



June 3, 1999  
Ref. No. 3042-029

Ms. Pamela J. Henderson  
Division of Nuclear Materials Safety  
United States Nuclear Regulatory Commission  
Region I  
475 Allendale Road  
Mail Control No. 126779  
King of Prussia, PA 19406

Subject: Amend License  
Breitling, U.S.A., Inc.  
License No.: 06-23863-01

Dear Ms. Henderson:

I write on behalf of Breitling U.S.A., Inc. ("Breitling"), to supplement Breitling's April 19, 1999 request to amend its license to possess and use Tritium. This letter addresses questions concerning Breitling's April 19, 1999 request that were raised in your letter dated May 25, 1999. Breitling requests that the enclosed "Radiation Protection Program" dated June 1999 replaces the "Radiation Protection Program(s)" submitted with our April 19, 1999 application.

1. You requested a possession limit increase from 27 curies to 200 curies in your April 19, 1999 letter. However, on page 5 of 26 of the "Radiation Protection Program" document submitted with your letter, there is a statement that inventory will be maintained at less than 60 curies. Please clarify your request.

*Page 5 of 26 of the enclosed "Radiation Protection Plan" dated June 1999, increases the possession limit to 200 curies.*

2. On page 12 of 26 of the "Radiation Protection Program" document submitted with your April 19, 1999 letter, table 4.2 "Tritium Concentration Action Levels" states that the action levels for airborne is  $2E-5$  and waste water (to sanitary sewer) is  $1E-2$ . This table also appears later in the submission on page 11 of 24 (NES Document No. 82A9097 Rev.1). Please note that for Tritium,  $2E-5$  is the DAC and the limit for effluent release as a liquid is  $1E-3$ . Your action levels should be set much lower than these limits (10% of these limits), rather than being set at the DAC and higher than the effluent limit.

ITEM # 2

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*The limits have been changed to 2E-6 uCi/cc which represents 10% of the DAC of 2E-5 uCi/cc and 1E-4 uCi/mL which reflects 10% of the effluent level of 1E-3 uCi/mL. These changes are reflected on pages 11 of 26 and Table 4.2 of the "Radiation Protection Program" dated June 1999.*

3. Your letter requests elimination of the black light testing. However, your submission on pages 5-7 of 24 (NES Document No. 82A9097 Rev. 1), "Surveying for Personnel Contamination" includes use of black light testing. This procedure does not appear in the "Radiation Protection Program" document also submitted with their letter. It appears that the NES Document No. 82A9097 Rev. 1 is replaced (superseded) by the Radiation Protection Program document and that the NES Document No. 82A9097 Rev. 1 may have been included with the submission in error. Please clarify whether your "Radiation Protection Program" document has replaced (superseded) NES Document No. 82A9097 Rev. 1.

*All NES documents entitled "Radiation Protection Program" 82A9097 Rev. 1 DRAFT are superseded by the most current "Radiation Protection Program," Rev. 1 DRAFT dated June 1999 which is enclosed with this letter. Our intention is to completely eliminate the black light survey. Indeed, the 24 page document was submitted in error. Please discard all previous drafts under Rev. 1. We are currently operating under Rev. 0 of the Program and will not finalize Rev. 1 until the amendment is approved.*

The information provided above and in the enclosed "Radiation Protection Program" should clarify our requests. If you have additional technical questions, please feel free to contact me at 203/796-5287.

Sincerely,

A handwritten signature in black ink that reads "Lori A. Glander".

Lori A. Glander  
Radiation Safety Officer

LAG:lh  
Enclosure

cc: K. Brown (Breitling, U.S.A., Inc.)  
L. Mantell (Squadron, Ellenoff, Plesent & Sheinfeld, LLP)

**BREITLING U.S.A., INC.**  
**RADIATION PROTECTION PROGRAM**

**Breitling U.S.A., Inc.**  
**Two Stamford Landing**  
**Stamford, CT 06902**

**JUNE 1999**

**DRAFT**

Project Application 3042		Copy No.	Assigned To
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## 1.0 PURPOSE

The Radiological Protection Program (herein referred to as the Program) presents the radiation protection standards and controls to be in effect for Breitling U.S.A., Inc. (herein referred to as Breitling) during the handling and shipping of licensed radioactive material. All management and contract personnel responsible for the handling and shipping of the radioactive material must be knowledgeable of the contents of this manual. Any deviation from this manual requires the written approval of the Breitling Radiation Safety Officer (RSO), Willie Yee. Additionally, NES, Inc. in Danbury, Connecticut provides assistance to the RSO on an as needed basis.

The major purpose of this Program is to establish the basic practices to be implemented during watch repair (including handling and interim storage of watches) at Breitling to ensure satisfactory control of radioactive materials and radiation exposures to personnel. Specifically, this Program pertains to the decasing of watches containing tritium-laden paint.

The watches containing dials and hands coated with tritiated luminous paint have a total average activity per watch ranging between 1.7 and 3.1 millicuries (mCi). The activity per watch is and will be maintained below the maximum allowable quantities specified in Title 10, Part 30 of the Code of Federal Regulations (10 CFR 30), specifically those described in 10 CFR 30.15 (a)(1). Additionally, the total inventory of tritium at Breitling will be maintained less than 200 Ci (including inventory, repair parts, and waste).

The tritiated luminous paint applied to the dials and hands is "Zeller Tritium Paint" produced by Radium-Chemie AG. The paint consists of zinc sulfide or zinc silicate crystals with an average grain size of 20 microns, which are coated with a very low solubility tritiated polymer to produce a continued excitation of the phosphors. This luminous pigment is mixed with and bound by an acid-free lacquer. This paint was registered with the United States Nuclear Regulatory Commission (USNRC) under registration No. PS-362.

The basic philosophy shall be to maintain radiation exposures as low as is reasonably achievable (ALARA) and to keep radioactive material contained at all times in the smallest practical volume. The implementation of this operating philosophy will be the responsibility of the RSO, management, and each worker.

## 2.0 RESPONSIBILITIES

### 2.1 Radiation Safety Officer (RSO)

The RSO has the authority to cease operations in the event that decasing operations and/or interim storage conditions are deemed unsafe or are not in compliance with safety controls or approved operating procedures established in this Program. In addition, the RSO has the authority to prohibit employees from conducting radiological activities who have not demonstrated a continued understanding of, or the need for, compliance with safety procedures.

In order to control radiation safety hazards, the RSO shall have the authority to stop work which violates the applicable work procedures or which, in his opinion, is likely to cause:

- radiation exposure to personnel in excess of 10% of any 10 CFR Part 20 occupational dose limit;
- contamination of the environment resulting in an exposure in excess of 25 mrem per year (Ref. 1);
- personnel injury or equipment damage from an identified industrial safety hazard.

When it becomes necessary to stop a job due to a safety hazard, conditions should be stabilized as soon as possible. Unless precluded by the urgency of the situation, cessation of operations will be implemented through the RSO who is responsible for radiation safety. Assistance to the RSO from NES, Inc. is initiated by telephone contact, fax, or verbally when a representative from NES is on-site. The RSO will report directly to Keith Brown, Vice-President of Breitling.

## 3.0 RADIATION DOSE LIMITS

### 3.1 Occupational Radiation Dose Limits

Radiation dose limits are used for controlling personnel occupational exposure to radiation (excluding medical and dental exposures) to levels which are believed to cause no ill-effects even if the employee was exposed to these levels throughout his/her entire working life. These

limits are found in 10 CFR 20.1201, "Standards for Protection Against Radiation" (Ref. 2). Personnel should maintain their own exposures as low as is reasonably achievable and below these Subpart 20.1201 limits. The public and occupational dose limits are contained in Table 3.1.

Normal operations shall be controlled such that no employee exceeds 10% of any 10 CFR 20 occupational dose limit, and so that the total of all employees' exposures is limited to the lowest levels reasonably achievable.

**Table 3.1 Public and Radiation Worker Annual Occupational Dose Limits**

TYPE OF EXPOSURE	DOSE LIMIT (10 CFR 20)
1. The more limiting of: The total effective dose equivalent (TEDE), or The sum of the deep-dose equivalent (DDE) and the committed dose equivalent (CDE) to any individual organ or tissue other than the lens of the eye	5 rem  50 rem
2. Eye dose equivalent to the lens of the eye (LDE)	15 rem
3. Shallow-dose equivalent (SDE) to the skin or to any extremity	50 rem
4. Declared pregnant worker: embryo/fetus	0.5 rem over 9 months
5. Minors (under age 18)	10 % of 1-3 above
6. Members of the public (TEDE limit)	0.1 rem

**3.2 Personnel Monitoring and Dosimetry**

Monitoring of an individual's external radiation exposure is required by 10 CFR 20.1502(a) if the *external occupational dose* is likely to exceed 10% of the dose limit appropriate for the individual (i.e., adult, minor, declared pregnant woman). Monitoring of the intake of radioactive material is required by 10 CFR 20.1502(b) if the *intake* is likely to exceed 0.1 ALI (annual limit on intake) during the year for the adult worker or the committed effective dose equivalent (CEDE) is likely to exceed 0.05 rem for the occupationally exposed declared pregnant woman. The tritium ALI for the adult worker is 80 mCi. Therefore, tritium monitoring is required for suspected intakes equaling or exceeding 8 mCi. Monitoring is not

expected to be required for the activities performed under the procedures outlined in this Program. *Informational* monitoring, however, will be performed on individuals frequenting the watch repair room and the storage vault. This monitoring will consist of tritium urinalysis bioassay sampling (Ref. 3).

### 3.3 Dose Records

Section 20.2106 of 10 CFR 20 requires that records of radiation doses be maintained for all individuals for whom personnel monitoring is required. However, no Breitling employee is expected to receive an external dose from radioactive material and it is unlikely that any Breitling employee will receive an internal dose from radioactive material above 10% of the limits stated in Table 3.1.

## 4.0 RADIOLOGICAL ACTIVITY PROCEDURES

### 4.1 Restricted Area Controls

#### 4.1.1 Restricted Areas

All watch decasing activities will be performed in a restricted area. A restricted area is an area in which access is limited for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. There are four restricted areas identified at the Breitling facility located at Two Stamford Landing in Stamford, CT. The first restricted area is the watchmaker room in which all tritium watch decasing procedures are performed. The second restricted area is the cleaning room where the rider tabs are washed. The third restricted area is the work room where the watches are stored. The fourth restricted area is the polishing room.

The restricted areas will be designated as radioactive materials (RAM) areas. Each RAM area shall be posted with signs meeting applicable standards, including the radiation symbol and the words "CAUTION - RADIOACTIVE MATERIALS."

#### 4.1.2 Identifying RAM Areas

The boundaries of the RAM area, if not a permanent wall or fence, shall be clearly identified by rope, or chain. Radiological warning signs printed in the standard yellow and magenta colors (see 10 CFR 20.1901) shall be

posted to warn personnel and the general public of the actual or potential presence of radioactive material, as well as to notify personnel of radiological conditions (exposure to external penetrating radiation will not be encountered at Breitling). In addition, requirements for entry into RAM areas as contained in this Program shall be conspicuously posted. The posting shall be accurate and legible in appearance.

The radiation symbol used on radiological signs and tags shall conform with American National Standards Institute (ANSI) Standard N2.1-1969 and as described in 10 CFR 20.1901. The radiation symbol in the standard colors (magenta and yellow) shall not be used for any purpose other than radiological controls.

All radiological postings shall be done by, or at the direction of, the RSO. Movement or removal of posted radiation warning signs, tags, or boundary markers by personnel other than the RSO, or without his approval, may be cause for disciplinary action. Radiation warning signs or tags other than those approved for use by this Program must have the written approval of the RSO before use. RAM areas shall be posted with the appropriate signs such that posting is readily identifiable from all ordinary avenues of approach.

In areas where walls form the boundary of RAM areas, and where doors are the only access to the areas, signs shall be conspicuously posted for the greatest visibility to all personnel entering the area. Normally, eye level on access doors, or on the wall adjacent to the entrance door on the latch side, is sufficient for ease of viewing.

#### 4.2 Protective Clothing, ALARA, and Training

Protective Clothing (PC) is clothing designed to minimize worker exposure to loose radioactive material. PCs, as prescribed by the RSO, should be selected based on the contamination level in the radioactive material work area, the anticipated work activity, worker health considerations, and regards for non-radiological hazards present. PCs must be donned upon entering the watchmaker room and must be removed upon exiting the watchmaker room.

The activities performed during the decasing and storage of watches containing tritium will not present an inhalation or exposure hazard. Therefore, respiratory protection is not required. Protective coveralls and shoe covers are not required. When possible, latex gloves should be worn

to minimize hand contact with tritium. Lab coats will be worn to minimize tritium contamination of personnel clothing. Protective clothing shall be left in the designated monitoring area. Protective clothing shall also be radiologically surveyed according to the procedures listed in Section 5.0 and disposed of as clean or radioactive waste, or reused as appropriate. Removal of protective clothing will be performed at the monitoring area so as to minimize contact with potential radioactive material as per the procedures in Section 5.3.1.

In keeping with the ALARA philosophy, activities will be conducted under the following ALARA guidelines:

- Protective lab coats will be worn in the watchmaker room.
- Watchmaker's tweezers and tools will be utilized to minimize hand contact with tritium during normal decasing procedures.
- Tools, tables, floors and work areas will be periodically wiped down.
- Eating, drinking, chewing and smoking will be prohibited in the restricted areas.
- The watchmaker room and vault will be locked when not in use.

All personnel working in a RAM area must have adequate radiological training. This includes a basic understanding of radiological processes and a thorough understanding of radiological work procedures and monitoring requirements. Each worker will be tested after the completion of the training to demonstrate understanding. The RSO will maintain records of the successful completion of the training for each employee for two years. The RSO is responsible for ensuring worker training is given to each new employee and that current employees receive refresher training.

#### 4.3 Watch Repair Activities

Baseline urinalysis bioassay samples were collected for each worker frequenting the watch repair room, the cleaning room, polishing room and the storage vault. Bi-weekly and then quarterly urine bioassay monitoring followed (Ref. 3). Based on the results of the bioassay program to date, (all less than 3 uCi/l,) a reduction in frequency is justified. The frequency for bioassay monitoring will be annually. In the event that loose contamination surveys yield results in excess of 120,000 dpm/100cm<sup>2</sup>, a bioassay round shall be collected immediately and the subsequent program frequency shall be determined in accordance with Ref. 3. Urine Bioassay

results will be analyzed by an independent laboratory and reviewed by the RSO to ensure that workers have not exceeded the occupational dose limits.

A quantitative loose contamination survey will be performed in the restricted areas and quantitative loose and fixed contamination surveys will be performed in the unrestricted areas quarterly. These results will be analyzed and reviewed. If the results of these surveys indicate activity levels greater than an average removable tritium contamination of: 1,000 dpm/100 cm<sup>2</sup> on items removed from restricted areas; 1,000 dpm/100 cm<sup>2</sup> in unrestricted areas; 2,000 dpm/100 cm<sup>2</sup> on floors within restricted areas; 10,000 dpm/100 cm<sup>2</sup> on walls, ceilings or tables in restricted areas; or 120,000 dpm/100 cm<sup>2</sup> on tools or in drawers within the watchmaker room, those areas will be immediately decontaminated.

Quantitative air sampling will be performed in the decasing area annually. The results will be analyzed and reviewed. If the results of these surveys indicate activity levels greater than 10% of an average airborne tritium contamination of 2E-5  $\mu$ Ci/ml, decasing activities will cease until a comprehensive evaluation and decontamination of surfaces is performed and subsequent air samples are below guidelines.

Quantitative water sampling will be performed on the cleaning room's sink drain elbow annually. The results will analyzed and reviewed. If the results of these surveys indicate activity levels greater than 10% of an average tritium concentration of 1E-3  $\mu$ Ci/ml, the cleaning process will be immediately stopped, reviewed and the area will be decontaminated.

A record of the number and type of watches repaired shall be maintained. Individual workers will be limited to decasing 4,500 watches per year. Declared pregnant workers will be limited to decasing 450 watches per year. Appendix B contains the derivations of these limits (Ref. 4, 5).

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4.4 Action Levels

The action levels specified here are for tritium activity. They are based on the results of quantitative surveys. Table 4.1 shows the action levels and the remediation required.

**Table 4.1 Tritium Activity Action Levels**

Location	Tritium Activity (dpm/100 cm <sup>2</sup> )	Required Remediation
Unrestricted areas	1,000 removable 5,000 fixed 15,000 maximum	Decontaminate area. Resurvey to ensure activity levels are reduced. Perform dose assessment.
Items removed from restricted areas	1,000 removable	Decontaminate item. Resurvey to ensure activity levels are reduced. Perform dose assessment.
Floors of restricted areas	2,000 removable	Decontaminate area. Resurvey to ensure activity levels are reduced.
Table tops and work stations	10,000 removable	Decontaminate area. Resurvey to ensure activity levels are reduced.
Walls and ceiling of restricted areas	10,000 removable	Decontaminate area. Resurvey to ensure activity levels are reduced.
Inside drawers and on tools in watchmaker room	100,000 removable	Decontaminate area. Resurvey to ensure activity levels are reduced.
Any location within the restricted area	120,000 removable	Decontaminate area. Resurvey to ensure activity levels are reduced. Institute bioassay, air and water sampling. Perform dose assessment.

**Table 4.2 Tritium Concentration Action Levels**

Location	Concentration uCi/ml	Required Remediation
Airborne	2E-6	Stop decasing operation. Perform dose assessment.
Liquid effluent	1E-4	Stop decasing operations. Perform dose assessment.

#### 4.5 Emergency Procedures

Breitling must have emergency procedures in place in the event of a spill of radioactive material or worker injury. The following procedures will be taken in the event of an emergency:

##### Spill of Radioactive Material

The following procedures will be enacted in the event of a spill of tritium. A spill of tritium is defined as the dropping, or otherwise releasing the radioactive contents, of 400 or more dials or hands in an open area. Additionally, a spill is defined as the dropping, or otherwise releasing, of 2,500 or more watches in an area in which the potential for radioactive materials to become lost, irretrievable or unaccounted for exists.

Emergency procedures can be remembered by the acronym SWIM:

- Stop the Spill. Barricade against possible migration or dispersion of the tritium.
- Warn others in the area. Have someone notify the RSO and emergency response.
- Isolate the area. Prevent personnel from walking through the area.
- Minimize your exposure to the spilled tritium. Do not attempt to clean the area without quantitative tritium monitoring equipment. Remain in a low radiation area until Health Physics personnel arrive.

Utmost care should be used in the handling and packaging of the open dials and hands to prevent a spill from occurring.

##### Physical Injury

Good judgment must be used to properly assess injuries which may occur while working in a radiological area. Minor injuries will allow the individual to leave the area with the minimum of assistance. All personnel with minor injuries must survey out as described in Section 5.3.

Personnel seriously injured or incapacitated will require immediate assistance. The first consideration is to tend to the seriously injured individual. Radiological controls are of secondary importance. Stabilize the injured individual as best you can, obtain assistance from co-workers

and immediately notify the RSO and emergency response personnel. Emergency response personnel includes calling 911 first and the NES, Inc. Radiological Department second.

**REMEMBER** Report unsafe or potentially unsafe working conditions to your co-workers, technical director, and RSO immediately.

**EMERGENCY RESPONSE** - In the event of a spill of tritium, the following emergency response personnel must be notified:

Willie Yee	Radiation Safety Officer	(203) 327-1411
Lori Glander	SCIENTECH NES, Inc.	(203) 796-5287
SCIENTECH NES, Inc.	Radiological Department	(203) 796-5191

## 5.0 RADIOLOGICAL MONITORING METHODOLOGY

### 5.1 Radiological Monitoring and Surveys

1. The RSO shall ensure that appropriate survey instruments are available and functional.
2. Quantitative radiological surveys shall be performed by an ANSI/ANS-3.1 (Ref. 6) qualified Health Physics Technician (or equivalent) to determine the extent and magnitude of contamination levels and whether or not abnormal radioactive contamination levels exist. Results of these surveys shall be provided to the RSO, and shall identify the areas where corrective action is required. Follow-up surveys shall be performed to assure appropriate corrective action has been taken.
3. The RSO shall maintain a routine schedule for radiological surveys at Breitling. This schedule will define the areas to be surveyed and the frequency of these surveys. Refer to Table 5.1 for survey frequencies.
4. During work with radioactive material, sufficient contamination surveys shall be taken to provide assurance that contamination control is maintained.
5. Any potentially contaminated item must be surveyed and released by radiation worker trained personnel before removing it from the RAM area.

5.2 Records

Instances of found radioactivity shall be recorded by the RSO, which will include the person, location, or article on which radioactivity was found; the date, time, and location; and the steps for remediation. Records of radiation surveys shall be retained indefinitely by the RSO.

5.3 Survey and Bioassay Determination

**Table 5.1 Survey Frequencies**

LOCATION	SURVEY TYPES	FREQUENCY
Areas outside the RAM area including, but not limited to, access paths, bathrooms, ventilation systems.	Quantitative tritium analysis for fixed and removable contamination*	Not to exceed quarterly**
Areas within the RAM area including, but not limited to, tables, tools, floors, walls, ceilings, watches, clothing and personnel.	Quantitative tritium analysis for removable contamination*	Not to exceed quarterly**

\*Liquid Scintillation Counter or Berthold tritium surface contamination monitor LB 1210 B/LB6255 or equivalent

\*\*See section 4.3

Personnel bioassay (*in vitro* sampling), i.e., urine analysis, shall be performed on all radiation workers. The frequency will be: initial baseline, periodic and termination bioassays. Any tritium found shall be investigated and documented per the direction of the RSO. The results shall be compared to the applicable limits and if required, internal dose assessment shall be performed and documented per 10 CFR 20, and the total effective dose equivalent (TEDE) shall be determined, documented and reported.

5.4 Surveying Potentially Contaminated Equipment

Breitling will designate any tools needed in the RAM area, such as mops, vacuums, screwdrivers, etc. as belonging specifically in the RAM area. To ensure cross contamination does not occur, these tools will not be removed from the RAM area until they become dysfunctional or are no longer

needed. Likewise, new tools will not be taken into the RAM area unless they are essential to the job or for good housekeeping practices, and will not be removed from the RAM area until they become dysfunctional or are no longer needed. Tools in the RAM area will be identified with magenta paint or some other appropriately designated color. Tools which are removed from the RAM area will undergo a thorough quantitative radiological survey before exiting the RAM. All radioactivity must be removed to unrestricted release conditions (Ref.1) and must be disposed of in a proper manner. If a tool cannot be decontaminated to unrestricted release levels, the entire tool must be disposed of as radioactive material.

## **6.0 RADIATION MONITORING EQUIPMENT**

Instruments used to quantitatively identify tritium will be tested and calibrated in accordance with manufacturer's recommendations. These instruments will be calibrated to a source traceable to the National Institute of Standards and Technology (NIST). Additionally, instruments used to measure radioactivity will be checked for response to a radioactive source each day quantitative measurements are taken.

## **7.0 BULK PACKAGING AND SHIPPING REQUIREMENTS**

Bulk shipments of decayed dials and hands shall be packaged in individual compartments on a styrofoam tray. Each shipment of bulk radioactive material must follow the requirements as listed in 49 CFR, Parts 100 - 177 (Ref. 7), with special attention given to Parts 171 - 173. The following apply to both decayed and whole watches.

Each box containing a bulk quantity of whole watches and/or the decayed dials must be marked "RADIOACTIVE." This shall be accomplished by placing yellow and magenta tape marked "Radioactive" on the outside of the box containing the radioactive components. In addition, a standard certification statement must be included in each box containing the radioactive components as required by 49 CFR Part 173.421-1. A copy of this statement is included in Appendix A.

If the smaller boxes containing the tritium dials are placed in a larger shipping box, the outer box does not require any special markings or communications.

## 7.1 Radioactive Waste Generation and Processing

During repair activities, radioactive waste in solid and/or liquid forms may be generated. Management of these wastes is an integral part of the operation and provisions for minimizing the amount of waste generated and provisions for waste collection, treatment, packaging and disposal must be made.

Whenever possible, liquid waste generated will be contained, sampled, and disposed of via sanitary sewer if release criteria are met. Otherwise liquid waste will be solidified and disposed of as solid waste.

Solid waste will be recycled whenever possible. Outside vendors may be utilized to wash protective clothing and towels. These items may then be reused in the restricted area. Likewise outside vendors may be utilized to decontaminate and release protective clothing, towels, and materials. Otherwise solid waste may be volume-reduced and stored until disposed at an approved site.

## 7.2 Radioactive Waste Disposal

Breitling shall handle, store and, if necessary, ship radioactive materials in accordance with 10 CFR 20.2006, "Transfer for Disposal and Manifests," 49 CFR Parts 100 - 177, "Transportation of Hazardous Materials," 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste," and applicable disposal site license conditions for processing and disposal of low-level radioactive wastes.

## 7.3 The Radioactive Material Shipment Manifest

Each shipment of radioactive waste transported off-site for disposal, must be accompanied by a shipment manifest as specified in Section I of Appendix F to 10 CFR 20. Breitling will utilize the Barnwell Radioactive Material Shipment Manifest for radioactive waste shipments to the Barnwell disposal site in South Carolina.

## 7.4 Waste Classification (Provisions of 10 CFR 61)

The criteria for waste classification is contained in 10 CFR 61 (Ref. 8). It is anticipated that Breitling's waste will be Class A.

## 8.0 RADIATION RECORDS CONTROL PROGRAM

A Radiation Records Control Program shall be implemented and maintained for all of Breitling radiological operations. The record management, control, and access are the responsibility of the RSO. The records necessary for maintenance in this program consist of the following:

- Those specifically delineated in this Program.
- Those prescribed in 10 CFR Parts 19, 20, 30, 61 and 71 (Ref. 9, 2, 10, 8, 11 respectively).
- Those required by Breitling's USNRC License.
- Those specifically required by the USNRC, DOT, or other regulatory agencies in addition to the above (Ref. 12).

### 8.1 Survey Records

For compliance with 10 CFR Part 20.2103, the RSO shall maintain the following records:

- records of the results of surveys (to determine dose in the absence of personnel monitoring),
- records of the results of measurements and calculations used to assess individual intakes and internal dose, and
- records showing the results of air sampling, surveys and bioassays required pursuant to 10 CFR 20.1703 (a)(3)(i) and (ii).

The specific records include, as a minimum, those specified in Table 8.1.

### 8.2 Personnel Training

All radiation worker training shall be documented and retained in the Radiation Records Control Program. These documents include all training which satisfies the requirements of 10 CFR 19 and those of this Program. The specific records include, as a minimum, those specified in Table 8.1.

**Table 8.1 Records Required**

Type of Record	Originator	Retention Period
NRC FORM-4 Lifetime Occupational Exposure History *	RSO	indefinite
NRC FORM-5 Occupational Exposure Record for a Monitoring Period *	RSO	indefinite
Radiation and contamination surveys	RSO	indefinite
Instrument calibration records	RSO	indefinite
Radiation worker training records	RSO	2 years
Technical guides and procedures	RSO	2 years
Annual audits and other program reviews	RSO	3 years
RSO logbook	RSO	indefinite
Personnel decontamination records	RSO	indefinite

\* If monitoring is required.

**9.0 REFERENCES**

1. Federal Register, Volume 63, No. 222, "Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination," November 18, 1998.
2. Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation."
3. Regulatory Guide 8.32 "Criteria for Establishing a Tritium Bioassay Program," July 1988.
4. "Certificate of Prototype Testing," Zeller Tritium Paint Batch 04/97, Registered USNRC No. PS362, February 13, 1997.
5. Title 10, Code of Federal Regulations, Part 32, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing By-Product Material."
6. "American National Standard for Selection, Qualification, and Training of Personnel for Nuclear Power Plants." American National Standards Institute, ANSI/ANS-3.1-1993.
7. Title 49, Code of Federal Regulations, Parts 100 - 177, "Transportation of Hazardous Materials."
8. Title 10, Code of Federal Regulations, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."
9. Title 10, Code of Federal Regulations, Part 19, "Notices, Inspections, and Reports to Workers: Inspection and Investigations."
10. Title 10, Code of Federal Regulations, Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material."
11. Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."
12. Title 29, Code of Federal Regulations, Part 1910, Section 1096, "Ionizing Radiation."
13. Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," June, 1974.

**APPENDIX A**  
**STANDARD CERTIFICATION STATEMENT**

**RADIOACTIVE  
LIMITED QUANTITY  
UN2910**

**THIS PACKAGE CONFORMS TO THE  
CONDITIONS AND LIMITATIONS  
SPECIFIED IN 49 CFR 173.421 FOR  
RADIOACTIVE MATERIAL, EXCEPTED  
PACKAGE-LIMITED QUANTITY OF  
MATERIAL, UN2910.**

**APPENDIX B**  
**DECASING ACTIVITY CALCULATIONS**

**Breitling Radiation Protection Program  
Decasing Activity Calculations**

**Activity Levels of Tritium in the Watches**

**Source**

**Total tritium applied to each watch**

7.80 mCi (289 MBq) per watch

5 % maximum allowable to flake off

**0.39 mCi (14 MBq) maximum allowable**

Certificate of Prototype Testing  
10 CFR 32.14(ii)

Five (5) dials coated with paint containing 767 mCi/g (28.4 GBq/g) showed no flaking or chipping of paint under the vibratory/bending test (27 cycles/sec and 2 G acceleration for 1 hour).

Certificate of Prototype Testing

**Maximum tritium in the water**

6.59 mCi (244 MBq) per watch

1.92 E-03 mCi (71 kBq) in water after a  
24-hr immersion

Certificate of Prototype Testing  
Certificate of Prototype Testing

**Allowable Limits**

**Personnel intake**

80 mCi (2.96 GBq)

ALI (10 CFR 20)

**Monitoring Level**

10 % of personnel intake  
= 8 mCi (296 MBq)

10 CFR 20

**without requiring tritium monitoring**

The test results indicate there is no flaking and 0.03 % maximum contamination is removed from the watches in water. Assume the total tritium released from offgas and removable paint is less than the amount removed during the immersion test. Therefore, the 0.03 % is conservative and will be used to estimate the maximum number of watches which can be decased per year per worker.

**From the prototype testing**

(Max.) 1.92 E-03 mCi of tritium in water per watch

Certificate of Prototype Testing

(Ave.) 1.76 E-03 mCi of tritium in water per watch

Certificate of Prototype Testing

1.84 E-03 mCi

1.92 E-03 mCi

1.78 E-03 mCi

1.73 E-03 mCi

1.54 E-03 mCi

8.81 E-03 mCi / 5 = **1.76 E-03 mCi**

**Number of watches that can be decased by each worker per year**

8 mCi / 1.76 E-03 = **4,545 watches**

10 % ALI limit/Ave. per watch

If 100 % of the average activity which comes off the watches during decasing (assumed to be equal to the amount that comes off during testing, see Certificate of Prototype Testing) were ingested, it would imply that each worker could decase approximately 4,500 watches per year before a tritium monitoring program would be required.

**APPENDIX C**  
**LOOSE CONTAMINATION LIMIT**

**Determination of a Loose Tritium Contamination Limit for Breitling**

**Proposed action level for removable contamination which would reinstate the bioassay program for Breitling:**

**1.2E5 dpm/100cm<sup>2</sup>**

FROM THE FEDERAL REGISTER, Vol. 63, No. 222, November 18, 1998, Notices:

Table 1 – Acceptable License Termination Screening Values of Common Radionuclides for Building Surface Contamination

Isotope	Acceptable Screening Level for Unrestricted Release (dpm/100cm <sup>2</sup> ):	Comments
Hydrogen-3 (Tritium)	1.2E8	If 10% of the activity is removable
Hydrogen-3 (Tritium)	1.2E7	If 100% of the activity is removable

SECTION COPY

The proposed action level represents 1% of the screening level for removable contamination. The screening level is dose-based and represents 25 mrem per year. Proportionally, the action level equates to a dose of 0.25 mrem per year. The current radiation dose limits from 10CFR20.1201 and 10CFR20.1208 are 5,000 mrem per year for a worker, and 500 mrem per gestational period for a declared pregnant worker. The proposed action level of 120,000 dpm/100cm<sup>2</sup> is a small fraction of the prescribed limits.

**Suggested Revision to Plan:**

Maintain quarterly smear surveys and in keeping with ALARA, decontaminate areas in excess of the limits established in the Radiation Protection Plan for Breitling, USA, March, 1999. In the event that removable contamination in excess of 120,000 dpm/100 cm<sup>2</sup> is identified in a pre-decontamination survey, reinstate the bioassay program in accordance with Reg. Guide 8.32<sup>1</sup>. Additionally, reinstate the air and water sampling programs.

<sup>1</sup>“Criteria for Establishing a Tritium Bioassay Program,” US Government Printing Office, Washington, D.C.

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