

## MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

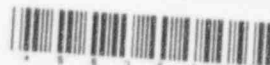
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|  |   |  |
|--|---|--|
| Licensee   |   |  |
| 1. Professional Service Industries, Inc.                 | 3. License Number   | 21-26782-01  |
| 2. 7936 South Webster Road<br>Freeland, MI 48623         | 4. Expiration Date  | June 30, 2007  |
|  | 5. Docket or<br>Reference No.   | 030-34393  |
| 6. Byproduct, Source, and/or<br>Special Nuclear Material | 7. Chemical and/or Physical<br>Form   | 8. Maximum Amount that Licensee<br>May Possess at Any One Time<br>Under This License |
| A. Cesium-137  | A. Sealed sources<br>registered either<br>with NRC under 10<br>CFR 32.210 or with<br>an Agreement State<br>and incorporated in<br>a compatible<br>portable gauging<br>device as specified<br>in Item 9 of this<br>license | A. No single source to<br>exceed 11<br>millicuries                                   |
| B. Americium-241   | B. Sealed sources<br>registered either<br>with NRC under 10<br>CFR 32.210 or with<br>an Agreement State<br>and incorporated in<br>a compatible<br>portable gauging<br>device as specified<br>in Item 9 of this<br>license | B. No single source to<br>exceed 300<br>millicuries                                  |

## 9. Authorized Use:

- A. and B. To be used, for measurement purposes, in portable gauging devices that have been registered either with NRC under 10 CFR 32.210 or with an Agreement State and have been distributed in accordance with an NRC or Agreement State specific license authorizing distribution to persons specifically authorized by an NRC or Agreement State license to receive, possess, and use the devices.

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PDR ADDCK 03034393  
B PDR



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MATERIALS LICENSE  
SUPPLEMENTARY SHEET

License Number

21-26782-01

Docket or Reference Number

030-34393

CONDITIONS

10. Licensed material may be stored at the licensee's facilities located at 3210 Sovereign Drive, Suite C, Lansing Michigan; 7936 South Webster Road, Freeland, Michigan; or 7962 Sprinkle Road, Kalamazoo, Michigan and may be used at temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material.
11. The Radiation Safety Officer for this license is Randal Pail, P.E.
12. Licensed material shall only be used by, or under the supervision and in the physical presence of, individuals who have received the training described in the application dated February 7, 1997 and have been approved in writing by the Radiation Safety Officer.
13. The licensee is authorized to collect leak test samples for analysis by Microtec Services, Inc. Alternatively, tests for leakage and/or contamination may be performed by persons specifically licensed by the Commission or an Agreement State to perform such services.
14. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.
15. When performing tests at temporary job sites, the authorized user shall not leave the moisture/density gauge unattended. Upon completion of tests the device shall be locked in the licensee's vehicle or a secure building to prevent unauthorized use, loss, or theft.
16. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license.
17. The licensee is authorized to transport licensed material only in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
18. Each portable nuclear gauge shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage, or when not under the direct surveillance of an authorized user.
19. Any cleaning, maintenance, or repair of the gauge(s) that requires removal of the source rod shall be performed only by the manufacturer or by other persons specifically licensed by the Commission or an Agreement State to perform such services.

COPY

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**

License Number

21-26782-01

Docket or Reference Number

030-34393

20. In addition to the possession limits in Item 8, the licensee shall further restrict the possession of licensed material to quantities below the minimum limit specified in 10 CFR 30.35(d) for establishing decommissioning financial assurance.
21. The licensee may not possess and use materials authorized in Items 6, 7, and 8 until:
1. The licensee has constructed the facilities and obtained the equipment described in the application and supporting documentation; and
  2. The U. S. Nuclear Regulatory Commission, Region III, ATTN: Chief, Materials Licensing Branch, 801 Warrenville Road, Lisle, IL 60532-4351 has been notified that activities authorized by the license will be initiated.
22. Within 30 days of the date of a decision not to complete the facility, acquire equipment, or possess and use authorized material, the licensee must notify the Commission in writing, of the decision.
23. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Application dated February 7, 1997; and
  - B. Letter dated May 3, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date

JUN 03 1997

By

*Michael F. Velt*

Nuclear Materials Licensing Branch, Region III

**COPY**

52

License Fee Management Branch, ARM  
and  
Regional Licensing Sections

```
: Program Code:  
: Status Code: 3-----  
: Fee Category: -----  
: Exp. Date: 0 -----  
: Fee Comments:  
: Decom Fin Assur Reqpt: -----
```

## A. REGION

Applicant/Licensee: PROFESSIONAL SERV. INDUS., INC.  
Received Date: 970210  
Docket No: 3034393  
Control No.: 302298  
License No.:  
Action Type: New License

Amount: 550  
Check No.: 973705

### 3. COMMENTS

Signed \_\_\_\_\_  
Date 2-1-93

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered)

1. Fee Category and Amount: 31 4550

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

|           | Amount | Fee | Paid: | Applied: |
|-----------|--------|-----|-------|----------|
| Amendment |        |     |       |          |
| Renewal   |        |     |       |          |
| License   |        |     |       |          |

3. OTHER

Signed \_\_\_\_\_  
Date 2/18/97

MAR 03 1997

Log Feb 7 III  
Remitter                       
Check No. 973705  
Amount \$550  
Fee Category 3P  
Type of Fee App  
Date Check Rec'd 2/18/17  
Date Completed                       
By:                     

1997 FEB 18 PM 1:39



(7-98)

10 CFR 30, 32, 33  
34, 35, 36, 39 and 40

Estimated burden per response to comply with this information collection request: 7 hours. Submission of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Forward comments regarding burden estimate to the Information and Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001 and to the Paperwork Reduction Project (3150-0120), Office of Management and Budget, Washington, DC 20503. NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

## APPLICATION FOR MATERIAL LICENSE

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

## APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY  
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS  
U.S. NUCLEAR REGULATORY COMMISSION  
WASHINGTON, DC 20555-0001

## ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

## IF YOU ARE LOCATED IN:

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

LICENSING ASSISTANT SECTION  
NUCLEAR MATERIALS SAFETY BRANCH  
U.S. NUCLEAR REGULATORY COMMISSION, REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PA 19406-1415

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

NUCLEAR MATERIALS LICENSING SECTION  
U.S. NUCLEAR REGULATORY COMMISSION, REGION II  
101 MARIETTA STREET, NW, SUITE 2900  
ATLANTA, GA 30323-0190

## IF YOU ARE LOCATED IN:

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

MATERIALS LICENSING SECTION  
U.S. NUCLEAR REGULATORY COMMISSION, REGION III  
801 WARRENVILLE RD.  
LISLE, IL 60532-4351

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS,  
LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA,  
OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH,  
WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING SECTION  
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV  
811 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TX 76011-8064

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

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

☒

A. NEW LICENSE

☐

B. AMENDMENT TO LICENSE NUMBER \_\_\_\_\_

☐

C. RENEWAL OF LICENSE NUMBER \_\_\_\_\_

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

Professional Service Industries, Inc.  
7936 South Webster Road  
Freeland, Michigan 48623

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

(Please see attachments.)

## 4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Adam Ackermann

## TELEPHONE NUMBER

630/691-1490 (x320)

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

## 5. RADIOACTIVE MATERIAL

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

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

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

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

## 9. FACILITIES AND EQUIPMENT

## 10. RADIATION SAFETY PROGRAM

## 11. WASTE MANAGEMENT

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

FEE CATEGORY

3.P.

AMOUNT

ENCLOSED \$ 550.00

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

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39 AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

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

## CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE

Adam C. Ackermann

Radiation Safety Director

## SIGNATURE

*Adam C. Ackermann*

## DATE

02/07/97

## FOR NRC USE ONLY

| TYPE OF FEE | FEE LOG | FEE CATEGORY | AMOUNT RECEIVED | CHECK NUMBER | COMMENTS |
|-------------|---------|--------------|-----------------|--------------|----------|
|             |         |              | \$              |              |          |
| APPROVED BY |         |              |                 | DATE         |          |

RECEIVED

FEB 10 1997

REGION III

PRINTED ON RECYCLED PAPER

February 7, 1997

U.S. Nuclear Regulatory Commission  
Region III  
801 Warrenville Road  
Lisle, Illinois 60532-4351

Attention: Materials Licensing Section

Re: USNRC RAM License Application

Gentlemen:

Professional Service Industries, Inc. (PSI) requests the issuance of a new USNRC Radioactive Materials License in accordance with the attached license application. Please note that the attached license (renewal) application has been prepared in accordance with DRAFT REGULATORY GUIDE DG-0008, APPLICATIONS FOR THE USE OF SEALED SOURCES IN PORTABLE GAUGING DEVICES.

A check in the amount of \$550.00 is enclosed to cover the license application fee.

Your attention to this matter is appreciated. Should you have any questions, please contact me at 708/691-1490 (x 320).

Sincerely,



Adam C. Ackermann  
Radiation Safety Director

ACA/

cc: R. Pail - Freeland, MI  
M. Famiglietti - Kalamazoo, MI  
J. Walter - Lansing, MI  
File

RECEIVED

FEB 10 1997

REGION III

*Information To Build On*

February 7, 1997

U.S. Nuclear Regulatory Commission  
Region III  
801 Warrenville Road  
Lisle, Illinois 60532-4351

Attention: Radioactive Materials Licensing Section

Re: USNRC RAM License Application  
Signatory Authorization

Gentlemen:

Mr. Adam C. Ackermann, who currently serves Professional Service Industries, Inc. (PSI) as Corporate Radiation Safety Director, is hereby authorized to sign license applications, amendment requests and compliance correspondence on behalf of Professional Service Industries, Inc. (PSI). All matters concerning Professional Service Industries, Inc. (PSI) radioactive materials licensing and/or compliance should be directed to Mr. Ackermann.

Should you have any questions, please do not hesitate to contact me.

Sincerely,



Michael Kesselmayr, P.E.  
Administrative Coordinator

MSK\ACA

cc: File

## PROFESSIONAL EXPERIENCE

01AUG96 to  
present      Corporate Radiation Safety Director  
Professional Service Industries, Inc.  
Responsibilities include but not limited to development and administration of a variety of radiation safety programs for 100+ branch offices, maintenance of 100+ USNRC and Agreement State radioactive materials licenses/registrations, coordination of emergency response actions, training of radiation safety management personnel.

09DEC92 to  
31JUL96      Assistant Radiation Safety Director  
Professional Service Industries, Inc.  
Assisted in the administration of radiation safety programs for 100+ offices, maintenance of 100+ radioactive materials licenses (USNRC and Agreement State), and records pursuant to PSI's corporate radiation safety programs. Provided assistance to offices in emergency response as well as daily operations.

06JUL90 to  
08OCT92      Naval Nuclear Power Plant Staff Instructor  
Idaho National Engineering Laboratories (INEL)  
A1W Nuclear Power Plant

15OCT90 to  
08OCT92      Radiological Control Point Access Watch  
Idaho National Engineering Laboratories (INEL)  
A1W Nuclear Power Plant

## EDUCATION & TRAINING

27FEB96 to  
29FEB96      Introduction to Emergency Management  
Illinois Emergency Management Agency (IEMA)

22FEB96      Inspection and Maintenance of Industrial Radiography Equipment  
Amersham QSA/Sentinel

13NOV95 to  
17NOV95      Radiation Safety Training Course  
Northwestern University

28NOV94 to  
02DEC94      Radiation Safety Training (Industrial Radiography)  
MQS Training Group

15APR93      Moisture/Density Gauge Radiation Safety Officer/Instructor  
Professional Service Industries, Inc.

18DEC92      Moisture/Density Gauge Operator  
Professional Service Industries, Inc.

27APR91 to  
17MAY91      Prototype Radiological Controls Maintenance  
Idaho National Engineering Laboratories (INEL)

08JAN90 to  
05JUN90      Naval Nuclear Prototype Operations  
Idaho National Engineering Laboratories (INEL)

03JUL89 to  
21DEC89      Naval Nuclear Power School  
Naval Training Station Orlando

## AFFILIATIONS

04MAY94 to  
present      Active member of Illinois Emergency Services & Disaster Agency (ESDA). Presently ESDA Director for the Village of Glendale Heights (volunteer position).



ATTACHMENT TO NRC FORM 313 (10-94)  
PAGE ONE

3. Licensed material shall be stored at the following (permanent) locations:

PSI  
3120 Sovereign Drive  
Suite C  
Lansing, MI

PSI  
7936 South Webster Road  
Freeland, MI

PSI  
7962 Sprinkle Road  
Kalamazoo, MI

Licensed material may also be stored at temporary job sites throughout the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction.

5. The licensed (radioactive) material to be possessed is as follows:

| Element & mass #  | Chemical/physical form  | No single source to exceed |
|---|---|----------------------------|
| Cesium-137  | Sealed sources registered either with NRC under 10 CFR 32.210 or with an Agreement State and incorporated in a compatible portable gauging device as specified in Item 6. | 11 millicuries             |
| Americium-241   | Sealed sources registered either with NRC under 10 CFR 32.210 or with an Agreement State and incorporated in a compatible portable gauging device as specified in Item 6. | 300 millicuries            |
| POSSESSION LIMIT COMMITMENT: The number of source/device combinations shall be limited so as not to exceed the quantities of byproduct material specified in 10 CFR 30.35(d) requiring financial assurance for decommissioning. |   |                            |

6. The material listed in Item 5. of this application shall be used in compatible portable gauging devices for the measurement of moisture, density or asphalt content of construction materials as appropriate for the individual device(s). Measurements at depths exceeding three (3) feet are not anticipated.

7. The Radiation Safety Officer (RSO) for the license shall be Mr. Randal Pail, P.E. Mr. Pail's qualifications are as follows (please reference the last paragraph of Item 8.2 on page 16 in DG-0008):

Education: B.S. degree, Civil Engineering (1988), Michigan State University

Registrations: P.E., Michigan

Experience: Approximately seven (7) years of experience with the management of moisture/density gauge radiation safety programs and approximately eight (8) years of experience with the use of moisture/density gauges.

Instruction Materials: Please refer to Item 8 for a description of the training materials used in the PSI "in-house" moisture/density gauge operator training program, including a description of materials were prepared by highly qualified individuals (PSI's Corporate Radiation Safety Director).

Evaluation of Exams: Moisture/density gauge operator exams are not graded by the RSO/Instructor. All such exams are graded by PSI's Corporate Radiation Safety Department under the direction of Corporate Radiation Safety Director.

Training: The RSO/Instructor shall be certified as a moisture/density gauge operator, and complete PSI's sixteen hour training course for moisture/density gauge RSO/Instructors.

Evidence: Copies of the RSO/Instructor's current resume and training certificates are attached.

Duties & Responsibilities: A statement describing the duties and responsibilities of the RSO/Instructor is attached.

8. A description of training provided to individual moisture/density gauge users is attached.
9. All facilities listed in Item 3. currently exist. None of the facilities are private residences. Attached is a description of the PSI facilities and equipment for the storage and security of licensed material.
10. Attached is a description of PSI's radiation safety program.
11. Attached is a statement regarding waste disposal.

## RESUME

**RANDAL H. PAIL, P.E.**

Freeland Branch Manager  
Upper & Mid-Michigan District Manager  
Geotechnical and Construction Engineering Services

### Education

Bachelor of Science, 1988, Civil Engineering  
Michigan State University

### Certifications

Professional Engineer, Michigan #39180  
OSHA Hazardous Waste Site Training 40 Hour  
OSHA Hazardous Waste/Site Refresher Training 8 Hour  
Windsor Test Probe Operator  
Nuclear Density Gauge Operator

### Responsibilities

Duties include management and supervision of geotechnical and construction materials engineering operations for local office and for the general management and supervision of three offices covering areas throughout Michigan, excluding Wayne, Oakland and Livingston Counties. Mr Pail is responsible for preparation and review of comprehensive geotechnical reports including foundation recommendations and design parameters.

### Project Experience

#### *Geotechnical Engineering*

Storm Sewer Improvement, Hartland Township, Michigan  
Bob Evans Restaurant, Frankenmuth, Michigan  
Meijer Store, Port Huron, Michigan  
Midland County Juvenile Facility, Midland, Michigan  
GM Buick City CLCD Expansion, Flint, Michigan

#### *Construction Materials Testing*

Saginaw Midland Water Authority Water Main Extension, Linwood to Kawkawlin, Michigan  
Saginaw Valley State University Proposed School of Business, Saginaw, Michigan  
GM Malleable, Oil Cooler Installation, and Water Treatment Plant, Saginaw, Michigan  
Statewide Landfill, Cells and Capping, State of Ohio  
Mobil Oil Company, Deep Monitor Wells, Gaylord, Michigan  
Circuit City Store, Saginaw and Flint, Michigan  
Art Van Furniture Store, Saginaw and Bay City, Michigan  
Roadway and Bridge Reconstruction, Pinconning, Michigan

# RADIATION SAFETY TRAINING PROGRAM FOR DENSITY GAUGES

THIS IS TO CERTIFY THAT

RANDAL HOWARD PAIL

OF

**Professional Service Industries, Inc.**

Has Successfully Completed the Radiation Safety Training Program for Nuclear Density Gauges.

Subjects included in the course were as follows:

*Gauge Operation*

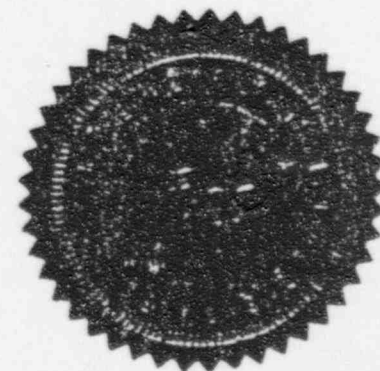
1. Instrument Theory
2. Operating Procedures
3. Maintenance
4. Field Use

*Radiation Safety*

1. Principles of Radiation Safety
2. Shipping and Storage
3. Radiation dosage calculations
4. Radiation detection and measurement
5. Biological effects
6. Emergency Procedures

 9/23/88

Corporate Radiation Safety Officer





# Professional Service Industries, Inc.

## RADIATION SAFETY TRAINING PROGRAM

FOR

## RADIATION SAFETY OFFICERS

FOR

MOISTURE DENSITY GAUGES

THIS IS TO CERTIFY THAT

RANDAL PAIL

Has Successfully Completed the Approved Corporate Radiation Safety  
Training Program for Radiation Safety Officers/Instructors.

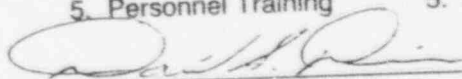
Subjects included in the course were as follows:

### REGULATIONS:

1. Security and Control
2. License Conditions
3. Records
4. Transportation
5. Personnel Training

### RADIATION SAFETY

1. Principles of Radiation Safety
2. Radiation Dosage Calculations
3. Radiation Detection and Measurement
4. Biological Effects
5. Emergency Procedures

  
Corporate Radiation Safety Director

11/06/90

Date



## DUTIES & RESPONSIBILITIES OF THE RADIATION SAFETY OFFICER 06/95

The Radiation Safety Officer (RSO) is responsible for implementing the radiation safety program and ensuring that radiation safety activities are performed in accordance with approved procedures and regulatory requirements.

The RSO's duties and responsibilities include ensuring that:

1. licensed material possessed by the licensee is limited to the kinds (e.g., cesium-137 as a sealed source) and quantities of byproduct material listed on the license;
2. individuals using gauges: are properly trained; receive refresher training at least annually to include a review of operating and emergency procedures and Department of Transportation (DOT) requirements; and are designated by the RSO;
3. personnel monitoring devices are used if required;
4. gauges are properly secured against unauthorized removal at all times when gauges are not in use;
5. appropriate persons are notified in case of accident, damage to gauges, fire, or theft;
6. all incidents, accidents, and personnel exposure to radiation in excess of regulatory limits are reported to the appropriate persons;
7. results of audits and inspections and corrective actions are documented and maintained on file, copies provided to management for review;
8. licensed material is transported in accordance with all applicable DOT requirements;
9. he/she has up-to-date copies of NRC's regulations, reviews new or amended NRC regulations, and complies with NRC regulations;
10. the appropriate person(s) is/are notified whenever there are changes in: licensed activities, responsible individuals, or information or commitments provided to NRC in the licensing process so that appropriate license action may be initiated.

## PSI TRAINING PROGRAM FOR MOISTURE/DENSITY GAUGE OPERATORS 06/95

Licensed material shall be used only by individuals who have received specific training in the use of the device and who have successfully completed the manufacturer's training course or PSI's "in-house" radiation safety training program. Radiation safety training and equipment instruction is provided to trainees at the Branch office using training materials (notes, slides, etc.) prepared by PSI's Corporate Radiation Safety Director, and the exam is administered by the Branch RSO. Once completed, the exam is sent to the Corporate Radiation Safety Department for grading. Upon successful completion, a certificate is issued from the Corporate Radiation Safety Department in the operator's name.

- Trainees will receive five (5) to six (6) hours of formal ("classroom") radiation safety training provided by a PSI certified RSO/Instructor. (An outline of required topics is attached. Specific times per topic may vary depending on particular trainee needs.)
- Trainees will receive two and a half (2½) hours of equipment ("hands-on") instruction which shall, at a minimum, include the following:
  - Proper storage and removal procedures.
  - Transportation and transportation security requirements.
  - Security and control of the gauge while in use, including restrictions for members of the public.
  - Device/transportation case maintenance, including charging, cleaning, leak testing, etc.
- A written, closed book exam of no less than fifty (50) questions shall be administered at the end of the training. A minimum score of 80% is required to pass. A sample exam is attached.
- Course Instructors shall have successfully completed PSI's Moisture/Density Gauge RSO/Instructor training program.

## TOPICS FOR GAUGE OPERATOR CLASSROOM TRAINING

06/95

The following is a list of topics to be covered in the five (5) to six (6) hours of formal "classroom" radiation safety training provided to moisture/density gauge trainees by the RSO/Instructor. Specific times per topic should be varied to meet the needs of the individual trainee(s).

### General

- Definitions
- History of Radiation
- Atomic Structure
- Types of Radiation

### Moisture/Density Gauge Materials

- "Normal Form"
- "Special Form"
- Gamma (Cesium-137)
- Neutron (Americium-241:Be)

### Reduction of Radiation Exposure

- Time
- Distance
  - Divergence
  - Inverse-Square Law
- Shielding
  - For Gamma Sources
  - For Neutron Sources
- ALARA
  - Philosophy
  - PSI Policy

### Operator Responsibilities

- Safety
- Regulatory Compliance
- PSI Procedure Compliance
- Disciplinary Action

### Emergency Response

- Loss
- Accident
- Hazards
- Immediate Actions
- The Human Factor
- Case Histories

### Regulatory Control

### Government Agencies

- USNRC
- Agreement States
- USDOT

### "Byproduct Material"

#### Regulations

- 10 CFR 19 or State Equivalent
- 10 CFR 20 or State Equivalent
- 10 CFR 30 or State Equivalent
- 10 CFR 71 or State Equivalent

#### Occupational Exposure Limits

#### Personnel Monitoring

#### License Authorizations

##### Materials

##### Storage

##### Use

##### Specific Conditions

##### Commitments

#### Reciprocity

#### Radiation Area

#### Restricted/Unrestricted Areas

#### Posting of Signs

#### Sealed Source Leak Testing

##### Requirements

##### Sample Collection

#### Security

##### In Storage

##### In Use

#### Transportation

##### Packaging

##### "Type A Package"

##### Radiation Limits

##### Marking

##### Labelling

#### Paperwork

#### Transport

#### Shipping

#### Records & Documentation

#### Operations

##### Safety

##### Supervision

##### Use of Equipment

##### Records



FULL NAME: \_\_\_\_\_ KEY \_\_\_\_\_ DATE: \_\_\_\_/\_\_\_\_/\_\_\_\_  
PLEASE PRINT  
SOCIAL SECURITY NO: \_\_\_\_\_ - \_\_\_\_\_ D.O.B. \_\_\_\_\_  
OFFICE (CITY and NO.): \_\_\_\_\_ ( ) SEX: \_\_\_\_\_

(SAMPLE)  
CLOSED-BOOK FORMAT

1. Describe radiation in general terms:

3pts

$$2p + 5$$
$$Z_{p+5} 3.$$

4. What are the three (3) basic ways to reduce exposure to radiation?

 $3p+5$ 

### C. Shielding

 $2p+5$ 
$$Z_{p+5}$$

Gamma (photon) and neutron

7. Define the term "Half-Life" in general terms as it relates to the decay of radioactive materials?

Amount of time required for one half of the unstable atoms to decay to stable form.

3pts

8. Radioactivity is measured in what units?

Curies (or Becquerels)

2pts

9. What does the term "REM" stand for and what does it represent?

2pts 1 → 2pts  
Roentgen Equivalent Man: Measure of the biological damage caused by radiation dose to animal tissue.

4pts

10. Define the prefix "milli" (as it applies to "millicurie" and "millirem").

$1/1000 \leftarrow \alpha \rightarrow 1000 \text{ mCi} = 1 \text{ Ci}, 1000 \text{ mRem} = 1 \text{ Rem}$

2pts

11. What is the annual whole body exposure limit for adult radiation workers in Rem and millirem, as set by the Nuclear Regulatory Commission. (WATCH UNITS)

1pt 1pt  
 $5 \text{ rem} = 5000 \text{ millirem}$

2pts

12. What does the acronym "ALARA" stand for and what does it pertain to?

1pt 2pts  
Keeping radiation exposure - As Low As Reasonably Achievable

3pts

13. Which of the following areas of the body is the least sensitive to the effects of ionizing radiation?

- a. bone and other blood forming organs  
b. reproductive organs (gonads)  
c. feet and hands (extremities)  
d. eyes

2pts

14. True or False: Personnel dosimetry (i.e., film badge, TLD, etc.) is required for all individuals who will receive or are likely to receive 10% of the annual occupational exposure limits, or who are not specifically exempted by submittal or license condition.

15. A film badge measures which of the following:

- a. dosage rate  
b. accumulated dose

16. Which of the following actions contribute to false readings of a film badge? (Choose all that apply.)

- a. heat  
b. direct sunlight  
c. cold  
d. color television radiation and/or microwave ovens  
e. getting badge wet  
f. storing badge with or near radiation sources (gauge)

17. At what intervals are sealed sources leak tested?

At intervals not to exceed <sup>2pts</sup> six months or <sup>1pt</sup> when suspicion warrants.

18. True or False: A radiation source installed in a moisture/density gauge emits radiation only when the gauge is turned on.

19. Circle answer: Radiation levels emitted from a moisture/density gauge will (increase) - decrease) when the source rod is protracted (moved out of the fully retracted position).

20. If the *encapsulated* source installed in a gauge should come in direct contact with your hand or the ground, you will have:

- a. radioactive contamination on your hand or the ground  
b. radiation exposure to your hand  
c. both a and b  
d. none of the above

21. True or False: A gauge operator is required to maintain "constant surveillance and immediate control" of a gauge at all times when not secured in storage or during transport.

22. Which of the following documents are you required to have with you at all times when using or transporting a gauge? (Choose all that apply.)

- 5pts
- ☒ a. copy of last leak test certificate
  - ☒ b. copy of complete license
  - ☐ c. bill of lading
  - ☒ d. "In Event of an Accident" sheet
  - ☒ e. certification card
  - ☒ f. completed "Shippers Declaration of Dangerous Goods" form

23. As a general rule, at what distance from the gauge should all unauthorized persons be kept at all times when the gauge is in operation?

2pts

15 feet

24. Indicate the manner in which moisture/density gauges are required to be "packaged" and secured for transportation in the following vehicles:

5pts

Pick-Up Truck:  $\frac{1}{2}$  pt In "Type A" package,  $\frac{1}{2}$  pt source rod & case locked,  $\frac{1}{2}$  pt package secured in right rear and locked  $\frac{1}{2}$  pt

Passenger Car:  $\frac{1}{2}$  pt In "Type A" package,  $\frac{1}{2}$  pt source rod & case locked,  $\frac{1}{2}$  pt package secured in right rear or  $\frac{1}{2}$  pt and locked in right rear or trunk.

25. How often should the sliding shield on a moisture/density gauge be cleaned and lubricated?

2pts

Once a week - more if necessary

26. True or ☒ False: A gauge may be stored at an individual's residence or in a hotel room.

27. True or ☒ False: The electronic components of a gauge may be removed or disassembled in the field.

28. True or ☒ False: A gauge may be transported without the shipping case.

29. True or ☒ False: A gauge may be left unattended at the job site as long as it is not in use.


30. True or ☒ False: A gauge transported in a personal vehicle is exempt from the Department of Transportation (DOT) requirements.

31. ☒ True or False: A gauge may be stored overnight at a job site so long as it is secured within a job site trailer.



- 2pts 32. True or False: A job site safety foreman is responsible for the security of all gauge(s) while at the job site.
- 2pts 33. True or False: A completed "Shipper's Declaration for Dangerous Goods" form does not have to accompany each gauge while being transported.
- 2pts 34. True or False: A gauge damaged in an incident may be immediately removed from the site to allow for the continuance of, site work.
- 2pts 35. True or False: During transportation, each gauge must be "triple-locked"
- 2pts 36. True or False: Most common substances are slightly radioactive to some degree.

MATCHING: Write the letter of the respective passage on the right in the space next to the corresponding term.

- |   |  |
|---|--|
| 2pts 37. <u>F</u> REM   | A. The symbol to denote radiation  |
| 2pts 38. <u>I</u> Agreement State   | B. $3.7 \times 10^{10}$ disintegrations per second                                 |
| 2pts 39. <u>J</u> license ("RAM")   | C. Encapsulated ("special form") radioactive material                              |
| 2pts 40. <u>H</u> ionizing radiation  | D. The smallest unit of an element, comprised of a nucleus and orbital electron(s) |
| 2pts 41. <u>C</u> sealed source   | E. An unstable substance that decays by emitting radiation                         |
| 2pts 42. <u>B</u> curie   | F. A unit of estimated biological effect (damage) that radiation has on tissue     |
| 2pts 43. <u>A</u>  | G. A "bundle" of electromagnetic energy  |
| 2pts 44. <u>E</u> radioactive material  | H. High energy electromagnetic radiation capable of damaging biological tissue     |
| 2pts 45. <u>G</u> photon  | I. A type of regulatory agency that regulates radiation within a specific state    |
| 2pts 46. <u>D</u> atom  | J. A document that authorizes the possession and use of radioactive material       |

Answer the following questions in detail.

47. Explain how to dry out a moisture/density gauge if moisture builds up internally.

- 1 Return gauge to storage location. 2pts  
2 Remove scalar unit. 1pt  
3 Charge overnight (or use hair dryer). 2pts

5pts

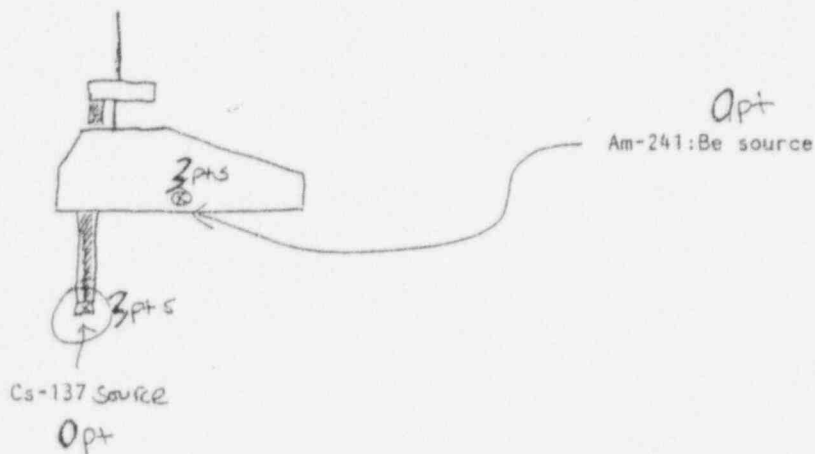
48. Explain where the Information Pouch should be kept when transporting and using a gauge.

During Transportation: In plain view, in reach of driver. 2pts

During usage: On person. 2pts

4pts

49. Draw a sketch of a gauge and indicate where the radioactive source(s) is/are.



6pts

50. Scenario: A moisture/density gauge you are using is stolen. Explain in detailed steps what should be done.

- 1 Immediately notify job site foreman. 2pts
- 2 Immediately contact Branch RSO, ARSO or others on "In Event of an Accident" form. 2pts
- 3 Remain on site to assist in search and recovery efforts. 1pt
- 4 Prepare a written statement. 1pt

6pts

51. Scenario: A moisture/density gauge you are using is run over and crushed. Explain in detailed steps what should be done in this type of accident.

- 1 Stop all operations in the area of the gauge, stop and isolate all vehicles and equipment involved in the accident. 2pts
- 2 Establish a 15' radius boundary - restrict access to PSI RSO, ARSO & emergency medical personnel only. 2pts
- 3 Stay with the gauge. 1pt
- 4 Immediately send someone else to notify RSO or others on "In Event of an Accident" form. 2pts

7pts

52. Describe in detail the security and control provision for moisture/density gauges in storage, during transport and during use.

In storage: Source rod locked, case locked, storage enclosure locked.

During transport: Source rod locked, case locked, package secured and locked in right rear of vehicle.

During use: Immediate control and constant surveillance.

1pt 1pt

9pts

Professional Service Industries, Inc.  
Training Confirmation Form

To: Corporate Radiation Safety Officer (CRSO)

I, \_\_\_\_\_, :  
(PRINT FULL LEGAL NAME)

- have viewed and completed "The Story of Radiation" video and corresponding study guide (copies available from the Corporate Radiation Safety Department),
- have read and fully understand the training section of the PSI Moisture/Density Gauge Manual (S.O.P. SF-9),
- have had all of my questions regarding the PSI moisture/density gauge program answered to my satisfaction,
- do hereby affirm that I will comply with all PSI procedures and regulations pertaining to the use of moisture/density gauges,
- understand that I may consult with my Branch Radiation Safety Officer (BRSO) or PSI's Corporate Radiation Safety Officer (CRSO) concerning any questions I may have.
- do hereby affirm that the information provided on this form is complete and true to the best of my knowledge.

| Date | Type of instruction  | No. of hours provided   | Trainee Initial | RSO Initial |
|------|--|-------------------------|-----------------|-------------|
|      | Radiation Safety Instruction<br>(2 1/2 hours required)     | $\geq 2\frac{1}{2}$ hrs |                 |             |
|      | Operating Procedures Instruction<br>(2 1/2 hours required) | $\geq 2\frac{1}{2}$ hrs |                 |             |
|      | Exam   | Not Applicable          |                 |             |

All blocks complete

\_\_\_\_\_  
(TRAINEE SIGNATURE)

\_\_\_\_\_  
(DATE)

Trainee's film badge should be assigned to:

\_\_\_\_\_  
(OFFICE [CITY])

\_\_\_\_\_  
(BRSO SIGNATURE)

\_\_\_\_\_  
(DATE)

## RSO/INSTRUCTOR TRAINING PROGRAM

06/95

The PSI Moisture/Density Gauge RSO/Instructor training program is a sixteen (16) hour course consisting of a combination of self-study material and formal "classroom" instruction. The self-study portion combines text and videotape information prepared by the Corporate Radiation Safety Director and is estimated to require a minimum of eight hours for completion. The "classroom" portion utilizes materials prepared by the Corporate Radiation Safety Director and is presented under the direct supervision of either the Corporate Radiation Safety Director or the Assistant Radiation Safety Director.

The prerequisites for the Moisture/Density Gauge RSO/Instructor training program are as follows:

- A degree in Engineering or Science, or equivalent.
- Certification as a moisture/density gauge operator, either by the manufacturer or through PSI's "in-house" training program.
- At least one week of experience in the use of moisture/density gauges.

At the end of the training program, a minimum 50 question test is administered with a minimum passing grade of 80%. The exams are evaluated by the Corporate Radiation Safety Director or the Assistant Radiation Safety Director.

Upon successful completion of the program, a certificate will be issued to the RSO/Instructor by the Corporate Radiation Safety Director.

An outline of the topics covered during the program is attached, including an approximate timetable for the "classroom" portion. (A [sample] test with answers is attached.)



## COURSE SCHEDULE

Radiation Safety Officers Training  
(Portable Moisture/Density Gauges)

---

8:00 AM Welcome and Introductions

8:30 AM Introduction to Radiation  
Definition of Terms  
Periodic Properties of Elements  
Early Models of Atomic Structure  
Bohr Atom  
Isotopes  
Environmental Radiation  
Cosmic  
Terrestrial  
Man-made Radiation  
Consumer Products

9:00 Types of Radiation  
X-Rays  
Alpha  
Beta  
Gamma  
Neutron

9:30 Radioactive Material Sealed Sources  
"Normal Form"  
"Special Form"  
Gamma  
Radium-226  
Cesium-137  
Neutron  
Radium/Beryllium  
Americium/Beryllium

9:45 BREAK

10:00 Radiation Interactions  
Radioactive Decay  
Half-Life  
Attenuation  
Ionization  
Units of Measurement  
Detection  
Survey Meter  
Dosimeter

Course Schedule (continued)  
Page Two

10:30      Radiation Exposure  
            Units  
            Dose & Dose Rates  
            Biological Effects & Hazards  
                Contamination  
                Exposure  
                Internal Hazards  
                    Biological Half-Life  
                    Effective Half-Life  
                External Hazards  
                Prompt Effects  
                    Radiation Injury  
                    Acute Exposure  
                Delayed Effects  
                    Cancer  
                    Genetic Defects  
                Exposure of Pregnant Women  
                Occupational Exposure  
            Risk vs. Benefit

12:00 NOON    LUNCH

1:00 PM      Reduction of Radiation Exposure  
            Time  
            Distance  
                Divergence  
                Inverse-Square Law  
            Shielding  
                Materials  
                    For Gamma Sources  
                    For Neutron Sources  
                Half-Value Layer  
            ALARA - Philosophy & Application

1:30    Regulatory Control  
          Governmental Agencies  
              U.S. Nuclear Regulatory Commission  
              Agreement States Program  
              U.S. Department of Transportation  
          Byproduct Material  
          Regulations  
              "Notices, Instructions and Reports to Workers"  
              "Standards for Protection Against Radiation"  
              "Rules of General Applicability to Domestic Licensing..."  
              "Packaging of Radioactive Material for Transport..."  
          Occupational Exposure Limits  
          Personnel Monitoring

Course Schedule (continued)  
Page Four

3:15 Training & Instruction of Operators

- Topics
- Examination
- Certification
- Documentation

3:30 Emergency Response

- Loss
- Accident
- Hazards
- Immediate Action
- Recovery
- The Human Factor
- Overexposure
- Case Histories

4:00 EXAMINATION

Course Schedule (continued)  
Page Three

Regulatory Control (continued)  
License Authorizations  
Materials  
Transfer  
Inventory  
Storage  
Use  
Personnel  
Service  
Commitments  
Reciprocity  
Radiation Area  
Restricted/Unrestricted Areas  
Posting of Signs  
Sealed Source Leak Testing  
Requirements  
Sample Collection  
Security  
In Storage  
In Use  
Transportation  
Packaging  
"Type-A Package"  
Radiation Limits  
Marking  
Labeling  
Paperwork  
Transport  
Shipping  
Records & Documentation  
Operations  
Safety  
Supervision  
Use of Equipment  
Records  
Governmental Inspections

2:45 BREAK

3:00 Occupational Responsibilities  
Individual Users  
Radiation Safety Officer  
Corporate Officers  
Legal Considerations  
Liability vs. Benefit

8 passing: 80%  
↳ (min pts: 91)

TO BE COMPLETED BY EXAMINER:

Final Score: \_\_\_\_\_

Certification Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

(SAMPLE)

PROFESSIONAL SERVICE INDUSTRIES, INC.

RADIATION SAFETY EXAMINATION

REV 03/18/94

\_\_\_\_\_  
DATE

Key  
\_\_\_\_\_  
NAME

SS# \_\_\_\_\_

DATE OF BIRTH \_\_\_\_/\_\_\_\_/\_\_\_\_



(Choose best answer for multiple-choice questions, T or F for True - False questions.)

1. The smallest part of an element that retains the properties of that element is called:

2 pts  
☒ a. atom  
b. electron  
c. alpha particle  
d. proton

2. High energy, short wavelength electromagnetic radiation emitted during radioactive decay is called a (an):

2 pts.  
a. alpha particle  
b. beta particle  
c. x-ray  
☒ d. gamma ray

3. The number of disintegrations that occur for a given radioisotope during a given length of time is a measurement of the:

2 pts.  
a. average gradient  
b. latitude  
☒ c. activity  
d. ionization

4. Compton scatter, pair production and the photoelectric effect are all processes by which electromagnetic radiation is absorbed.

2 pts  
☒ a. True  
b. False

5. In comparing the wave length of x- and gamma rays to the wave length found in the visible light spectrum, it is noticed that the wave lengths of x- and gamma rays are:

2 pts  
a. longer by comparison  
b. higher by comparison  
c. lower by comparison  
☒ d. shorter by comparison

12. Which of the following is not required to be posted?:

2pts

- a. Appropriate "Notice to Employees"
- b. Applicable regulations, or notice as to their location
- c. Radioactive material storage sign
- (d.) Leak test certificate

13. The Code of Federal Regulations in Title 10 Part 20 establishes the maximum permissible occupational dose limits in rem per calendar year for different parts of the body. These limits apply to individuals 18 years of age or older in restricted areas. In an individual's lifetime, these limits allow a maximum permissible occupational dose of radiation that is not expected to cause appreciable body injury. The whole body, head and trunk may receive no more than \_\_\_\_\_ rem per calendar year:

2pts

- a. 50 rem/year
- b. 1 1/4 rem/year
- c. 1 rem/year
- (d.) 5 rem/year

14. A moisture/density gauge operator is in compliance with the regulations so long as he maintains visual surveillance of a gauge, regardless of whether the device is in his immediate control.

2pts

- a. True
- (b.) False

15. Describe the basic structure of the atom:

3pts

Nucleus comprised of protons (+) and Neutrons (0)  
(which determine element and isotope, respectively),  
orbital electrons (-) ( $\approx 1/1840$ th AMU) in orbital  
(energy) shells  $e^-$  + Protons (+)  
determine charge

6. The term ALARA, when dealing with radiation safety stands for:

- 2pts. a. At last, a Roentgen analyzer  
b. As low as is reasonably achievable  
c. As low as regulations allow  
d. As long as readings allow

7. When x and gamma rays pass through matter, the matter becomes radioactive for a few minutes.

- 2pts. a. True  
b. False

8. What is the proper posting required to denote storage of moisture/density gauges?

- 2pts. a. "Caution - Radioactive Materials"  
b. "Caution - Radiation Area"  
c. "Caution - High Radiation Area"

9. The abbreviation "rem" represents:

- 2pts. a. "radiation effect on man"  
b. "roentgen equivalent man"  
c. "regulations equivalent man"  
d. "milliroentgen equivalent man"

10. Alpha particles are considered to be more highly ionizing than x- or gamma rays.

- 2pts. a. True  
b. False

11. X-rays were discovered in Germany in 1895 by:

- 2pts. a. Wilhelm Roentgen  
b. Almer Conrad  
c. Marie Curie  
d. Henri Becquerel

16. Which of the following is not true for requirements of reciprocity:

- a. must notify state prior to entry
- b. must remain only at jobsite location
- c. may store gauge at jobsite
- d. must operate in accordance with the license
- ☒ e. must adhere to regulations of "home" state

2pts

17. Elements with common atomic numbers but with different atomic weights are called:

- a. Ions
- ☒ b. Isotopes
- c. Radioactive
- d. Elements

2pts

18. The radiation dose that will result in the death of 50 percent of the people exposed is called the:

- a. maximum permissible dose
- b. daily occupational dose
- ☒ c. median lethal dose
- d. maximum lethal dose

2pts

19. The presence of unwanted radioactive matter, or the tainting of objects with radioactive "dust" or "dirt", is referred to as:

- a. high risk area
- b. occupational hazard
- ☒ c. contamination
- d. none of the above

2pts

20. Regulations require that personnel monitoring be provided to:

- a. only individuals who work at nuclear power plants
- b. all employees whether certified or not
- ☒ c. all individuals likely to receive 10% of annual limit
- d. only individuals under 18 years of age and pregnant women

2pts

21. When x and gamma rays pass through the human body, the primary cause of damage is a direct result of ionization:

- 2 pts. ☒ a. True  
b. False

22. The term "somatic effect" applies to:

- 2 pts. ☒ a. the physical effects on the human body, as a result of cell damage  
b. mutation caused by genetic damage  
c. the physical effects on the iris of the eye, as a result of cell damage  
d. none of the above

23. Which of the following is not correct regarding incidents involving moisture/density gauges?

- 2 pts. ☐ a. contact corporate office immediately  
☐ b. only authorized personnel may be involved in gauge recovery  
☐ c. assume contamination is present until it is determined that no contamination exists  
☐ d. Radiation Safety Officer shall personally handle device recovery  
☒ e. remove device from site without precautions for contamination

24. The attenuation (reduction) in the radiation as it passes through material is caused by:

- 2 pts. ☒ a. absorption  
☐ b. osmosis  
☐ c. backscatter  
☐ d. epidemiology

25. Leak tests of sealed sources of radioactive material are performed:

- 2 pts. ☐ a. every three years  
☐ b. only if a leak is suspected  
☒ c. at intervals not to exceed six months by certified individual(s) only  
☐ d. daily



26. The total number of protons in the nucleus of an atom represents the:

- a. number of subatomic particles
- b. the neutrons
- ☒ c. the atomic number
- d. the atomic weight

2 pts.

27. An electrically balanced atom containing two protons in the nucleus would contain how many orbital electrons:

- a. 3
- b. 4
- c. 1
- ☒ d. 2

2 pts.

28. All isotopes are unstable and therefore radioactive.

- a. True
- ☒ b. False

2 pts.

29. Radiation from nuclear decay may be found in three basic types of emission. They are:

- a. alpha, beta and x
- b. gamma, alpha and x
- c. beta, x and alpha
- ☒ d. gamma, beta and alpha

2 pts.

30. What term is used as a measure of the activity of a radioisotope?:

- ☒ a. curies
- b. ions
- c. isotopes
- d. electrons

2 pts.

31. Which of the following statements is not correct regarding shipping and transportation of moisture/density gauges?

- 2 pts.
- a. Gauges are to be shipped in D.O.T. approved "TYPE A", "YELLOW II" packages.
  - b. Gauges in transit must be secured to prevent unauthorized removal.
  - c. Gauges transported in personal vehicles are exempt from D.O.T. Regulations.
  - d. Gauges may not be shipped on passenger aircraft.

32. The time required for one half the atoms in a radioactive substance to disintegrate is called the:

- 2 pts.
- a. specific activity
  - b. half-life
  - c. shelf life
  - d. wave length

33. The shorter the wave length of electromagnetic radiation, the lower the energy level.

- 2 pts.
- a. True
  - b. False

34. One of the most critical factors when considering human safety when working with x- and gamma rays is:

- 2 pts.
- a. that they can only be detected by smell
  - b. they may be detected only by touch
  - c. they cannot be detected by human senses
  - d. there is no critical factor

35. The abbreviation of "rad" is representative of:

- 2 pts.
- a. roentgen absorbed data
  - b. radiation absorbed dose
  - c. 1/100 of a roentgen
  - d. 1/10th of a roentgen

36. Dosimetry (film badge) reports must be retained on file:

- 2 pts.
- a. for 1 year
  - b. for 3 years
  - c. for 5 years
  - ☒ d. indefinitely

37. Any area for which an access is controlled for purposes of protection of individuals from exposure to radiation and radioactive materials is called:

- 2 pts.
- a. a quiet area
  - b. a hazardous area
  - c. a vacated area
  - ☒ d. a restricted area

38. List four characteristics of x-rays and gamma rays:

- 4 pts.
- a. Electromagnetic radiation, travel in straight lines.
  - b. No charge, No mass, Not effected by electric or magnet field
  - c. Short wave length, high frequency, penetrate matter, may ionize matter
  - d. Can not be detected by human senses, may not be reflected or refracted (may "scatter").

39. An ion is a (an) \_\_\_\_\_ with either a positive or negative charge.

- 2 pts.
- ☒ a. Particle, or combination of particles
  - b. excess neutrons
  - c. gamma ray
  - d. high energy x-ray

40. Which of the following may be completely absorbed by a piece of paper?

- 2 pts.
- ☒ a. alpha particles
  - b. beta particles
  - c. gamma rays
  - d. high energy x-rays

41. The symbol "R" stands for:

- a. radiation absorbed dose
- b. relative biological effectiveness
- c. roentgen equivalent man
- ☒ d. none of the above

2pts

42. Relatively speaking, which of the following types of radiation has the greatest biological effect?

- a. x-rays
- b. gamma rays
- ☒ c. alpha particles
- d. beta particles

2pts

43. To determine rem (roentgen equivalent man) values, one would multiply:

- a. roentgen times rad
- b. roentgen times ICE
- ☒ c. rad times RBE
- d. RBE divided by rad

2pts

44. Regulations require that individuals under 18 years of age receive no more than 10% of 5 rem per calendar year (whole body).

- ☒ a. True
- b. False

2pts

45. Cell damage due to radiation exposure increases as cell reproduction rate increases.

- ☒ a. True
- b. False

2pts

46. When one looks at the human cell sensitivity, it may be noted that the most sensitive cells in the human body are the:

- 2 pts.
- a. digestive system lining cells
  - b. cells of the gonad
  - c. blood vessel cells
  - ☒ d. white blood cells

47. It is expected that a dose of over 1,000 rem in any 24 hour period will result in:

- 2 pts.
- ☒ a. 100% fatalities
  - b. 50% fatalities
  - c. 25% fatalities
  - d. 10% fatalities

48. List the primary factors that determine a cell's sensitivity to radiation damage.

3 pts

Cell age (i.e. maturity)

rate of reproduction (regeneration).

degree of differentiation or specialization.

49. What are the two general categories of cellular damage? (Pick two)

- 2 pts.
- a. cancer
  - ☒ b. somatic effects
  - ☒ c. genetic effects
  - d. radiation burns

50. Which of the following doses is likely to be the most damaging?

- 2 pts.
- ☒ a. 25 rem over a 24 hour period
  - b. 25 rem over a 1 year period
  - c. 25 rem over a 5 year period
  - d. 25 rem over a 10 year period



51. What is the likely effect to an individual if the individual were to receive 1000 mrem in less than 24 hours? (watch units)

- 2 pts.
- a. No obvious injury
  - b. Possible disability
  - c. Possible death
  - d. Certain death

52. Regulations require that radioactive material, while in storage, must be:

- 2 pts.
- a. kept warm and dry
  - b. accessible to all employees whether certified or not
  - c. secured against unauthorized removal at all times
  - d. kept in office lab

53. The dose rate at 4 feet from a Cesium-137 source is 16 R/hr. What would the dose rate be at 100 feet? (Note difference in units of exposure.)

- 2 pts.
- a. 16 mR/hr
  - b. 26 mR/hr
  - c. 160 mR/hr
  - d. 260 mR/hr
- $$\frac{I_1}{I_2} = \frac{(D_2)^2}{(D_1)^2} = \frac{16,000 \text{ mR/hr}}{x} = \frac{(100)^2}{(4)^2} \text{ or } \left( \frac{10,000}{16} \right)$$

$$\text{So, } 16,000 \text{ mR/hr} \cdot 16 = 10,000 \times$$

$$256,000 \text{ mR} = 10,000 \times$$

$$25.6 \text{ mR/hr} = x \quad 26 \text{ mR/hr}$$

54. The dose rate indicated on your survey meter is 25 mR/hr. If you were to stay in that location for 5 minutes, 15 minutes, 1 hour or 8 hours, what would your dose be?

- a. 5 minutes  $25 \text{ mR/hr} \cdot \frac{5}{60} = 2.08\overline{3} \text{ mRem/5 min}$
- b. 15 minutes  $25 \text{ mR/hr} \cdot \frac{15}{60} = 6.25 \text{ mrem/15 min}$
- c. 1 hour  $25 \text{ mR/hr} \cdot \left( \frac{60}{60} \right) = 25 \text{ mrem/hr}$
- d. 8 hours  $25 \text{ mR/hr} \cdot 8 = 200 \text{ mrem/8 hrs.}$

## FACILITIES AND EQUIPMENT

06/95

A annotated diagram of the location(s) included in Item 3. is/are attached.

The following security measures will be taken with devices in storage:

- Devices with extendable source rods will be stored with the source rod locked in the "safe" position.
- The storage room/cabinet shall be locked at all times not under the immediate control of a certified operator.

Licensed material transported by PSI, or delivered by PSI to a carrier for transport, shall be packaged in accordance with the provisions in 10 CFR 71 (Packaging of Radioactive Materials for Transport) and Title 49 Code of Federal Regulations. These provisions require:

- Moisture/density gauges shall be transported in USDOT "Type A Package" transport cases.
- For shipment of packages that are not excepted, proper shipping paper, certification, marking and labelling in accordance with 49 CFR.
- Placement of the package as far from the driver's position as practical (in the interest of ALARA).
- Accessibility of shipping paper and emergency response information within reach of a seat-belted driver of the vehicle.
- Source rod locked, transport case (tightly) secured to right rear of vehicle.

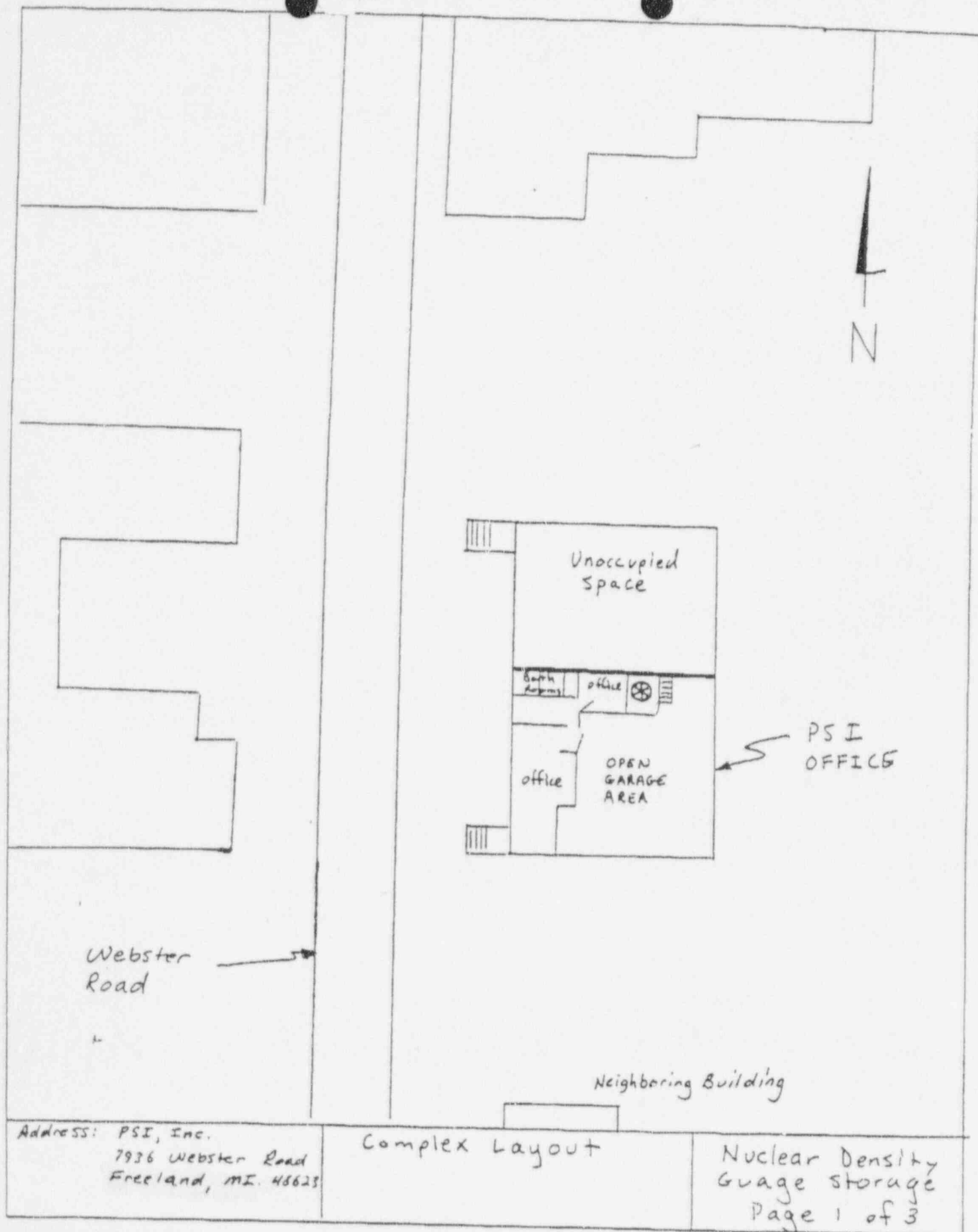
Licensed material not in storage shall be under the constant surveillance and immediate control of a certified operator.

In some cases, the return of licensed material to one of the permanent storage locations listed on the license is not practical. In such cases, storage of licensed material at temporary job sites shall be in accordance with the attached temporary job site storage instructions, or stored in the transport vehicle overnight.



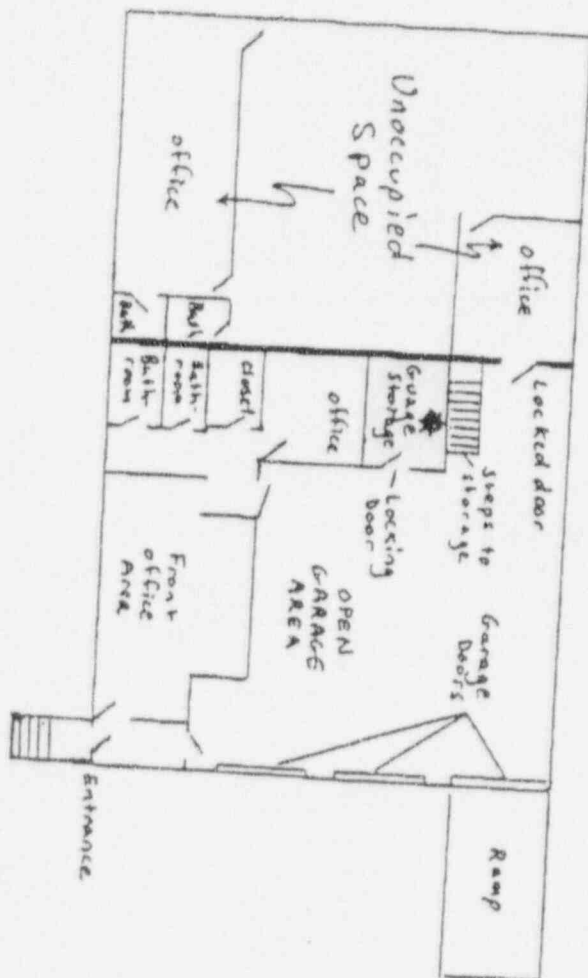


VAULT IS CONSTRUCTED OF CONCRETE MASONRY UNITS  
TOP OF VAULT IS CAST IN PLACE SLAB. VAULT DOORS  
ARE STEEL WITH BUILT IN LOCKS. OUTLET FOR  
CHARGING IS INSIDE VAULT.



WESTER ROAD

● utility pole



N  
1" = 20'

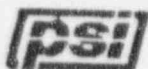
Guage Storage Room  
Construction Materials:  
2x4 Stud walls with dry wall  
on both sides. Locking door  
entry.

Legend:

★ = Nuclear Guage Storage  
1" = 20'

PSI office Layout

Nuclear Density  
Guage Storage  
Page 2 of 3





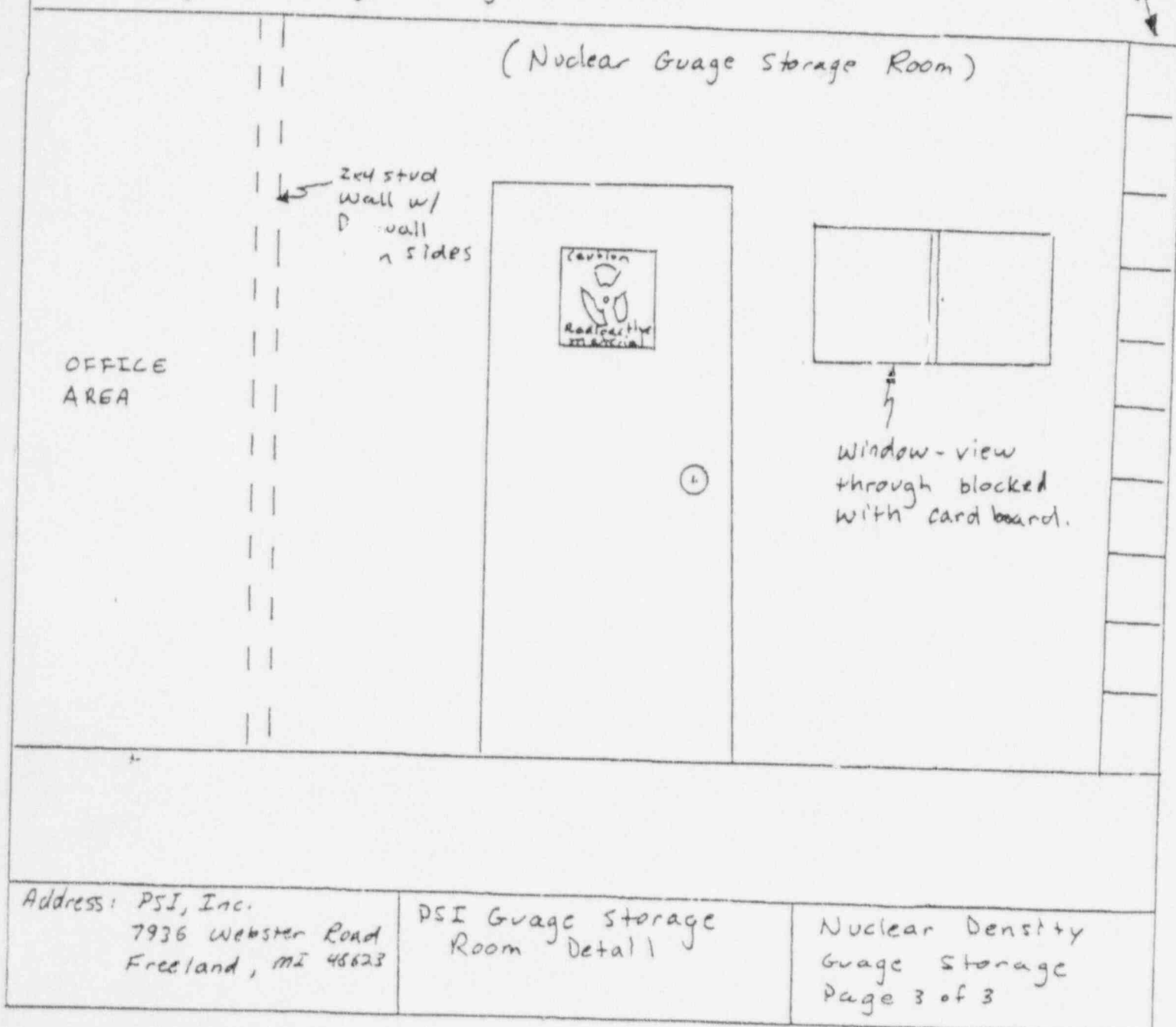
Construction: - 2x4 wood framed walls with  
Drywall inside and out.

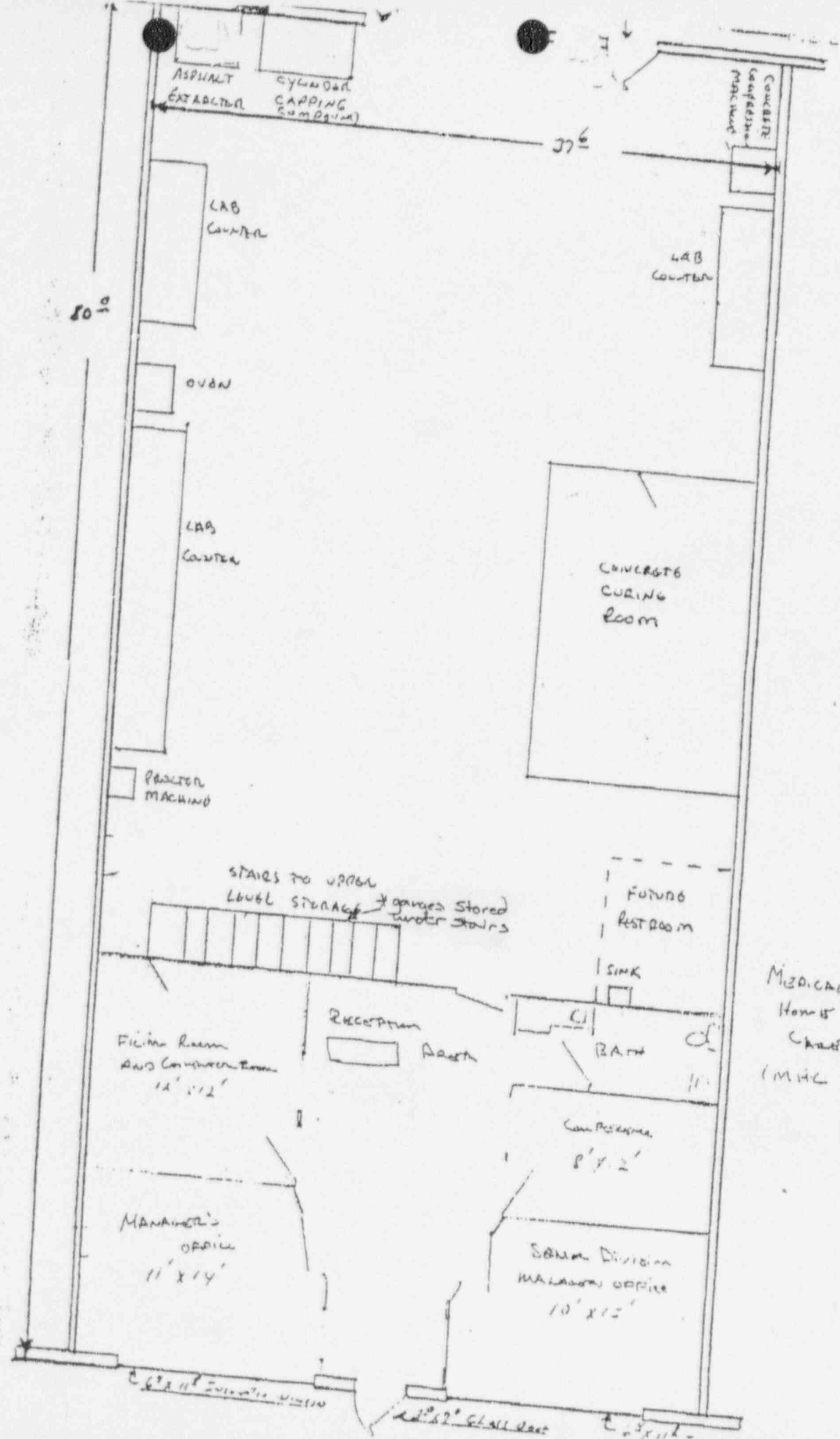
Security: - Locking Door.  
- Internal Hinges.  
- Posted with Appropriate Sign.

Guage Storage: - Guages stored in transport cases.  
- Guages charged in storage.

Note: Only certified operators have access to  
keys for guage storage Room.

Steps to Overhead  
Storage

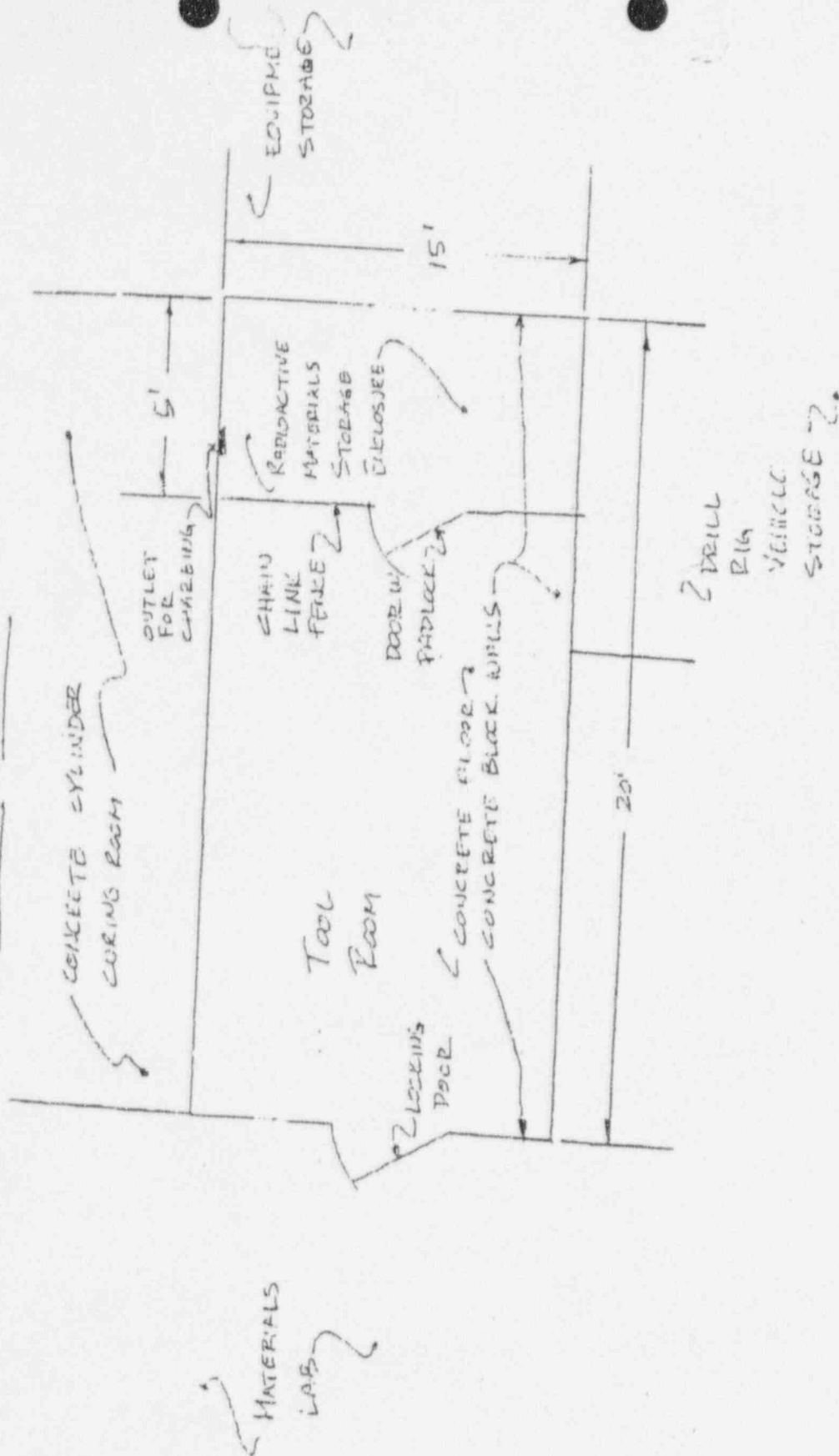




Kalamazoo

TELE-CONNECT  
PLUS INC.

STORAGE DIAGRAM



# TEMPORARY JOB SITE STORAGE

The use of portable moisture/density gauges often involves storage at remote locations (job sites) due to long distances between the licensed storage facility and the job site. Gauges stored at the job site on a temporary basis must be used only at the specific site where stored, and must be returned to the licensed location upon completion of activities at the job site. Gauges may not be stored at an individuals' residence or in a hotel room. Temporary job sites may not be used as a "base of operations" for servicing other customers or performing work at other jobs in the area.

Device(s) stored at temporary job sites must be stored in the following manner:

1. All gauge(s) stored at job sites must be secured with a padlock inserted into the source rod handle or trigger mechanism to prevent extension of the source rod (if applicable).
2. All gauge(s) stored at job sites must be stored in a Department of Transportation (DOT) approved shipping case. (Storage of the gauge(s) in the shipping case provides the necessary distance to decrease to radiation levels to below regulatory limits in an unrestricted area [less than 2 mR/hr or 100 mR in 7 consecutive days].)
3. All gauge(s) stored at temporary job sites must be secured against unauthorized removal at all times. Gauge(s) stored in a trailer at the job site must be secured in a locked enclosure, such as a cabinet or a closet. (In the event a lockable storage cabinet or closed is unavailable, the gauge(s) stored in its shipping case may be chained to an immovable object within a job site trailer.) Only individuals certified in accordance with licensed procedures are to have keys to the storage cabinet. A "Caution-Radioactive Materials" sign must be posted on the door of the cabinet or closet.
4. A copy of the complete, unexpired radioactive materials license must be available for review at the job site. A copy of the appropriate "Notice to Employees" and a statement as to where a copy of the current regulations and licensed procedures may be reviewed must be posted at the job site.

Storage of the gauge(s) in a manner other than that described above must be pre-approved by the Corporate Radiation Safety Director. To obtain approval, contact the corporate office prior to storing the gauge(s) at the job site.

## RADIATION SAFETY PROGRAM

06/95

Professional Service Industries, Inc. (PSI) maintains a Corporate Radiation Safety Oversight Program to monitor PSI's activities involving licensed (radioactive) material. The aspects of PSI's Corporate Radiation Safety Oversight Program include, but are not limited to, the following:

- personnel monitoring program
- leak testing monitoring
- inventory control
- device maintenance
- procedure development
- annual audit program

PSI's Corporate Radiation Safety Program is the responsibility of PSI's Corporate Radiation Safety Director and Assistant Radiation Safety Director, both of whom may be reached at PSI's Corporate office.

The use of radioactive material and daily management of the radiation safety program at the individual Branch offices are the responsibility of the License Radiation Safety Officer. The License Radiation Safety Officer is responsible for:

- State/Federal regulatory compliance
- adherence to PSI radiation safety procedures
- operator training
- assurance of proper utilization of licensed material as prescribed by the manufacturer or PSI procedures

Individual operators (field personnel) are responsible for safe use of licensed material and adherence to PSI and State/Federal regulations.

## PERSONNEL MONITORING PROGRAM

06/95

In 1994, PSI conducted a study of moisture/density gauge operator personnel monitoring results. With over 1,000 monitored moisture/density gauge users company wide, PSI has a large base for study data.

The study (copy attached) clearly demonstrates that PSI moisture/density gauge users are not likely to receive in excess of 10 percent of the allowable regulatory limits; therefore, PSI requests a specific exemption to the requirements for personnel monitoring.

In the event that the exemption is not granted, PSI shall provide monthly personnel dosimetry (film badge[s]) capable of detecting X-, Gamma, Beta, and Neutron radiation to moisture/density gauge operators for whom personnel monitoring is required. Dosimetry will be contracted through a NAVLAP accredited dosimetry supplier. (PSI currently uses Landauer, Inc. in Glenwood, Illinois, but requests that a dosimetry provider not be specified on the license.)

Summary of 1994 personnel monitoring data for PSI gauge operators at  
PSI offices conducting licensed moisture/density gauging activities.

| Reported whole body exposure<br>(millirem per year) | Number of<br>exposures<br>in each<br>range |
|---|--|
| No measurable exposure ("M")                        | 781  |
| 10 mrem   | 96   |
| 20 mrem   | 58   |
| 30 mrem   | 38   |
| 40 mrem   | 15   |
| 50 mrem   | 11   |
| 60 mrem   | 7  |
| 70 mrem   | 8  |
| 80 mrem   | 4  |
| 90 mrem   | 4  |
| 100 mrem  | 3  |
| 110 mrem  | 4  |
| 120 mrem  | 1  |
| 130 mrem  | 3  |
| 140 mrem  | 1  |
| 150 mrem  | 1  |
| 160 mrem  | 1  |
| 170 mrem  | 1  |
| 180 mrem  | 0  |
| 190 mrem  | 0  |
| 200 mrem  | 0  |
| 210 mrem  | 1  |
| 220 mrem  | 0  |
| 230 mrem  | 0  |
| 240 mrem  | 0  |
| 250 mrem  | 0  |
| 260 mrem  | 0  |
| 270 mrem  | 0  |
| 280 mrem  | 1  |
| 290 mrem  | 0  |
| 300 mrem  | 0  |
| 310 mrem  | 0  |
| 320 mrem  | 0  |
| 330 mrem  | 0  |
| 340 mrem  | 0  |
| 350 mrem  | 0  |
| 360 mrem  | 0  |
| 370 mrem  | 0  |
| 380 mrem  | 0  |
| 390 mrem  | 0  |
| 400 mrem  | 0  |
| 410 mrem  | 0  |
| 420 mrem  | 0  |
| 430 mrem  | 1  |
| ↓   | 0  |
| 790 mrem  | 1  |
| TOTAL   | 1041                                       |

Supplier: Landauer, Inc.  
2 Science Road  
Glenwood, Illinois 60425

Exchange period: monthly

Dose equivalents below the minimum measurable quantity are reported as "M". The assigned film badge worn by PSI operators (type "B1" badge) has a minimum reporting value of 10 mrem for x-ray, gamma, beta and fast neutron radiation.

PSI corporate radiation safety staff investigates film badge exposure reports exceeding 40 millirem per month (the "wear period"). In a 40+ mrem exposure, investigation typically reveals an exposure to the badge(s) stored in elevated radiation levels adjacent to radioactive material storage, or badges temporarily stored in the gauge transportation case. No personnel exposure over 40 mrem has been substantiated. PSI gauge operators following proper procedures typically receive a minimal ("M") exposure.

- Highest "verifiable" annual exposure: 170 mrem

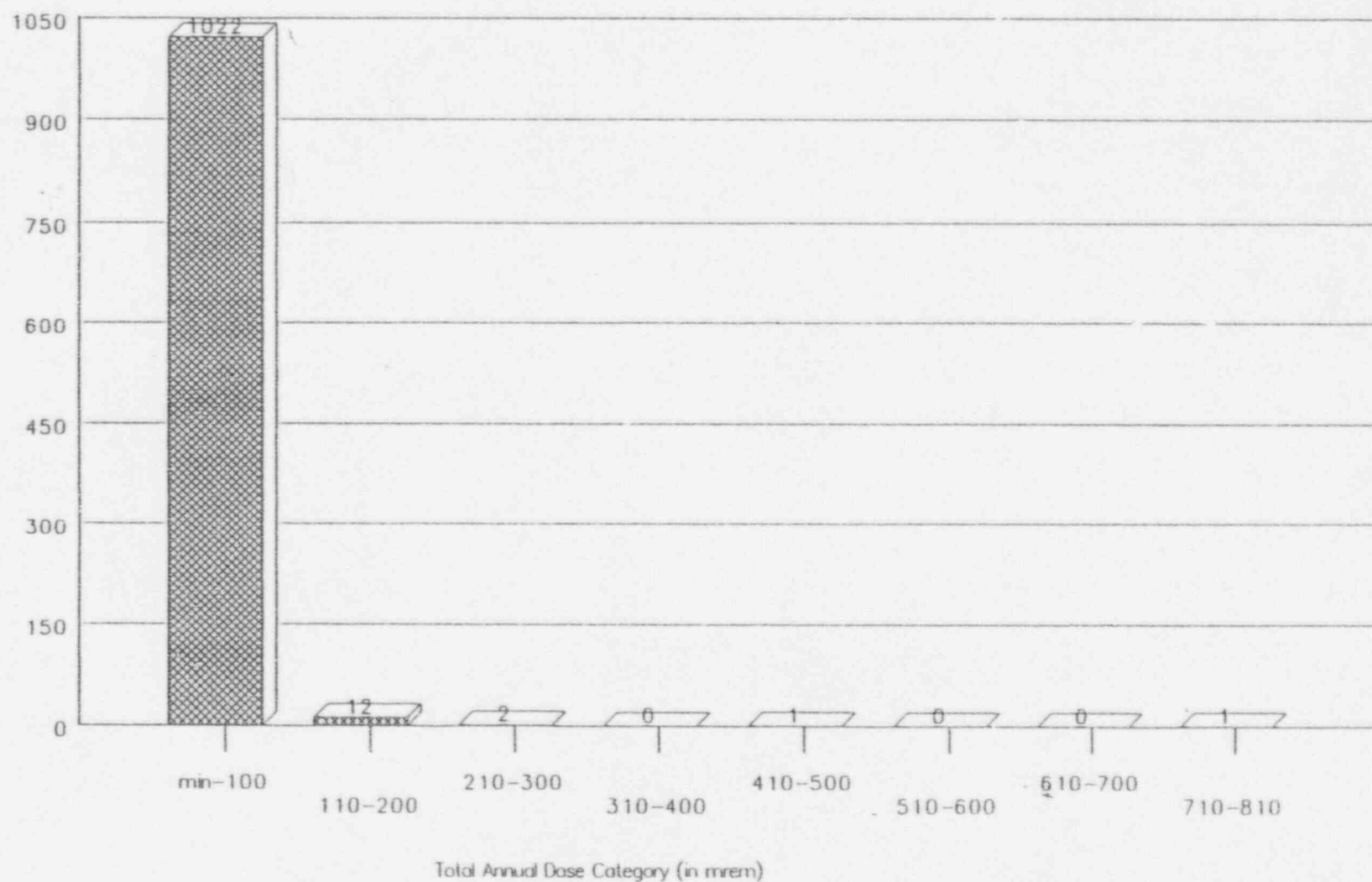
- > 99% of all annual exposures reviewed were less than 140 mrem/year; > 98% were <100 mrem/year.

- < .2% of all annual exposures reviewed were above 300 mrem/year.



# 1994 Annual Dose Summary

(1041 personnel monitored)



## RADIATION DETECTION INSTRUMENTS

06/95

Radiation survey instruments (survey meters) used in conjunction with moisture/density gauge operations (emergency response, etc.) shall be an NDS Products model ND-500A, capable of detecting X- and gamma rays in a range of 0.1 mR/hr to 500 mR/hr, or equivalent meter.

Survey meters for use in conjunction with the moisture/density gauge program shall be calibrated at intervals not to exceed twelve (12) months or after servicing. Calibration shall be performed by persons specifically licensed by the USNRC or an Agreement State Agency to provide such services.

At least one calibrated, operable survey meter shall be maintained by the Radiation Safety Officer for use during routine surveys or emergency response.

Survey meters will not normally be maintained at each temporary job site. The Radiation Safety Officer, the Corporate Radiation Safety Department staff or a licensed consultant will normally conduct all surveys. Field technicians (moisture/density gauge operators) do not normally conduct radiation surveys.

## LEAK TESTING

06/95

Each gauge containing licensed material will be tested for leakage and/or contamination at intervals not to exceed six months with the following exception:

Sources in storage will not be tested. When a source is removed from storage that has not been leak tested within the last six months, it shall be leak tested before being placed in service or shipped.

Leak test samples will be analyzed by individual(s) specifically licensed by the USNRC or an Agreement State Agency to provide such services. (PSI currently uses Microtec Services, Inc. in Pasadena [Texas RAM License No. L04656], but requests that the license condition not specify one leak test vendor.)

The following safety precautions will be followed when taking leak test samples:

1. Assigned dosimeters will be worn.
2. The instructions provided in the leak test kit will be followed in collection of the wipe sample. (A copy of the instructions are attached, and a sample leak test kit is enclosed.)

## INSTRUCTIONS FOR LEAK TEST KIT

### GENERAL

1. Perform all work quickly and safely. Handle cotton swab applicator by screw cap only!
2. Film badge must be worn at all times during the leak testing procedures.

### BEFORE THE TEST

3. Survey the area and the device with a calibrated survey meter to insure that the source is in the "SAFE" position.
4. Complete the self-adhesive test tube label and the leak test form (PSI B-900-140) with a ball point pen. Make two photocopies of the completed form. Attach the completed label to the side of the test tube and the mailing label to the outside of the box.
5. Remove the screw cap swab applicator from the test tube and check to see that it is still moist. If the swab has dried out, moisten the tip with water.

### MOISTURE/DENSITY GAUGE

- A. Follow steps 1 and 2 above (GENERAL).
- B. Follow steps 3, 4 and 5 above (BEFORE THE TEST).
- C. Stand gauge on end. Face gauge bottom away from your body. LEAVE THE SOURCE ROD LOCKED IN THE "SAFE" POSITION; DO NOT EXTEND THE SOURCE ROD.
- D. With the moistened swab, wipe around the inside of the source rod hole at the bottom of the gauge. DO NOT OPEN THE SLIDING "SHUTTER MECHANISM" (SHIELD) OR WIPE THE SOURCE ROD ITSELF.
- E. Next, set the gauge upright and remove the screws holding the electronic face plate. Move the electronic panel aside.
- F. With the same swab, wipe the circular area in the base of the device identified by the radiation label (inside the device).
- G. Replace the electronic face plate.
- H. Follow steps 6, 7 and 8 below (AFTER THE TEST).

### RADIOGRAPHIC EXPOSURE DEVICE

- A. Follow steps 1 and 2 above (GENERAL).
- B. Follow steps 3, 4 and 5 above (BEFORE THE TEST).
- C. Remove the safety plug from the source tube end ("outlet nipple") of the exposure device.
- D. Wipe around the interior of the device opening by inserting the moist cotton swab tip two to three inches and rotating the swab around the interior upper portion of the "S" tube. Remove the swab and replace the safety plug.
- E. Follow steps 6, 7 and 8 below (AFTER THE TEST).

### (SCITEC) X-RAY FLUORESCENCE (XRF) SPECTRUM ANALYZER

- A. Follow steps 1 and 2 above (GENERAL).
- B. Follow steps 4 and 5 above (BEFORE THE TEST).
- C. VERIFY THAT THE "SHUTTER MECHANISM" IS CLOSED AND REMOVE THE KEY. Wipe around the outer edges of the metal plate (inside the black rubber boot) on the front of the device ("face scanner").
- D. Follow steps 6 and 8 below (AFTER THE TEST).

### (PGT) X-RAY FLUORESCENCE (XRF) PAINT ANALYZER

- A. Follow steps 1 and 2 above (GENERAL).
- B. Follow steps 4 and 5 above (BEFORE THE TEST).
- C. DO NOT DEPRESS THE HANDLE ("SHUTTER MECHANISM"). Wipe around the outer edges (perimeter) of the bottom and top surfaces.
- D. Follow steps 6 and 8 below (AFTER THE TEST).

### AFTER THE TEST

6. Place the swab applicator back into the test tube and securely tighten the cap. Place the test tube and completed PSI B-900-140 form in the box. Send one copy of the leak test form to the Corporate Radiation Safety Department and maintain the second copy for your records.
7. Perform a survey of the box with a calibrated survey meter in an area away from the device storage. If the survey is greater than 0.5 Mr/hr, DO NOT MAIL THE BOX! CALL THE CORPORATE RADIATION SAFETY DEPARTMENT FOR INSTRUCTIONS.
8. Apply appropriate postage to the leak test kit box and mail.

## INVENTORIES

06/95

A physical inventory of licensed material shall be performed at intervals not to exceed six (6) months. Records shall include the radionuclide, activity, manufacturer's name, model and serial number of each device containing licensed material. Records of physical inventories shall be kept on file for three years from the date of inventory.

-4

## MAINTENANCE

06/95

The licensee shall not perform any maintenance or repairs involving removal of sealed sources from the device, removal or extension of the source rod.

The licensee may perform maintenance and repairs on the device(s) including replacement of batteries, repair and/or replacement of electronic components, leak test sample taking and cleaning and lubricating bearings. All other repairs shall be provided by individuals specifically licensed by the USNRC or an Agreement State Agency to provide such services.

## TRANSPORTATION OF DEVICES TO FIELD LOCATIONS

06/95

In accordance with 10 CFR Part 70, the transportation of licensed (radioactive) materials is conducted in accordance with U.S. Department of Transportation (DOT) regulations (49 CFR Parts 172, 173 and 177).



## OPERATING AND EMERGENCY PROCEDURES

06/95

PSI's Corporate Radiation Safety Department develops and implements operating and emergency procedures for PSI offices that utilize licensed (radioactive) material. A copy of the procedures will be distributed to moisture/density gauge operators before they begin using licensed material and a copy will be available at each temporary job site.

PSI commits that the operating and emergency procedures will include the following instructions as a minimum:

Use of utilization logs with date(s) of use, name(s) of users, job site(s) of use, and indication of return of gauge(s) to storage.

To maintain licensed material under constant surveillance and immediate control when not locked in storage.

To follow transportation requirements listed in procedure manual (to include USDOT requirements).

To not unnecessarily expose any portion of the body to the source(s) in the device(s).

To always wear assigned personnel dosimetry (if applicable) when using a gauge.

To not store personnel dosimetry in close proximity to the device(s).

To keep unauthorized individuals away from the area where the device(s) are being used.

To place the device(s) in a secured storage location when not in use or under constant surveillance and immediate control of an authorized user.

In the event of emergency circumstances (source rod will not fully retract, device is struck by a vehicle, etc.) to:

To immediately secure the area around the device.

To prevent unauthorized individuals from entering the area.

To isolate any equipment involved in the accident.

To notify appropriate persons in accordance with the most current version of PSI's "In Event of an Accident" sheet, copy attached.

To follow the instructions of individual(s) contacted in the step above.

NOTE: PSI's Corporate Radiation Safety Department will normally handle notification of regulatory agencies and "follow-up" reporting requirements.

# IN EVENT OF AN ACCIDENT

(SAMPLE)

08/14/96

## ACTIONS TO BE TAKEN BY THE DEVICE OPERATOR

(In order!)

1. Evacuate and isolate entire accident area. Keep all unauthorized individuals away from the entire area of accident. Maintain constant surveillance of the accident site.
2. Do not move device or other equipment involved in the accident.
3. Do not leave area *but remain at restricted area boundary* ( $\approx 15$  feet for moisture/ density gauges). Send someone else to call your **Manager (RSO)** to report the incident.

Manager's (RSO's) name:

Local office telephone number:

Manager's (RSO's) home telephone number:

|     |
|-----|
|     |
| / - |
| / - |

4. If your local manager is unavailable, please contact the Radiation Safety Director at the Corporate Office.

**Corporate Office telephone number - 630/691-1490 or - 1-800/426-2897**

5. If the **Radiation Safety Director** is unavailable, please ask for the **Assistant Radiation Safety Director** or **Administrative Coordinator**.

6. If the incident occurs during non-business hours or you cannot make contact with the individuals listed above, please contact the telephone number listed below:

1-800/486-6922

7. If no answer, please contact the Radiation Safety staff at home at:

**Adam Ackermann, Radiation Safety Director - 630/545-0572**

**Michael Kesselmayer, Administrative Coordinator - 630/393-0306**

8. If you are unable to reach PSI management, call the appropriate government agency number for the State in which you are working. (Most are 24-hour numbers.)

|               |              |               |              |                                    |              |
|---------------|--------------|---------------|--------------|------------------------------------|--------------|
| Alabama       | 334/613-5391 | Louisiana     | 504/765-0160 | Ohio                               | 301/816-5100 |
| Alaska        | 301/816-5100 | Maine         | 207/624-7000 | Oklahoma                           | 301/816-5100 |
| Arizona       | 602/223-2212 | Maryland      | 410/631-3300 | Oregon                             | 503/731-4014 |
| Arkansas      | 501/661-2136 | Massachusetts | 617/727-9710 | Pennsylvania                       | 301/816-5100 |
| California    | 916/445-0931 | Michigan      | 301/816-5100 | Rhode Island                       | 401/421-7333 |
| California N: | 800/852-7550 | Minnesota     | 301/816-5100 | S. Carolina                        | 803/737-7400 |
| Colorado      | 303/756-4455 | Mississippi   | 601/354-6657 | " N:                               | 803/698-2990 |
| Connecticut   | 301/816-5100 | " N:          | 601/352-9100 | South Dakota                       | 301/816-5100 |
| Delaware      | 301/816-5100 | Missouri      | 301/816-5100 | Tennessee                          | 615/532-0364 |
| Florida       | 407/297-2095 | Montana       | 301/816-5100 | " N:                               | 615/741-0001 |
| Georgia       | 404/624-7222 | Nebraska      | 402/471-2168 | Texas                              | 512/458-7460 |
| Hawaii        | 301/816-5100 | " N:          | 402/471-4545 | Utah                               | 801/536-4250 |
| Idaho         | 301/816-5100 | Nevada        | 702/687-5394 | " N:                               | 801/536-4123 |
| Illinois      | 217/785-9900 | " N:          | 702/687-5300 | Vermont                            | 301/816-5100 |
| Indiana       | 301/816-5100 | New Hampshire | 603/271-3636 | Virginia                           | 301/816-5100 |
| Iowa          | 515/281-3478 | New Jersey    | 301/816-5100 | Washington                         | 360/682-5327 |
| " N:          | 515/993-5386 | New Mexico    | 505/827-9329 | W. Virginia                        | 301/816-5100 |
| Kansas        | 913/296-3176 | New York      | 518/457-2200 | Wisconsin                          | 301/816-5100 |
| Kentucky      | 502/564-7815 | N. Carolina   | 800/662-7956 | Wyoming                            | 301/816-5100 |
|               |              | North Dakota  | 701/328-2121 | <b>** N: AFTER HOURS NUMBER **</b> |              |

9. If you cannot contact persons listed in items 3 through 8 above, call the State Police, Hazardous Materials Unit.

State Police telephone number

|     |
|-----|
| / - |
|-----|

# EMERGENCY RESPONSE INFORMATION RADIOACTIVE MATERIAL

**PROPER SHIPPING NAME:** Radioactive Material, Special Form, N.O.S., UN2974

## HEALTH HAZARDS

- External radiation hazard from unshielded radioactive material; gamma and/or neutron.
- Low level radioactive material -- little personal radiation hazard: Radiation exposure levels at 5 feet from unshielded radiation source are below regulatory limits for unrestricted areas; i.e., less than 2 milliroentgen per hour (  $< 2 \text{ mR/hr}$  ).
- Radioactive material in Special Form is not expected to present a contamination hazard when subjected to transportation accident conditions.
- Some radioactive materials can not be detected by common gamma/beta instruments.
- Internal radiation hazards from inhalation, ingestion or breaks in skin are not expected, unless Special Form stainless steel capsule is compromised.

## FIRE OR EXPLOSION

- No risk of fire or explosion.
- Radioactivity does not change flammability or other properties of materials.

## EMERGENCY PRECAUTIONS

- Keep unnecessary people *at least* 5 feet from damaged radioactive material container. *(No area restriction necessary if container is undamaged.)*
- Isolate hazard area and permit access only to emergency, official and radiation response personnel.
- Rescue and lifesaving may be safely performed prior to any radiation measurements.
- **DO NOT DELAY RESCUE EFFORTS!** Limit entry to shortest possible time.
- Notify Radiation Authority of accident conditions.
- If contamination is suspected, detain uninjured persons, isolate equipment with suspected contamination, and delay cleanup until instruction of Radiation Authority.
- Undamaged containers may be safely moved to clear a way for traffic through the accident area; vehicles, undamaged containers and debris should be moved the shortest distance required.
- For additional hazard and emergency response assistance (24-hour) :



CALL NUMBER: 1 - 8 0 0 - 4 8 6 - 6 9 2 2

## FIRE

- Do not move damaged containers; undamaged containers may be safely moved outside of fire zone.
- **Small Fires:** Dry chemical,  $\text{CO}_2$ , water spray or regular foam.
- **Large Fires:** Water spray, fog (*flooded amounts*).

## SPILL OR LEAK

- No liquid or loose radioactive material is involved. The package contains radioactive material in Special Form; a solid contained in small steel capsule permanently installed within an electronic device. Catastrophic destruction of the device could cause a leak.
- Do not touch damaged device, shipping container or exposed contents.
- Damage to outer container may not affect primary inner container/shielding (*device*).

## FIRST AID

- Use first aid treatment according to the nature of the injury.
- Advise medical personnel that victim may be contaminated with low-level radioactive material.

\* (Guidance for moisture/density gauge: 10 mCi Cs-137, 40 mCi Am-241:Be) \*

\* (Guidance for x-ray fluorescence (XRF) device: 10 - 40 mCi Co-57) \*

## ANNUAL AUDIT OF RADIATION SAFETY PROGRAM

06/95

The individual Branch offices are to be audited annually by the respective Vice President using an audit form prepared by the Corporate Radiation Safety Director. The audit shall include a review of documents and records required by regulations and licensed conditions. The records shall include, but will not necessarily be limited to, the following:

- Training
- Surveys
- Leak test records
- Transfer/receipt records
- Utilization logs
- Personnel dosimetry records
- Instrument calibrations

The audit will be designed to verify compliance with NRC and DOT regulations, conditions of the license, compliance with PSI's radiation safety program.

One copy of the audit is maintained on file at the audited Branch office for three years and one copy is forwarded to the Corporate Radiation Safety Department for review. The Corporate Radiation Safety Department typically writes a letter to the Branch office and the auditing Vice President regarding the audit findings.

## FINANCIAL ASSURANCE

06/95

POSSESSION LIMIT COMMITMENT: The number of source/device combinations shall be limited so as not to exceed the quantities of byproduct material specified in 10 CFR 30.35(d) requiring financial assurance for decommissioning.

## WASTE MANAGEMENT

06/95

PSI does not anticipate the generation of any radioactive waste of any kind. Any "waste" (e.g., device involved in an accident) generated may be returned to the manufacturer or another individual or entity specifically licensed to receive such material (e.g. ADCO, etc.).

JUN 03 1997

Randal Pail, P.E.  
Professional Service Industries, Inc.  
7936 South Webster Road  
Freeland, MI 48623

Dear Mr. Pail:

Enclosed is your NRC Material License Number 21-26782-01 in accordance with your request.

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region III office at (630) 829-9887 so that we can provide appropriate corrections and answers.

Please be advised that your license expires at the end of the day, in the month, and year stated in the license. Unless your license has been terminated, you must conduct your program involving byproduct materials in accordance with the conditions of your NRC license, representations made in your license application, and NRC regulations. In particular, note that you must:

1. Operate in accordance with NRC regulations 10 CFR Part 19, "Notices, Instructions and Reports to Workers; Inspections," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.
2. Not possess and use materials authorized in Items 6, 7, and 8, on the license until:
  - a. You have constructed the facilities and obtained the equipment described in the license application and supporting documentation; and
  - b. You have notified the U. S. Nuclear Regulatory Commission, Region III, ATTN: Chief, Nuclear Materials Licensing Branch, in writing, that activities authorized by the license will be initiated.
3. Notify NRC, in writing, within 30 days:
  - a. When the Radiation Safety Officer permanently discontinues performance of duties under the license or has a name change; or

302298



- b. When the mailing address listed on the license changes. (No fee is required if the location of byproduct material remains the same.)
- 4. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license:
  - a. When you decide to terminate all activities involving materials authorized under the license; or
  - b. If you decide not to complete the facility, acquire equipment, or possess and use authorized material.
- 5. Request and obtain a license amendment before you:
  - a. Change Radiation Safety Officers;
  - b. Order byproduct material in excess of the amount, or radionuclide, or form different than authorized on the license;
  - c. Add or change the areas of use or address or addresses of use identified in the license application or on the license; or
  - d. Change ownership of your organization.
- 6. Submit a complete renewal application with proper fee or termination request at least 30 days before the expiration date of your license. You will receive a reminder notice approximately 90 days before the expiration date. Possession of byproduct material after your license expires is a violation of NRC regulations. A license will not normally be renewed, except on a case-by-case basis, in instances where licensed material has never been possessed or used.

In addition, please note that NRC Form 313 requires the applicant, by his/her signature, to verify that the applicant understands that all statements contained in the application are true and correct to the best of the applicant's knowledge. The signatory for the application should be the licensee or certifying official rather than a consultant.

You will be periodically inspected by NRC. Failure to conduct your program in accordance with NRC regulations, license conditions, and representations made in your license application and supplemental correspondence with NRC will result in enforcement action against you. This could include issuance of a notice of violation, or imposition of a civil penalty, or an order suspending, modifying or revoking your license as specified in the General Statement of Policy and Procedure for NRC Enforcement Actions. Since serious

R. Pail

-3-

consequences to employees and the public can result from failure to comply with NRC requirements, prompt and vigorous enforcement action will be taken when dealing with licensees who do not achieve the necessary meticulous attention to detail and the high standard of compliance which NRC expects of its licensees.

Sincerely,

Original Signed By  
Michael F. Weber  
Nuclear Materials Licensing Branch

License No.: 21-26782-01  
Docket No.: 030-34393

Enclosures:

1. License No. 21-26782-01
2. Form NRC-3

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| NAME   | MFWeber:brt |  |  |  |  |  |  |  |  |
| DATE   | 06/ /97     |  |  |  |  |  |  |  |  |

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May 3, 1997

U.S. Nuclear Regulatory Commission  
Region III  
801 Warrenville Road  
Lisle, Illinois 60532-4351

Attention: Michael F. Weber

Re: USNRC RAM License Application  
Control No. 302298

Dear Mr. Weber:

Professional Service Industries, Inc. (PSI) is in receipt of your letter dated 03/18/97 requesting additional information regarding PSI's 02/07/97 radioactive materials license application. The following is submitted in response:

1. a. The designated Radiation Safety Officer (RSO) is a salaried, District Manager who is responsible for scheduling his own time. The RSO is also supported by various Assistant RSOs who are typically Branch or Department managers.
- b. PSI conducts an internal audit program on a periodic basis that, in part, verifies that the RSO has current copies of the applicable regulations. PSI's Corporate Radiation Safety Department reviews updated regulations and updates internal procedures as necessary to comply with revised regulations.
2. PSI conducts periodic refresher training with users of licensed material that includes, in part, discussions of various incident scenarios (theft, destruction, etc.). Refresher training will be conducted on an annual basis.

Should you have any questions, please contact me at 630/691-1490 (x 320).

Sincerely,



Adam C. Ackermann  
Radiation Safety Director

ACA\

cc: R. Pail - Freeland, MI  
File

RECEIVED

MAY 07 1997

REGION III

*Pm: 5-5-97*

*Information To Build On*

MAR 18 1997

Adam C. Ackermann  
Radiation Safety Director  
Professional Service Industries, Inc.  
510 East 22nd Street  
Lombard, IL 60148

Dear Mr. Ackermann:

We have reviewed your application dated February 7, 1997, requesting a new materials license, and find that we need additional information, as follows.

1. Individuals Responsible for Radiation Safety Program
  - a. Please provide management's commitment that the Radiation Safety Officer (RSO) will be given sufficient time to fulfill his or her radiation safety duties and responsibilities.
  - b. Please provide a description of the methods and checks that management will use to ensure that the RSO has current copies of the regulations, reviews all new and revised regulations, and makes changes, as needed, in licensee procedures to comply with the regulations.

2. Training Provided to Users

Please commit to providing annual refresher training which includes participation in a "dry run" of emergency procedures.

We will continue our review of your application upon receipt of this information. Please reply in duplicate, within 30 days, and refer to Control Number 302298.

If you have any questions or require clarification on any of the information stated above, you may contact us at (630) 829-9887.

Sincerely,  
Original Signed By  
Michael F. Weber  
Nuclear Materials Licensing Branch

License No. 21-26782-01  
Docket No. 030-34393

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| OFFICE | DNMS/RIII  | C |  |  |  |  |  |  |  |
| NAME   | MWEBER:jaw |   |  |  |  |  |  |  |  |
| DATE   | 03/18/97   |   |  |  |  |  |  |  |  |

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION III  
801 WARRENVILLE ROAD  
LISLE, ILLINOIS 60532-4351

February 14, 1997

Randal Pail, P.E.  
Radiation Safety Officer  
Professional Service Industries, Inc.  
7936 South Webster Road  
Freeland, MI 48623

SUBJECT: ACKNOWLEDGEMENT OF CORRESPONDENCE  
(Letter & Application Dated 02/07/97)

Dear Licensee:

In response to your request, we have completed the initial processing, which is an administrative review of your application for a(n):

☒ New License                      ☐ Amendment                      ☐ Renewal  
☐ Termination                      ☐ Auth User (Amendment not required)  
☐ Other \_\_\_\_\_

No administrative deficiencies were identified during this initial review. However, it should be noted that a technical review may identify omissions in the submitted information.

It appears that your request is routine (see 1-3 below, as applicable).

1. New and amendment actions are normally processed within 90 days, unless we find major deficiencies, or policy issues requiring central program office assistance.
2. Renewal actions are normally processed within 180 days, however, under timely filing (before expiration), you may continue to operate under your existing license.
3. Termination actions are normally processed within 90 days, unless confirmatory surveys following decontamination/decommissioning activities are involved.

A copy of your correspondence has been forwarded to our Licensing Fee and Debt Collection Branch (301/415-6097) for approval of the fee category and amount, if required.

If you have a compelling safety or business-related reason for requesting expedited review, please contact the Materials Licensing Branch at (630) 829-9887. We will try to complete your request as soon as practicable. Any correspondence about this request should reference the control number.

Nuclear Materials Support Branch

Mail Control No. 302298  
License No. 21-26782-01