TELEDYNE ISOTOPES

IWL-0312-451

# RADIATION SAFETY CODE
# AND
# QUALITY CONTROL MANUAL

AUGUST 1984

RSC/QCM 4.80

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# SECTION I - MANAGEMENT POLICY AND ORGANIZATION

## I-1.0 INTRODUCTION

### I-1.1 Statement of Basic Policy

The basic policy underlying this Radiation Safety Code and Quality Control Manual is that the health and safety of personnel working with ionizing radiation and the release of radioactive contaminants to the environment are of paramount importance to Teledyne Isotopes. All decisions, rules and recommendations will be made with the basic premise that levels of radiation exposure are to be minimized to the lowest level that can be reasonably achieved (ALARA).

### I-1.2 Implementation of Policy

The policy is enunciated by a Radiation Safety Committee composed of members drawn from various company departments who use or manage the use of sources of ionizing radiation. The implementation of decisions of the Radiation Safety Committee is the responsibility of the Health Physics Office.

### I-1.3 Philosophy of Radiation Safety: Risk versus Benefit

The benefits to be derived from the use of ionizing radiation may require some risk of exposure to radiation. In such instances it is necessary to strike a balance between risk and benefit in keeping with basic company policy. This decision is part of the function of the Radiation Safety Committee together with the Health Physics Office. Though strict objective criteria cannot be drawn up to apply in all circumstances, objective guidelines and established regulations will be followed wherever possible.

TELEDYNE ISOTOPES

5/10/85

- PRESIDENT — DR. D. F. SCHUTZ
  - H. Principe
- PLUM BROOK OPERATIONS — J.E. ROSS, MGR. — Company Health Physicist
- QUALITY ASSURANCE — H. KING, MGR. *
- MARKETING — D. K. SLANE, V.P.
  - M. Keenan
    - I. Lindsey**
  - ASIAN SALES & SERVICE
    - D. W. Lee
- U.K. Badge Service — H. Preston, Mgr.
  - A. Heasman
  - OPERATIONS
    - D. Gill
- ADMINISTRATION & FINANCE — E. O'BRIEN, V.P.
  - J. Barker
    - M. Schaeffer
    - A. Blankenbush
  - PERSONNEL
    - D. McThomas
    - V. Miller
  - PURCHASING
    - C. Doblin
    - A. Begen
  - ACCOUNTING / PAYROLL
    - G. Papa
    - A. Baker
      - L. Hopp
      - M. Oggenfuss
      - V. Swift
  - BUILDING SERVICES
    - R. Pavese
    - J. Ferro
    - C. Goebel
    - F. Hall
    - J. Colegrove
- MASS SPECTROMETRY SERVICES — L. CASABONA, MGR.
  - NUCLEAR FUELS ANALYSIS
    - T. Amato
    - S. Kaminsky
    - K. Noyes
  - ISOTOPE GEOCHRONOMETRY
    - Dr. J. Powell, Mgr.
      - G. Piete
        - M. Siragusa
        - (T. Amato)
  - METAL PROCESSING
    - (S. Kaminsky)
- ENVIRONMENTAL ANALYSIS — DR. J. D. MARTIN, V.P.
  - C. Starr
    - C. Mendola
  - A. Hogan
  - B. Walsh
    - M. Jassy
  - E. Cunningham
    - M. Goldblatt
    - R. Doehl
    - N. Cobin
  - RADIOCHEMISTRY
    - Dr. H.W. Jeter
      - B. Campbell
      - M. Burdel
      - A. Alston
        - W. Thomas
        - P. Oravetz
        - B. Jablonski
        - P. Friedman
        - O. Krotoff
  - GAS ANALYSIS
    - A. Carmichael
      - R. Iverson
      - E. Gyuro
  - GAMMA-RAY SPECTROSCOPY
    - L. Tyndall
      - J. Carr
      - J. Brown
  - RADIOCARBON / TRITIUM
    - J. Buckley
      - E. French
      - D. McKillop
      - M. Somerville
  - ANALYTICAL REPORTS
    - H. King
      - A. Wragge
  - TELETRACE
    - (A. Carmichael)
      - P. Kamfor
  - ENVIRONMENTAL TLD
    - E. Demos
      - N. Cobin
  - ADVANCED SYSTEMS DEVELOPMENT
    - A. Skaar
  - FIELD SAMPLING
    - R. Dinello
  - COMPUTER SERVICE
    - C. Hirmke
      - R. Toro
      - L. Barceline
      - N. Peszko
- RADIOLOGICAL SERVICES — S. BLACK, MGR. (R.S.O.)
  - J. Kracov
    - J. McLaughlin
  - RAD WASTE DISPOSAL
    - H. Martos
      - V. Driscoll
      - (D. Peterson)
  - HEALTH PHYSICS
    - J. Guenther (Alt RSO)
      - D. Peterson
      - S. Dennerlein
  - MIDWEST LABORATORIES
    - L. Huebner, Gen. Mgr.
      - T. Brainard
      - C. Carlson
      - T. Coorilum
      - P. Girgis
      - B. Grob
      - L. Hinze
      - J. Karnazes
      - R. Lesko
      - T. Patton/Baker
      - D. Rieter
      - F. Shaw
      - A. Sturgis
      - M. Wyco
- TLD/NUCLEAR INSTRMENTS — G. ASCIONE, MGR.
  - BADGE SERVICE
    - G. Sanchez
      - E. Pavese
      - P. Nixon
  - PHOSPHORS & DOSIMETER PRODUCTION
    - B. Terry
      - R. Rodriguez
  - DOSIMETER INVENTORY CONTROL
    - (M. Keenan)
  - NUCLEAR INSTRUMENTS
    - ENGINEERING SERVICES
      - M. Graziul
      - S. Friscia
    - FIELD SERVICE
      - R. Hoellger
    - INSTRUMENT PRODUCTION
      - A. Salat
      - R. Kohlberger
  - TLD TECHNICAL SUPPORT
    - C. Grisoni
- CRYSTALS — L. SINE, MGR.
  - A. Gutfranski
  - J. Kehoe
  - D. Stumper
  - J. Machanty
  - J. Dembin

* H. King reports directly to Company President as Manager of Quality Control

** Less than 30 hours/week

## I-2.0 RADIATION SAFETY COMMITTEE

### I-2.1 Responsibilities

The Radiation Safety Committee is responsible to the President of Teledyne Isotopes. The responsibilities of this Committee are:

1) Formulate special company policy in the area of radiation safety.

2) Make decisions on the uses of and approve the users of ionizing radiation.

3) Approve new facilities and major equipment for use of ionizing radiation by the company.

4) Approve changes for existing facilities and major equipment.

5) Enforce the safety requirements of international, federal, state, and local agencies as well as the procedures and policies as set forth by the Radiation Safety Code and Quality Control Manual.

### I-2.2 Membership & Qualifications

The Committee is composed of members from the following divisions, sections or areas of responsibility:

1) Health Physics
2) Services
3) Products
4) Administration

Membership may be changed as necessary. The membership of this Committee as of the date of this revision is shown in Table I-2.2. The company organization as of the date of this revision is shown in Figure I-2.1.

All members of the Radiation Safety Committee must have a college level degree and be familiar with radiation safety procedures and regulations. All members of the Radiation Safety Committee must also be of management level or higher, or a member of the Health Physics Department with a minimum of 2 years experience.

### I-2.3 Executive Committee

An Executive Subcommittee comprised of the Chairman, the company Health Physicist, R.S.O. and Alternate R.S.O. is authorized to act on behalf of the committee for approval of necessary actions between regular meetings of the Radiation Safety Committee. A quorum shall consist of either the Chairman or Company Health Physicist and the R.S.O. or Alternate R.S.O.

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TABLE I-2.2

MEMBERS OF RADIATION SAFETY COMMITTEE

| | |
|---|---|
| Donald F. Schutz, Chairman | President |
| Jack E. Ross, C.H.P.<br>Company Health Physicist | Manager, Plum Brook Operations |
| Steven A. Black<br>Radiation Safety Officer | Manager, Radiological Services |
| Jeffrey M. Guenther<br>Alternate Radiation Safety Officer | Health Physics Department |
| J. David Martin<br>Vice President | Manager, Environmental Analysis |
| Darrell Slane<br>Vice President, Marketing | Director, Nuclear Instruments |
| Lewis F. Casabona<br>Senior Scientist | Manager, Mass Spectrometry Services |
| Eugene B. O'Brien<br>Vice President | Manager, Administration & Finance |

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I-2.4 Safety Subcommittee

A Safety Subcommittee comprised of various representatives of operational departments will make recommendations to the R.S.C. for implementation of safety programs beyond the specific scope of radiation safety but within the requirements for general health and safety. The Safety Subcommittee is chaired by the Manager, Personnel Department, and membership is presented in Table I-2.4.

I-2.5 Records

The Radiation Safety Committee is required to keep minutes of all quarterly meetings and any meetings of an Executive Subcommittee.

I-2.6 Qualifications of the Company Health Physicist and the Radiation Safety Officer

2.6.1 The Company Health Physicist must have a B.S. degree in Health Physics or related field and have at least 4 years of practical health physics experience. Unless certified by the American Board of Health Physics, 8 or more years practical experience is required.

2.6.2 The Radiation Safety Officer must have a college degree in Health Physics or related field, and have at least 3 years practical health physics experience.

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TABLE I-2.4

MEMBERS OF SAFETY SUBCOMMITTEE

| | |
|---|---|
| Steve Black | RadWaste Department |
| Larry Gibson | Radiochemistry Department |
| Jeffrey Guenther | Health Physics Department |
| Doris McThomas, Chairperson | Personnel Manager |
| Robert Pavese | Maintenance Department |
| Jonathon Powell | Manager, Geochronometry |
| Helen Principe | Administrative |
| Les Sine | Crystals Department |
| Bruce Terry | Nuclear Instruments Department |
| William Thomas | In-Plant Analysis Lab |
| Lynn Tyndall | Environmental Analysis Department |

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Donald F. Schutz, Ph. D.

TELEDYNE ISOTOPES

President

Dr. Schutz is President of Teledyne Isotopes in which capacity he has overall responsibility for all activities of the company. These include products, services, and research in environmental radioactivity monitoring, thermoluminescent dosimetry, sodium iodide crystal manufacture, radiological waste disposal, nuclear fuel analysis, geochronometry, and isotope geochemistry. Dr. Schutz is actively engaged in the technical direction and marketing of TeleTrace - a subsurface fluid tracing procedure offered to the petroleum industry to enable them to obtain more meaningful data in their enhanced secondary recovery operations. He is the Chairman of the Radiation Safety Committee and is responsible for the Quality Assurance Program of the company.

From 1970 to 1975 Dr. Schutz was Vice President of the company in charge of the Westwood Laboratories. Prior assignments have included Manager of Nuclear Operations from 1968 to 1970, with responsibility for projects carried out for the Nuclear Monitoring Research Office of the Defense Advanced Research Projects Agency (DARPA, the Arms Control and Disarmament Agency (ACDA), and the Atomic Energy Commission for the study of radioactive products of underground nuclear explosions. His responsibilities ranged from laboratory studies of inert gas extraction and radioassay techniques to engineering development of sampling and detection systems. He participated in, and directed numerous field operations at the Nevada Test Site and at various off-site nuclear test areas in Mississippi, New Mexico, Colorado, Nevada, and Alaska. Dr. Schutz was principal investigator on Department of Energy projects concerned with the application of nuclear techniques to the exploration for uranium ore deposits.

Prior to joining Teledyne Isotopes in 1964, Dr. Schutz was a Research Staff Geologist in the Department of Geology at Yale University where he received the Ph.D. degree in geology. He was primarily concerned with development of analytical techniques for the determination of trace elements in seawater and stream water by neutron activation, X-ray fluorescent and emission spectrographic analysis. The techniques developed were applied to a worldwide sampling of seawater which included samples taken by Dr. Schutz in the Antarctic during the summer of 1963-1964.

At Rice University Dr. Schutz completed a statistical study of regional variations in the chemical composition of basaltic rocks for which he received the M.A. in geology in 1958. Dr. Schutz received the B.S. (cum laude) in Geology from Yale University in 1956. Prior field experience includes work for the Bear Creek Mining Company on geochemical prospecting projects in the states of Maine and Arizona.

Professional and technical memberships include Sigma Xi, Geochemical Society, Geological Society of America, American Geophysical Union, American Nuclear Society, Society of Petroleum Engineers of A.I.M.E., Society of Petroleum Exploration, American Association of Petroleum Geologists, Energy Minerals Division of AAPG, Air Pollution Control Association, Atomic Industrial Forum, American Public Health Association, and Scientists & Engineers for Secure Energy.

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RESUME

Eugene B. O'Brien, B.S.

Vice President, Administration & Finance

Mr. O'Brien is Vice President of Administration and Finance at the Westwood Laboratories of Teledyne Isotopes. His responsibilities include supervision of Program Planning and Control, Contracts Administration, Personnel, Building Services, Purchasing, Shipping and the general administration of the Profit Center. He is responsible for the coordination and monitoring of performance of each operational department.

Prior to joining Teledyne Isotopes in 1967, Mr. O'Brien worked as a Senior Contracts Administrator at Thiokol Chemical. During this period he was involved extensively with the adminstration of research and service contracts with various agencies of the U.S. Government.

Between 1958 and 1963 Mr. O'Brien held various engineering administrative positions with Curtiss Wright Corporation. As a Program Planner he was responsible for preparing program cost analysis reports for customers and management. He is experienced in all DOD, DOE and NASA cost reporting techniques.

Mr. O'Brien received his B.S. degree in Business Administration from Fairleigh Dickinson University. He has also attended Newark College of Engineering for various engineering courses, including PERT courses.

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## I-3.0 HEALTH PHYSICS OFFICE

### I-3.1 Personnel

This office is headed by a person qualified in the field of health physics and radiation protection. This person's title is Company Health Physicist and he performs or oversees the work of the person designated as Radiation Safety Officer (R.S.O.) on the various licenses. The R.S.O. is assisted by sufficient staff to carry out the Radiation Safety Program as set forth in this manual.

### I-3.2 Duties

The duties of this office are:

1) Approve all requests for the purchase or use of radioisotopes (IWL-HP-04).

2) Survey all radioisotopes received by or shipped by Teledyne Isotopes (IWL-HP-05).

3) Maintain radiation histories of all Teledyne Isotopes personnel working with or exposed to sources of ionizing radiation (IWL-HP-11 & NRC Form 4 or equivalent).

4) Periodically (generally weekly) survey and make recommendations concerning Teledyne Isotopes radiologically controlled areas.

5) Dispose of all radioactive waste generated on Teledyne Isotopes property or under Teledyne Isotopes licenses.

6) Prepare emergency procedures in case of an accident involving ionizing radiation.

7) Indoctrinate all new Teledyne Isotopes personnel who will be working with, or be exposed to sources of ionizing radiation (IWL-HP-07).

8) Perform quarterly calibrations of all radiation survey instruments (IWL-HP-08).

9) Perform semiannual leak tests of all licensed sealed sources owned by Teledyne Isotopes.

10) Assure compliance with all effective licenses and apply for amendments and renewals in a timely manner as approved by the Radiation Safety Committee.

11) Formulate procedures for, revise, and maintain the Radiation Safety Code and Quality Control Manual.

12) Serves as technical advisor to Health & Safety Subcommittee of the Radiation Safety Committee. Provides liaison with the Radiation Safety Committee and submits recommendations for approval.

13) Approve all users of radioactive materials (IWL-HP-06).

14) The Company Health Physicist has the authority to shut down any operation involving the use of radioactive materials if he feels the continuation of such activities could pose a hazard to the health and well-being of the employees or the general public. The Radiation Safety Officer will have this authority when the company Health Physicist is unavailable.

15) The Radiation Safety Officer will review all survey and personnel monitoring data and report to the Radiation Safety Committee, at periods not exceeding one year, his recommendations to reduce exposure with respect to ALARA.

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I-3.3 Records

Records are maintained by the Health Physics Office on the following:

1) Licenses and license applications.

2) License inspection reports and responses.

3) Radiation history, past and present, on all Teledyne Isotopes personnel.

4) All requests for sources of ionizing radiation.

5) Waste disposal.

6) Surveys and recommendations.

7) Calibration results.

8) Surveys of all sealed sources.

I-3.4 Reference Material

1) Maintains a current file of all domestic and foreign regulations pertinent to activities under the various licensed activities.

2) Maintains a reference library of health physics, radiation protection and related measurement technology as required for support of licensed activities, license revisions, and expansion of business in related areas.

I-3.5 Professional Association

1) Maintains membership in appropriate local, state, national and international professional societies as required to remain current in development of radiation protection philosophy, regulation, and techniques, and to enhance Teledyne Isotopes' professional reputation and explore opportunities for future business.

## I-4.0 PROCEDURE FOR REVISING RADIATION SAFETY CODE AND QUALITY CONTROL MANUAL

To ensure that any procedure or form complies with all of the laws, rules, and regulations governing the safe handling of radioactive materials, a procedure whereby a person directly involved in the manipulation of the materials may submit a procedure or form for approval by the Radiation Safety Committee and the company Health Physicist must be followed. The following lists the steps to be followed to ensure such compliance.

### I-4.1 Writing a Procedure or Producing a Form

4.1.1 The person who writes the procedure will generally be the supervisor or manager of the area.

4.1.2 A general outline will be followed in the writing of a procedure as follows:

- General Information
- Detailed Procedures
- Conclusions (when necessary)
- Forms Used (Documentation)

4.1.3 The numbering system will be as follows:

1.0 General Information
1.1
1.1.2
1.1.2.1

1.2
1.2.1

1.3
1.3.1
1.3.2
1.3.2.1

2.0
2.1

etc. .....

Forms are numbered by IWL (Isotopes Westwood Laboratories), plus a two letter code designating the license area (e.g. RW=Radiological Waste) and a consecutive two or three digit serial number. Each page of each manual or procedure must be identified by a code which indicates the manual or procedure, the date of revision, and an indication of approval.

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I-4.2 Submission and Review

4.2.1 Once drafted, the procedure will be reviewed by the Department Manager with respect to general safety practices and fulfillment of objectives.

4.2.2 Once reviewed by the Department Manager, he will submit it to the company Radiation Safety Officer (R.S.O.) for review with respect to compliance with all the applicable laws, rules and regulations.

4.2.3 The R.S.O. will make any changes deemed necessary and return the draft to the Department Manager for review. This is done to ensure that any changes made will not appreciably alter the scope or purpose of the procedure.

4.2.4 The Manager will then submit the draft to the Executive Subcommittee. The Executive Subcommittee will make a determination on the draft and if acceptable, the Chairman of the R.S.C. will approve the draft. He will endorse the procedure to verify acceptance.

4.2.5 If the procedure does not meet with approval by the Executive Subcommittee, the changes will be made and resubmitted.

4.2.6 Upon final acceptance, the procedure and/or forms will be incorporated into the appropriate section of the Radiation Safety Code and Quality Control Manual.

4.2.7 Review of Radiation Safety Code and Quality Control Manual

The entire Radiation Safety Code and Quality Control Manual will be reviewed and approved by the R.S.C. at intervals not to exceed three years. Upon complete review and revision, all previously issued copies will be replaced. Significant interim changes will be issued for insertion into issued copies as they occur.

## SECTION II - GENERAL PROCEDURES FOR CONTROLLING RADIOACTIVE MATERIALS AND RADIATION EXPOSURES

This section deals with the general procedures for radiation protection which apply to the activities carried on under the several licenses currently in effect. Specific procedures relating to activities under particular licenses are included as sub-sections of Section III of this Manual.

## II-1.0 INDOCTRINATION OF PERSONNEL EXPOSED TO IONIZING RADIATION

### II-1.1 Company Policy on Matters Involving Radiation Exposure

Work performed under the various licensed activities treated in this manual require in some cases some degree of exposure to radiation by operating personnel. It is necessary, therefore, to classify these individuals in the population subgroup of occupational radiation workers. For individuals classified in this group, radiation exposure must be recorded on the employee's radiation exposure history while in the employ of Teledyne Isotopes.

### II-1.2 Indoctrination of Personnel

All persons starting to work with any radiation sources at Teledyne Isotopes are required to read this Radiation Safety Code and this is documented on Form IWL-HP-07. In addition, each employee is required to furnish as complete a history as possible of their training in the principles and practices of radiation protection. This is documented on Form IWL-HP-06. A basic radiation safety course is then presented to each employee. Included is the showing of a ten part film series entitled "The Story of Radiation", distributed by Training Resources, a division of Nuclear Support Services. The outline of this course is given on Form IWL-HP-07 and this form is used as documentation of the presentation. These records are kept in the person's health physics folder. Periodcally, lectures and films on radiation safety are shown to keep all personnel appraised of the necessity for safe operating procedures.

Form IWL-HP-06 is given to the supervisor of the employee who then fills in the section requesting authorization for the employee. This form is sent to the Radiation Safety Officer who will determine what additional training or monitoring is required for the employee to begin work utilizing radioactive materials.

Persons who through their work attitudes and habits show a disregard for safe operating procedures with radioactive material are recommended for transfer out of radiation work or, if such alternative work is not available, may be terminated from employment.

### II-1.3 Rights and Responsibilities of Radiation Workers and the Company Regarding NRC Licensed Activities

#### 1.3.1 Exposure History

All personnel starting to work with radiation at Teledyne Isotopes are required to supply their supervisor and the Health Physics Office as complete a radiation exposure history as available. Pursuant to 10 CFR PART 19.13(c), a worker may request his/her exposure history from a previous licensed employer.

Pursuant to 10 CFR PART 19.13(b), a worker may request, and each licensee (company) shall furnish annually, the radiation exposure that the worker has received.

When the company (licensee) is required pursuant to 10 CFR 20.405 to report to the NRC an exposure of an individual to radiation or radioactive material, the company (licensee) must also report to the individual.

1.3.2 Notification of Violations During Inspections

Pursuant to 10 CFR 19.14(b) the NRC inspector may consult privately with workers concerning matters of occupational radiation protection and other matters as deemed necessary by the inspector. During the course of these consultations, any worker may bring privately to the attention of the inspector, either orally or in writing, any past or present condition which he has reason to believe may have contributed to or caused any violation of the act, the regulations of PARTS 19, 20, and 21, or license condition, or any unnecessary exposure of any individual to radiation from licensed radioactive material under the licensee's control.

1.3.3 Notice of Violations, Adverse Conditions, or Potential Violations or Conditions Prior to an Inspection

If an employee becomes aware of any condition which may cause a violation of 10 CFR PARTS 19, 20, or 21 or a license condition or any unnecessary radiation exposure of an individual, the employee is responsible for the reporting of such a condition. The procedures for reporting can be found in Section II-1.3.4.

1.3.4 Procedure for Reporting Violations and/or Potential Violations

Upon noticing a suspected item of non-compliance as detailed in Section II-1.3.3, the individual is required to report the incident or condition according to the following procedures.

1.3.4.1 Supervisor Contact

The first person to be notified is the supervisor of the area in question. This notification is to be in writing and as detailed as possible.

The supervisor is then to take the necessary steps to follow up the report. If the problem is of sufficient severity, he will report it to the company Radiation Safety Officer.

1.3.4.2 Radiation Safety Officer Contact

The Radiation Safety Officer will be notified in writing by the individual if they feel the supervisor has not handled the situation in a prompt and efficient manner. This report is to be in writing and as detailed as possible.

The Radiation Safety Officer is then to take the necessary steps to follow up the report. If the problem is of sufficient severity, he will report it to the Radiation Safety Committee.

1.3.4.3 Radiation Safety Committee Contact

The Radiation Safety Committee will be notified in writing by the individual if they feel the R.S.O. has not handled the situation in a prompt and efficient manner. This report is to be in writing and as detailed as possible.

The R.S.C. is then to take the necessary steps to follow up the report. If in the estimation of the Radiation Safety Committee, the situation warrants it, they will notify the Nuclear Regulatory Commission. See 10 CFR 19.5 for whom to contact.

1.3.4.4 Nuclear Regulatory Commission Contact

The Nuclear Regulatory Commission will be notified in writing by the individual as detailed in 10 CFR 19.5 if he feels the Radiation Safety Committee has not handled the situation in a prompt and efficient manner. The report shall include appropriate identifying data such as the name of the licensee, the name of the individual, and a detailed description of the suspected violation.

1.3.4.5 Review of Reports on Violations

In all cases where the report reaches the Radiation Safety Committee, the actions required, the actions taken, and the results obtained will be kept with the minutes of the Radiation Safety Committee. If the report does not warrant the Radiation Safety Committee's review, it will be deemed of not sufficient importance and therefore no written record shall be required.

1.3.5 Requirement for Posting NRC "Notice of Violations"

If subsequent to an NRC inspection the licensee is given a "Notice of Violations", such notice must be posted in a conspicuous place for 5 days or until compliance is achieved, whichever period is longer.

## II-2.0 MEDICAL EXAMINATIONS AND EMERGENCIES

### II-2.1 Pre-Employment Medical Examination

New company personnel who will be exposed to, or potentially exposed to ionizing radiation may be required to submit to a medical examination at the discretion of the Company Health Physicist. The results of this examination become a part of each person's pre-employment record and is kept on file in the Personnel Department.

### II-2.2 Follow-Up Medical Examination

Routine medical examinations are not presently required for those persons who are working with ionizing radiation due to the low permissible limits and excellent detection methods now available for external and internal radiation protection. At present, physical methods of detection of radiation are much more sensitive than signs or symptoms of deleterious biological effects identifiable in a routine medical examination. However, if a person receives an exposure in any one quarter in excess of the radiation protection guide value but less than two times this value, then he may be required to take a medical examination at the discretion of the company Radiation Safety Officer or Company Health Physicist. If the exposure is in excess of two times the radiation protection guide value, a medical examination is mandatory.

### II-2.3 Termination Medical Examination

Persons who are leaving the employment of the company may be required to submit to a medical examination as directed by the Company Health Physicist or Radiation Safety Officer. A radiobioassay examination is required for all personnel having worked with ionizing radiation.

### II-2.4 Accidents Involving Radiation

Every incident involving exposure of company personnel to radiation in excess of the quarterly radiation protection guide value is classified as an accident and a report of the accident must be made to the Radiation Safety Committee by the Radiation Safety Officer. An accident involving exposure of company personnel to two times the quarterly radiation protection guide must be immediately reported to the Radiation Safety Committee and company President at the earliest practical date on its findings.

Every incident involving contamination of equipment and requiring disposal or decontamination in exceess of $100 or 1 man-day cleanup time must be investigated by the Radiation Safety Officer and a report made to the Radiation Safety Committee. Incidents with equipment losses in excess of $1,000 or 5 man-days for decontamination must be investigated by an Investigating Subcommittee appointed by the Radiation Safety Committee.

Reports to federal, state, county and city authorities as required by law are the responsibility of the company Radiation Safety Officer.

## II-2.5 Emergencies and Decontamination of Equipment

The Health Physics Office is equipped with the necessary tools and protective clothing to handle all foreseeable incidents on company property. Specially trained teams are available to handle most anticipated incidents involving company personnel and property.

## II-2.6 Fire

Every precaution must be taken by all personnel to eliminate the possibility of fire on company property. This involves personal habits in regard to smoking and housekeeping. All electrical connections and electrical equipment installation are made only with the approval of company Maintenance Department.

The presence of radioisotopes can complicate the control of a fire once started. Therefore, sources must not be left unattended except for standard sources used in instrument calibration containing an insignificant amount of activity (less than ten microcuries). Overnight, all sources except as noted must be locked in fire-resistant containers. Those sources under active preparation are excluded from this requirement as long as adequate safeguards are instituted and cleared with the Health Physics Office. Also excluded are those sources which are permanently mounted in a shielded source holder.

In case of a fire near or involving radioactive material, the person(s) must immediately alert the Radiation Safety Officer or company President who will call the local Fire Department and then notify Teledyne Isotopes personnel. In the case of restricted labs, reentry will not be made unless accompanied by a Health Physicist.

Fires at night in company buildings will be controlled by the local Fire Department, but company personnel will be alerted by the Fire Department and be present to direct them in fires involving radioactive material. The list of persons to call is included in Section II-3.4 and is posted in easily accessible locations at the front and rear entrances of the main building and radiological warehouse. The local Fire Department will be updated every three years with the location of different sources of radioactive material at our facility. An "Introduction to Radiation" training program will also be presented at these times.

## II-2.7 Security

All radioactive material misplaced, lost or stolen must be immediately reported to the Health Physics Office. An immediate investigation is made by this office to locate the radioactive material. If it is not immediately found, steps must be taken to alert other persons in the company to this fact as well as federal, state, county, and city officials as required by law.

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## II-3.0 LABORATORY PRACTICES IN THE SAFE HANDLING OF RADIOACTIVE MATERIALS

### II-3.1 Personnel Directives

3.1.1 Wear laboratory coats or other protective clothing at all times in areas where loose radioactive materials are used.

3.1.2 Wear disposable gloves at all times while handling loose radioactive materials.

3.1.3 Do not eat, drink, smoke, or apply cosmetics in any area where radioactive materials are stored or used.

3.1.4 Wear a TLD badge at all times if you have been assigned one. If you are entering an area where the suspected radiation levels can be in excess of .5 mR/hr., the entry will be posted that TLD badges are required. Please contact the Health Physics Office for a temporary TLD badge.

3.1.5 Confine radioactive materials in covered containers plainly identified and labeled with an identification number and if applicable, a "radioactive material" label bearing the radionuclide, activity, date and radiation level.

3.1.6 Always transport radioactive material in shielded containers if required by the character of radiation and strength of source.

3.1.7 Dispose of radioactive wastes only in specifically designated receptacles. See Section II-8.0 for packaging and disposal procedures.

3.1.8 Remove your lab coat when you leave an area where loose radioactive materials were used. No lab coats are to be worn outside the restricted areas.

3.1.9 Never pick up an unshielded radioactive container with your hands. Even short tongs may make a significant difference in exposure.

3.1.10 Remember the inverse square law:

$$\text{Dose Rate} = \frac{1}{d^2} \text{ where } d = \text{distance}$$

II-3.2 Minor Spills

3.2.1 Notify persons in the area that a spill has occured.

3.2.2 Cover the spill with absorbant material.

3.2.3 Use disposable gloves and remote handling tongs. Carefully fold the absorbant paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Also insert into the plastic bag all other contaminated materials such as disposable gloves.

3.2.4 Report the incident to the Radiation Safety Officer for followup survey.

II-3.3 Major Spills

3.3.1 Notify all persons not involved in the spill to vacate the room.

3.3.2 Cover the spill with absorbant material, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.

3.3.3 If possible, and warranted by the characteristics of the isotope(s) involved, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

3.3.4 Leave the room and lock the door(s) to prevent entry.

3.3.5 Notify the Radiation Safety Officer immediately.

3.3.6 Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

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## II-3.4 List of Persons to Call In Radiation Emergency

1) Person who is in charge of laboratory or area where emergency has occurred. This person's name will be on the radiation hazard sign for the laboratory area.

2) Radiation Safety Officer — Steven A. Black

   Office: (201) 664-7070 Ex. 228
   Home: (201) 967-8837

3) Alternate Radiation Safety Officer — Jeffrey Guenther

   Office: (201) 664-7070 Ex. 257
   Home: (201) 368-2163

4) Maintenance Engineer — Robert Pavese

   Office: (201) 664-7070 Ex. 205
   Home: (201) 262-4270

5) President - Chairman, Radiation Safety Committee — Donald F. Schutz

   Office: (201) 664-7070 Ex. 213
   Home: (201) 391-2790

6) Company Health Physicist — J.E. Ross, C.H.P.

   Office: (419) 625-7853
   Home: (419) 433-2378

TELEDYNE ISOTOPES

## II-3.5 Contamination Control Directives

3.5.1 Never consider the outside surface of the inner container of radioactive material to be free of contamination.

3.5.2 Always survey the inner container surface for contamination by taking a smear and checking it with the proper instrument.

3.5.3 Always use gloves and radiochemical hood when working with unsealed radioactive materials in excess of exempt quantities.

3.5.4 Never open a container unnecessarily without a definite purpose.

3.5.5 In transferring any liquids, the following steps must be taken:

a) Prepare a shallow tray by lining it with plastic-backed absorbant material.

b) Put the radioisotope container, the properly labeled receptacle and necessary tools into the tray.

c) Evaluate by calculation or measurement the extremity and whole body dose expected during the operation.

d) Consider that the radioisotope container top and the neck of the container is highly contaminated.

e) Perform the transfer operation in a hood wearing gloves and lab coat.

f) Remove and dispose of the absorbant liner, survey and dispose of or decontaminate any contaminated items.

g) Decontaminate the original container unless it is to be disposed of, seal it in a plastic bag and return it to storage.

3.5.6 Notify Health Physics whenever work is to be done with finely divided powders or especially hazardous substances.

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## II-4.0 ORDER, TRANSFER, RECEIPT AND SHIPMENT OF RADIOACTIVE MATERIALS

### II-4.1 Order

All purchase requests for radioisotopes must be forwarded to the Health Physics Office on a standard Teledyne Isotopes Purchase Requisition form and Form IWL-HP-04.

### II-4.2 Transfer

No radioisotope can be transferred from the user(s) as recorded on Form IWL-HP-04 for the specific radioisotope or radiation source unless another Form IWL-HP-04 is submitted and approved indicating the new user(s), use, and location of the radioisotope.

### II-4.3 Receipt

All incoming radioactive material must be checked and recorded by the Health Physics Officer or designated representative on Form IWL-HP-05. Prior to delivery of radioisotopes from the Receiving Department to a user, the shipment must be checked by the Health Physics Office.

### II-4.4 Shipment

Shipment of all radioactive material is under the supervision of the Health Physics Office. Each shipment must be checked and approved by the Health Physics Office on Form IWL-HP-05. Shipment procedures are dealt with in detail in subsections on Radiological Waste Disposal License (NRC License #29-00055-14), State of New Jersey License (#10123), TeleTrace License (NRC License #29-00055-02), Source Material License (NRC License #SUB-1235), and Special Nuclear Material License (NRC License #SNM-107), and Export Licenses.

# II-5.0 PERSONNEL MONITORING

## II-5.1 External Dosimetry

Every employee of, and visitor to, Teledyne Isotopes laboratories and plants must wear personnel monitoring devices such as TLD badges and/or pocket dosimeters if their work or tour involves entry to radiologically controlled areas containing sources of penetrating radiation.

Radiologically controlled areas are defined as specified by Part 20 of Title 10 of the Code of Federal Regulations and consist of the following areas:

| | | |
|---|---|---|
| Environmental Analysis Standard Solution Storage Room | - | Provisions of NRC License #29-00055-06 |
| Laboratory Room 88 | - | Provisions of NRC License #SNM-107 |
| Metals Processing & Nuclear Fuels Laboratory | - | Provisions of NRC Licenses #29-00055-15, SUB-1235 and SNM-107 |
| Source Room | - | Provisions of NRC Licenses #29-00055-02 and #29-00055-06 |
| Warehouse | - | Provisions of NRC License #29-00055-14 and NJ License #10123 |

A list of those persons monitored by TLD badges is maintained by the Health Physics Office. The TLD badges are read out by Teledyne Isotopes Badge Service Department.

Quality Control of TLD dosimetry is set forth in the TLD Personnel Badge Service Quality Control Manual (IWL-0342-416) and TLD Badge Service Quality Assurance Manual (IWL-0792-442).

## II-5.2 Internal Dosimetry

Some radioisotopes do not emit radiation capable of penetrating 1 millimeter of tissue but are extremely toxic if taken internally. In this case, the standard monitoring technique is to analyze urine, feces, breath or blood of the person exposed to the particular radioisotope. This analysis is called bioassay and approximate equations permit an estimate of the internal body burden and whole body dose.

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Bioassay samples are collected from all Teledyne Isotopes personnel working with alpha emitters, carbon-14, hydrogen-3 (tritium) and such other radioisotopes as indicated by the Health Physics Office on a quarterly basis. Whole or partial body counts can also be used to estimate the body burden. Direct thyroid counting is done on employees using quantities in excess of 0.1 mCi of any of the iodine isotopes. Bioassays for company personnel are carried out under the same procedures and controls employed for commercial service under Clinical Laboratory License #29-1012 by the New Jersey and New York State Departments of Health.

Procedures are set forth in the Environmental Analysis Analytical Procedures Handbook (IWL-0032-419) with Quality Assurance as set forth in Section IV of IWL-0052-420, Radiocarbon Age Determination Quality Control Procedures. Bioassays are also performed in the Health Physics Department under the Health Physics Analytical Procedures Handbook (IWL-0312-452) with Quality Assurance according to Section IV of the Radiation Safety Code and Quality Control Manual (IWL-0312-451).

## II-6.0 SURVEYS

All areas where Teledyne Isotopes personnel work with significant quantities of ionizing radiation are surveyed by the Health Physics Office on a routine basis (generally weekly or monthly). Depending on the nature of the radiation emitted and the level of radioactivity, the area is checked for external radiation as well as airborne and surface contamination.

### II-6.1 Area Surveys

Areas are checked with the properly calibrated instrument for intensity of external radiation. In addition, smears are taken on all accessible surfaces to check for transferable radioactivity. Particulate air and gas samples are collected with the appropriate sampling device to check for airborne contamination when required. The operation of all safety devices incorporated in laboratories and work areas for safe work with ionizing radiation such as interlocks, hoods and area radiation alarms are periodically checked as well. If the results of these surveys are in excess of the contamination levels listed in Section II-6.3, the person responsible for the area is notified. A copy of the Health Physics Survey is kept in the Health Physics Office for future references. Non-compliance with these recommendations is cause for removal from work with sources of ionizing radiation in Teledyne Isotopes facilities.

### II-6.2 Decontamination

Periodically, areas will become contaminated with radioactive material. The above-mentioned periodic surveys attempt to control this contamination hazard but will not eliminate it. Therefore, the Health Physics Office is equipped with decontamination clothing, face masks, tools, and cleaning solutions to assist in the decontamination of equipment and buildings in case the need arises. In most cases, the Health Physics Office will merely supervise the decontamination operation because of the educational value of decontamination experience by personnel responsible for the contamination. Request for permission to deviate from this rule must be made to the Health Physics Office.

### II-6.3 Survey Review

All survey results are reviewed by the Radiation Safety Officer or, in his absence, the Alternate R.S.O. Results are evaluated according to the action limits designated in this document. Items found to be in excess of 25% of these limits will be reported to the laboratory manager. Items in excess of 50% will be decontaminated as soon as practicable.

## II-7.0 INSTRUMENT CALIBRATION

### II-7.1 General

On each company instrument a label must be placed indicating date of calibration, instrument serial number, and persons doing the calibration. Instrument calibration records traceable to NBS standardized sources are maintained by the Health Physics Office (Form IWL-HP-08).

Each scale of the instrument is calibrated using two points. One point is in each half of the scale and they are separated by approximately 35% of the full scale. Log scale instruments are calibrated with one point near the mid-point of each scale. All instruments used must read within ± 10% of the calculated or known calibration point. If the reading cannot be adjusted within ± 10% but is within ± 20%, the instrument will not be used unless a graph indicating the actual value is attached. If the reading is off by more than ± 20%, the instrument will be declared out of service and repaired.

A reference check source with a specific geometry shall be utilized after calibration, before use, after use, after maintenance and after a battery change. If the reading differs by more than the ± 20% of the reading measured after calibration, the instrument will be recalibrated.

### II-7.2 Gamma Calibration

All gamma sensitive radiation survey instruments are calibrated quarterly utilizing standard sources traceable to NBS. The sources are approximate point sources.

### II-7.3 Beta Calibration

All instruments used to measure beta radiation during radiation surveys are calibrated quarterly with sources traceable to NBS.

### II-7.4 Alpha Calibration

All instruments used to measure alpha radiation during radiation surveys are calibrated quarterly with sources traceable to NBS.

### II-7.5 Frequency of Calibration

All survey instruments are calibrated on a quarterly basis.

### II-7.6 Standards

The standards utilized depend on the radiation to be detected. Generally, we use Cs-137, Co-60, Tc-99 or Pu-239 sources. All standards are traceable to NBS.

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## II-8.0 RADIOACTIVE WASTE PACKAGING & DISPOSAL

Radioactive waste materials are disposed of by the Radiological Services Department in accordance with all federal, state and local regulations. The generators of the waste are trained in the proper method of packaging the waste and then tested on their knowledge to ensure compliance. The materials will be packaged using the "Classification of Radioactive Waste to be Packaged for Shipment" as a guide, and in conformance with the "Packaging Procedure for Radioactive Waste".

### II-8.1 Training and Retraining of Personnel Involved With the Safe Packaging of Radioactive Material

Any person engaged in the preparation of waste for disposal must be properly trained in all the DOT, NRC and burial site requirements for proper packaging. The training program is as follows:

8.1.1 Each person is given a copy of the current Radiation Safety Code and Quality Control Manual. He is to study these procedures (II-8.2 and II-8.3) and then be tested on his knowledge of the material using form IWL-RW-231, "Packaging of Radioactive Waste Examination".

8.1.2 Subsequent to the examination, each person will be physically supervised in the proper classification and packaging of waste in his area. Using Form IWL-RW-206, the supervisor will document such on-the-job training.

8.1.3 When the supervisor is satisfied the person has demonstrated a complete understanding of the procedures, he will notify the Radiation Safety Officer, who will authorize the individual to perform these procedures unsupervised and will document this on Form IWL-RW-206.

8.1.4 Retraining of the individual in the most current DOT, NRC, and burial site packaging requirements is to be performed at a maximum six-months interval unless significant changes require immediate review. Retraining and review will be documented using Form IWL-RW-206, or by filing a memorandum in each trainee's training folder.

## II-8.2 Classification of Radioactive Waste to be Packaged for Shipment

### 8.2.1 Characteristics of Material to be Packaged

Isotope
Activity (mCi)
Physical State (solid, liquid, vials, animal carcasses, biological matter or gaseous)
Concentration (mCi/gram)
$A_1$, $A_2$ Values
Form (Normal or Special)

### 8.2.2 Type of Material (Proper Shipping Name and UN ID Number)

Radioactive Material, Limited Quantity, n.o.s. (UN2910)
Radioactive Material, Low Specific Activity or LSA, n.o.s. (UN2912)
Radioactive Material, n.o.s.(UN2982)
Radioactive Material, Special Form, n.o.s. (UN2974)
Radioactive Material, fissile, n.o.s. (UN2918)
Radioactive Material, Instruments & Articles (UN2911)
Thorium Nitrate (UN2976)
Uranyl Acetate (RQ-5000/2270) (NA9180)
Uranyl Nitrate, solid (RQ-5000/2270) (UN2981)

### 8.2.3 Determination of Shipment Specification

What specification container is required.
What labels are required.
Whether a security seal is needed or not.
mR/hr limits @ contact.
Additional requirements.

| MATERIAL DESCRIPTION | CONTAINER TYPE | LABEL REQUIRED | SECURITY SEAL REQUIRED | INTERNAL PACKAGING REQUIRED | mR/hr LIMITS @ CONTACT | COMMENTS |
|---|---|---|---|---|---|---|
| (DSM) DRY SOLID MATERIAL | | | | | | |
| a. Radioactive Material, LSA, n.o.s. (exclusive-use) | Unspecified | Radioactive-LSA | no | Unspecified | 0-200.0 | |
| b. Radioactive Material, Limited Quantity, n.o.s. | Unspecified | Radioactive | no | Unspecified | 0-0.5 | mR/hr limits @ contact 0-2.0 if shipped exclusive-use |
| c. Radioactive Device, n.o.s. | Unspecified | Radioactive | no | Unspecified | 0-2.0 | |
| d. Radioactive Material, n.o.s. | DOT 7A-Type A | Radioactive White I | yes | Braced | 0-0.5 | Require weight printed on outside of package when in excess of 110 lbs. |
| | | Radioactive Yellow II | yes | Braced | 0.5-50.0 | |
| | | Radioactive Yellow III | yes | Braced | 50.0-200.0 | |
| e. Radioactive Material, special form, n.o.s. | DOT 7A-Type A | Radioactive White I | yes | Braced | 0-0.5 | Require weight printed on outside of package when in excess of 110 lbs. |
| | | Radioactive Yellow II | yes | Braced | 0.5-50.0 | |
| | | Radioactive Yellow III | yes | Braced | 50.0-200.0 | |
| (SVL) SMALL VOLUME LIQUIDS | | | | | | |
| a. Radioactive Material, LSA, n.o.s. (exclusive-use) | DOT 7A-Type A | Radioactive-LSA | no | *See Instructions | 0-200.0 | |
| b. Radioactive Materials, n.o.s. | DOT 7A-Type A | Radioactive White I | yes | *See Instructions | 0-0.5 | Require weight printed on outside of package when in excess of 110 lbs. |
| | | Radioactive Yellow II | yes | *See Instructions | 0.5-50.0 | |
| | | Radioactive Yellow III | yes | *See Instructions | 50.0-200.0 | |
| (DWLVL) LARGE VOLUME LIQUIDS | | | | | | |
| a. Radioactive Material, LSA, n.o.s. (exclusive-use) | DOT 7A-Type A | Radioactive-LSA | no | *See Instructions | 0-200.0 | |
| b. Radioactive Material, n.o.s. | DOT 7A-Type A | Radioactive White I | yes | *See Instructions | 0-0.5 | Require weight printed on outside of package when in excess of 110 lbs. |
| | | Radioactive Yellow II | yes | *See Instructions | 0.5-50.0 | |
| | | Radioactive | yes | *See Instructions | 50.0-200.0 | |
| (DWAC) DOUBLE WALLED ANIMAL CARCASSES | | | | | | |
| a. Radioactive Material, LSA, n.o.s. (exclusive-use) | DOT 7A-Type A | Radioactive-LSA | no | *See Instructions | 0-200.0 | |
| b. Radioactive Material n.o.s. | DOT 7A-Type A | Radioactive White I | yes | *See Instructions | 0-0.5 | Require weight printed on outside of package when in excess of 110 lbs. |
| | | Radioactive Yellow II | yes | *See Instructions | 0.5-50.0 | |
| | | Radioactive Yellow III | yes | *See Instructions | 50.0-200.0 | |

*SPECIAL NOTE ON SMALL VOLUME LIQUIDS: Scintillation Vials and fluids must be packaged separately from all other small volume liquids.

NOTE: n.o.s. means: "not otherwise specified."

IWL-0372-451

RSC/QCM 4.80

Date Approved

Rev'd:

Revs'd: 4/84

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## II-8.3 Packaging Procedures for Radioactive Waste

### 8.3.1 General

8.3.1.1 Seven Categories

- Dry Solid Material (DSM)
- Small Volume Liquids (SVL) Scintillation vials only
- Small Volume Liquids (SVL) Other than scintillation vials
- Large Volume Liquids (DWLVL) 50 ml or greater
- Animal Carcasses (DWAC) or biological waste
- Liquid Special Nuclear Material (LSNM)
- Dry Solid Compactibles (DSC)

8.3.1.2 Items in different categories cannot be mixed.

8.3.1.3 The packaging procedure that is used is to be marked on the drum (e.g. DSM-4/84).

8.3.1.4 Transuranic and Ra-226 waste in excess of 10 nanocuries per gram is not acceptable. (See the burial site's license for more details.)

8.3.1.5 Gaseous tritium waste must meet certain provisions. Please see the burial site's license for details or call the Radiological Services Department Office.

8.3.1.6 Special Nuclear Material requires specific approval and will be accepted only upon special request to the Radiological Services Department Office.

8.3.1.7 Liquid Special Nuclear Material (LSNM) additionally requires that the material be solidified. See SNM Liquid Packaging Procedures.

8.3.1.8 DO NOT EXCEED THE FOLLOWING WEIGHTS:

30 gallon container - 280 lbs.
55 gallon container - 480 lbs.

8.3.1.9 Special Note:

The chemical composition of the materials disposed must be compatible with the procedures which follow. Any additional hazards of the material must be evaluated to determine if additional treatment of packaging is required.

8.3.2 Dry Solid Material (DSM-4/84)

8.3.2.1 Select a 5, 30 or 55-gallon drum.

8.3.2.2 Fill to capacity with only dry solid materials. Do not exceed the following weights: 100, 280 or 480 lbs. respectively for 5, 30 and 55-gallon drums.

8.3.2.3 Secure drum cover.

8.3.2.4 Label drum DSM-4/84, to designate that the drum has been packaged according to these directions.

8.3.3 Small Volume Liquid Waste (SVL-4/84), Scintillation Vials or Other SVL's

Liquid should not be absorbed directly onto the absorption media (e.i. do not open vials). Any tool or device which contains any amount of liquid (e.g. syringes or test tubes) must be considered small volume liquid waste.

8.3.3.1 Select only a 30 or 55-gallon drum; 5-gallon pails are not allowed.

8.3.3.2 Line the drum with 4 ml thick poly liner. (See special notes following this section.)

8.3.3.3 Using an approved absorbant, alternate layers of absorbant with layers of waste. (See special notes following this section.)

8.3.3.4 Twist and seal liner.

8.3.3.5 Secure drum cover.

8.3.3.6 Label drum SVL-4/84, to designate that the drum has been packaged according to these instructions.

8.3.3.7 Special Notes

Two 2 ml liners may be used in place of a single 4 ml liner.

Instead of lining the whole drum, individual 4 ml (or double 2-ml) bags may be substituted, provided each bag is layered as above.

See burial site's license for a current list of approved absorbants.

When layering, the absorbant must be the first layer on the bottom and the last layer on the top. Proper volume ratios must be determined by generator to be used for the different absorbants.

The amount of absorbant must be capable of absorbing twice the amount of liquid present.

8.3.4 Large Volume Liquid Waste (DWLVL-4/84)

All items containing 50 ml or more of liquid may not be disposed in an SVL drum. The liquid must be packaged as follows while the container itself must be either (1) dried and placed in a DSM drum or (2) placed in an SVL drum once the bulk of the liquid is removed.

8.3.4.1 Select only the 55-gallon double-walled container for liquid waste.

8.3.4.2 Remove the 55-gallon drum cover.

8.3.4.3 Loosen and remove the bung from the 30-gallon drum which has been filled with Zonolite #4.

8.3.4.4 Pour up to 10 gallons of liquid (ph-6.0 - 9.0) into the absorbant in the 30-gallon drum through the 2-1/2" opening.

8.3.4.5 Replace bung and tighten.

8.3.4.6 Twist and seal poly liner.

8.3.4.7 Secure cover of 55-gallon drum.

8.3.4.8 Label drum DWLVL-4/84 to designate that the drum has been packaged according to these instructions.

8.3.5 Animal Carcasses or Biological Waste (DWAC-4/84)

Animal carcasses or biological waste must be disposed using a double-walled container. Be sure when ordering to specify a 55-gallon double-walled container for animal carcasses.

8.3.5.1 Select only a 55-gallon double-walled drum.

8.3.5.2 Remove inner 30-gallon container and absorbant.

8.3.5.3 Line 30-gallon drum with 4 ml poly liner. See Section 8.2.3.7.

8.3.5.4 Package waste into liner using at least one part slaked lime for every 10 parts of absorbant. See approved absorbant list in Section 8.3.3.7. Fill completely.

8.3.5.5 Twist and seal liner.

8.3.5.6 Seal 30-gallon drum.

8.3.5.7 Place 30-gallon drum into 55-gallon drum.

8.3.5.8 Place absorbant around and covering 30-gallon drum.

8.3.5.9 Secure 55-gallon drum cover.

8.3.5.10 Label drum DWAC-4/84 to designate that drum has been packaged according to these instructions.

8.3.6 Liquid Special Nuclear Material (LSNM-4/84)

8.3.6.1 Select a 30-gallon or 55-gallon DOT 17H container.

8.3.6.2 Line the drum with a 4 ml poly liner.

8.3.6.3 Solidify the liquid using an approved solidification media. See the burial site's license for an updated list.

8.3.6.4 Place solidified waste into the container.

8.3.6.5 Secure drum cover.

8.3.6.6 Label drum LSNM-4/84 to designate that the drum has been packaged according to these instructions.

8.3.7 Dry Solid Compactibles (DSC-4/84)

8.3.7.1 Select a 5, 30 or 55 gallon container.

8.3.7.2 Place waste into double 4 mil plastic liners. (Note: For 55 gallon drums, use two sets of double 4 mil bags, each set approximately 27 gallons.)

8.3.7.3 Twist and seal liners.

8.3.7.4 Place double 4 mil bags into the selected container.

8.3.7.5 Replace lid and ring.

8.3.7.6 Secure ring. DO NOT BOLT.

8.3.7.7 Label drum DSC-4/84 to indicate it was packaged in accordance with these instructions.

NOTE: UPON SPECIFIC APPROVAL IN WRITING FROM TELEDYNE ISOTOPES MANAGER, RADIOLOGICAL SERVICES DEPARTMENT, FIBERBOARD DRUMS MAY BE USED TO PACKAGE THIS TYPE OF WASTE ONLY.

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## II-9.0 INTERSTATE OPERATIONS

From time to time Teledyne Isotopes will engage in activities involving the use of radioisotopes in Agreement States. A list of such states is included in Table 9.0 for reference so that appropriate regulations can be consulted regarding interstate operations.

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TABLE II-9.0

LICENSING OFFICIALS IN AGREEMENT STATES

ALABAMA (205-261-5313)

Mr. Aubrey Godwin, Director
Bureau of Radiological Health
State Department of Public Health
Room 510, State Office Building
Montgomery, AL 36130

ARIZONA (602-255-4845)

Mr. Charles F. Tedford, Dir.
Arizona Radiation Regulatory Agency
925 South 52nd Street, Suite 2
Tempe, AZ 85281

ARKANSAS (501-661-2301)

Mr. Frank Wilson
Director
Division of Environ. Protection
Department of Health
4815 West Markham Street
Little Rock, AR 72201

CALIFORNIA (916-322-2073)

Mr. J. Ward, Chief
Radiological Health Section
State Department of Public Health
714 P Street, Building 498
Sacramento, CA 95814

COLORADO (303-320-8333)

Mr. A. J. Hazle, Director
Radiation and Hazardous Waste
Control Division
Department of Health
4210 East 11th Avenue
Denver, CO 80220

FLORIDA (904-487-2437)

Dr. Lyle E. Jerrett
Director
State of Florida
Department of Health &
Rehabilitative Services
Radiological Health Program
1323 Winewood Boulevard
Tallahassee, FL 32301

GEORGIA (404-894-5795)

Mr. Bobby G. Rutledge, Director
Radiological Health Unit
Department of Human Resources
State Office Building
47 Trinity Avenue
Atlanta, GA 30334

IDAHO (208-334-4107)

Mr. Robert Funderburg, Supervisor
Radiation Control Section
Idaho Department of Health & Welfare
Statehouse
Boise, ID 83720

KANSAS (913-862-9360 Ex. 284)

Mr. Gerald W. Allen, Chief
Materials Licensing & Control Section
Department of Health & Environment
Forbes Field, Building 740
Topeka, KS 66620

KENTUCKY (502-564-3700)

Mr. Donald Hughes, Manager
Radiation Control Branch
Department of Human Resources
275 East Main Street
Frankfort, KY 40621

LOUISIANA (504-925-4518)

Mr. William Spell, Administrator
Department of Natural Resources
Office of Environmental Affairs
Nuclear Energy Division
PO Box 14690
Baton Rouge, LA 70898

MARYLAND (301-383-2744)

Mr. Robert E. Corcoran, Chief
Division of Radiation Control
Department of Health &
Mental Hygiene
201 West Preston Street
Baltimore, MD 21201

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| | Date | Approved |
|---|---|---|
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| Revs'd: | 5/24/85 | |

MISSISSIPPI (601-354-6657/6670)

Mr. Eddie Fuente, Director
Division of Radiological Health
State Board of Health
Felix J. Underwood
2423 North State Street, PO Box 1700
Jackson, MS 39205

NEBRASKA (402-471-2168)

Mr. Julius E. Haes, Jr.
Division of Radiological Health
Department of Health
201 Centennial Mall, South
PO Box 95007
Lincoln, NE 68509

NEVADA (702-885-4750)

Mr. John Vaden, Supervisor
Radiological Health
State Department of Human Resources
Capital Complex, Rm. 103 Kinkead Bldg.
Carson City, NV 89701

NEW HAMPSHIRE (603-271-4587)

Ms. Diane Tefft, Program Mgr.
State Radiation Control Agency
Health & Welfare Building
Hazen Drive
Concord, NH 03301

NEW MEXICO (505-984-0020)

Dr. Thomas Buhl, Chief
Environmental Improvement Div.
Radiation Bureau
PO Box 968
Sante Fe, NM 87504-0968

NEW YORK (518-474-2178)

Mr. Jay Dunkleberger, Director
Bureau of Nuclear Operation
NY State Energy Office
Agency Building 2
2 Rockefeller Plaza
Albany, NY 12223

NORTH CAROLINA (919-733-4283)

Mr. Dayne H. Brown, Director
Radiation Protection Section
Division of Facility Service
Box 12200
Raleigh, NC 27605

NORTH DAKOTA (701-224-2348)

Mr. Dana Mount, Director
Div. of Environmental Engineering
Radiological Health Program
State Department of Health
1200 Missouri Avenue
Bismarck, ND 58501

OREGON (503-229-5797)

Mr. Ray Paris, Manager
Radiation Control Section
Department of Human Resources
1400 South West Fifth Avenue
Portland OR 97201

RHODE ISLAND (401-277-2438)

Mr. James E. Hickey, Chief
Div. of Occupational Health
& Radiation Control
Rhode Island Dept. of Health
Cannon Building
75 Davis Street
Providence, RI 02908

SOUTH CAROLINA (803-758-5548)

Mr. Heyward Shealy, Chief
Bureau of Radiological Health
State Department of Health &
& Environmental Control
J. Marion Sims Building
2600 Bull Street
Columbia, SC 29201

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| Revs'd: | 5/24/95 | |

TELEDYNE ISOTOPES

TENNESSEE (615-741-7812)

Mr. Michael H. Mobley, Director
Division of Radiological Health
Department of Public Health
Cordell Hull State Office Building
Nashville, TN 37219

TEXAS (512-835-7000)

Mr. David K. Lacker, Chief
Radiation Control Branch
Division of Occupational
Health & Radiation Control
Texas Department of Health
1100 West 49th Street
Austin, TX 78756

UTAH (801-533-6734

Mr. Larry Anderson, Director
Bureau of Radiation Control
State Department of Health
150 W. North Temple, Box 2500
Salt Lake City, UT 84110

WASHINGTON (206-753-3459)

Mrs. Nancy Kirner, Supervisor
Radiation Control Program
Department of Social and
Health Service
MS LD-11, Airdustrial Park
Olympia, WA 98504

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| | Date | Approved |
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| Revs'd: | 5/24/85 | |

TELEDYNE ISOTOPES

## II-10.0 FORMS

All forms referenced in Section I and II follow. Forms referenced in Sections III-1.0 through III-11.0 can be found at the end of each individual section.

| IWL FORMS | TITLE |
|---|---|
| IWL-HP-04 | Purchase Isotopes |
| IWL-HP-05 | Shipping/Receiving Form |
| IWL-HP-06 | User Request |
| IWL-HP-07 | Basic Indoctrination |
| IWL-HP-08 | Calibrations |
| IWL-HP-11 | Radiation History |
| IWL-HP-18 | List of Instruments |
| IWL-RW-206 | Retraining in Regard to Processing Generated Waste |
| IWL-RW-231 | Pack. of RADWASTE Exam Pg.1 |
| IWL-RW-231A | Pack. of RADWASTE Exam Pg.2 |

TELEDYNE ISOTOPES

# APPLICATION FOR RADIATION SOURCE(S)

Name _____ Date _____

Building _____ Position _____

Isotope(s) _____ Telephone Number _____

Quantity(ies) _____ Chemical Form _____

Present Inventory _____ Physical Form _____

Location of Use (Bldg. & Rm.) _____ Location of Storage _____

Proposed use (activity levels, special hazards, method of disposal of wastes, safety measures) Attach supplementary sheet if necessary.

_____

_____

_____

_____

Applicant's training and experience (relevant to use of radioisotopes):

_____

_____

Radiation detection instruments, facilities, and equipment that will be used:

_____

The applicant agrees to abide by the letter and spirit of all applicable regulations as recorded in Isotopes, Inc. Radiation Safety Code.

_____

Applicant's Signature

---

For Use of Health Physics Office Only

Comments of Health Physics Office _____

_____

Decision: _____

Date: _____ Signature _____

Please complete and return with Purchase Request to: Health Physics Office

RSC/QCM 4.80 Date Approved

Rev'd: 9/27/ _____

Revs'd: _____ _____

IWL-HP-04

TELEDYNE ISOTOPES

# SHIPPING/RECEIVING SURVEY RECORD

A. Shipment Data

Date Shipped _____ Date Received _____

From _____

To _____

Via _____

Owner of Transport _____

Type of Package _____

Approximate Size _____

B. DOT Label Information

Class I, II, III (circle)

Radioactive Contents _____

Activity of Contents _____

Transport Index (Radiation dose rate @ 3 ft. from package) Maximum 10 mR/hr.

_____

C. Health Physics Office Survey Data

Reading at Contact _____

Reading at 3 ft. _____

Instrument _____

Smear Survey _____

DOT Label Attached _____ Yes _____ No _____

Surveyed by _____

Date _____



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| | Date | Approved |
|---|---|---|
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| Revs'd: | | |

TELEDYNE ISOTOPES

# USER REQUEST FORM

TO BE FILLED OUT BY INDIVIDUAL

Name _____ Social Security No. _____

Birth Date _____

Training:

Highest level of education completed _____

| Type of Training | Where Trained | Duration of Training | On the Job | Formal Course |
|---|---|---|---|---|
| a. Principles and practices of radiation protection. | | | Yes No | Yes No |
| b. Radioactive measurement standardization and monitoring techniques and instruments. . . | | | Yes No | Yes No |
| c. Mathematics and calculations basic to the use and measurement of radioactivity . . . . | | | Yes No | Yes No |
| d. Biological effects of radiation . . . . . | | | Yes No | Yes No |

EXPERIENCE WITH RADIATION (Actual use of radioisotopes or equivlant experience)

| ISOTOPE | MAXIMUM AMOUNT | WHERE EXPERIENCE WAS GAINED | DURATION OF EXPERIENCE | TYPE OF USE |
|---|---|---|---|---|
| | | | | |

TO BE FILLED OUT BY SUPERVISOR

Radiation work for which authorization is sought _____

Isotopes: _____ Physical and Chemical Form _____

Activity _____ Supervisor Requesting Authorization _____

Date: _____

TO BE FILLED OUT BY THE HEALTH PHYSICS DEPT.

Health Physics Comments _____

TLD Badge Required _____ Yes _____ No

Bioassay Required _____ Yes _____ No

Type _____ Analysis _____ Frequency _____

Authorization Date _____ By _____

Radiation Safety Officer

Copies of this form are to be distributed as follows:

Health Physics

TLD Badge Service (If checked above)

Original form to be returned to Personnel Department

RSC/QCM 4.80 Date Rev'd: 12/2/82 Revs'd: _____ Approved _____

Form TWC-HP-04

TELEDYNE ISOTOPES

RSC/QCM 4.80

| | Date | Approved |
|---|---|---|
| Rev'd: | | |
| Revs'd: | 5/83 | |

# BASIC HEALTH PHYSICS TRAINING COURSE

Name _____ Length of Course _____

Presented by _____ Test _____

## Course Outline

I. Introduction

- A. Electromagnetic Spectrum
- B. Ionizing Radiation
  - 1) Alpha
  - 2) Beta
  - 3) Gamma
  - 4) X-rays
- C. Radiation in the Environment

II. History of Uses

- A. Consumer Products
- B. Medical
- C. Industry

III. Nuclear Constituents, Properties & Production

- A. Alpha Particles
- B. Beta Particles
- C. Fission
- D. Gamma & X-rays

IV. History of the Atom

- A. Democritus
- B. Modern Theory
- C. Applications for Radiation

V. Radiation Protection

- A. Monitoring Instrumentation
  - 1) Film badges
  - 2) Thermoluminescent dosimeters
  - 3) Portable survey meters
  - 4) Bioassay
- B. Effects
  - 1) Chemical change
  - 2) Biological
  - 3) High doses
  - 4) Low doses
  - 5) Incidence of disease
- C. Cause & Effect Relationships
- D. Risk Assessment
- E. Regulations
  - 1) ICRP
  - 2) NCRP
  - 3) Discussion of Lauristan Taylor
- F. Organizational Groups
- G. Prenatal Exposure: - Regulatory Guide 8.13

I have received the training outline above, read the Radiation Safety Manual and Regulatory Guide 8.13 "Instruction Concerning Prenatal Radiation Exposure", and understand its implications. Any questions I may have had were answered to my satisfaction.

Employee's Signature _____ Date _____

Remarks: _____

# CERTIFICATE OF CALIBRATION

TELEDYNE ISOTOPES
50 Van Buren Ave., Westwood, N.J. 07675
(201) 664-7070 Telex: 134-47

Instrument _____

Serial No. _____

Type of Source _____

| RANGE | CALIBRATION POINT | READING |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

_____ Dose rates were determined with a Victoreen condenser R-Meter with calibration traceable to the National Bureau of Standards.

_____ Measurements were determined on electroplated disk sources with certification traceable to the National Bureau of Standards.

Date _____ * Calibrated by _____

Approved by _____

RSC/QCM 4.80 Date Approved
Rev'd: _____ _____
Revs'd: _____ _____

IWL-HP-08

TELEDYNE
ISOTOPES
50 VAN BUREN AVENUE
WESTWOOD, NEW JERSEY 07675
(201) 664-7070
TELEX 134474 TDYISOT WTWD

# SUMMARY REPORT OF RADIATION EXPOSURE DOSE

TO:

In accordance with the provisions of 10 CFR Part 20 "Standards for Protection Against Radiation" the following information concerning the radiation exposure history of _____, Social Security Number _____ is given.

Our records show that the person identified above was with Teledyne Isotopes during the period _____ to _____ and received a whole body radiation exposure during this period of _____ rem. To our knowledge, there were no overexposures to the (1) whole body; (2) skin of the whole body; or (3) hands and forearms; or (4) feet and ankles during this period.

Significant bioassay data (if any) is summarized by an attached report.

I certify that the exposure history above is correct and complete to the best of my knowledge and belief.

TELEDYNE ISOTOPES

IWL-HP-18

RADIATION DETECTION INSTRUMENTATION

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Rev'd:
Revs'd:

The following instruments are currently available for field use or laboratory counting as Radiation Protection devices:

| MANUFACTURER'S NAME | DESCRIPTION | MODEL NO. | NO. AVAILABLE | TYPE RADIATION DETECTABLE | RANGE | WINDOW THICKNESS | USE |
|---|---|---|---|---|---|---|---|
| Eberline | Lin-Log Gas Proportional Alpha Counter | PAC-4G FM-4G | 3 | alpha beta | 0-500,000 cpm | Aluminized Mylar 0.85 mg/cm$^2$ | Surveying Floor Surveying |
| Eberline | Lin-Log Gas Proportional Alpha Counter | PAC-4G-3 | 1 | tritium beta alpha | 0-500,000 cpm | Aluminized Mylar 0.85 mg/cm$^2$ | Surveying |
| Eberline | Beta-Gamma Survey Meter | E-120 | 4 | alpha beta gamma | 0-50 mR/hr | Mica 1.4 to 2 mg/cm$^2$ | Surveying |
| Eberline | Gamma Radiographic Survey Meter | E-120G | 1 | gamma | 0-1000 mR/hr | none | Surveying |
| Eberline | Gamma Radiographic Survey Meter | E-130G | 3 | gamma | 0-1000 mR/hr | none | Surveying |
| Eberline | Beta-Gamma Survey Meter | E-530 | 1 | alpha beta gamma | 0-200 mR/hr | Mica 1.4 to 2.0 mg/cm$^2$ | Surveying |
| Eberline | Beta-Gamma Survey Meter | E-140 | 2 | alpha beta gamma | 0-50 mR/hr | Mica 1.4 to 2.0 mg/cm$^2$ | Surveying |
| Victoreen | Ion Chamber Survey Meter | V-440/V-440RF | 2 | alpha beta gamma x-ray | 0-300 mR/hr | Mylar 1/4 mil | Surveying |
| Victoreen | Ion Chamber Survey Meter | V-471 | 1 | alpha beta gamma x-ray | 0-300 R/hr | Mylar 1.1 mg/cm$^2$ | Surveying |
| Intertechnique | Liquid Scintillation | SL-30 | 1 | low energy beta | 0-1,000,000 total counts | none | Laboratory Counting |
| Eberline | Mini Scaler | MS-2 | 2 | alpha, beta, gamma | 0-500,000 total counts | Mylar (0.9 mg/cm$^2$) | Laboratory Counting |
| Eberline | Alpha Counter | SAC-4 | 1 | alpha | 0-1,000,000 total counts | none | Laboratory Counting |

## Retraining of Personnel
## Regarding Processing of Generated Waste

DATE: / /

INSTRUCTOR:

ATTENDEES: _____

_____

_____

_____

_____

SUBJECT OUTLINE:

TELEDYNE ISOTOPES

# Packaging of Radioactive Waste Examination

I. Fill in the blanks (3 pts. each)

1. List 5 characteristics of the material needed in order to determine the "proper shipping names":

   _____ _____

   _____ _____

   _____

2. List 5 "proper shipping names":

   _____ _____

   _____ _____

   _____

3. The radiation limit at contact with the container cannot exceed _____ mR/hr for a package of LSA material.

4.

| Label | mR/hr limits @ contact |
|---|---|
| Radioactive White I | _____ to _____ |
| Radioactive Yellow II | _____ to _____ |
| Radioactive Yellow III | _____ to _____ |

5. The marking (label) needed on a package of LSA material (exclusive-use) should read _____.

6. The marking (label) on a package of Radioactive devices should read _____.

7. The weight is required to be printed on a container when it is in excess of _____ lbs., and it is a DOT-7A TYPE A container.

8. List the 6 categories of radioactive waste:

   _____ _____

   _____ _____

   _____ _____

9. Items in different categories _____ be mixed.

10. ALL SVL drums must be lined with a _____.

11. The amount of absorbant added to any SVL drum must be capable of absorbing _____ the volume of liquid in the drum.

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Rev'd: _____ _____

Revs'd: _____ _____

Form TWL-RW-231

04 80

12. Liquid Special Nuclear Material has to be _____ before disposal.

II. True or False (1 pt. each)

1. _____ All drums which have a Radioactive I, II or III label require security seals.

2. _____ 400 lbs. is the maximum weight allowed in a 55-gallon container.

3. _____ 11 gallons of liquids are allowed in a DWLVL container.

4. _____ Two 2-mil liners is an acceptable substitute for a 4-mil liner.

5. _____ The pH range for liquids in a DWLVL container is 5.0-10.0.

6. _____ The animal carcass is to be completely surrounded with rock salt and absorbant.

7. _____ Cement is an acceptable solidification media.

8. _____ H-3 gas is acceptable at the Washington burial site under certain conditions.

9. _____ Packaging regulations are under the direct control of the NRC only.

10. _____ The burial site's requirements are of paramount consideration when determining how to package a given material.

TELEDYNE ISOTOPES

SECTION III - SPECIAL PROCEDURES APPLICABLE TO ACTIVITIES UNDER SPECIFIC LICENSES

Teledyne Isotopes carries out activities involving radioactive material under 13 different licenses from state, national and foreign government authorities. In addition to continuing licenses, other activities are carried out under temporary permits or reciprocal recognition of existing licenses with a variety of special requirements. Because the Radiation Safety Code & Quality Control Manual may be required to support the application for or operation under a given license, it is designed in such a way that only the general provisions of the code and the provisions particularly applicable to a given license are included in copies presented to a given agency.

This copy includes the sections relevant to the licensed activities checked below.

| | | |
|---|---|---|
| _____ | III-1.0 | USAEC BYPRODUCT MATERIAL LICENSE (#29-00055-06) C SPECIFIC LICENSE OF BROAD SCOPE |
| _____ | III-2.0 | USNRC MATERIALS LICENSE (#29-00055-14) RADIOACTIVE WASTE DISPOSAL |
| _____ | III-3.0 | USNRC SPECIAL NUCLEAR MATERIALS LICENSE (#SNM-107) |
| _____ | III-4.0 | USNRC MATERIALS LICENSE (#29-00055-15) METAL DECONTAMINATION |
| ✓ | III-5.0 | USNRC DEPLETED URANIUM SOURCE MATERIAL LICENSE (#SUB-1235) |
| _____ | III-6.0 | USNRC BYPRODUCT MATERIAL LICENSE (#29-00055-02) TELETRACE |
| _____ | III-7.0 | COLOMBIA, SOUTH AMERICA LICENSE FOR IMPORTATION OR USE OF RADIONUCLIDES (#320) (LICENCIA PARA IMPORTACION O MANEJO DE RADIONUCLIDES #320) TELETRACE |
| _____ | III-8.0 | STATE OF NEW JERSEY, DEPARTMENT OF ENVIRONMENTAL PROTECTION, RADIOACTIVE MATERIAL LICENSE (#10123) |
| _____ | III-9.0 | U.S. DEPARTMENT H.E.W. CLINICAL LABORATORY LICENSE (#29-1012) RADIO-BIOASSAY |
| _____ | III-10.0 | RADIATION SURVEYS |
| _____ | III-11.0 | ATOMIC ENERGY CONTROL BOARD OF CANADA RADIOISOTOPES LICENSE |
| _____ | III-12.0 | REFINERY PROCESS RESEARCH AMENDMENT APPLICATION PROCESS FOR USNRC LICENSE (#29-00055-06) |
| _____ | III-13.0 | STATE OF ILLINOIS RADIOACTIVE MATERIAL LICENSE (#IL-00514-01) |

TELEDYNE ISOTOPES

## III-5.0 SPECIAL PROCEDURES FOR DEPLETED URANIUM SOURCE MATERIAL LICENSE NO. SUB-1235

### III-5.1 Introduction and Description

This section of the Radiation Safety Code and Quality Control Manual covers specific procedures applicable to our U.S. NRC License No. SUB-1235.

Licensed material is used in the manufacturing and distribution of depleted uranium calibrators for Thermo Luminescent Dosimeters (TLD's). Distribution to our domestic customers is licensed under the general license provision of 10CFR 40.22. Distribution to foreign customers is licensed under specific export licenses.

The Model RGD-C Calibrator contains two metallic uranium plates mounted inside a solid walnut case. The case is composed of two wooden blocks which are lined with lead and fastened together with screws. This effectively reduces the possibility of mechanical injury to the plastic film covering the uranium plates and greatly reduces operator exposure to the uranium beta and gamma radiation.

TLD's are calibrated by placing them in the hinged tray and inserting the tray into the calibrator. The tray and block assemblies are manufactured so that direct impingement of the tray and uranium is avoided.

Krylon plastic spray is used to coat the uranium plates to retard oxidation.

The source material is purchased to the length, width and thickness that is required for assembly. The screw holes for attaching the plates to the inside surface of the calibrators are drilled by the supplier. No cutting, drilling, chemical or physical processes are performed on the source material. The only handling of the uranium plates required is that necessary to spray them with Krylon and attach them to the inner surface of the calibrator.

III-5.2 Specifications

5.2.1 Model No. RGD-C

5.2.2 Figure 1 shows dimensions (4-3/4" x 8-1/4" x .12") of the uranium plate.

5.2.3 Figure 2 shows dimensions of the top of the wooden case.

5.2.4 Figure 3 shows dimensions of the bottom of the wooden case.

5.2.5 Figure 4 shows dimensions of the handle of the wooden case.

5.2.6 Figure 5 shows dimensions of the hinged plate (slide mechanism).

5.2.7 Lead shielding is 4-3/4" x 8-1/4" x 1/8" thick.

5.2.8 Weights: Depleted uranium plates: 2.5 lbs. each.
Total depleted uranium: 5 lbs.
(2.3 Kg per calibrator)
Total weight of calibrator: 13 lbs. 6 oz.

III-5.3 Exposure Limits

Prior to shipment, each calibrator is surveyed with a calibrated survey instrument. The maximum acceptable exposure is taken to be 0.5 mR/hr with probe centerline 12 inches from the calibrator surface, and 2 mR/hr with probe in contact with the walnut calibrator enclosure.

III-5-4 Contamination Control

There is no direct access to the uranium plates except by dismantling the unit. However, radiation degration of the film coating is estimated to occur after an exposure of about $10^5$ rad. The maximum dose rate expected to the film coating is about 0.56 rad per hour which results in a predicted lifetime of 20 years. Although uranium tends to oxidize slowly, we recommend annual contamination checks of the slide assembly. If any activity greater than 0.001 microcuries is found, the unit should be disassembled and re-coated with Krylon in a proper facility.

III-5.5 Labelling

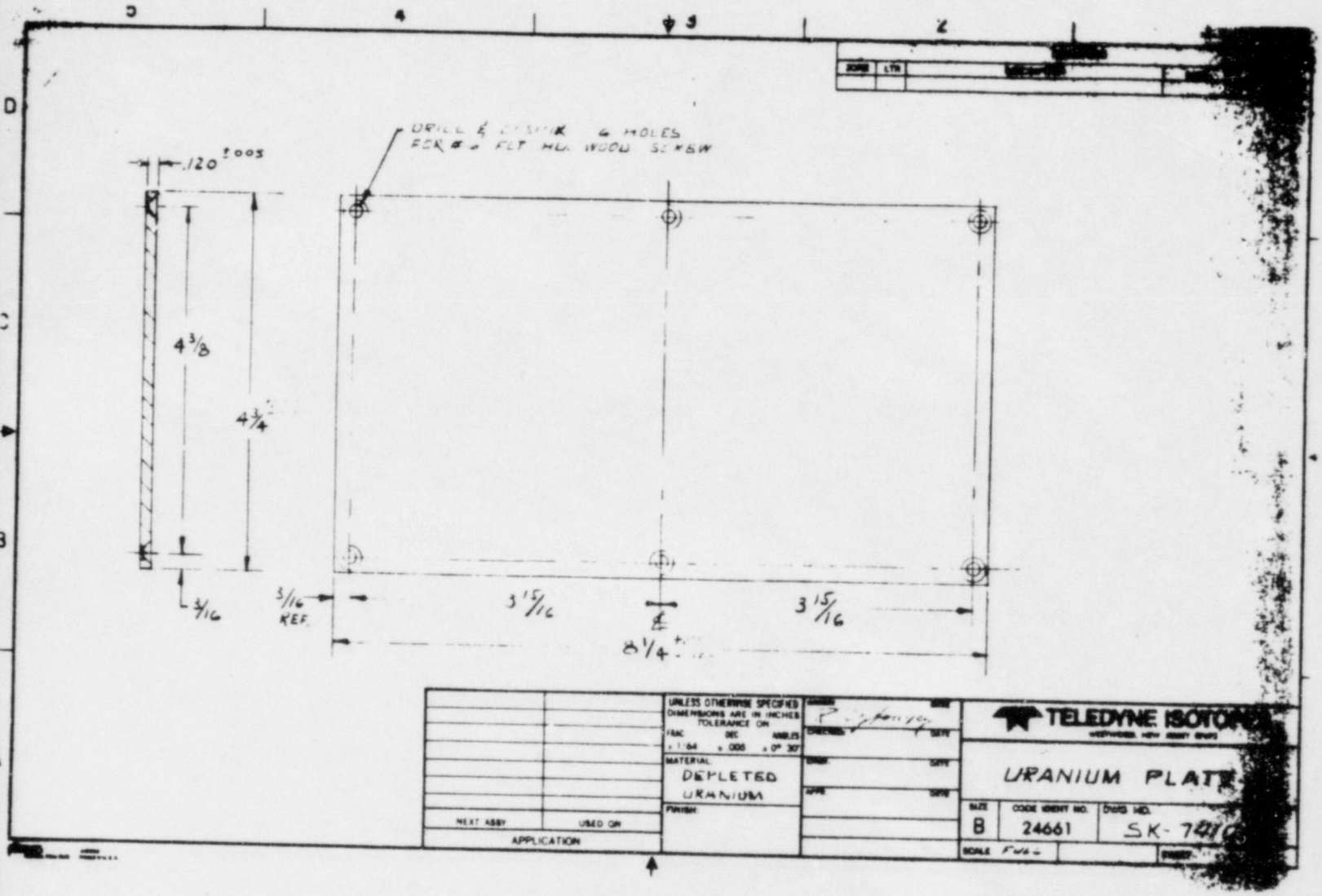
Each completed uranium calibrator has "Caution - Radioactive Material" labels attached to the top and bottom of the unit. The letters on the labels must be a minimum of 1/4" in height, and the radiation symbol must be at least 5/8" in diameter.

III-5.6 Radioactive Waste Handling

As the source material is purchased in the size required and pre-drilled, there is no radioactive waste generated during the manufacturing or distribution of the calibrators.

III-5.7 Instrumentation

A list of the Health Physics survey instruments can be found in Section II of our Radiation Safety Code and Quality Control Manual (Form IWL-HP-18).

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| | Date | Approved |
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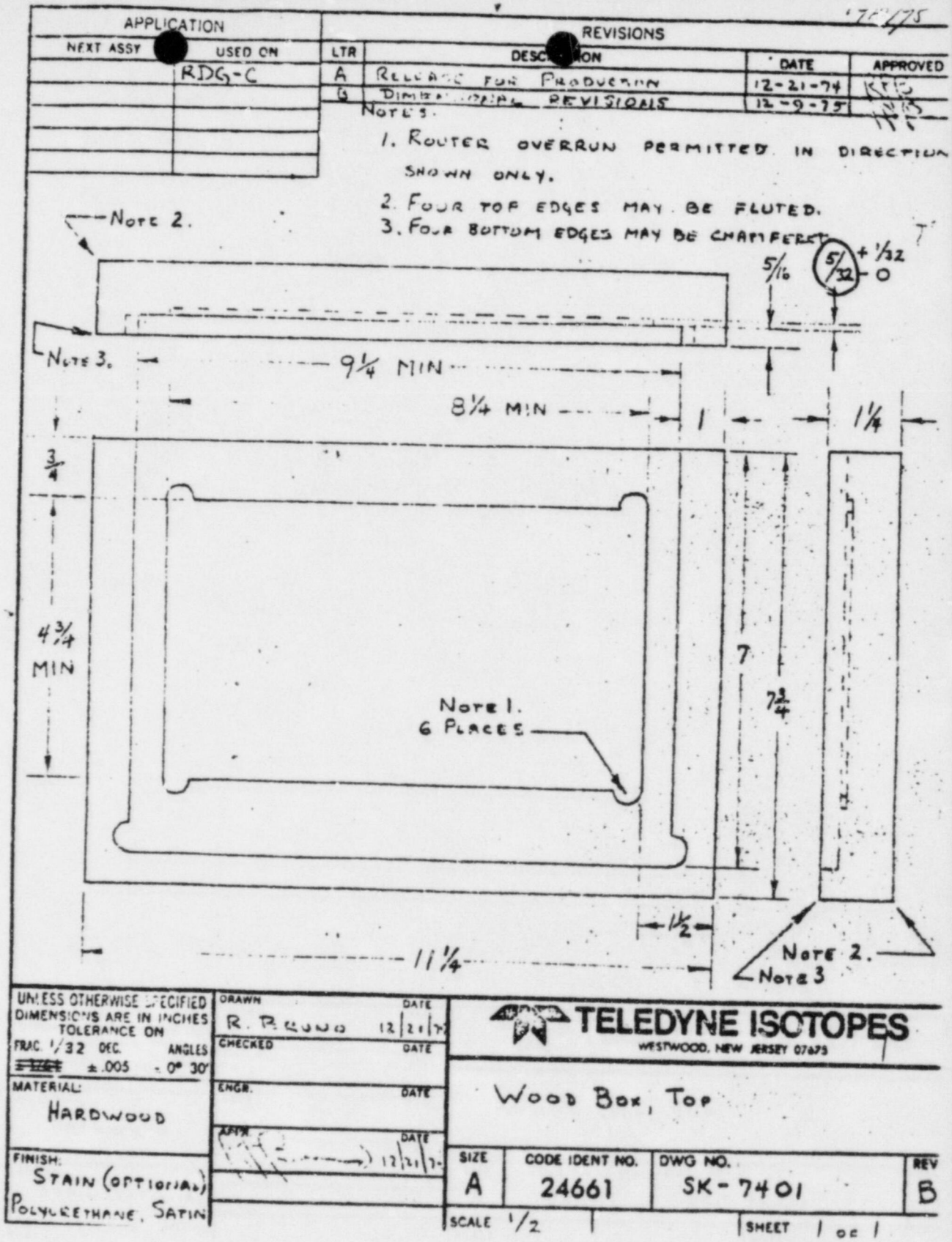
| Rev'd: | 9/26/85 | |
| Revs'd: | | |



FIGURE 1

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| | Date | Approved |
|---|---|---|
| Rev'd: | 9/24/85 | |
| Revs'd: | | |

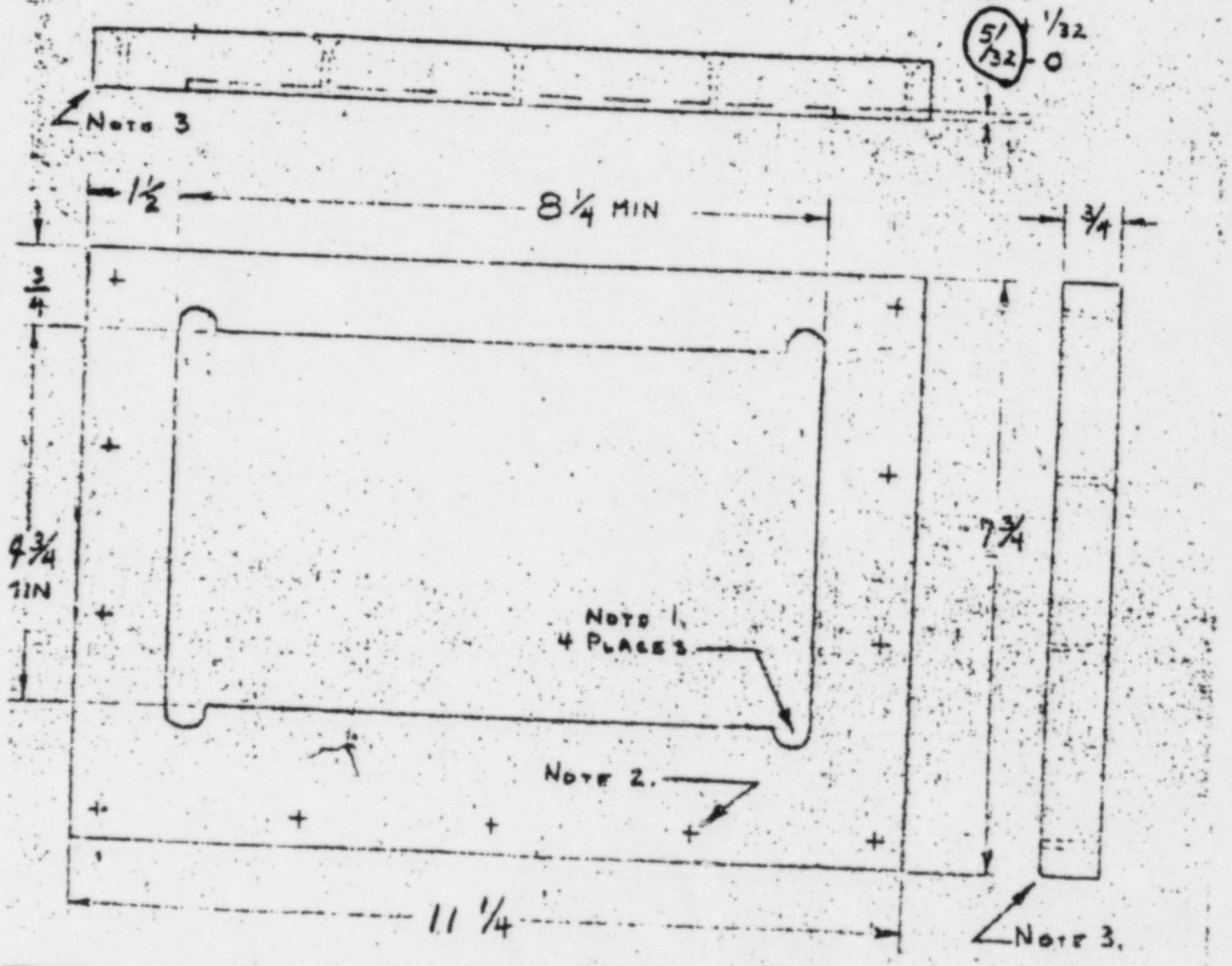


FIGURE 2

| APPLICATION | | REVISIONS | | | |
|---|---|---|---|---|---|
| NEXT ASSY | USED ON | LTR | DESCRIPTION | DATE | APPROVED |
| | RI[illegible]C | A | RELEASE FOR PRODUCTION | 12-21-74 | [illegible] |
| | | B | DIMENSIONAL REVISIONS | 13-3-75 | [illegible] |

NOTES:

1. ROUTER OVERRUN PERMITTED AS SHOWN.
2. SUFFICIENT QUANTITY OF #8 X 1¼ FLAT #10 HEAD SCREWS LOCATED 3/8 FROM EDGE.
3. FOUR TOP EDGES MAY BE CHAMFERED.




| | | | |
|---|---|---|---|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON .X ±1/32 DEC. .XX ±.005 ANGLES ±0° 30' | DRAWN R. BRUNO DATE 12/21/74 | TELEDYNE ISOTOPES WESTWOOD, NEW JERSEY 07675 | |
| | CHECKED DATE | | |
| | ENGR. DATE | Wood Box, Bottom | |
| MATERIAL: HARDWOOD | APPR. DATE 12/21/74 | | |
| FINISH: STAIN (OPTIONAL) POLYURETHANE, SATIN | | SIZE A / CODE IDENT NO. 24661 / DWG NO. SK-7402 / REV B | |
| | | SCALE 1/2 | SHEET 1 OF 1 |

FIGURE 3

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|---|---|---|
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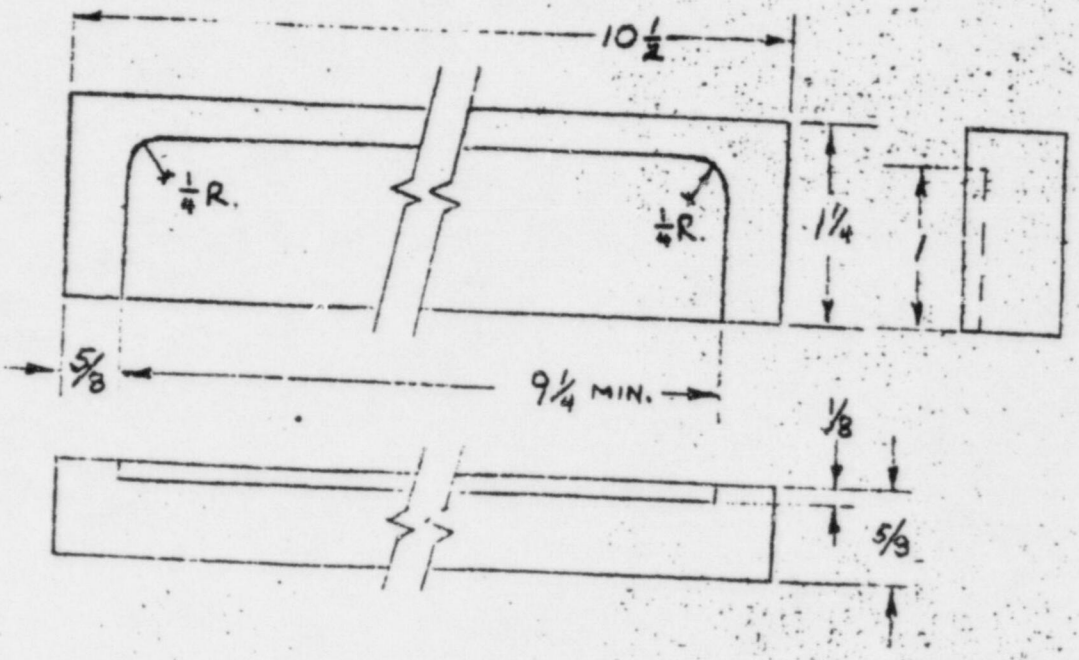
| Revs'd: | | |

| APPLICATION | | REVISIONS | | | |
|---|---|---|---|---|---|
| NEXT ASSY | USED ON | LTR | DESCRIPTION | DATE | APPROVED |
| | R[illegible]-C | A | RELEASE FOR PRODUCTION | 12-31-74 | [illegible] |
| | | B | REVISED DIMENSIONS | 12-9-24 | [illegible] |

10171




| | | | |
|---|---|---|---|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON FRAC. 1/32 DEC. .005 ANGLES ± 0° 30' | DRAWN R. P. RUNO DATE 12/31/74 | TELEDYNE ISOTOPES WESTWOOD, NEW JERSEY 07675 | |
| | CHECKED DATE | | |
| MATERIAL: HARDWOOD | ENGR. DATE | HANDLE | |
| FINISH: STAIN (OPTIONAL) POLYURETHANE, SATIN | APPR. DATE 1/31/75 | SIZE A / CODE IDENT NO. 24661 / DWG NO. SK-7404 / REV B | |
| | | SCALE 1/1 | SHEET 1 OF 1 |

FIGURE 4

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| | Date | Approved |
|---|---|---|
| Rev'd: | 9/26/85 | |
| Revs'd: | | |

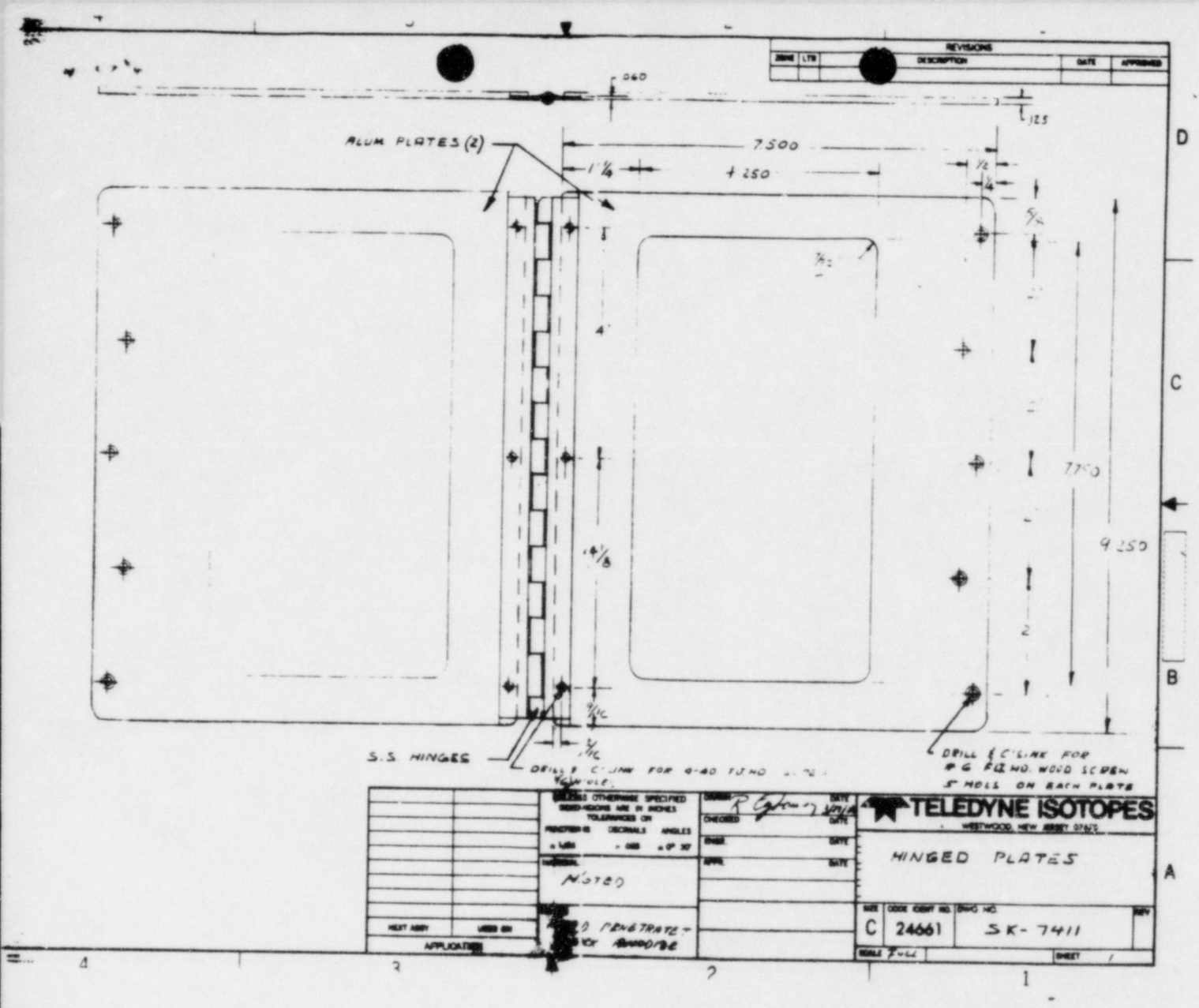


FIGURE 5

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| | Date | Approved |
|---|---|---|
| Rev'd: | 9/26/85 | |
| Revs'd: | | |

BETWEEN: William O. Miller, Chief
License Fee Management Branch
Office of Administration

John E. Glenn, Chief
Nuclear Materials Section B
Division of Engineering and
Technical Programs

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED

Applicant/Licensee: Teledyne Isotopes, Inc.

Application Dated: 9/26/85

Control No.: 104452

License No.: SUB-1235

2. FEE ATTACHED

Amount: $230.00

Check No.: 42696

3. COMMENTS

FMS 03

11210
10/85

Signed Brenda Pilatchek

Date 10/4/85

B. LICENSE FEE MANAGEMENT BRANCH

1. Fee Category and Amount: 2C ($230)

2. Correct Fee Paid. Application may be processed for:

Amendment _____

Renewal ✓

License _____

Signed D Jackson

Date 10/8/85

REGION I FORM 213
(MARCH 1983)