aging effects are of particular importance. The results of testing which demonstrate that the device meets the designated performance classification according to the current ANSI Standard entitled, "Classification of Industrial Radiation Gauging Devices" shall also be submitted.

(c) Submit radiation profiles (isodose curves e.g. dose rates at 5 cms, 30 cms and 100 cms) of a prototype of the device with shutter(s) in the open and closed position(s). Radiation levels should be measured using the maximum activity of each kind of radioactive material expected to be used in the device. A description of the method used to measure the radiation levels should be included.

(d) For device intended for distribution to persons generally licensed pursuant to 31.5, 10 CFR Part 31, sufficient information to provide reasonable assurance that:

(i) The device can be safely operated by persons not having training in radiological protection:

(ii) Under ordinary conditions of handling storage, and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in any period of one calendar year an external radiation dose or dose commitment in excess of the following organ doses:

Whole body; head and trunk; active
blood-forming organs; gonads; or
lens of eye.....0.5 rem

Hands and forearms; feet and ankles;
localized areas of skin averaged over
areas no larger than 1 square
centimeter.....7.5 rems

Other organs.....3.0 rems

(iii) Under accident conditions (such as fire and explosion) associated with handling, storage, and use of the device, it is unlikely that any individual would receive an external radiation dose or dose commitment in excess of the following organ doses:

Whole body; head and trunk; active
blood-forming organs; gonads; or
lens of eye.....15 rems

Hands and forearms; feet and ankles;
localized areas of skin averaged
over areas no larger than 1 square
centimeter.....200 rems

Other organs.....50 rems

G. Quality Control

1. Each manufacturer, assembler, or distributor shall describe the quality control procedures to be followed in the fabrication and assembly of the device and the quality control standards for maintaining source design specifications. Also, if available, describe the quality assurance aspects and provide certificate(s) of compliance related to the device.
2. Each manufacturer, assembler, or distributor shall describe the assay method used to determine the radioactive content of the source. The assay shall be traceable to a National Standard.
3. Each manufacturer, assembler, or distributor shall perform a leak test on each source by applying procedure(s) in the current ANSI Standard entitled, "Classification of Sealed Radioactive Sources." Acceptability of source leakage shall be indicated by removal of less than 0.005 microcuries.

H. Labeling and Instructions for Use of Gauge

1. Each manufacturer, assembler, or distributor shall provide a copy or facsimile of the label to be applied to the device. The label or marking shall consist of the name, trademark, or symbol of the manufacturer, assembler, or distributor, the type and amount of radioactive material, the date of measurement, the standard radiation symbol, and the words, "CAUTION - RADIOACTIVE MATERIAL." The label or marking must be durable enough to remain legible for the useful life of the device and be readily visible.
2. For devices intended for distribution to persons generally licensed pursuant to 31.5, 10 CFR Part 31, the label shall comply with the requirements of Section 32.51(a)(3), 10 CFR Part 32.
3. Each distributor shall provide a sample of the following documents to be supplied with each device:
 - (a) A certification that the sealed source has been appropriately tested for leakage and contamination within six (6) months of date of transfer.
 - (b) A certificate of assay for each source.
 - (c) Instructions for the safe and efficacious usage of the device.