030-38282

HITACHI
Inspire the Next

VIA FEDERAL EXPRESS

April 2, 2010

Ms. Shirley Xu
US NRC/FASME/MSSA/ASPB
Mail Stop T8E24
Washington, D.C. 20555-0001

Re: Exempt Distribution License Application.

Dear Ms. Xu:

Hitachi is requesting a new E-Distribution license for distribution of projectors containing lamps (and individual replacement lamps) in which a component is 5 nCi of ^{85}Kr. We have included all pertinent documents for your review. This license request is virtually a duplicate of the existing license held by Panasonic Corporation of North America due to the fact that Panasonic is our supplier of the lamps we hope to distribute pursuant to this E-Distribution license.

With respect to the $10,000 fee for the license application, Hitachi will be paying by direct wire transfer to the Nuclear Regulatory Commission. Currently, the funds are scheduled to be transferred on Thursday, April 8, 2010. We will forward a digital copy of the transfer slip confirming payment as soon as we receive it.

Should you have any questions about the enclosed license application, please feel free to contact our consultant, Sue Engelhardt, President, Engelhardt & Associates, Inc. (Tel. 608-213-0113 or sengelhardt@wi.rr.com). You also are welcome to contact me directly (Tel. (619) 591-5337 or neal.svalstad@hal.hitachi.com).

Your expeditious response to this application will be greatly appreciated.

Sincerely,

Neal Svalstad, Esq.
Senior Corporate Counsel

ATTACHMENTS:
Form 313 and attachments thereto
Diagrams of the lamps
Labels
Testing performed by Panasonic
Copy of Panasonic license
Possession license issued to Hitachi by State of California
Training and Experience documents

Hitachi America, Ltd., Digital Media Division
900 Hitachi Way, Chula Vista, CA 91914-3556 Tel: 619.591.5335 Fax: 619.591.5338

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NRC FORM 313 (3-2009) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIALS LICENSE

APPROVED BY OMB: NO. 3150-0120 **EXPIRES: 3/31/2012**

Estimated burden per response to comply with this mandatory collection request: 4.3 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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:

OFFICE OF FEDERAL & STATE MATERIALS AND
ENVIRONMENTAL MANAGEMENT PROGRAMS
DIVISION OF MATERIALS SAFETY AND STATE AGREEMENTS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

I CODE 23985

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

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

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MISSISSIPPI, 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 BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
612 E. LAMAR BOULEVARD, SUITE 400
ARLINGTON, TX 76011-4125

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)*

- [x] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [ ] C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include ZIP code)*

Hitachi America, Ltd.
Attention Neal Svalstad
900 Hitachi Way
Chula Vista, CA 91914-3556

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Hitachi Transport System (America)Ltd.
Attention: Fernando Ramos
1650 Glenn Curtiss St.
Carson, CA 90747

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Susan Engelhardt

TELEPHONE NUMBER

(608) 213-0113

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. maiximum 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. LICENSE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY **3i** | AMOUNT ENCLOSED $ **10,000.00**

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 CONTANED 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	SIGNATURE	DATE
Neal Svalstad, Senior Corporate Counsel	Neal Svalstad	4-02-10

FOR NRC USE ONLY

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

022827

APPLICATION FOR E-DISTRIBUTION LICENSE

HITACHI

HITACHI AMERICA LTD, DIGITAL MEDIA DIVISION

SUBMITTED BY NEAL SVALSTAD

SENIOR CORPORATE COUNSEL

ANSWERS TO NRC FORM 313: ITEMS 5-11 (This application does not authorize possession of radioactive materials, only exempt distribution)

ITEM 5: RADIOACTIVE MATERIAL

Radioactive Material	Physical Form	Maximum Quantity
^{85}Kr	Gas, sealed in an Electron tube	No possession alllowed (see possession license From CA that allows 5 nanoCuries/lamp)

ITEM 6: PURPOSES FOR WHICH RADIOCTIVE MATERIALS WILL BE USED

Radioactive materials shall be used in electron tubes that are part of a lamp assembly for projectors. The construction of this assembly is the same as that in a glow starter. (The glow starters were also authorized in the E-Distribution license for Panasonic, NRC license number 29-27907-01E. The electron tube assemblies were added to this as an amendment to the afore mentioned license.

ITEM SEVEN: PERSONS RESPONSIBLE FOR RADIATION AND THEIR TRAINING AND EXPERIENCE.

The RSO for this license is Mr. Fernando Ramos. His training and experience is attached to this document. In addition, he receives annual refresher training from Engelhardt & Associates, Inc.

ITEM EIGHT: TRAINING FOR INDIVIDUALS WORKING WITH RADIOACTIVE MATERIALS

The distribution warehouse is located at 1650 Glenn Curtiss Street, Carson, CA, 90747.

A copy of the possession license for this location is attached to this document.

Initial training of personnel at these sites was completed in January, 2010. These documents were submitted to the State of California as part of the possession license application for the warehouse. The training included the topics listed below:

- Regulatory control
- Radiation protection
- Postings of Notices to Workers
- Contacts for questions or concerns about radiation
- Emergency response—including breakage of lamps
- Specific terms and radiation principles as pertains to the lamps
- Construction of the lamps and the safety features associated with them
- Radiation safety programs: Who is responsible for radiation safety
- Security of lamps
- Storage of lamps in the warehouse.
- Quiz

ITEM NINE: DESCRIPTION OF FACILITIES

The lamps are stored in the warehouse at the afore named address in item 8 above. The lamps are stored in one location unless they are being staged for outbound shipment. The security of the warehouse is very intense in that inventory control is imperative. In that Hitachi makes and distributes home products (tv sets, computers and such) that have great value, security is extreme. Individuals coming to the warehouse from the front of the building cannot gain access to the warehouse. Truckers entering the property to unload/load products enter through a guard gate and are directed to a specific truck bay for their delivery/pickup. A Hitachi employee is present and

directs the activities related to the truck's presence (loading or unloading). In addition, even at the truck bays themselves, access into the warehouse is under constant control.

ITEM 10: RADIATION SAFETY PROGRAM

The warehouse has a radiation safety program in place as required by their California possession license. A summary of this program is described below:

Postings: The CA Notice to Workers and the NRC Notice to Workers (Form 3) will be posted when the distribution license is put into place.

Training: This is described earlier.

Security: In addition to the security already described in item 9 above, all non-Hitachi personnel in the warehouse are escorted by an authorized Hitachi employee.

Inventory: This is a continuous process. However, lamp inventory will be tallied quarterly and the required report sent to NRC on an annual basis.

Dosimetry: This is not required. A member of the public dose study was done and there is no risk of any member of the public receiving any exposure from these lamps. The containment of the source within the electron tube, inside of the lamp, precludes exposures.

Records: These are retained as required. The reports to NRC on the numbers of lamps passing through the warehouse shall be done as required and a record of these reports retained.

Emergencies: Even in a worst case scenario, the source component of the lamp would not be impacted. If the electron tube/source bead were opened the miniscule quantity of ^{85}Kr would not cause harm. In fact, the total quantity of ^{85}Kr present in the warehouse at any one time would not cause any harm since the volume of air moving through the warehouse is very high due to the presence of truck bays.

Audits: Annual audits of the radiation safety program shall be performed by Engelhardt & Associates, Inc.

ITEM 11: WASTE MANAGEMENT

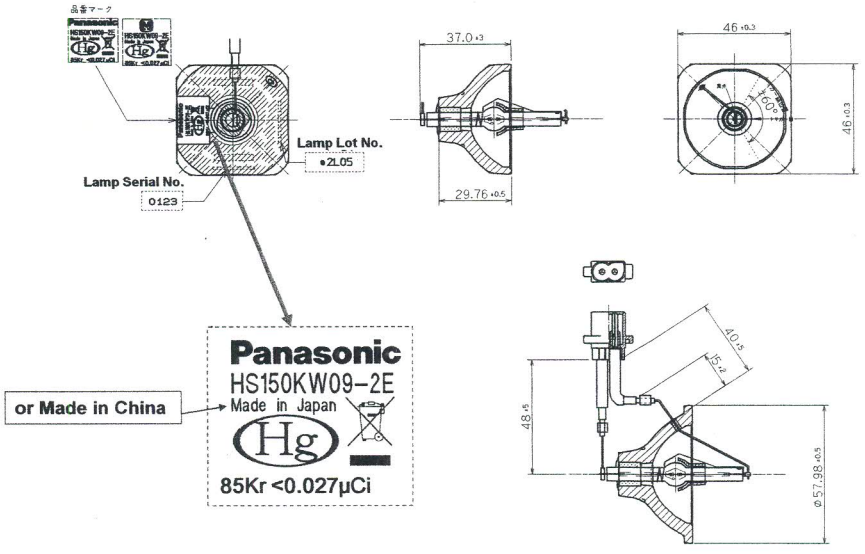
This is a moot point in that the quantity of radioactive material is so small that it would not be of concern. If several boxes of replacement lamps were to shatter onto the floor of the warehouse, the warehouse personnel would be instructed to sweep the glass into a drum and leave it for assessment by the radiation safety consultant. Engelhardt & Associates, Inc. would be notified of the breakage.

QA/QC PROGRAM

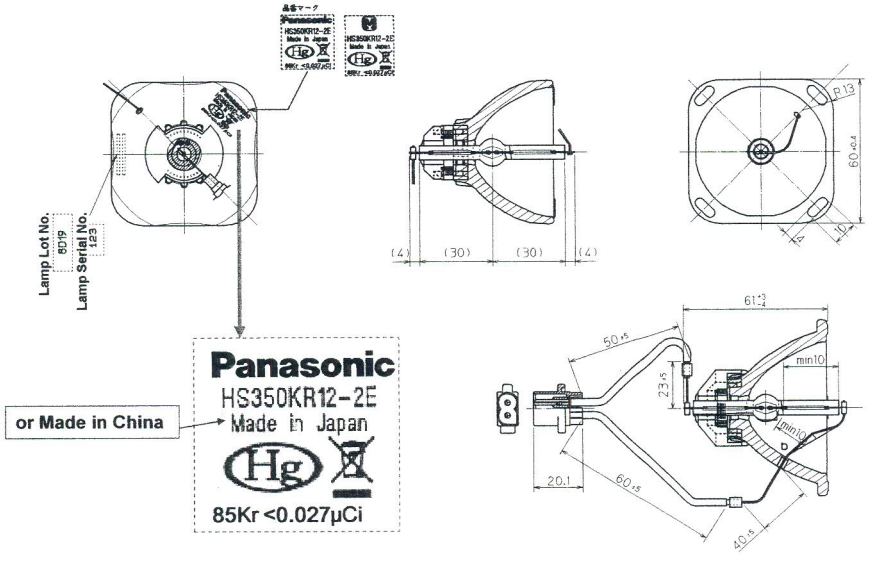
The lamps being sold by Hitachi and under the E-Distribution license are manufactured by Panasonic. The information on this part of the program is part of the E-Distribution license for Panasonic (NRC License # 29-27907-01).

The attached document on the testing for ^{85}Kr was done for the bulbs and lamps. The application of ^{85}Kr in the lamps of projectors was the same structural assembly as attached here, so no further testing was required. We have attached the structure and the description of the lamp assemblies themselves for your review.

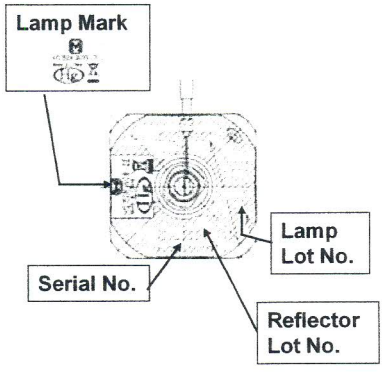
Drawing of HS150KW09-2E

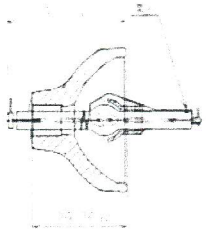


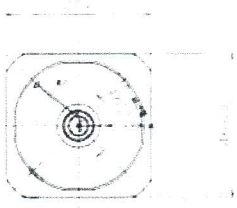
Drawing of HS350KR12-2E



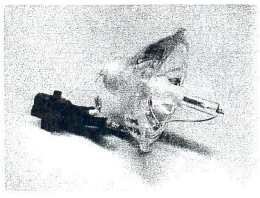
Drawings





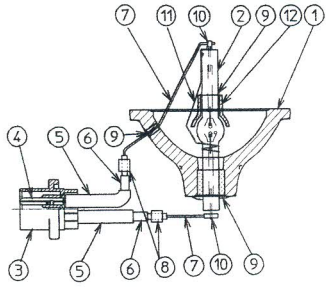


Lamp Voltage (V)	Lamp Current (A)	Lamp Wattage (W)	Life time (hrs)
75+/- 15	2.13	160	2,000



Material list

No.	Parts	Material	Description
1	Reflector	Hard glass	Elliptical
2	Lamp	Quarts glass Tungsten, Molybdenum Argon, Mercury, 85Kr	85Kr ; <1kBq
3	Plug housing	PPS resin	
4	Terminal	Copper alloy (Sn plating)	
5	Fluorine rubber tube	Fluorine rubber	
6	Lead wire	Silicone rubber insulated nickel wire	
7	Outer lead wire	Ni wire	
8	Parallel connector	Copper alloy (Sn plating)	
9	Cement	Alumina, Silica	
10	Sleeve	Fe-Ni	
11	Trigger wire	Fe-Cr	
12	Sub-reflector	Quarts glass	



LABELLING: The lamps are labeled directly on the outer casing of the lamp itself. Please see the drawings above for more detail. In addition, when spare lamps are shipped, the inner box, containing the lamp itself will be labeled with the following : Radioactive Material- ^{85}Kr

Exempt Quantity: 5nanoCi.

The outer shipping box will not bear labels.

NRC FORM 374

U.S. NUCLEAR REGULATORY COMMISSION

Amendment No. 09

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.

Licensee	In accordance with letter dated
	October 30, 2009
1. Panasonic Corporation of North America	3. License number 29-27907-01E is amended in its entirety to read as follows:
2. One Panasonic Way, 4B-8 Secaucus, NJ 07094	4. Expiration date August 31, 2013
	5. Docket No. 030-29563 Reference No.

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Krypton-85	A. Gas	A. Not applicable (See Condition 10)

9. Authorized use:

Pursuant to Section 32.14, 10 CFR Part 32, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material," the licensee is authorized to distribute electron tubes (lamps), and glow switches, containing not more than 30 microcuries of krypton-85, to persons exempt from licensing pursuant to 10 CFR 30.15, or equivalent provisions of the regulations of any Agreement State.

CONDITIONS

10. This license does not authorize possession or use of licensed material.

11. The licensee is authorized to distribute only from its facilities located at:

    13335 Orden Drive, Santa Fe Springs, California,
    Sanyo Logistics Warehouse at 8400 Milliken Avenue, Suite 111, Rancho Cucamonga, California.

12. The licensee shall submit periodic material transfer reports as specified in 10 CFR 32.16.

13. The licensee is exempt from the labeling requirements of 10 CFR 32.15(d), as they apply to individual tubes or switches provided that each immediate lamp container is labeled in accordance with 10 CFR 32.15(d) and licensee's letter dated September 16, 1992 enclosed with letter dated February 14, 2003.

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NRC FORM 374A	PAGE 2 OF 2 PAGES
MATERIALS LICENSE SUPPLEMENTARY SHEET	License Number 29-27907-01E Docket or Reference Number 030-29563

14. Except as specifically provided otherwise by 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. Letter dated February 14, 2003;
B. Letter dated September 22, 2003;
C. Letter dated April 8, 2008;
D. Letter dated May 13, 2008 and,
E. Email dated July 8, 2008,
F. Letter dated October 30, 2009.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date January 04, 2010

By Richard K. Struckmeyer

Richard K. Struckmeyer
Licensing Branch
Division of Materials Safety and State Agreements
Office of Federal and State Materials and
Environmental Management Programs
Washington, DC 20555

Products & Manufacturer for compact fluorescent lamps (CFL)

(Type-1) Glow starters having a filling gas with 85Kr

	Products		Manufacture	Quality control for Kr85
THE NETHERLANDS	Materials And Component	Filling gas Gaseous 85Kr	AIR LIQUIDEBV	Radioactive (acceptance inspection)
JAPAN		Glow starter The above-mentioned gaseous 85 Kr is filled in glass enclosure.	INAI ELECTRONICS Co. Ltd.	Gaseous pressure control for an indirect measurement of radioactive (doped quantity of radiation is less than 0.10 micro-curies)
				None (after fabrication) Rational: B-ray, 99.6% of radiation quantity, is completely shielded by glass enclosure of glow starter. ~~Gamma-ray passing through glass enclosure is less than 0.4% of radiation quantity.~~
	Lamp	CFL The above-mentioned glow starter is sealed in outer enclosure of the CFL.	MATSUSHITA ELECTRIC INDUSTRIAL Co. Ltd.	None Rational: B-ray is completely shielded by both glass enclosure of glow starter and outer enclosure of the CFL.

(Type-2) Glow starters having an inner-lead with 147Pm

	Products		Manufacture	Quality control for Pm147
JAPAN	Materials And Component	<u>Inner-lead</u> Plating of 147Pm covered with Ni plating.	NEMOTO & Co. Ltd.	Radioactive (less than 0.50 micro-curies)
CHINA		<u>Glow starter</u> The above-mentioned inner-lead is sealed in glass enclosure.	HON YUNG JIAN ELECTRICAL EQUIPMENT Co. Ltd.	None Rational: B-ray is completely shielded by glass enclosure of glow starter.
	Lamp	<u>CFL</u> The above-mentioned glow starter is sealed in outer enclosure of the CFL.	MATSUSHITA ELECTRIC INDUSTRIAL Co. Ltd.	None Rational: B-ray is completely shielded by both glass enclosure of glow starter and outer enclosure of the CFL.

Compact FL in individual package and master cartons.

USA	Sales & Distribution of CFL	MATSUSHITA ELECTRIC CORPORATION OF AMERICA	

Quality Control Procedure

(Type-1) Glow starters having a filling gas with 85Kr

Method of procedure and radiation level

(A) Method of measurement

(1) Select samples at random of 5 pcs. representative of production lot.

(2) Measure the partial gas pressure of 85Kr in a glow starter.

(3) Convert to the doped quantity of radiation from the partial pressure by means of the radiation quantity and gaseous pressure of original gas purchased.

(B) Quality control standard

INS`ECTION ITEM	METHOD OF INSPECTION	ACCEPTANCE
Doped quantity of radiation	Measure a gaseous pressure in a chamber in which after it is evacuated a glow starter is broken before the measurement.	Less than 0.10 micro-curies (<3.7kBq).

Prototype Testing Procedure

(Type-2) Glow starters having an inner-lead with 147Pm

Method of procedure and radiation level

(A) Methods of measurement

(1) Select samples at random of 4 pcs. representative of production lot.

(2) Measure the doped quantity of radiation by GM counter.

(B) Quality control standard

INS`ECTION ITEM	METHOD OF INSPECTION	ACCEPTANCE
Doped quantity of radiation	Measure per 12 seconds at 3 centi-meter from a broken glow starter	Less than 0.50 micro-curies (<18.5kBq).

ATTACHMENT A-3-1

Result of prototype testing to demonstrate the radiation quantity of a glow starter having a filling gas with 85Kr.

Result of Type Test

Date: 02.6.27

Lot size: 15.000pcs

(Type-1) Glow starters having a filling gas with 85Kr

Sample		kBq
No.	1	1.08
	2	1.07
	3	1.06
	4	1.13
	5	1.08
	6	1.12
	7	1.16
	8	1.10
	9	1.12
	10	1.08
	11	1.15
	12	1.14
	13	1.64
	14	1.19
	15	1.16
	16	1.18
	17	1.12
	18	1.10
	19	1.16
	20	1.12
	21	1.08
	22	1.12
	23	1.13
	24	1.19
	25	1.17
Average		1.13
Standard deviation		0.04
Maximum		1.19
Minimum		1.06

Requirement less than 0.1 uCi (3.7kBq)

Limitout 0

Judgement Acceptable

Result of prototype testing to demonstrate the radiation quantity of a glow starter having an inner-lead with 147Pm.

Result of Type Test

Date: 02.6.27

Lot size: 10,000pcs

(Type-2) Glow starters having an inner-lead with 147Pm

Sample		kBq
No.	1	1.44
	2	1.79
	3	1.44
	4	1.08
	5	1.44
	6	2.15
	7	1.44
	8	2.52
	9	2.52
	10	2.52
	11	3.96
	12	0.72
	13	1.79
	14	1.79
	15	1.97
	16	2.15
	17	0.72
	18	2.52
	19	1.97
	20	1.08
	21	3.78
	22	2.71
	23	2.52
	24	1.79
	25	0.72
Average		1.90
Standard deviation		0.80
Maximum		3.96
Minimum		0.72

Requirement less than 0.5 uCi (18.5kBq)

Limitout 0

Judgement Acceptable

ATTACHMENT A

Distribution

1. The glow starter employed in the Light Capsule and the T5 Quad-tube Compact Fluorescent Lamps (2-pin type) is actually manufactured by Inai Electronics, Co., Ltd., Japan. Please refer to attachment page A-1-1. The chart also describes the manufacturer of the radioactive filling gas which actually contains Krypton 85.

2. The glow starter employed in the T4 Compact Fluorescent Lamps (2-pin type) is actually manufactured by HON YUNG JIAN ELECTRICAL EQUIPMENT Co., Ltd., China. Please refer to attachment page A-1-2. The chart also describes the manufacturer of the inner lead which actually contains Promethium 147.

3. It is our wish to continue the exemption from the labeling requirements of 10CFR32.15(d). Due to the design, construction and location of the glow starter, labeling of the glow starter is not possible. As an alternative, we requested and receive an exemption from labeling of individual glow starters.
   However, in order to meet the intent of the requirements, a label is provided on the carton box (container) of each light source. Please refer to attachment A-2.

4. The manufacturer of each lighting good is included on the label on each container. Please refer to attachment A-2.

5. The requirements in paragraph 32.15 of CFR Part 32 in regard to testing of inspection lots under 32.14 taking a random sample of the size required by the table in 10CFR32.110, and for Lot Tolerance Percent Defective of 5.0 percent are met at the point of manufacture.

6. The verification of the maximum radioactivity of 0.10 and 0.5 uCi for each glow starter type is performed as part of the quality control and prototype testing procedures. Please refer to attachments A-3, A-3-1 and A-3-2.

7. Please refer to the quality control procedure in attachment A-3.

ATTACHMENT B

Possession

1. Information on the GM counter and the gaseous pressure measuring apparatus:

   A) GM counter (model HLB-2501, manufactured by ALOKA)

   Specs.:

Counting efficacy	1.2% at 3 cm distance
Counts (NET)	2400cpm+/-5% for 1kBq
B.G. (background)	60 cpm

   B) Appratus for measuring gaseous pressures (Type : McLeod gauge)

   Specs.:

Measuring range	10^{-2} to 10^{4} Pa
Minimum scale	26.6 Pa

   Gaseous pressure of each sample is converted into radiation quantity based on the declared radiation quantity in former gas purchased.

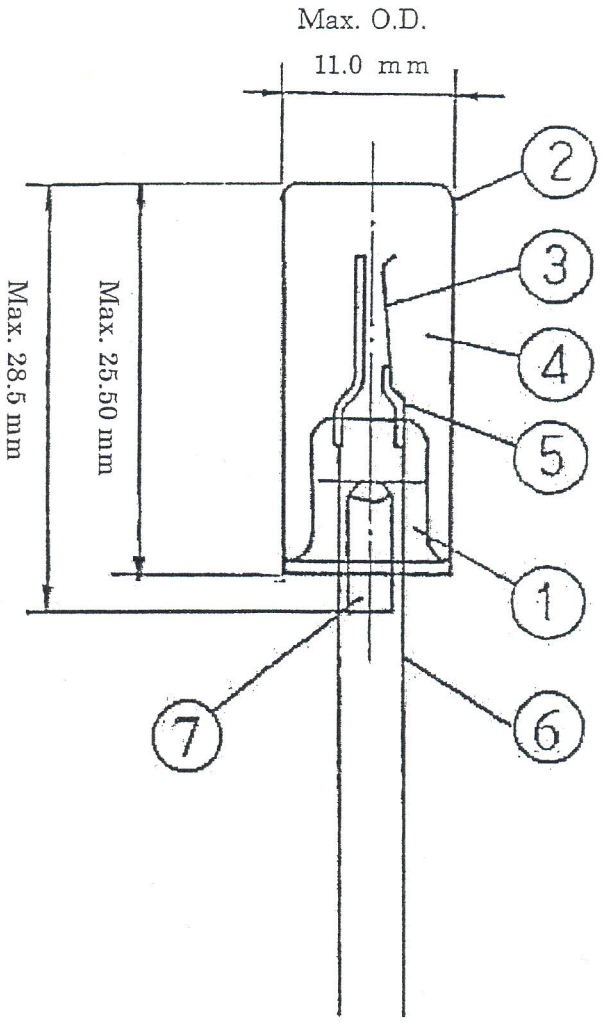
2. Calibration standards in Japan are traceable to a national standard maintained by Japan's Ministry of International Trade and Industry (MITI)

3. Responsible person in charge is officially qualified as "First Grade Radiation Protection Officer" by Science and Technology Agency, Japanese Government.

Detail of construction and design

(Type-1) Glow starters having a filling gas with 85Kr

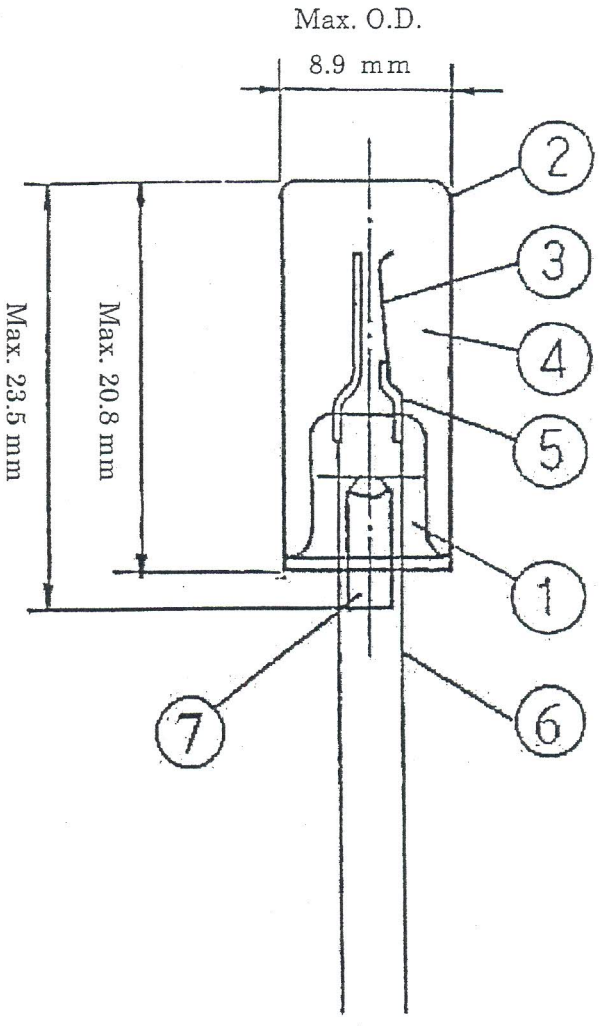
Glow starter FG-1PL



No.	Address term	Material
1	Stem	Lead glass
2	Enclosure	Lead glass
3	Bi-metal	Ni-Cr-Fe/42Ni-Fe
4	Filling gas	Ar with minor 85Kr
5	Inner lead	Fe-Ni alloy
6	Outer lead	Copper coated steal wire
7	Exhaust tube	Lead glass

(Type-2) Glow starters having an inner-lead with 147Pm

Glow starter HN 10/13W



No.	Address term	Material
1	Stem	Lead glass
2	Enclosure	Lead glass
3	Bi-metal	Ni-Cr-Fe/42Ni-Fe
4	Filling gas	Ar
5	Inner lead	147Pm-Ni alloy on core Fe-Ni alloy
6	Outer lead	Copper coated steal wire
7	Exhaust tube	Lead glass

State of California-Health and Human Services Agency

California Department of Public Health

RADIOACTIVE MATERIAL LICENSE

Pursuant to the California Code of Regulations, Division 1, Title 17, Chapter 5, Subchapter 4, Group 2, Licensing of Radioactive Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, use, possess, transfer, or dispose of radioactive material listed below; and to use such radioactive material for the purpose(s) and at the places(s) designated below. This license is subject to all applicable rules, regulations, and orders of the California Department of Public Health now or hereafter in effect and to any standard or specific condition specified in this license.

1. *Licensee*	Hitachi America, Ltd.	3. *License Number* 7820-19	*Amendment Number:*
2. *Address*	900 Hitachi Way Chula Vista, CA 91914-3556	4. *Expiration date* February 26, 2020	(5)
Attention:	Fernando Ramos Radiation Safety Officer	5. *Inspection agency*	Los Angeles County

6. Nuclide	7. Form	8. Possession Limit
A. Krypton-85	A. Sealed sources (Panasonic lamps)	A. 10,000 lamps not to exceed 5 nanoCi each. Total not to exceed 50 microCi.

9. Authorized Use

A. Possession only. To be distributed under an NRC exempt distribution license.

LICENSE CONDITIONS

10. Radioactive material shall be stored at and distributed from the following location only:

(a) 1650 E. Glenn Curtiss Street, Carson, CA 90747

11. This license is subject to an annual fee for sources of radioactive material authorized to be possessed at any one time as specified in Items 6, 7, 8 and 9 of this license. The annual fee for this license is required by and computed in accordance with Title 17, California Code of Regulations, Sections 30230-30232 and is also subject to an annual cost-of-living adjustment pursuant to Section 100425 of the California Health and Safety Code.

12. Radioactive material shall be used by, or under the supervision of, the following individuals:

(a) Fernando Ramos

13. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 7, 8 and 9 of this license in accordance with the statements, representations, and procedures contained in the documents listed below. The Department's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

(a) The application dated November 12, 2009, signed by Neal Svalstad, Senior Corporate Counsel, with attachments, fax dated January 14, 2010, signed by Susan Engelhardt, President, CEO, Engelhardt Associates, Inc., with attachments and fax dated January 19, 2010, signed by Susan Engelhardt, President, CEO, Engelhardt Associates, Inc., with attachments.

14. The Radiation Safety Officer in this program shall be Fernando Ramos.

15. At least 30 days prior to vacating any address of use listed in Condition 10 of this license, the licensee shall provide written notification thereof to the California Department of Public Health, in accordance with Title 17, California Code of Regulations, Section 30256 (b).

022827

RADIOACTIVE MATERIAL LICENSE

License Number: 7820-19

Amendment Number:

16. A copy of this license and all records and documents pertaining to this license shall be maintained available for inspection at 1650 E. Glenn Curtiss Street, Carson, CA.

17. The licensee will provide the Low Level Radioactive Waste (LLRW) reports specified in the California Health and Safety Code section 115000.1(h) to the California Department of Public Health (CDPH) on an annual basis for both shipped and stored LLRW. Alternatively, LLRW shipment information may be provided on a per shipment basis. LLRW shipment information and annual reports shall be mailed to:

Attn: LLRW Tracking Program
California Department of Public Health
Radiologic Health Branch, MS 7610
P.O. Box 997414
Sacramento, CA 95899-7414

Issued for the California Department of Public Health

Date: 2/25/10 By:

Ronald Rogus
Radiologic Health Branch
MS 7610, P.O. Box 997414
Sacramento, CA 95899-7414

Radiation Safety Training
Panasonic/Sanyo/Hitachi

Presented by
Sue Engelhardt
President
Engelhardt & Associates, Inc.

NRC vs. State Regulation

NRC Control

- Source material (U, Th ores)
- Special Nuclear Material (fuel)
- Byproduct material (made in a nuclear reactor)

State Control

- Machine produced radiation
  - X-ray machines
  - Accelerators
- Naturally occurring radioactive material (NORM)

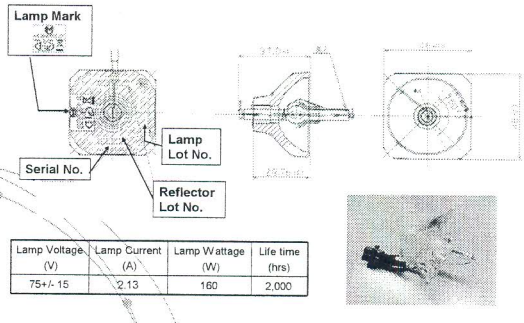
Agreement State

NRC = US Nuclear Regulatory Commission

Projector Lamps

- Sealed inside of the lamp assembly
- Lamp is inside of projectors
- Contain Kr-85
- Very small amount
- Can be sold to the public
- Same way as smoke detectors

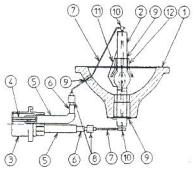
Drawings



Lamp Voltage (V)	Lamp Current (A)	Lamp Wattage (W)	Life time (hrs)
75+/- 15	2.13	160	2,000

Material list

No.	Parts	Material	Description
1	Reflector	Hard glass	Elliptical
2	Lamp	Quarts glass Tungsten, Molybdenum Argon, Mercury, 85Kr	85Kr ; <1kBq
3	Plug housing	PPS resin	
4	Terminal	Copper alloy (Sn plating)	
5	Fluorine rubber tube	Fluorine rubber	
6	Lead wire	Silicone rubber insulated nickel wire	
7	Outer lead wire	Ni wire	
8	Parallel connector	Copper alloy (Sn plating)	
9	Cement	Alumina, Silica	
10	Sleeve	Fe-Ni	
11	Trigger wire	Fe-Cr	
12	Sub-reflector	Quarts glass	

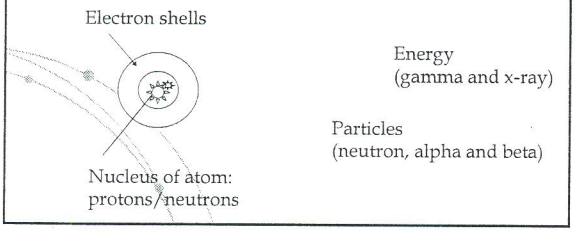


Other Places Where Radiation is Used in the Public

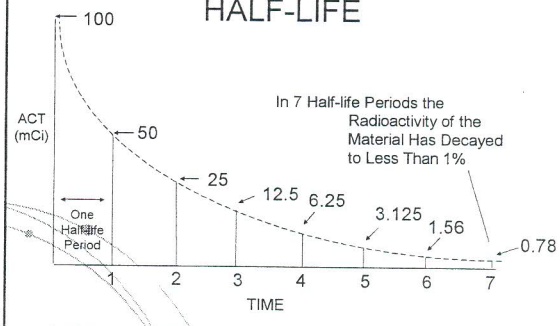
- Door locks on cars
- Smoke detectors
- Exit lights
- Aircraft aisle-way lights
- Watches that glow in the dark
- Lantern mantles used for camping
- Naturally Occurring Radioactive Materials (NORM)

Radioactive Decay

Nuclei that have excess energy are radioactive. They emit particles and energy to remove the excess.

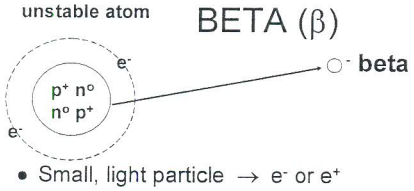


HALF-LIFE



Definition: Time it takes for half of the atoms to decay away

BETA (β)



- Small, light particle → e^- or e^+
- High speed
- Can penetrate outer layers of skin: burns
- Range: cm to meter range in air
- Shielding: low E - none, high E - plastics/metal
- Biological hazard: External - none at low E
  Internal - low LET

Curie

- This says how much
- It is the physical amount of radioactive material
- In your case, it is very small

Quantities of Radioactive Materials

• Krypton-85	.005 microCuries
• Same as	5 nanocuries

RADIATION PROTECTION

- Most radiation protection is common sense
- Education—Know where the radiation is and how to handle it
- ALARA: Keep all exposures As Low As Reasonably Achievable.
- Time, Distance and Shielding: Reduce the time you are around sources, keep distance between you and the sources.
- Shielding—the bulbs are well shielded.

Wherever radioactive materials are stored/used

Notices to Workers

- Notice to workers from the State of California will be posted in the warehouse
- Read this—its your rights as a worker.
- Also, attached to this notice is information on where the license from Washington DC. is located, regulations, the radiation safety program and who to call if there is an emergency

Units of Dose

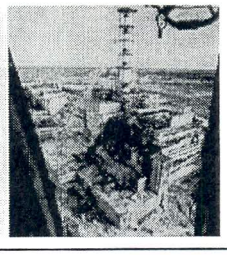
- Millirem is the unit of dose.
- Most folks don't understand what this means
- Lets look at some examples.

Radiation Sources and Background



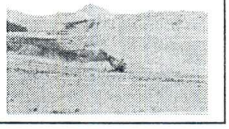

Radiation Sources

- Natural background
  - Air
  - Water
  - Ground Minerals
  - Cosmic
  - Internal (body tissues – inges food/tobacco)
- Man made
  - Medical
  - Consumer Products
  - Weapons



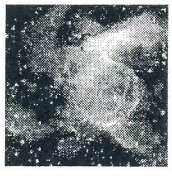
Terrestrial Radiation

- Varies greatly with location
  - Uranium, thorium, radium
- Ground 28 mrem/yr
  - Granite, minerals, soils, water
- Radon 200 mrem/yr
- Total 228 mrem/yr
- Examples:
  - Ramsar, Iran (26 rem/yr)
    - ~2 mrem/hr @ waist level
  - Brazil (7 rem/yr)



Cosmic Radiation

- Exposure changes with elevation
- Average: ~30 mrem/yr
- Sources of exposure
  - protons, neutrons, betas, gammas, x-rays, etc.
  - Cosmogenic radionuclides



Internal Sources

- Our body tissues 39 mrem/yr
  - Carbon-14
  - Potassium-40
  - Radium-226
- Diet
  - Water
  - Food
    - Brazil nuts
    - No Salt
    - Whiskey
    - Milk
    - Salad Oil

Consumer Products

- US Average 11 mrem/yr
- Products include:
  - Orange fiesta ware
  - Ceramics
  - Porcelains
  - Luminous dials
  - Smoke Detectors
  - Lantern Mantles

Medical Exposures

- Doses vary tremendously based on type of treatment
  US Average: 53 mrem/yr
- Examples:
  - Chest x-ray (~20 mrem)
  - Dental x-ray (hundreds of mrem)
  - CAT Scan (50-5000 mrem)
  - Cardiac Catherization (~10 rem)
  - Radiotherapy (~200 rem each)

Weapons

- Dose depends on many factors
  - Size of bomb
  - Type of bomb
  - Location
  - Weather
  - Time

US Average today <1 mrem/yr
Nagasaki ~200,000 rad

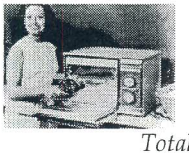
- Dirty Bombs

Average US Population Doses

- Natural Background ~ 295 mrem/yr
  - From body tissues, terrestrial and cosmic
- Man-made Sources ~ 65 mrem/yr
  - From products, medical and fallout
- Total ~ 360 mrem/yr

Note: statistics taken from NCRP Report #93

Other sources?



Total: 0 mrem/year

Background Summary

- Doses are quite varied
- Tobacco is the wild card: Pack/day for a year 2-8 rem
- Statistics
  - Chance of dying of cancer ~20%
  - Chance of getting cancer 38-48%
  - 1000 mrem will increase chance of dying of cancer by 0.04%

Medical

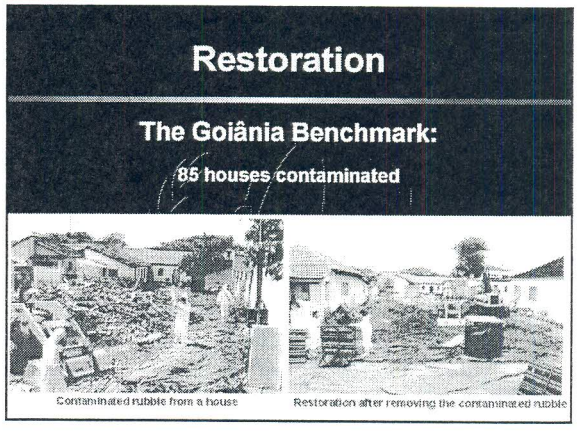
• CT Scan	5000mrm/hr
• Card. Cath	10000mrem/~2hr
• Chest X-ray	20mrem X 2 = 40mrem
• Nuc. Med.	2000mrem/targ.organ

Radiation Biology

- Radiation is energy so enough of it can hurt you.
- The quantities in the bulbs you have is so small that it has no effect on humans at all; this is why Panasonic can sell them to the general public

Radiation Effects

- Occurs mostly when a dose is delivered over a short period of time; greater than 50,000mrem is needed to cause an effect.
- If, the radioactive materials are inhaled or eaten, the effects are more likely to occur because you can't get away from the source—its inside of you!
- Examples of effects:
  - Radium Dial Painters
  - Goiana Brazil



Goiania

- 1000 Curies of Cesium chloride
- 14 people overexposed
- 4 dead within 4 weeks
- 112,000 monitored
- 249 contaminated
- 85 houses contaminated
- Resulted in 5000 cubic meters of waste

Perceived vs. Real Risk

- Real Risk: We know the risk and the potential effect (supported by facts)
- Perceived Risk: The real risk does not matter → it's how a person views the risk
  - Examples:
    Flying, skydiving, drinking, smoking, etc.

Radiation Safety Program

- There is a written program describing radiation protection at Panasonic
- Your RSO is Taylor Woods for Sanyo
- Your RSO for Hitachi is Fernando Ramos
- Audits of radiation safety: Annual
- Inspections: Will be done by the State of California
- Training for personnel
  - Initial and annual refresher training

Radiation Emergency

- If you suspect that the source housing of the lamp is broken, get all personnel away from the unit—at a minimum: 10 feet.
- Contact the Radiation Safety Officer (RSO) and the Warehouse Supervisor.
- REMEMBER: These sources are so small that they cannot do harm, but we want to keep all radiation exposures As Low As Reasonably Achievable

SECURITY

- The State of California says you have to keep security high on all radioactive materials.
- Inventory control is excellent
- Don't change storage locations in the warehouse without approval from the RSO

QUIZ FOR HITACHI

NAME: FERNANDO RAMOS DATE: NOV. 18, 2009

1. True and False

a.	T	F	Radiation cannot hurt you
b.	T	F	The source in the projector lamps is ^{85}Kr
c.	T	F	The source in the projector lamps is a gas
d.	T	F	Security of radioactive materials is of no concern
e.	T	F	The State of California is the regulatory agency for radioactivity
f.	T	F	The radioactive source is shielded within the lamp assembly
g.	T	F	Even if the lamp is broken, the radioactive source would not break
h.	T	F	If a source were destroyed and the gas released, there would be no harm to personnel or public

2. Multiple choice
   a. Half life is the time it takes for half of the radioactivity to decay away
   b. The half life of ^{85}Kr in the projector lamps is approximately 10 years
   c. Half life is the reason why we want to distribute older projectors in the warehouse first
   d. All of the above

3. Multiple choice-which is true about the radioactive source in the lamps
   a. The radioactivity in the lamps is a beta emitter
   b. A beta particle is the same thing as an electron
   c. The source is sealed in a tube so it cannot break
   d. All of the above

4. Who is your Radiation Safety Officer (RSO) FERNANDO
5. Which of the following are duties of the RSO
   a. Training
   b. Licenses
   c. Postings
   d. Audits
   e. All of the above
6. True and False

a.	T	F	Caution Radioactive Material signs are posted where radioactive materials are use or stored
b.	T	F	The Notice to Workers from the State of CA describes your rights as a worker

c. T F Most exposure to radiation is from non-working doses
d. T F Radiation dose is measured in the millirem
e. T F The source in each lamp is 5 nanocuries of activity
f. T F The nanocurie, (curie) is the physical amount of radioactive material
g. T F The millirem is the dose to a person.
h. T F ALARA means keeping radiation exposures as Low As Reasonably Achievable

7. In the event of an emergency, such as lamp breakage (projector breakage, who do you call? RSO

8.

Radiation Safety Seminar

Day One	Description	Objectives	Trainer(s)
07:30 – 8:00 a.m.	Continental Breakfast	Not Applicable (NA)	
08:00 – 08:10	Seminar Objectives/Overview	Explain seminar objectives and meet trainers.	Sue Engelhardt
08:10 – 08:30	Radiation and Its Uses (Chapter 1) • Ionizing radiation and radioactive decay • Contemporary applications	Relate the basic properties of ionizing radiation. List common applications of ionizing radiation in industry, research and medicine.	Sue
08:30 – 08:50	Regulatory Agencies and Licensing (Chapter 2) • Where regulatory standards come from • NRC vs. Agreement States • Other agencies (e.g., OSHA, FDA, EPA, DOT)	Relate how the NRC regulations are developed. Define difference between Agreement vs. Non-Agreement states. Recognize how other agencies regulate radiation.	Sue
08:50 – 09:00	Break	NA	
09:00 – 10:30	Radiation Physics (Chapter 5) • Atomic composition, structure, and terms • Radioactive decay and half-life • Properties of common decay products • Radioactive decay modes and schemes • Interactions with matter	Relate the basic atomic structure and common terms. Define half-life and radioactive decay. Describe basic properties of alpha, beta, x-ray, & gamma. Recognize the basic radioactive decay modes and emission characteristics. Compare interaction mechanisms (directly vs. indirectly ionizing).	Ralph Grunewald
10:30 – 11:30	Group Sessions	See Performance Objectives for Group	All
11:30 – 12:30 p.m.	Lunch	NA	
12:30 – 01:00	Radiation Units (Chapter 6) • Exposure units • Dose and dose equivalent units • Energy transfer (LET, QF)	Identify the difference between exposure and dose. Relate the traditional and SI units for exposure (R C/kg), dose (rad, Gy), and dose equivalent (rem, Sv). Examine linear energy transfer and quality factors as these pertain to biological effectiveness.	Josh Walkowicz
01:00 – 01:20	Common Sources of Radiation (Chapter 6) • Naturally occurring • Medical	Relate typical levels of radiation from common sources.	Michael Smith

Day One (continued)	Description	Objectives	Trainer(s)
01:20 – 01:30	Break	NA	
01:30 – 02:20	Regulatory Dose Limits and Radiation Dosimetry (Chapter 7) • Dose limits (public vs. occupational) • Types of dosimeters; how they work • Personnel monitoring requirements • Dosimetry reporting requirements	Identify the regulatory dose limits for radiation workers, the embryo/fetus of a declared pregnant woman, and members of the public. Explain types of personnel dosimeters and their limitations. Relate monitoring and reporting requirements.	Josh
02:20 – 02:30	Break	NA	
02:30 – 03:00	Radiation Biology (Chapter 9) • Cellular, tissue, and systemic effects • Delayed effects, early somatic effects • Acute radiation syndrome • Hormesis, threshold vs. non-threshold	Describe the biological effects of radiation and the dose levels where these effects occur. Contrast perceived vs. real risk.	Josh
03:00 – 04:00	Group Sessions	See Performance Objectives for Group	All

Day Two	Description	Objectives	Trainer(s)
07:30 – 08:00 a.m.	Continental Breakfast	NA	
08:00 – 09:40 (10 min. break)	Radiation Detection and Measurement (Chapter 10) • Types of equipment • Appropriate uses • Demonstration of equipment • Self-reading dosimeters	Describe how to select and operate equipment for the different types of radiation. Identify the basic design principles of various detectors.	Ralph
09:40 – 09:50	Break	NA	
09:50 – 10:40	Radiation Protection (Chapter 11) • ALARA • Methods for protection • Posting and labeling requirements	Explain what ALARA is and how to implement. Describe methods used for radiation protection (e.g., time, distance, shielding, contamination control). Apply inverse square law. Recognize when and where to post signs and apply labels.	Josh

Day Two (continued)	Description	Objectives	Trainer(s)
10:40 – 11:30	Group Sessions	See Performance Objectives for Group	All
11:30 – 12:30 p.m.	Lunch	NA	
12:30 – 01:30	Packaging, Transport, and Receipt of Radioactive Materials (Chapter 15) • Shipper's responsibilities • Transportation regulations (NRC, DOT, IATA) • Classification and packaging • Transport on public roads • Receipt of radioactive materials	Define shipper's responsibilities and regulations affecting radioactive materials transportation. Describe basic packaging, marking, and labeling provisions for limited and Type A quantities. Describe DOT provisions for employee training and transport on public roads. Relate procedures for safe receipt of packages.	Michael
01:30 – 01:40	Break	NA	
01:40 – 02:30	Radiation Protection Programs (Chapter 3) • Written programs • Key elements (e.g., RSO/RSC, facility design, PPE, procedures, records, audits) • Annual reviews	Examine key elements of an effective radiation protection program. Assess record keeping requirements.	Josh
02:30 – 02:40	Break	NA	
02:40 – 03:00	Responsibilities for Radiation Protection (Chapter 16) • Who is responsible • Legal issues	Relate various responsibilities for radiation protection and regulatory compliance.	Michael
03:00 – 04:00	Group Sessions	See Performance Objectives for Group	All

Day Three	Description	Objectives	Trainer(s)
07:30 – 08:00 a.m.	Continental Breakfast	NA	
08:00 – 08:40	Radiation Incidents and Emergency Response (Chapter 13) • Types (gauge, medical, academic) • Procedures • Source leakage, loss • Emergency personnel as responders • Performance based training • Interactions with public, media, and employees	Define the RSO's role in planning for and preventing accidents. Examine key components of an emergency plan.	Judy Grunewald
08:40 – 08:50	Break	NA	
08:50 – 09:40	NRC Regulations (Chapter 2) • Part 19, Notices, Instructions to Workers • Part 20, Radiation Protection Standards • Parts 30-35, license types and provisions • Special requirements (gauges and licenses)	Identify critical provisions of Part 19 and 20 worker information and protection standards. Identify NRC license and registration requirements (e.g., exempt, general, specific). Interpret basic provisions for specific license categories (e.g., manufacture, broad scope, radiography, medical use, irradiators).	Josh
09:40 – 09:50	Break	NA	
09:50 – 10:30	Regulatory Inspections (Chapter 17) • How to prepare for NRC/state inspections • How to deal with inspectors • What to do if the inspection is going badly • What to do if called for an enforcement conference • Interactions with the public and media	Relate the inspection process. Explain how to prepare for and respond to enforcement activities. Define the NRC's media notification criteria. Define key aspects of communicating with the public and media.	Sue
10:30 – 11:20	Group Sessions – Key aspects for writing a license • New, renewal, & amendment applications • Content, fees Reportable incident scenarios • When to/not to report an incident • Interactions with the public and media	Identify references available for assistance when writing a license (e.g., NRC Regulatory Guides). Identify key aspects (do's, don'ts) for writing a license. Discuss incident scenarios and Identify NRC requirements for reporting incidents and misadministrations (medical).	All
11:20 – 12:00	Group Sessions – Examination	Complete exam and score 85% or better.	All

Radiation Safety Seminar
Performance Objectives for the Gauge Group

These performance objectives are tailored to the participants' needs. Each session is approximately one hour.

Day One: Morning Session

- Relate physics and interactions of radiation with matter as it pertains to common radionuclides used in gauges.
- Compare slides on specific operation of many types of gauges (to understand common types of gauges and how they work).
- Recognize general characteristics of source capsule configuration and shutter designs.
- Calculate radioactive decay.

Day One: Afternoon Session

- Recognize the use of various gauge types
- Differentiate what you can and cannot do with gauges with regards to maintenance and repair.
- Demonstrate opening and closing shutters (both cylinder and flat swing type).
- Define badge requirements - who needs them, why, etc.
- Recognize difference between device registrations and general/specific licenses for gauges.

Day Two: Morning Session

- Examine gauges/dummy sources.
- Observe proper lockout/tagout demonstration and then lockout/tagout a gauge (hands-on).
- Differentiate what signs are needed in experimental settings.
- Describe ALARA strategies for mills/gauges.
- Demonstrate time, distance, and shielding principles.
- Demonstrate survey procedures - exposure rate monitoring, leak tests, and wipe tests.
- Calculate dose from a point source.

Day Two: Afternoon Session

- Identify responsibilities of the RSO for the radiation safety program.
- Recognize emergency preparedness and response.
- Perform leak tests.
- Demonstrate radiation measurements with a Geiger counter and an ionization chamber around sources to observe how radiation is shielded, collimated, and scattered.
- Demonstrate radiation measurements of a source through various shielding materials to observe attenuation.
- Demonstrate radiation measurements of a source at various distances to understand the inverse square law.
- Define how to receive and ship a radioactive package.

Radiation Safety Seminar
Performance Objectives for the Medical Group

These performance objectives are tailored to the participants' needs. Each session is approximately one hour.

Day One: Morning Session

- Restate the regulatory structure for various types of radiation and radioactive materials commonly used in medicine.
- Examine alpha, beta, and gamma decay processes and interactions with matter.
- Define and convert between various radioactivity units (Ci, Bq, dpm, dps).
- Calculate radioactive decay both forward and backward in time.
- Calculate attenuation of radiation.

Day One: Afternoon Session

- Define NRC dose limits and personnel dosimetry requirements - who needs dosimeters, when, why, etc.
- Recognize regulatory requirements and NRC licensing process for medical uses.
- Define personnel bioassays for radioactive materials commonly used in medicine.
- Examine radiation risk vs. benefit issues.

Day Two: Morning Session

- Recognize various types of detectors for beta and gamma radiation (e.g., GM, LEG, HEG), and how to select appropriate detectors (e.g., for dose surveys vs. contamination surveys).
- Demonstrate how to perform function tests (hands-on) and understand calibration requirements for survey meters commonly used in medical settings.
- Compare patient release after nuclear medicine procedures vs. non-release of radioactivity from the research setting.
- Describe practical radiation protection measures (e.g., use of time, distance, shielding, contamination control) and ALARA strategies for medical settings.
- Demonstrate how to conduct wipe tests and leak tests for removable contamination.
- Differentiate NRC required radiation warning signs, labels, postings, etc. needed in experimental settings.
- Calculate dose from a point source.

Day Two: Afternoon Session

- Identify RSO responsibilities and the critical components of a radiation safety program in a medical facility.
- Describe Quality Management Program and written directive requirements.
- Identify effective auditing techniques.
- Describe NRC requirements for training (frequency, content, etc.).
- Examine radiation emergency preparedness and response for incidents likely to occur in a medical setting.
- Explain how to receive/ship a radioactive package.
- Describe radioactive waste management and setting up a decay in storage procedure.

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Radiation Safety Seminar
Performance Objectives for the Research Group

These performance objectives are tailored to the participants' needs. Each session is approximately one hour.

Day One: Morning Session

- Restate the regulatory structure for various types of radiation and radioactive materials commonly used in research.
- Examine alpha, beta, and gamma decay processes and interactions with matter.
- Define and convert between various radioactivity units (Ci, Bq, dpm, dps).
- Calculate radioactive decay.
- Calculate attenuation of radiation.

Day One: Afternoon Session

- Examine NRC dose limits and personnel dosimetry requirements - who needs dosimeters, when, why, etc.
- Restate regulatory requirements and NRC licensing process for research related use.
- Explain personnel bioassays for radioactive materials commonly used in research.
- Contrast radiation risk vs. benefit issues.

Day Two: Morning Session

- Recognize various types of detectors for beta and gamma radiation (e.g., LSC, GM, LEG), and how to select appropriate equipment (e.g., for exposure rate monitoring vs. radioanalyses).
- Demonstrate how to perform function tests (hands-on) and understand calibration requirements for survey meters commonly used in research facilities.
- Describe practical radiation protection measures (e.g., use of time, distance, shielding, contamination control) and ALARA strategies for research settings.
- Demonstrate how to conduct wipe tests and leak tests for removable contamination.
- Differentiate NRC required radiation warning signs, labels, postings, etc. needed in experimental settings.
- Calculate dose from a point source.

Day Two: Afternoon Session

- Identify RSO responsibilities and the critical components of a radiation safety program in a research facility.
- Describe effective auditing techniques.
- Describe NRC requirements for training (frequency, content, etc.).
- Examine emergency preparedness and response for incidents likely to occur in a research setting.
- Explain how to receive/ship a radioactive package.
- Describe radioactive waste minimization, management, and disposal (including decay in storage) for radioactive materials commonly used in research.