

<p>NRC FORM 313 U.S. NUCLEAR REGULATORY COMMISSION</p> <p>(4-2008) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40</p> <p style="text-align: center;">APPLICATION FOR MATERIALS LICENSE</p>	<p>APPROVED BY OMB: NO. 3150-0120 EXPIRES: 10/31/2008</p> <p>Estimated burden per response to comply with this mandatory collection request: 4.4 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@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.</p>
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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.

<p>APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:</p> <p>DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS U.S. NUCLEAR REGULATORY COMMISSION WASHINGTON, DC 20555-0001</p> <p>ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:</p> <p>IF YOU ARE LOCATED IN:</p> <p>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:</p> <p>LICENSING ASSISTANCE TEAM DIVISION OF NUCLEAR MATERIALS SAFETY U.S. NUCLEAR REGULATORY COMMISSION, REGION I 475 ALLENDALE ROAD KING OF PRUSSIA, PA 19406-1415</p>	<p>IF YOU ARE LOCATED IN:</p> <p>ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:</p> <p>MATERIALS LICENSING BRANCH U.S. NUCLEAR REGULATORY COMMISSION, REGION III 2443 WARRENVILLE ROAD, SUITE 210 LISLE, IL 60532-4352</p> <p style="text-align: center; font-size: 24px; font-family: cursive;">I CODE 23962</p> <p>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:</p> <p>NUCLEAR MATERIALS LICENSING BRANCH U.S. NUCLEAR REGULATORY COMMISSION, REGION IV 612 E. LAMAR BOULEVARD, SUITE 400 ARLINGTON, TX 76011-4125</p>
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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.

<p>1. THIS IS AN APPLICATION FOR <i>(Check appropriate item)</i></p> <p><input checked="" type="checkbox"/> A. NEW LICENSE</p> <p><input type="checkbox"/> B. AMENDMENT TO LICENSE NUMBER _____</p> <p><input type="checkbox"/> C. RENEWAL OF LICENSE NUMBER _____</p>	<p>2. NAME AND MAILING ADDRESS OF APPLICANT <i>(Include ZIP code)</i></p> <p>Heng Ngai Jewelry, Inc. 5525 N. MacArthur Blvd., Suite 160 Irving, TX 75038</p>
<p>3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED</p> <p>Heng Ngai Jewelry, Inc. 5525 N. MacArthur Blvd., Suite 160 Irving, TX 75038</p>	<p>4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION</p> <p>Kristin Holcomb</p> <p>TELEPHONE NUMBER</p> <p style="text-align: center; font-size: 18px;">(972) 550-0228</p>

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.

<p>5. RADIOACTIVE MATERIAL</p> <p>a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.</p>	<p>6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.</p>			
<p>7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.</p>	<p>8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.</p>			
<p>9. FACILITIES AND EQUIPMENT.</p>	<p>10. RADIATION SAFETY PROGRAM.</p>			
<p>11. WASTE MANAGEMENT.</p>	<p>12. LICENSE FEES <i>(See 10 CFR 170 and Section 170.31)</i></p> <table style="width:100%; border: none;"> <tr> <td style="border: none;">FEE CATEGORY</td> <td style="border: none;">AMOUNT ENCLOSED</td> <td style="border: none;">\$</td> </tr> </table>	FEE CATEGORY	AMOUNT ENCLOSED	\$
FEE CATEGORY	AMOUNT ENCLOSED	\$		

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 Kristin Holcomb Sales Executive	SIGNATURE 	DATE 12-8-08
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FOR NRC USE ONLY					
TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			\$		
APPROVED BY				DATE	

December 4, 2008

Nuclear Materials Licensing Branch

U.S. Nuclear Regulatory Commission, Region IV

612 E. Lamar Boulevard, Suite 400

Arlington, TX 76011-4125

Re: Application for Exempt Distribution License

Docket Number : ~~030-37586~~

Mail Control No. : ~~022650~~

Introduction

Heng Ngai Jewelry, Inc. (HNJ) intends to import irradiated gemstones into the United States and requests your consideration of this application for a distribution license. This document will provide the information required by CFR 30.33 and 30.70 for a distribution license.

HNJ is located in an agreement state (Texas) and has obtained a possession license through the Texas Department of State Health Services. A copy of the possession license (Texas Radioactive Materials License L06108) is included with this application.

HNJ initially applied for an NRC license in 2007 and received a response on December 10, 2007 which indicated that additional information was needed before a review could be completed. The response from the NRC also indicated that if the application was re-submitted by December 10, 2008, there would be no additional fee for this revised license request.

NRC Form 313

5. Radioactive Material

a. Element and mass number;

- Any radioactive material with atomic number 1-83
with no single radionuclide to exceed 2 mCi
- Any radioactive material with atomic number 84-96
(Per Texas DSHS RAM License L06108)

b. Chemical and/or Physical Form;

Irradiated Gemstones, (topaz, tourmaline, spinel)

c. Maximum Amount which will be possessed at any one time;

- 20 mCi for radioactive materials with atomic number 1-83
- 1 uCi for radioactive materials with atomic number 84-96
(PER Texas DSHS RAM License L06108)

6. Purpose(s) for which licensed material will be used;

The exempt distribution of irradiated gemstones

A. Basic Information

1. Name of Applicant: Heng Ngai Jewelry, Inc.
2. Mailing Address: 5525 N. MacArthur Blvd., Suite 160
Irving, TX 75038
3. Point of Contact: Todd Anderson
Consulting Medical Physicist
Phone – (469)258-7550
4. (a,b,c) Locations: The irradiated gemstones will be received, possessed, and distributed at the address given above in item 2. Records pertaining to possession and distribution of irradiated gemstones will be maintained at the address given above in item 2.

B. Background Information

1. Describe the material to be imported
 - a. The type of gems;
Topaz , other gems such as tourmaline and spinel
 - b. Extent to which gems have been processed before irradiation;
Only finished gems which do not require cutting, grinding, or polishing after irradiation will be imported into the United States by HNJ.
 - c. The type(s) and sequence of irradiation or other treatment to which gems have been exposed before they are to be imported;
The gemstones will be subjected to one of the following processes;
 - Reactor irradiation only (primarily neutron)
 - Reactor irradiation followed by accelerator-irradiation
 - Accelerator irradiation only (primarily electron)

d. Where and by whom, each irradiation or other treatment is performed identify U.S. reactors by name and location; identify foreign reactors by name and country.

Irradiated gemstones will be treated by overseas facilities such as;

Zimmerman BCS Stones GmbH Im Spielberg 6, D-55296
Harxheim, Germany

e. If gems are exposed to additional irradiation or treatment after importation, for neutron irradiation only, the type(s) and sequence and where and by whom each is performed;

No additional irradiation treatment will occur after importation by HNJ

f. How gems are handled to ensure grouping according to geologic origin of gems and type(s) of irradiation or treatment to which gems have been exposed;

All irradiated gemstones are maintained in separate lots based on the date/time received and the type of gemstone. The grouping by gemstone type accounts for grouping by type of irradiation.

A record of the mass and activity per lot will be maintained on site.

It is noted that information on the geologic origin of the gems is not available to HNJ.

- g. Identification of all radionuclides with physical half-lives greater than 2 hours (regardless of method of production) induced in gems and classification of each as either "major" or "minor" radionuclide depending on its contribution to total activity in gems to be distributed to persons who are exempt from licensing;

Classification	Nuclide	Half-Life
Major	Sc-46	84 days
Major	Mn-54	312 days
Major	Zn-65	244 days
Major	Cs-134	752 days
Major	Ta-182	114 days
Minor	Na-24	15 hours
Minor	P-32	14 days
Minor	S-35	89 days
Minor	Cr-49	42 minutes
Minor	Cr-51	28 days
Minor	Fe-59	44 days
Minor	Cu-64	13 hrs
Minor	Ga-72	14 hrs
Minor	As-77	39 hours
Minor	Ge-77	11 hours
Minor	Sb-124	60 days
Minor	Ta-183	5 days

- h. How the information provided in response to Item B.1.g above was obtained and how NRC can be assured that this information is representative of gems imported in the future;

The information provided in response to Item B.1.g was obtained from NUREG/CR-5883, Health Risk Assessment of Irradiated Topaz.

- i. The requested possession limit determined by multiplying the maximum number of gems to be possessed at one time by the maximum total activity anticipated in any one gem;

The possession limits in HNJ's Texas Radioactive Materials License are as follows;

A. For radioactive materials with atomic number 1-83, total maximum activity of 20 mCi with no single radionuclide to exceed 2 mCi.

B. For radioactive materials with atomic number 84-96,

total maximum activity of 1 uCi.

2. Describe the handling of gems, including;

- a. Procedures used to ensure that each irradiated gem is free of removable contamination, including a description of sampling, monitoring, counting and statistical techniques, used, specification of the criteria used to determine when gems are essentially "free of removable contamination" and a description of what will happen to gems exceeding the specified criteria;

All irradiated gemstones received by HNJ will satisfy the exemption requirements of 10 CFR 30.70. Gemstones are thoroughly cleaned at various stages of the pre-importation process. Upon arrival at HNJ, the gemstones are finished stones and and require no additional cutting.

Zimmerman BCS Stones has 30 years of experience in exporting irradiated gemstones. All topaz is cleaned before shipping and larger gemstones are packaged individually. The exporter also tests for removable contamination and provides the results with each shipment.

The procedures followed by the exporter make HNJ confident that spot-checking some gemstones from each shipment for removable contamination is adequate.

Upon arrival at HNJ, all shipments containing radioactive materials will be placed in a secure area. Within three hours of receipt, the Radiation Safety Officer or designee will conduct a radiation survey. Wipe tests on five items chosen at random from the shipment will be taken to identify removable contamination.

- b. The processing of irradiated gems at the importer's facility and the sequence of these activities (e.g. counting of gems and storage for physical decay; mounting in rings, pendants or other settings);

The gemstones are irradiated and then inspected and sorted based on color, imperfections, size, and other variables. Sorted gems are stored for at least three weeks after irradiation to allow for the radioactive decay of short-lived activation products, and gem storage locations are surveyed for radiation levels during the decay process. Some gemstones may require cleaning to remove debris. They are then mounted and cleaned in an ultrasonic sink. Some pieces of jewelry may then be electroplated with precious metals. Each finished piece is cleaned again and is visually inspected for quality, after which it is packaged for shipment.

c. The categories of unlicensed organizations to which irradiated gems will be transferred (e.g. wholesaler; manufacturing jeweler; retail jeweler; individual consumer);

HNJ will distribute irradiated gems to jewelry retailers and wholesalers.

d. What will be done with gems whose concentrations exceed the criteria specified in response to Item C.2.e below (Alternatives include hold in storage for physical decay, transfer to a person specifically licensed to receive them, or disposal as radioactive waste in accordance with the requirements of 10 CFR Part 20 or equivalent regulations of an Agreement State);

Gemstones with concentrations exceeding the criteria specified in Item C.2.e below will be held for radioactive decay in a secure area. When a subsequent survey of the material proves that it is below the exemption limit, the item will be released for distribution.

C. Information Required by 10 CFR 32.11

1. Paragraph 32.11(a) requires that the general requirements of 10 CFR 30.33 be satisfied. To comply with this requirement (or equivalent requirements of Agreement States), the applicant will:
 - a. Explain how the facilities and equipment proposed in the application are adequate to protect health and minimize danger to life or property; specifically explain how irradiated gems will be stored and secured against unauthorized removal or, when not stored and secured, will be tended under the constant surveillance and immediate control of a knowledgeable, responsible person on the importer's staff;

The gemstones received by HNJ are stored in a secure room and the facility has a surveillance and alarm system to provide 24-hour security. Extensive records of all irradiated gemstones received by HNJ are maintained on-site.

b. Identify by name the individuals who will be responsible for handling, irradiation, storing, counting, evaluating, and controlling the release irradiated gems; correlate individuals' names with their responsibilities; and describe the training and experience of each of these individuals that assures protection of the public health and safety.

Heather Johnson and Kristin Holcomb are responsible for the handling Of irradiated gems. They will both perform all duties listed above as needed. Ms. Johnson, Ms. Holcomb, and all other employees who may become involved in the handling of irradiated gemstones will receive training in general radiation safety and the handling and shipping of hazardous materials. This training will be conducted by a medical physicist licensed by the State of Texas. HNJ has retained a licensed medical physicist to conduct periodic on-site audits to ensure general program safety and compliance with regulatory requirements.

2. Paragraph 32.11 (b) requires that certain information be provided. If information on one or more points has already been provided, reference the previous response by section and item number or provide a complete response. To comply with 10 CFR 32.11 (b), the applicant will describe:
- a. The product or material into which byproduct material will be introduced;

Topaz , other gems such as tourmaline and spinel

- b. The intended use of the byproduct material and the product or material into which it is introduced;

Gemstones are irradiated to enhance their color. HNJ will distribute These gemstones to jewelry retailers and wholesalers.

- c. The method of introduction (see response to B.1.c. and e. above);
See response to B.1.c. and e. above.

- d. Initial concentration of byproduct material in the product or material;

This value varies greatly and depends on the irradiation hours. The maximum activity levels observed in irradiated gemstones, analyzed for release has been as high as 20 nCi/g (740 Bq/g).

- e. Estimated maximum concentration of the radioisotopes in the product or material at the time of transfer to persons exempt from licensing.
2 nCi/g (74 Bq/g)

- f. Control methods to assure that no more than the specific maximum concentration is in the product at the time of transfer.

The exporter does not release the irradiated gemstones until they are below 74 Bq/g. In fact, the exporter will not authorize release until the average concentration is below 70 Bq/g.

- g. Estimated time interval between introduction and transfer of the product or material (i.e. between completion of all types of irradiation and transfer to unlicensed persons.);

There is considerable variation in the time intervals between introduction and transfer. The intervals typically range from six months to two years.

This variation can be influenced by product demand, details of the particular order, and the range of decay times used for various irradiation processes.

- 3. Paragraph 32.11(c) requires applicants to provide reasonable assurance of the following:

- a. Concentrations of byproduct material at time of transfer will not exceed the concentrations in 10 CFR 30.70, Schedule A;

HNJ will conduct radiation surveys to ensure that the concentrations of byproduct materials do not exceed exemption concentrations prior to transfer to an unlicensed entity.

The irradiated gemstones will be maintained in a secure area at HNJ until they are authorized for distribution. HNJ will maintain permanent records to prove that the concentrations do not exceed those listed in 10 CFR 30.70, Schedule A.

- b. Reconcentration of the byproduct material in concentrations exceeding those specified in 10 CFR 30.70 is not likely (e.g., in the case of gemstones, one could consider that neutron-irradiation followed by accelerator-irradiation could increase the induced activity and thus be considered "reconcentration")

Shipments of irradiated gemstones must meet the requirements of 10 CFR 30.70 before they are sent to HNJ. HNJ will not irradiate any gemstones after importation into the United States so there is no possibility of reconcentration and no possibility that the concentrations given in 10 CFR 30.70 would be exceeded. ←

c. Use of concentrations lower than those specified in response to Item C.2.e. are not feasible (i.e., why maximum values for a single radionuclide should not be lower; why values for multiple radionuclides should not be calculated by setting the "sum of the ratios" equal to a value less than unity);

Requiring that the "sum of the ratios" is less than unity would mean a significant increase in release intervals. This would adversely affect the domestic market for irradiated gemstones. This seems unnecessary in light of the dose rates found above (C.2.e). ←

d. The product or material is not likely to be incorporated into any food, beverage, cosmetic, drug, or other commodity or product designed for ingestion or inhalation by a human being;

All radioactive material received by HNJ will be finished gemstones. The gemstones are not water-soluble and would not be used in any product or material designed for ingestion or inhalation by a human.

D. Information on QA Program

1. Describe the radiation detection equipment and shielding associated with it that are to be used to identify and quantify the radioactivity induced in gems;

- a. Ludlum Model 2200 Scaler
- b. Ludlum Model 44-2 Scintillation Probe
- c. Ludlum Model 44-88 Pancake GM Detector
- d. Ludlum Model 3 Survey Meter

2. Specify the frequency, standards (including radionuclide, activity, and accuracy), and procedures used to calibrate such radiation detection equipment;

All survey meters will be calibrated annually by a licensed facility. HNJ will use NIST-traceable reference sources to test constancy, efficiency, and energy resolution for the Ludlum Model 2000 Scaler.

a. Selection of Samples;

Each shipment will be surveyed at the package surface and at a distance of 1 meter from the package. Samples will then be selected so that each type of jewelry and each type of irradiated gemstone is tested for each shipment.

b. maximum and minimum sample size
(in terms of number of stones and mass);

The minimum sample size will be 10 pieces of jewelry with a mass of 2 g or greater.

The maximum sample size will be 5% of the number of items in the shipment.

c. counting efficiency;

Efficiencies will be determined by a licensed calibration facility. The measured efficiency will be included on the calibration certificate and used by HNJ staff to account for detector performance in counting results.

d. counting times;

Exposure rates will be recorded when the meter is stable and will typically take a minimum of 15 seconds per reading.

Counts for assessing removable contamination will be done using count intervals of no less than 30 seconds.

e. Counting geometry;

The geometric efficiency depends on the source-to-detector distance and the cross-sectional area of the detector.

The geometric efficiencies for the proposed detectors approach 50% when the source is directly against the detector face.

The geometric efficiency falls off as the inverse square of the source-to-detector distance when that distance is much larger than the radius of the detector face.

The geometry for the counting of individual items will be to isolate the item from other radioactive sources and to keep the detector close to the source.

f. Time of counting;

Counts are typically taken within several months from the end of irradiation. This, of course, is determined by the exporter and can vary considerably. HNJ will count the samples within one day of receipt. The gemstones will usually be released by HNJ within two weeks from the time they are counted by HNJ.

g. Lower limit of detection;

The methods for determining the Lower Limit of Detection (LLD) and Minimum Detectable Activity are those found in NUREG-1156 and Report No. 58 of the National Council on Radiation Protection and Measurements.

The background count, counting efficiency for the particular isotope in question, and effective area of the detector must be known in order to calculate this value. HNJ has not yet purchased the equipment listed in D.1 pending completion of the NRC licensing process, so the LLD is not known at this time.

h. Statistical Methods

The methods for determining the Lower Limit of Detection (LLD) and Minimum Detectable Activity are those found in NUREG-1156 and Report No. 58 of the National Council on Radiation Protection and Measurements.

As part of the quarterly program reviews, the physicist will perform chi-square tests on the detectors to check for random counting errors

- i. The exporter measures all stones to ensure that each is below the concentration limit. The sorting procedures for minimizing false negatives are in place and adhered to by the exporters used by HNJ.

j. Sample Calculations

LLD

$$LLD = \frac{1.645 (R_b / T_b)^{1/2}}{E \times (A/100 \text{ cm}^2)}$$

Where T_b = background count interval
 R_b = background count rate
E = efficiency
A = effective detector area

Problem - A portable survey meter is used to monitor P-32 contamination. It has a standard Pancake GM probe with effective area = 20 cm² and an efficiency of 25%. A background count is taken for one minute and yields 50 counts.

Determine the LLD;

$$LLD = \frac{1.645 (50 \text{ cpm} \times 1 \text{ min})^{1/2}}{.25 \times (1/5)} = 233 \text{ cpm}$$

4. Specify who will be responsible for the QA program, and describe this individual's training and experience in detection and analysis of low-levels of radioactivity. If this individual was identified in response to Item C.I.b, it is not necessary to repeat the individual's qualifications, provided that the response to Item C.I.b includes a clear description of the person's training and

experience in low-level counting techniques;

Heather Johnson is the Radiation Safety Officer and has primary responsibility for the QA program.

HNJ has retained a licensed medical physicist who will provide extensive training to the HNJ staff in many aspects of radiation safety and federal and state regulatory compliance. This training will address the detection and analysis of low-levels of radioactivity.

The physicist will also conduct quarterly reviews of HNJ's radioactive materials program to ensure that, among other things, the proper techniques for radiation detection are in use.

5. Describe the QA program used to assure reliable data, including:

- a. The standards, frequency and procedures used to perform constancy tests on the counting systems;

Constancy for the Ludlum scaler will be tested with a NIST-traceable Cs-137 rod source. This test will be done at the beginning of each day that the unit is used to count samples. The results of this test will be maintained permanently on site in a record that includes the name of the person conducting the test and the model number, serial number, and high-voltage setting on the unit.

- b. The methods and frequency of introducing "spiked" samples into the routine counting process to assure identification of gems with concentrations in excess of your criteria (i.e., response to Item C.2.e. above);

Rather than using spiked samples, HNJ will use reference sources that exceed the levels given in Item C.2.e. These tests will be conducted at the beginning of each day that the scaler will be used to count samples.

6. Provide a commitment that, during the term of the license, the applicant will comply promptly with requests from NRC designed to monitor counting techniques. The general nature of these requests is outlined below:

- a. Upon request, the applicant will provide samples of irradiated gems to NRC for independent verification of radionuclide identity and concentration. NRC's request will be in writing, signed by the appropriate Regional Administrator or the Director, Office of Nuclear Material Safety and Safeguards. The request will specify who (i.e., NRC representative, NRC contractor, or applicant) will

select the samples for independent verification. After analysis, samples will be returned promptly to the applicant;

HNJ will provide samples of irradiated gems to NRC for independent verification of radionuclide identity and concentration.

b. Upon request, the applicant will analyze qualitatively, quantitatively, or both gems or groups of gems provided by NRC or its contractor. The request will be in writing; signed by the appropriate Regional Administrator or Director, Office of Nuclear Material Safety and Safeguards; will specify the type of analysis requested and techniques to be followed; and will provide instructions for reporting results and for returning gems;

At the written request of a Regional Administrator or Director, Office of Nuclear Material Safety and Safeguards, HNJ will analyze qualitatively, quantitatively, or both gems or groups of gems provided by NRC or its contractor.

E. Information Needed to Support Request for Exemption from Portion of 10 CFR 32.11(c);

1. To fulfill the requirements of 10 CFR 30.11(a), make a specific request for an exemption from that portion of 10 CFR 32.11(c) that prohibits incorporation of exempt concentrations in products or materials designed for application to a human being;

If NRC considers gems to be products intended for application to human beings, then an exemption from this portion of the requirements in 10 CFR 32.11(c) is requested.

2. Using a worst case scenario, calculate the annual radiation dose and assess the health risk to unlicensed persons. Calculate the dose at contact and at 4 cm from jewelry (e.g., pendant) containing neutron-irradiated gems that is worn continuously (24 hours per day, 365 days per year). Assume that these gems contain those radionuclides (identified in your response to Item B.1.g) with the longest physical half-lives and highest energy emissions at the maximum concentrations (identified in your response to Item C.2.e.) you propose to release to unlicensed persons. Dose calculations must consider all types of emissions (e.g., beta, gamma) from the identified radionuclides.

This item will be addressed using information and calculations from license applications submitted by the University and Missouri and HBM Virginia. This information was found in the Electronic Reading Room on the NRC website.

		Gamma Dose (Year 1)	Gamma Dose (Year 1)	Gamma Dose (Year 1)	Beta Dose (Year 1)
Isotope	Maximum Concentration (Bq/g)	At Surface w/ Movement (mrem)	3mm from Surface (mrem)	At 4 cm Tissue Depth (mrem)	Beta Dose (mrem)
Sc-46	14.8	26	68	4	3
Mn-54	37	61	160	9	0
Fe-59	2.2	1	4	0.2	0.4
Cs-134	3.3	13	33	2	9
Ta-182	14.8	21	55	3	9

SKIN DOSE

NCRP Report 91 gives 5 rem/year as the skin dose limit for public exposure. The highest dose rates found above are less than 1% of the suggested limit per gram of radioactive material.

DEEP DOSE

The values for the dose rate at 4 cm tissue depth do not exceed 2.5% of the average annual whole body dose of 360 mrem/year from natural sources of radiation (primarily soil, building materials, and the sun). This value is an average for the United States taken from NCRP Report 93.

3. Provide similar calculations and assessments for gems that are outliers (i.e., gems with concentrations as much as twice the criteria you plan to use);

The activity of these outlier materials with twice the concentration, and therefore twice the activity of the materials described in Part 2 of Section E can be determined by doubling the dose rates determined in Part 2.



Department of State Health Services
RADIOACTIVE MATERIAL LICENSE

Pursuant to the Texas Radiation Control Act and Texas Department of State Health Services (Agency) regulations on radiation, 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 radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations and orders of the Agency now or hereafter in effect and to any conditions specified below.

LICENSEE			This license is issued in response to a facsimile	
1. Name HENG NGAI JEWELRY INC DBA HNJ INC ATTN HEATHER JOHNSON			Dated: October 30, 2007	
2. Address 5525 N MACARTHUR BLVD STE 160 IRVING TX 75038			Signed by: Kristin Holcomb	
3. License Number L06108		Amendment Number 01		
PREVIOUS AMENDMENTS ARE VOID				
4. Expiration Date October 31, 2017				
RADIOACTIVE MATERIAL AUTHORIZED				
5. Radioisotope A. Any radioactive material with atomic number 1 to 83 B. Any radioactive material with atomic number 84 to 96	6. Form of Material A. Solid in gemstones B. Solid in gemstones	7. Maximum Activity* A. No single radionuclide to exceed 2 mCi Total: 20 mCi B. 1 µCi total	8. Authorized Use A. Possession of radioactive activation products in gemstones incident to distribution pursuant to USNRC Exempt distribution license. B. Possession of radioactive activation products in gemstones incident to distribution pursuant to USNRC Exempt distribution license.	

* Ci-Curies mCi-Millicuries µCi-Microcuries nCi--Nanocuries

9. Radioactive material shall only be stored at:

<u>Site Number</u>	<u>Location</u>
000	Irving - 5525 North MacArthur, Suite 160

10. Each site shall maintain documents and records pertinent to the operations at that site. Copies of all documents and records required by this license shall be maintained for Agency review at Site 000.
11. This license does not authorize distribution of radioactive material. Distribution can only be authorized by a United States Nuclear Regulatory Commission (USNRC) Exempt Distribution License.
12. The individual designated to perform the functions of Radiation Safety Officer (RSO) for activities covered by this license is Heather Johnson.
13. The licensee shall comply with the provisions (as amended) of Title 25 Texas Administrative Code (TAC) §289.201, §289.202, §289.203, §289.204, §289.205, §289.251, §289.252 and §289.257.



Department of State Health Services

RADIOACTIVE MATERIAL LICENSE

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- 14. The licensee shall conduct a physical inventory every six months to account for all radioactive material received, and possessed under the license. The records of the inventories shall be maintained for inspection by the Agency for three years from the date of the inventory and shall include the radionuclide, number of curies, location of each source of radiation, the name of the individual making the inventory, and the date of the inventory.
- 15. The licensee is required to notify and supply the Agency with a copy of the USNRC Exempt Distribution License when issued.
- 16. Survey instruments used to determine radioactive content of gemstones shall have documentation verifying the instrument/detector sensitivity is appropriate for the isotopes present in the gemstones.
- 17. Except as specifically provided otherwise by this license, the licensee shall possess and use the radioactive material authorized by this license in accordance with statements, representations, and procedures contained in the following:

application dated October 10, 2007, RC Form 252-1 dated July 30, 2007 and building diagram labeled Exhibit B.

Title 25 TAC §289 shall prevail over statements contained in the above documents unless such statements are more restrictive than the regulations.

AJG:ajg

FOR THE DEPARTMENT OF STATE HEALTH SERVICES

Date October 31, 2007


 Michael L. Dunn, Chief
 Industrial Licensing Program