RHF – 1FG
Application for
Radioactive Material License
- Fixed Gauge

Instructions – Complete all items in this application for a new license or the renewal of an existing license. Use supplemental sheets where necessary. Item 20 must be completed on all applications. Mail original to Washington State Department of Health in accordance with the directions contained in the application cover letter. Upon approval of this application, the applicant will receive a State of Washington Radioactive Material License issued in accordance wit the general requirements contained in Washington State Department of Health, Radiation Protective Division, Radiation Control Regulations, and the Washington Nuclear Energy and Radiation Control Act, Chapter 70.98 RCW.

1a. **NAME AND MAILING ADDRESS OF APPLICANT**	1b. **STREET ADDRESS(ES) AT WHICH RADIOACTIVE MATERIAL WILL BE STORED OR USED** (if different than 1a) INCLUDE ZIP CODE
2. **PERSON TO CONTACT REGARDING THIS APPLICATION**	**TELEPHONE NUMBER**
3. **THIS IS AN APPLICATION FOR** (check one) A. ☐ New License* B. ☐ Renewal of License No. WN- _____	

4a. **INDIVIDUAL USERS** *Name of individuals who will use or directly supervise use of radioactive material.*	4b. **TRAINING AND EXPERIENCE** (Check at least one) ☐ Appendix "A" completed and attached for RSO and each user. ☐ Training Previously Filed under License # _____
5a. **RADIATION SAFETY OFFICER** (RSO) *Name of person designated as Radiation Safety Officer* *Include training certificates*	5b. **DUTIES OF RADIATION SAFETY OFFICER** (check one) ☐ Sign and dated Appendix "B" Duties Attached, OR ☐ Equivalent Duties Attached

6. **RADIOACTIVE MATERIAL** *Elements and Mass number of each*	7. **SEALED SOURCE MANUFACTURER AND MODEL NUMBER**	8. **MAXIMUM ACTIVITY OF EACH SOURCE**
A. _____ _____	A. _____ _____	A. _____ _____
B. _____ _____	B. _____ _____	B. _____ _____
C. _____ _____	C. _____ _____	C. _____ _____

9. **DEVICE AND USE DESCRIPTION** (Make lettering correspond to lettering in Items 6. 7. and 8 above.)

	MANUFACTURER OF DEVICE	**SOURCE HOLDER MODEL NUMBER**	**USE**
A.		A.	A.
B.		B.	B.
C.		C.	C

***LICENSE FEE REQUIRED WITH NEW LICENSE APPLICATION** (Complete Item No. 19)

10. **MAINTENANCE OF GAUGES** (check one)

☐ Applicant will contract with manufacturer or approved consultant for all gauge installation, maintenance, relocation, calibration, and/or source change. (Radiation detection instruments not required)

Approved Consultant for the Above:
Name _____
Address _____
_____
License Number _____

☐ Applicant will do one or more of the following: Gauge installation, maintenance, relocation, calibration, and/or source change. **(Radiation detection instruments required)**
Complete Items 11 and 12.

11. **RADIATON DETECTION INSTRUMENTS**
List Radiation Detection Instruments possessed in this space.

MANUFACTURER	MODEL #	RANGE
_____	_____	_____
_____	_____	_____

12. ***CALIBRATION OF SURVEY INSTRUMENTS*** *Mandatory for non-routine use as in 10; not required for routine use.* (check one)

☐ No radiation detection instruments possessed. N/A

☐ Calibration will be done annually and after each repair.
If this line is checked, then (check one)

☐ Applicant will do own survey instrument calibrations. (attach methods and procedures)

☐ Appendix C Calibration Procedures signed and attached, or.
☐ Equivalent procedures attached.

☐ Calibration will be done by an approved calibration service agency.

Name _____
Address _____
_____
License Number _____

13. **PERSONNEL MONITORING** *Required for non-routine use as in 10; not required for routine use.* (check one)

☐ None (Routine use of fixed gauges only) N/A
☐ Thermoluminescent dosimeters (TLD) used, or

13. **PERSONNEL MONITORING** (continued)
☐ Film badges used. If this line is checked, then (check one)
☐ Beta-Gamma-Neutron Film Badge
☐ Beta-Gamma Film Badge

Badges must be exchanged at least quarterly. Supplier must be NVLAP certified.
Name _____
Address _____
_____

14. **FACILITIES AND EQUIPMENT**

☐ Facilities and Storage Diagram Attached (required)

15. **RADIATION PROTECTION PROGRAM** (check one)

☐ Sign and date Attachment 'B' and return, or
☐ Equivalent Procedures Attached

16. **LEAK TEST PROGRAM** (check one)

☐ Applicant will contract with approved outside consultant to do leak tests.
Name _____
Address _____
_____

☐ Applicant will do leak tests using approved leak test kit, mailing. leak tests to kit manufacturer for counting
Manufacturer Name _____
Address _____
_____

☐ Will do own leak test including counting. Detailed procedures Attached.

17. **LOCK-OUT PROCEDURES** ☐ Attached.

18. **DISPOSAL OR TRANSFER**

☐ Nuclear Gauge(s) containing radioactive sealed sources will be returned to manufacturer; transferred to an authorized licensee, or transferred to a licensed waste broker.

19. **LICENSE FEE REQUIRED** (See Chapter 246-254 WAC)

a. License Fee Category 34 (Fixed Gauge)

b. License Fee Enclosed $ _____
(see cover letter to determine fee amount)

ITEM 20 **– CERTIFICATE (This item must be completed by management)**

The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certifies that this application is prepared in conformity with Washington State Department of Health, Division of Radiation Protection Regulations, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

_____ _____
(Type or print name of certifying official) (Signature)

_____ Date _____
(Title of certifying official)

Appendix A

Training and Experience
Authorized User or Radiation Safety Officer

(Add supplemental sheets, if necessary)

1. **Name of User/RSO**	2. **Date of Application**

3. Training for Routine Use of Fixed Gauges (Briefing by manufacturer/RSO/or licensed institution).

Gauge	Manufacturer	Type of Gauge	Isotope	Activity	Date of Briefing	By Whom
1						
2						
3						
4						

4. Non-routine Use of Fixed Gauges (gauge installation, maintenance, relocation, calibration, and/or source change).
   □ Certificate of Training attached for each nuclear gauge you are certified by the manufacturer as qualified to service.

Authorized User History

Gauge	Manufacturer	Model No.	Isotope	Activity	RAM License Authorization to Service Nuclear Gauge			License No.	State
					From-To	Years	Months		
1									
2									
3									
4									

5. Training received in basic radioisotope handling techniques

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

6. Experience with Radioactive Materials

Isotope	Maximum Amount	Where Experience Was Gained	Duration of Experience	Type of Use.

7. Resumé of Radiation Work Experience for: _____

Dates of Employment Beginning / Ending	Employer Name / Address	Job Title / Duties

Appendix B
Duties of the Radiation Safety Officer for Fixed Gauge Licenses

1. Make sure that all use of radiation are 1) conducted safely, 2) adhere to the conditions of the license, and 3) result in exposures to personnel which are as low as reasonably achievable (ALARA)

2. Act as liaison agent with regulatory authorities, be available for assistance in inspection and audits, and notify the department:

   A. In writing before making any change which would render the Application for Radioactive Materials License, supplemental information, or Radioactive Materials License no longer accurate;

   B Immediately in the event of any radiation accident or incident;

   C. Within five (5) days of any positive sealed source leak test result; and/or

   D. Within thirty (30) days in a report stating remedial action taken after accident or incident.

3. Be familiar with all applicable regulations and regulatory guides, and assure that license applications are properly filled out and are submitted on time.

4. Perform, or cause to be performed (e.g., by manufacturer, consultant, or qualified employee), appropriate surveys, using operable and, calibrated instruments.

5. Make sure all leak tests are performed on time.

6. Establish and maintain record systems for leak tests, shutter tests, surveys, receipt, inventory and use records, and (if personnel dosimetry is required) for personnel dosimetry reports.

7. Provide a personnel dosimetry program when required. Advise individual radiation workers of each high exposure report, and conduct an investigation to determine the cause of all overexposures so as to preclude reoccurrence. Perform a quarterly review of occupational exposure to authorized users and workers to determine that the exposures are within the limits established by the ALARA program. Annually apprise each dosimetry user of their accrued dose.

8. Maintain a current inventory of the types, quantities, and locations of all radioactive material possessed, making sure the activity and types possessed never exceed license limits.

9. Post conspicuously “Notice to Employees” RHF-3 and notices of items of noncompliance resulting from Department inspections.

10. Make sure radioactive shipments are properly packaged and labeled according to U.S. DOT requirements, and that shipments are accompanied by proper shipping documents.

11. Instruct workers, who work or may work in or about the vicinity of the fixed gauge or gauges, of all applicable radiation safety rules and procedures 1) initially, 2) with every addition of new personnel, and 3) with each change in the radiation safety program.

12. Apprise management of the status of the radiation safety program and management’s responsibility for maintaining an adequate radiation safety program.

13. Take charge in all emergency situations (loss, theft, fire, explosion, etc.) to make sure correct emergency procedures are carried out, including notification of the State of Washington per Chapter 246-221 WAC. Also evaluate the situation that led to the emergency to reduce the chance of further problems.

14. Assure that radioactive materials are only used by, or under the supervision of individuals authorized by the license.

15. Assure that radioactive materials are properly secured against unauthorized removal.

16. Maintain current operating and emergency procedures, including maintenance and lock-out procedures for work in and around fixed gauges.

17. Perform other duties as required t n compliance with Title 246 WAC.

Approved By _____ Date: _____

Appendix C
Calibration of Exposure Rate Instruments

1. Calibration of survey meters shall be performed with radionuclide sources.

   A. The sources shall approximate point sources.

   B. The source activities or exposure rates at given distances shall be traceable by documented measurements to a standard source certified within five percent accuracy by the National Institute of Standards and Technology (NIST).

   C. The frequency shall be at least every twelve (12) months after servicing.

   D. Each scale of the instrument shall be calibrated at least at two points located at approximately 1/3 and 2/3 of full scale.

   E. The exposure rate (MR/hr) measured by the instrument shall differ from the true exposure rate by no more than ± 10 percent at the two points on each scale (read appropriate section of the instrument manual to determine how to make necessary adjustments to bring instrument into calibration). Readings within ± 20 percent will be considered acceptable if a calibration chart, graph, or response factor is prepared, **attached to the instrument,** and used to interpret meter readings to within 10 per cent for radiation protection purposes.

   F. Records of required calibrations shall be maintained for inspection for a period of at least four years from the date of the last Department inspection.

   NOTE: Sources of Cs=137, Ra-226, or Co-60 * are appropriate for use in calibrations. Since these sources emit rather high-energy photons, they are not suitable for low-energy calibrations that may be required under special circumstances (see Item 3 below). The activity of the calibration standard should be sufficient to calibrate the survey meters on each scale to be used for radiation protection purposes. Scales up to 1R/hr should be calibrated, but higher-range scales above 1R/hr need not be calibrated when they will not be needed for radiation protection surveys. If there are higher ranges, they should at least be checked for operation and approximately correct response to radiation. Otherwise, a cautionary note that they have not been checked should be placed on the instrument.

2. A reference check source of long half-life, e.g., Cs-137 or Ra-226, shall also be read at the time of the above calibration or as soon as the instrument is received from the calibration laboratory. The readings shall be taken with the check source placed in specific geometry relative to the detector. A reading of this reference check source shall be taken:

   A. Before each use and also after each survey to ensure that the instrument was operational during the survey.

   B. After each maintenance and/or battery change; and

   C. At least every three months.

   If any reading using the same geometry is not within ± 20 percent of the reading measured immediately after calibration, the instrument must be recalibrated (see Item 1).

3. Calibration source energies must correspond to energies of radioactive materials to be detected if instrument response is energy dependent.

4. Records of the above Items 1, 2-A – C must be maintained.

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* Minimum activities of typical sources are 84 mCi of Cs-137, 21 mCi of Co-60, and 34 mCi of Ra-226 (to give at least 700 mR/hr at 20 cm).

5. Use of Inverse Square Law and Radioactive Decay Law

A. An approved calibration source will have a calibration certificate giving its exposure rate at a given distance, or its activity, measured on a specified date by the manufacturer or NIST.

1. The Inverse Square Law may be used with any point source to calculate the exposure rate at other distances.

2. The Radioactive Decay Law may be used to calculate the exposure rates or source activities at times other than the calibration date.

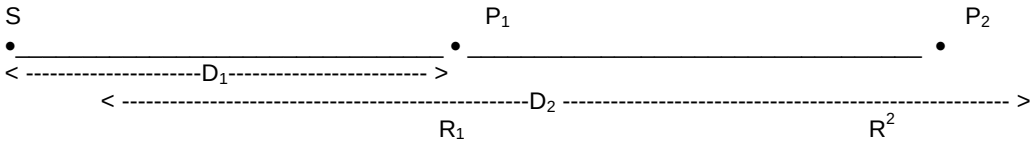
B. Inverse Square Law.

Consider a "point" * source of radiation at position S, as shown in Figure B-1. Then, the relationship between exposure rates R_1 and R_2 at detector positions P_1 and P_2, which are at distances D_1 and D_2 and S, respectively is given by the following equation:

$$R_2 = \frac{D_1^2 \times R_1}{D_2^2}$$

Where R_1 and R_2 are exposure rates in the same units (e.g., mR/hr, R/hr) and D1 and D2 are the distances in Figure D-1 in the same units (e.g., m, cm, ft).

FIGURE B-1



C. **Radioactive Decay Law**

Exposure rate "t" units of time after specified calibration date

$$R_t = R_o \times e^{-\left(\frac{0.693}{T_{1/2}}\right) \times t}$$

Where

R_0 and R_t are in the same units (e.g., mR/hr or R/hr)

R_0 is exposure rate on the specified calibration date

R_t is exposure rate t units of time later

$T_{1/2}$ and t are in the same units (years, months, days, etc.)

$T_{1/2}$ is the radionuclide half-life.

t is number of units of time elapsed between calibration and present time.

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* A Source may be considered a "point" source when the source and the radiation detector are small, in any dimension, compared to the distances at which radiation is to be measured. The center of the detector should be at distances D_1 or D_2 as shown in Figure B-1

Appendix C **(continued)**

D. **Example:** Source output is given by calibration certificates as 100 mR/hr at 1 foot on March 10, 1975. Radionuclide half-life is 5.27 years.

Questions: What is the output at 3 feet on March 10, 1977 (2.0 years later)?

1. Output at 1 foot, 2.0 years after calibration date:

$$R = 100 \text{ mR/hr} \times e^{-\frac{(0.693 \times 2.0)}{5.27}}$$

$$= 100 \times 0.77 = 77 \text{ mR/hr at 1 foot on March 10, 1977.}$$

2. Output at 3 feet, 2.0 years after calibration date:

$$R_3 = \frac{(1 \text{ ft})^2}{(3 \text{ ft})^2} \times 77 \text{mR/hr}$$

$$= 1/9 \times 77 = 8.6 \text{ mR/hr at 3 feet, 2.0 years after calibration.}$$

Approved by: _____ Date: _____

Sample Form
Certificate of Instrument Calibration

Licensee Name: _____

Instrument: Probe (if detachable):

Manufacturer_____ Manufacturer _____

Type _____Type _____

Model No. _____ Model No. _____

Serial No. _____ Serial No. _____

Calibration Data:

Scale	Actual Exposure Rate (mR/hr)	Initial Instrument Reading (mR/hr)	% Error	Adjusted Instrument Reading (mR/hr)	Final % Error

Replace Batteries? □ Yes □ No

Comments:

Calibration Source:

Manufacturer/Model No. _____ Serial No. _____

Nuclide _____ Accuracy _____ Original Activity/Date _____ / _____

Decay Factor _____ Current Activity _____

Exposure Rate at Specified Distance _____

Calibrated by: _____ Date _____

Appendix D
Radiation Protection Program for Fixed Gauges

The following Radiation Protection Program will be followed at all times. A copy of these procedures shall be maintained in the licensee's radioactive materials license file, and copies shall be posted for the reference of fixed gauge users.

1. Only authorized users shall use or supervise the use of radioactive material.

2. All unauthorized persons shall be kept out of the gauge operating area.

3. The licensee shall not open a source containing radioactive material

4. No one shall be permitted to touch or handle directly any unshielded source.

6. Sources shall be locked in the safe (off, closed, or stored) position when not in use.

7. Security of sources shall be maintained at all times.

8. If any malfunction of the gauge occurs, immediately notify the Radiation Safety Officer.

9. The licensee may not install, relocate, do maintenance upon, leak test, calibrate, exchange sources, or otherwise service the fixed gauge(s) unless specifically authorized to do so by conditions of the Radioactive Materials License.

10. Transportation of the nuclear gauges (if any) shall be carried out in accordance with requirements of Title 246 WAC, 10 CFR Part 71 and U.S. Department of Transportation regulations (49 CFR Parts 100-199).

11. The Radiation Safety Officer shall maintain the following publications: State of Washington Department of Health Title 246 WAC, Rules and Regulations for Radiation Protection and Washington State Department of Health, Radiation Emergency Handbook.

12. Fixed gauges and radioactive materials storage and use areas shall be posted with CAUTION RADIOACTIVE MATERIALS signs. Form RHF-3 "Notice to Employees" shall be posted in a conspicuous place wherever individuals work in or frequent any portion of a restricted area. Authorized users shall be responsible for posting the above at all field locations.

13. Lock-out procedures are necessary for all fixed gauges associated with tanks, vessels, pipes, chutes, etc., where human access is possible.

14. Authorized users and other persons working in the proximity of the nuclear sources when they are being transported or used, if applicable, shall wear appropriate personnel dosimetry, such as film badges or thermoluminescent dosimeters (TLDs). Each worker shall be assigned his or her own dosimeter. On no occasion shall a person wear a dosimeter assigned to another individual.

15. If personnel dosimeters are required, they will be kept in a cool, dry, low radiation background area when not in use.

16. Personnel dosimeters shall be processed immediately if there is any indication of a high or unusual exposure, or if a dosimeter is damaged in any way. The Radiation Safety Officer shall investigate all high or unusual exposures, and take corrective action, if necessary, to prevent other such high exposures. Notification procedures shall be in accordance with WAC 246-221-250 and WAC 246-221-260.

17. Exposure records shall be kept on the Department of Health form RHF-5a or in a manner that includes all information required on said form. Each entry shall be for a period of time not exceeding one calendar quarter.

18. The company shall indefinitely maintain exposure records and supply employees with exposure data annually, upon termination of employment or hiring by another radiation work employer.

Approved by: _____ Date: _____

Standard Emergency Procedures for Fixed Gauges

Loss, Theft, Fire, Explosion, or Vehicle Accident

Follow the procedures outlined in the Washington State Department of Health Radiation Emergency Handbook. Principally this shall include:

1. **Secure the area around the accident. Keep unauthorized persons away. Alert people in the vicinity of a possible hazard due to the presence of radioactivity.**

2. **Do not leave the site.** Send a helper or onlooker to notify the following:

   A. Radiation Safety Officer _____

      1. Work Phone: _____ 2. Home Phone: _____

   B. Local Police _____

   C. Local Fire Department (where applicable) _____

3. The Radiation Safety Officer in turn must immediately notify state of Washington Radiation Emergency Response 206 – N-U-C-L-E-A-R (206-682-5327) and other local authorities as indicated.

4. The radiation worker should inform emergency workers of the possible radiation hazard, should help them keep the area secure, and should explain to the emergency personnel the location of the radioactive device or chemical and extent of the possible hazard. In no case should the radiation workers leave the site until qualified experts arrive; unless, of course, the operator is seriously injured or incapacitated, and must be removed from the sit by emergency personnel.

Alternate Names and Telephone Numbers Designed by the Radiation Safety Officer:

_____ _____

_____ _____

_____ _____

Approved by: _____ Date: _____