

Applicant
Check No. 4922
Amount \$110-32
Type
Date of Issue
Received By

20980

FORM NRC-313 I (1-79) 10 CFR 30		U.S. NUCLEAR REGULATORY COMMISSION		1. APPLICATION FOR: (Check and/or complete as appropriate)	
APPLICATION FOR BYPRODUCT MATERIAL LICENSE INDUSTRIAL				<input checked="" type="checkbox"/> a. NEW LICENSE 13212	
				<input type="checkbox"/> b. AMENDMENT TO LICENSE NUMBER	
				<input checked="" type="checkbox"/> c. RENEWAL OF LICENSE NUMBER 23368	
See attached instructions for details. Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.					
2. APPLICANT'S NAME (Institution, firm, person, etc.) Lauren Associates, Inc.		3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION Jack Lauren			
TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 313-642-9330		TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 313-642-9330			
4. APPLICANT'S MAILING ADDRESS (Include Zip Code) Boxx 308A Birmingham, Mich. 48012		5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED (Include Zip Code) 2254 Cole St. Birmingham, Mich. 48008			
(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)					
6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL (See Items 16 and 17 for required training and experience of each individual named below)					
FULL NAME		TITLE		RECEIVED BY URM	
Coleman Watkins		Warehouse Manager		Date: 2/10/84 By: Brown	
Applicant...		4922		By: Brown	
Check No.		110-32		By: Brown	
Amount/Fee		21-23368-01		By: Brown	
Type		PDR		By: Brown	
Date of Issue		2/10/84		By: Brown	
Received By		Brown		By: Brown	
7. RADIATION PROTECTION OFFICER Coleman Watkins					
8. LICENSED MATERIAL					
L I T	ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	NAME OF MANUFACTURER AND MODEL NUMBER (If Sealed Source)	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTI- VITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME	
	8409120508 840809 NMS LIC30 21-23368-01	B	C	D	
(1)	Hydrogen 3	Self-luminous Exit and	Brandhurst Inc Model No. B-100	Not to exceed 25 curies per sign	
(2)		Safety signs containing	constructed in accordance with	and not to exceed	
(3)		gaseous tritium	Brandhurst Co. Ltd. Dwg. #P-1625	1000 curies total	
(4)		Light Sources	Sheets 1 & 2 & Dwg. P1624		
DESCRIBE USE OF LICENSED MATERIAL E					
(1)	Possession and storage of pre-packaged Brandhurst Series B100 EXIT				
(2)	signs & Safety Signs pursuant to Section 32.51 10 CFR Part 32; & re-				
(3)	distribution only of these signs to persons generally licensed pursuant				
(4)	to Section 31.5, 10 CFR Part 31 or equivalent provisions of the regulations of any Agreement State				

16915
16915

Resume of Coleman Watkins

Coleman has been the warehouse manager for over 20 years, and is responsible for maintaining strict inventory control. He must take quarterly inventories of stock products, and make certain the inventory corresponds with the stock cards.

Coleman is married and has 3 children.

9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	Sealed Sources will be contained	Brandhurst Inc.	B-100
(2)	within Model B-100 EXIT Signs		
(3)	The sealed sources will not be		
(4)	removed from the signs		

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A.	MANUFACTURER'S NAME B.	MODEL NUMBER C.	NUMBER AVAILABLE D.	RADIATION DETECTED (alpha, beta, gamma, neutron) E.	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F.
(1)	No instrumentation is required since tritium gas is					
(2)	a weak and pure beta emitter.					
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

<input type="checkbox"/> a. CALIBRATED BY SERVICE COMPANY NAME, ADDRESS, AND FREQUENCY None required	<input type="checkbox"/> b. CALIBRATED BY APPLICANT Attach a separate sheet describing method, frequency and standards used for calibrating instruments.
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12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A.	SUPPLIER (Service Company) B.	EXCHANGE FREQUENCY C.
<input type="checkbox"/> (1) FILM BADGE <input type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD) <input type="checkbox"/> (3) OTHER (Specify): _____ _____ _____	None required since tritium gas is a weak and pure beta emitter.	<input type="checkbox"/> MONTHLY <input type="checkbox"/> QUARTERLY <input type="checkbox"/> OTHER (Specify): _____ _____

13. FACILITIES AND EQUIPMENT (Check where appropriate and attach annotated sketch(es) and description(s).)

- ☐ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.
☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.
☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.
☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

Any damaged, broken or unused parts will be returned to manufacturer

Brandhurst Inc., Robin Hill Corporate Park, Patterson, N.Y. for disposal.

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Enter in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

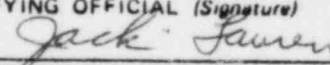
15. **RADIATION PROTECTION PROGRAM.** Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures (if needed), day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.
16. **FORMAL TRAINING IN RADIATION SAFETY.** Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.
 - a. Principles and practices of radiation protection.
 - b. Radioactivity measurement standardization and monitoring techniques and instruments.
 - c. Mathematics and calculations basic to the use and measurement of radioactivity.
 - d. Biological effects of radiation.
17. **EXPERIENCE.** Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our 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.

LICENSE FEE REQUIRED " Section 170.31, 10 CFR 170) \$110.00	b. CERTIFYING OFFICIAL (Signature) 
LICENSE FEE CATEGORY: 10CFR 170.31 Item 3L	c. NAME (Type or print) JACK LAUREN d. TITLE President
LICENSE FEE ENCLOSED: \$ 110.00	e. DATE 2-4-84

RE: ITEM 13b - FACILITIES AND EQUIPMENT

(1) Applicant maintains a place of business and warehouse facility at the location shown in Item 5 form NRC 3131. The warehouse facility contains many tens of thousands of dollars worth of inventory of various products supplied to the electrical contracting trade and is equipped with commensurate fire and burglary protective devices for security purposes.

(2) The applicant will store the signs in a locked metal cabinet(s) whose key will be under the control of the individual(s) identified in item 6 of Form NRC 3131. The metal cabinet will be located in the warehouse area whose volume will be a minimum of 20,000 cu.ft. with a normal ventilation rate of 15 air changes per hour.

RE: ITEM 15 - RADIATION PROTECTION PROGRAM

The following documents are attached hereto:

- (1) Analysis of Radiation Safety;
- (2) Test Specification for Self-Luminous Signs; Document 82-5, Revision 0, Issued January 28, 1983 by Brandhurst Co. Ltd., High Wycombe, England.
- (3) Test Report - Series B100 Sign Containing Gaseous Tritium Light Sources; Document 82-6, Revision 0, Issued February 9, 1983 by Brandhurst Co. Ltd., High Wycombe, England.
- (4) Drawing No. P1624-(2 Sheets): B100A Light Module Assembly.
- (5) Drawing No. P-1625-(2 Sheets): B100A Sign Assembly.
- (6) Drawing No. P1652: Label, USNRC.
- (7) License NO. 2341-3196GL issued by New York State Department of Labor.
- (8) Installation Instructions for Series B100 EXIT signs.
- (9) Responsibilities of Radiation Protection Officer.
- (10) Enclosures sent with each shipment, including Clean Up Procedures for Damaged or Inoperative Tritium EXIT and Safety Sign.



BRANDHURST INCORPORATED

Box 238 RR3, Robin Hill Corporate Park, Route 22, Patterson N.Y. 12563
Telephone: (914) 878-2033 Telex: 4994886 BRAND

ANALYSIS OF RADIATION SAFETY

1. NORMAL USE

Radiation emitted by sealed borosilicate glass tritium gas light sources is limited to low energy secondary bremsstrahlung (x-rays) produced by the action of Beta particles from tritium within the glass capsule. No primary radiation is emitted. Measurements made using X-ray sensitive films on a variety of gaseous tritium light sources confirms that radiation dose at a distance of 5 cms from the source will be negligible, i.e. less than 0.1 mrad per hour. At 10 cms, the radiation would be effectively zero.

The data given apply to unprotected light sources, without the shielding that would be provided by a sign case. Additionally, the measurement distances are far less than the distance between an EXIT sign and an individual using the area wherein the sign is installed.

The manufacturer's Production Quality Control procedures for gaseous tritium light sources allow a maximum leakage rate of .050 microcuries per light source over a 24 hour period and a maximum tritium oxide content of 1%. The following calculation of potential radiation dose to individuals resident in the area where an Exit or safety sign is installed assumes that the maximum constant leak rate exists in a sign containing 12 light sources, although the quality control experience of the manufacturer has shown that the actual leakage rate is lower by a factor of approximately 10.

Total radiation dose to an individual will be due to inhalation and skin exposure to soluble (oxide) forms of tritium. Irradiation of the skin by elemental tritium is negligible since tritium Beta particles have insufficient energy to penetrate the basal layer of the skin.

The maximum permissible dose for an individual in unrestricted areas is 0.5 rem/yr. as stated in 10CFR20.105(a). Total intake of tritium oxide by an individual will result equally from breath inhalation and skin absorption. Therefore, as noted in 10CFR20.103(a)(1) footnote (1), the maximum permissible intake is twice that from inhalation alone.



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Thus:-

Maximum Permissible Intake (MPI) = Total Annual Inhalation Volume x Maximum Permissible Concentration x 2.

Per 10CFR Part 20, Appendix B, Maximum Permissible Concentration for tritium oxide for a 168 hour week of continuous exposure = 2×10^{-7} $\mu\text{Ci/cc}$. Total daily air intake volume of standard man is 2×10^7 cc.

Therefore:

$$\text{MPI} = \left(2 \times \frac{10^7 \text{cc}}{\text{day}} \right) \left(\frac{365 \text{ days}}{\text{year}} \right) \left(2 \times 10^{-7} \frac{\mu\text{Ci}}{\text{cc}} \right) (2)$$

Maximum Permissible Intake = 2.9 mCi/year.

Using the previously stated Maximum Permissible dose of .5 rem/year and the MPI calculated above, the following dose equivalent can be obtained:

$$\begin{aligned} \text{Dose Equivalent} &= \frac{\text{Maximum Permissible Dose}}{\text{Maximum Permissible Intake}} \\ &= \frac{.5 \text{ rem/year}}{2.9 \text{ mCi/year}} \\ &= .17 \text{ rem/mCi} \end{aligned}$$

To obtain the Concentration, the following assumptions were made for normal exposure to an individual:

1. Signs leak at maximum rate and contain 12 sources
..... .60 $\mu\text{Ci}/24 \text{ hr}$.
2. One sign is mounted in a building corridor
measuring 10 x 20 x 25ft. (5000 ft^3)
 $14.15 \times 10^7 \text{cc}$.
3. Ventilation rate, 10 air changes per hour.
4. Oxides of tritium, 2% by volume (actual Quality
Control limits: 1% tritium oxide).
5. Subject remains in corridor or room 40 hrs/week
continuously, for one year.



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6. Inhalation intake of Standard Man during 8 hour
workday = 10^7 cc.

$$\begin{aligned}\text{Concentration} &= \frac{(\text{Oxide content}) (\text{Leakage rate})}{(\text{Room volume}) (\text{Ventilation rate})} \\ &= \frac{(.02) (.60 \mu\text{Ci}/24 \text{ hours})}{(14.15 \times 10^7 \text{ cc}) (10/\text{hr.})} \\ &= \frac{(.02) (.6) (10^{-7})}{(14.15) (10) (24)} \mu\text{Ci/cc} \\ &= .35 \times 10^{-12} \mu\text{Ci/cc}\end{aligned}$$

Actual Total Dose = Concentration x Inhalation Intake x
Dose Equivalent.

$$\begin{aligned}&= \frac{(.35 \times 10^{-12} \mu\text{Ci})}{(\text{cc})} \frac{(10^7 \text{ cc})}{(\text{day})} \frac{(260 \text{ days})}{(\text{year})} \frac{(.17 \text{ rem})}{(\text{mCi})} \\ &= \frac{(91 \times 10^{-5} \mu\text{Ci})}{(\text{year})} \frac{(.17 \text{ rem})}{(\mu\text{Ci})} \\ &= \frac{(.091 \times 10^{-5} \text{ mCi})}{(\text{year})} \frac{(.17 \text{ rem})}{(\text{mCi})} \\ &= 0.015 \times 10^{-5} \text{ rem/year.}\end{aligned}$$

The above is orders of magnitude less than the limit
of .5 rem/year given in 10CFR 20.105(a) as Maximum
Permissible Dose in unrestricted areas. The
probability is negligible that a sufficient quantity
of signs would be placed in a room of 5000 ft³ volume
to collectively reach a Total Dose of .5 rem/year.

2. NORMAL HANDLING AND STORAGE: (Re 32.23 (b))

For these conditions, the following assumptions are made:

1. Tritium release per sign60 $\mu\text{Ci}/24$ hrs.
2. Storage room size 20,000 ft³ 5.66×10^8 cc.



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3. Ventilation rate, 15 changes per hour.
4. Tritium oxides 2%.
5. Subject remains in room 40 hours/week continuously for one year.

We present the same series of calculations to reach Total Dose Commitment as used in Section 1.

For one sign:

$$\text{Concentration} = \frac{(.02) (.60 \mu\text{Ci}/24 \text{ hrs})}{(5.66 \times 10^8 \text{cc}) (15/\text{hr})}$$
$$=.0585 \times 10^{-12} \mu\text{Ci}/\text{cc}.$$

Total Dose = Concentration x Inhalation Intake x Dose Equivalent.

$$= \frac{(.0585 \times 10^{-5} \mu\text{Ci})}{8 \text{ hours}} \cdot \frac{(2080 \text{ hrs})}{\text{year}} (.17 \text{ rem}/\text{mCi})$$
$$= (15.21 \times 10^{-5} \mu\text{Ci}/\text{yr}) (.17 \text{ rem}/\text{mCi})$$
$$= (.015 \times 10^{-5} \text{ mCi}/\text{yr}) (.17 \text{ rem}/\text{mCi})$$
$$= (.0025 \times 10^{-5} \text{ rem}/\text{year}).$$

The above Total Dose is several orders of magnitude less than the maximum allowable dose of .01 rem/year from the table in 10CFR32.24, Column II. The probability is negligible that a sufficient quantity of signs will simultaneously be in storage at one location to reach the allowable Dose of .01 rem/year.

3. USE AND DISPOSAL (SINGLE UNIT) RE: 32.23 (d)

The maximum amount of tritium contained in any single sign is 25 Ci. If we assume that accidental damage causes failure of the sign case and breakage of all light sources, followed by release of all 25 Ci of tritium gas contained,



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in a typical warehouse of the same size and ventilation as the warehouse considered in Section 2 above, (20,000 ft³ and 15 air changes per hour), the following calculation applies for dose to an exposed individual based on an exposure time of 168 hours per week, using the same assumptions.

$$\begin{aligned}\text{Initial Concentration} &= \frac{(\text{oxide content}) (\text{tritium released})}{\text{room volume}} \\ &= \frac{(.02) (25 \times 10^3 \text{mCi})}{5.66 \times 10^8 \text{cc}} \\ &= .09 \times 10^{-5} \text{ mCi/cc}\end{aligned}$$

Total Intake assuming no ventilation

$$\begin{aligned}&= (\text{concentration}) (\text{breath volume for standard man}) \\ &= (.09 \times 10^{-5} \text{ mCi/cc}) \left(\frac{2 \times 10^7 \text{cc}}{24 \text{ hrs.}} \right) \\ &= 0.7 \text{ mCi/hr.}\end{aligned}$$

Now since the room containing the released tritium is being ventilated at a constant rate of 15 air changes per hour, we can assume that a constant fraction of tritium is removed per unit time.

The concentration can be expressed as an exponential function:

$$T_c = T_{co}^{-vt}$$

T_c = Tritium concentration at time t

T_{co} = Initial Tritium concentration ($t=0$)

v = Ventilation Rate (air changes/hr.)

t = Time after release (hrs.)



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This expression enables a Mean Residence Time for tritium in the room to be established, and this is equal to

$$\int_0^{\infty} e^{-vt} dt = \frac{1}{v} \quad \left| \quad e^{-vt} \right|_{t=0}^{t=\infty}$$

Thus with 15 air changes per hour, the mean residence time is .07 hour.

Therefore,

$$\begin{aligned} \text{Total Intake} &= 0.7 \text{ mCi/hr} \times .07 \text{ hr.} \\ &= .05 \text{ mCi} \end{aligned}$$

Using the Dose Equivalent for 168 hour residence as calculated in Section 1, then,

$$\begin{aligned} \text{Total Dose} &= (\text{Dose Equivalent}) (\text{Total Intake}) \\ &= .17 \text{ rem/mCi} \times .05 \text{ mCi} \\ &= .008 \text{ rem per year.} \end{aligned}$$

The above Total Dose is 2 orders of magnitude below the level of .5 rem/year given in Column 111 of the table in 10CFR32.24 as specified in 10CFR32.23 (d).

From the above calculation, it is shown that up to 62 complete breakages of an entire sign per year could occur under the conservative room conditions considered, before the limits of 10CFR32.24 were reached.

Prototype tests have shown that breakage to the sign case under severe handling and abuse is extremely unlikely. The calculation above assumes that a very destructive accident occurs to signs stored in a metal storage cabinet,



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wherein the shock resistant housing is completely shattered and all of the tritium light sources are broken. The possibility of such destruction occurring in a closed area is extremely remote.

We note further that authoritative sources now recommend a quality factor of one (1) to be used for tritium. The calculations herein are all based on a QF of 1.7, hence the use of a QF of 1.0 would reduce all dose estimates by about 70%. Both ICRP and NCRP have recommended a QF of 1 for tritium, a recent reference being NCRP 62, page 67 (1979).



BRANDHURST COMPANY LIMITED

PO. Box 70, Wellington Road, High Wycombe, Buckinghamshire HP12 3PS
Telephone: High Wycombe (0494) 33411 Telex: 837138

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TEST SPECIFICATION

FOR

SELF-LUMINOUS SIGNS



BRANDHURST COMPANY LIMITED

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1. INTRODUCTION

The tests described below are in accordance with American National Standard N540-1975 "Classification of Radioactive Self-Luminous Light Sources". Test procedures are consistent with performance standards in Table 3 for devices containing 5.0 to 50 curies of tritium and intended for fixed use.

2. CLASSIFICATION

The classification designation for the devices is T5GC1333X33.

3. GENERAL

The testing procedures described below are acceptable and recommended procedures. Procedures demonstrated to be at least equivalent are also acceptable.

Tests shall be run consecutively in the order shown in table 2. Unless otherwise specified the tests shall be performed at $23^{\circ}\text{C} \pm 10^{\circ}\text{C}$, at barometric pressure of 710-790mm (28-31") mercury and at a maximum relative humidity of 80 percent. Temperature changes, unless otherwise specified, shall be gradual to reduce the possibility of thermal shock.

4. TEST PROGRAM

Discoloration:	Level 1
Temperature:	Level 3
Thermal Shock:	Level 3
Pressure (Reduced):	Level 3
Impact:	Special Test Level.
Vibration:	Level 3
Immersion:	Level 3



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5. TEST EQUIPMENT

i. Test - Discoloration

Equipment: J.B. MARR Weatherometer

Calibration Procedure: The instrument is produced to British Standard Institute BS.3900. The system is approved to:

Ministry of Defence D.Q.A.B.
Defence Standard 05-24
DEFCON 2H

The calibration is carried out directly by the British Ministry of Defence. Standard material finishes are exposed to varying conditions and checked by the M.O.D. for deterioration.

Calibration Frequency: Six monthly - December 1982.

Error Estimate: $\pm 5\%$ on M.O.D. standard.

ii. Test - Temperature

Equipment: Gallenkamp Chamber
Digitron Monitoring

Calibration Procedure: The temperature monitoring device is calibrated by Digitron Ltd. in accordance with British Calibration Service operated by National Physical Laboratory. The technique is voltage/temperature correlation traceable to N.P.L. standards.

Calibration Frequency: Annual

Error Estimate: Better than $\pm 1\%$.



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5. iii. Test - Thermal Shock

Equipment: Gallenkamp Chamber
Cliffco Low Temperature Chamber
Digitron Monitoring

Calibration Procedure: The temperature control of both the Gallenkamp and Cliffco chambers are calibrated before each test using direct comparison with the Digitron temperature monitoring system. Calibration of this device is explained under (i).

Calibration Frequency: Chambers before each use.

Estimate of Errors: $\pm 1\%$.

iv. Test - Pressure (Reduced)

Equipment: B.C.L. Pressure Chamber.
Edwards Vacuum Monitoring

Calibration Procedure: The vacuum monitoring equipment is calibrated annually against an atmospheric pressure compensated mercury in glass manometer.

Calibration Frequency: Annually - 1.6.83.

Estimate of Error: $\pm 1\%$.

v. Test - Impact

Equipment: Metre Rule
Steel Plate

Calibration Procedure: Certified steel rule

Calibration Frequency: As required.

Estimate of Error: $\pm 1\%$.



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5. vi. Test - Vibration

Equipment: Derritron Vibration Controller E147
Derritron Signal Conditioning Amplifier E198
Bruel & Kjaer Accelerometer E275

Calibration Procedure: The equipment is calibrated in accordance with the British Ministry of Defence Quality Assurance Directorate, by the British Calibration Service where all standards are traceable to the National Physical Laboratory.

Calibration Frequency: The calibration of all units is 6 monthly.

Estimate of Errors:

Acceleration	$\pm 1\%$
Velocity	$\pm 2\%$
Displacement	$\pm 2\%$
Gain	$\pm 1\%$
Frequency Response	20 hz:100Khz $\pm 0.5\text{db}$
Accelerometer	20 hz:5000 hz $\pm 2.5\%$

vii. Immersion

Equipment: Water Bath
Callenkamp Temperature Control
Digitron Monitoring

Calibration Procedure: The temperature of the water bath is checked before each use using the Digitron monitoring system, the calibration of which is described under (i).

Calibration Frequency: Before each use.

Estimate of Errors: $\pm 1\%$.



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6. TEST CONDUCTOR

All tests were carried out under the supervision of Mr. T.J. Allen, Quality Control Manager, Brandhurst Company Limited.

Mr. Allen was educated at the Royal Grammar School, High Wycombe, U.K. and the Slough Technical College where he obtained his qualification in Chemistry.

He is 35 years old and has worked in Quality Control for 14 years. Before joining Brandhurst Co. Ltd. in 1974 he worked as a Quality Controller with:-

Reckitt & Colman
Lindsey Oil Refinery
Capseals Liners

Mr. Allen was promoted to Quality Control Manager in 1977 and has total responsibility in this area, reporting directly to the Managing Director.

Mr. Allen has been successful in gaining Ministry of Defence 05-24 Quality Control Approval, British Standard Institute Approval and directly supervises all production of tritium light sources and devices manufactured for the U.S. Army, ensuring that they meet the relevant Mil. Standard.

7. TEST PROCEDURE

7.1. Discoloration, Test Level 1

7.1.1. Equipment

Weatherometer of S-4 Sunlamp, Corex D Filter, calcium chloride, 8 liters or larger, glass container.



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7.1.2. Procedure

- a. Expose devices in weatherometer for twelve hours, alternating on half-hour wet and dry cycles or,
- b. Expose devices for twelve hours to the light from an S-4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters from the S-4 lamp.

All tests shall be performed in air with an ambient temperature of $27^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and a relative humidity of 95 to 100 percent. The samples shall be irradiated with the light impinging on the translucent surface of the device.

7.1.3. Evaluation

Test devices shall be examined visually and any discoloration or other effects observed. The light spectrum and output after the test shall be compared with that before the test. When measured with a visual photometer or a color corrected photocell, no greater loss of luminosity than 20 percent shall be observed.

7.2. Temperature Test - Level 3, Minimum -30°C , Maximum $+65^{\circ}\text{C}$

7.2. 1 Equipment

The heating or cooling equipment shall have a test zone volume (that volume at essentially constant temperature) of at least five times the volume of the test specimen. The temperature of the test chamber shall be determined by at least two recently calibrated temperature measuring instruments, and the average of the readings shall be taken as the true temperature.



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If a gas or oil-fired furnace is used for the temperature test, an oxidizing atmosphere must be maintained at all times.

7.2.2. Procedure

All temperature tests shall be performed in air. All test devices shall be held at or above the maximum (or at or below the minimum for low temperature tests) test temperature for a period of at least one hour. The test devices shall be allowed to remain in the test chamber until they return to ambient conditions.

Devices to be subjected to temperatures below ambient shall be cooled to the test temperature in less than 45 minutes.

Devices to be subjected to temperatures above ambient shall be heated to the test temperature within a 5 minute period.

7.2.3. Evaluation

Test devices shall be examined visually for any evidence of failure and, in the absence of any evident failure, shall be used in the succeeding thermal shock test. In the event of any uncertainty regarding possible failure, the person performing the test may, at his option, subject the device(s) to the final immersion test before proceeding with the next test.

7.3. Thermal Shock Test - Level 3, Minimum -35°C, Maximum + 65°C

7.3.1. Equipment

Same as 4.1. - Temperature test.



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7.3.2. Procedure

Use the devices used in temperature test. Heat the device(s) to the maximum test temperature (required for that particular class) and hold at this temperature for at least 15 minutes. Transfer the device, in 15 seconds or less, to the cold chamber, held at or below the minimum temperature required for the particular class. If water is used for the cold test, it shall be flowing at a rate of at least ten times the device volume per minute, or, if the water is stationary, it shall have a volume of at least twenty times the device volume.

7.3.3. Evaluation

Test devices shall be examined visually for any evidence of failure and, in the absence of any evident failure, shall be used in the succeeding pressure test. In the event of any uncertainty regarding possible failure, the person performing the test may, at his option, subject the device(s) to the final immersion test before proceeding with the next test.

7.4. Pressure (Reduced) Test - Level 3, Pressure 175 mmHg

7.4.1. Equipment

The apparatus used for the pressure test shall consist of a vacuum pump, vented to a suitable exhaust system, and a suitable sealed chamber having means for visual observation of the devices under test. The pressure gauge shall be recently calibrated and should have a range at least 10 percent greater than the test pressure.



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7.4.2. Procedure

The test devices shall be put into the chamber and exposed to the test pressure for four periods of 15 minutes each, the pressure being returned to atmospheric between each period.

7.4.3. Evaluation

Test devices shall be examined visually for any evidence of failure and in the absence of any evident failure, shall be used in the succeeding impact test. In the event of any uncertainty regarding possible failure, the person performing the test may, at his option, subject the device(s) to the final immersion test before proceeding with the next test.

7.5. Impact Test - Level 4, Free Fall to Steel Plate

Special test, 3 meters, 2 times, Test Level X

7.5.1. Equipment

Rigid steel plate. Support or shelf for devices
The steel plate shall be rigidly mounted on an unyielding surface so that it will not deflect appreciably during the test.

7.5.2. Procedure

Mount the device support above the steel plate at the appropriate height. Place the device to be tested on the support and, using any device or means which will not have a tendency to orient the device, push the device from the support and allow it to free fall and impact the steel plate in a random manner. Repeat the required number of times specified for the particular test level.

7.5.3. Evaluation

Each test device shall be examined visually for any evidence of failure and, in the absence of an evident failure, shall be used for the succeeding vibration test. In the event of uncertainty regarding possible failure, the person performing the test may, at his option, subject the device(s) to the final immersion test before proceeding with the next test.



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7.6. Vibration Test - Level 3, Duration 30 Minutes

7.6.1. Equipment

The equipment shall be capable of providing a simple harmonic motion having an amplitude of 0.075 centimeter (0.03") and a maximum total excursion of 0.15 centimeter (0.06"), the frequency being varied uniformly between the approximate limits of 10 and 55 hertz (Hz).

7.6.2. Procedure

Test devices shall be subjected to the above simple harmonic motion for the time interval indicated for the specific test level. The entire frequency range, between 10 and 55 Hz and return to 10 Hz, shall be traversed in approximately one (1) minute.

7.6.3. Evaluation

Test devices shall be examined visually for any evidence of failure and, in the absence of any evident failure, shall be used for the succeeding immersion test.

7.7. Immersion Test - Minimum 0°C, Maximum 65°C, Number of Cycles - 2

7.7.1. Equipment

Hot and cold baths.

7.7.2. Procedure

Immerse the test device(s) in a water bath, maintained at 0°C, and allow to remain for 15 minutes. Immediately (one minute maximum) transfer the device(s) to a hot water bath, maintained at the temperature specified for



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the particular test level ($\pm 3^{\circ}\text{C}$), and allow to remain for 15 minutes. Immediately (one minute maximum), transfer to the cold bath and allow to remain for 15 minutes. Repeat the cycle as indicated for the specific test level. A dye may be used to observe any gross penetration.

Bath volume, or temperature control, shall be such that bath temperature does not change by more than $\pm 3^{\circ}\text{C}$ during the test cycle.

7.7.3. Evaluation

The radioactivity in the hot and cold baths shall be determined. The radioactivity in the liquid shall not exceed 50 nanocuries per gaseous tritium device.

8. COMPLIANCE

Determination of compliance with the performance test requirements shall be made on all samples after they have been subjected to the entire test sequence in accordance with the procedures described below. These evaluations shall be made in addition to the evaluation procedures specified for the individual tests.

- 8.1. The test samples shall be examined visually for any evidence of failure, visible leakage or degradation.
- 8.2. The test samples shall be subjected to brightness measurements using Aminco Photomultiplier in conjunction with brightness standards traceable to the National Bureau of Standards.
- 8.3. The test samples shall be tested for loss of radioactive contents as follows, using Liquid Scintillation Counter.



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Each sample shall be soak tested for 24 hours in a volume of water equal to at least 10 times the total volume of the device. The sample shall be removed and the activity of the soak water measured. The total activity of the soak water shall not exceed 50 nanocuries multiplied by the number of devices immersed.

9. CONCLUSIONS

Successful completion of the above test procedure shall confirm that the device(s) have passed the ANSI standard test program and creditable accident evaluation.



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TEST REPORT

SERIES B-100 SIGN CONTAINING

GASEOUS TRITIUM LIGHT SOURCES

Performed by: Brandhurst Company Limited

Date: Feb. 9, 1983



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Test Sample Data:

Test Samples - Series B-100, Model No. B-100A, Exit Sign
per drawing No. Pl624 containing 12 gaseous
tritium light sources.

Test Sample Quantity - 2 pieces.

Test Procedure: Per Test Specification for Self-Luminous
Exit and Safety Signs, Document No. 82-5,
Revision 0.

Test Programme:

Equipment Used

Discoloration	Test Level 1	J.B. Marr Weatherometer to B.S.3900
Temperature	" " 3	Gallenkamp Chamber Digitron Monitoring
Thermal Shock	" " "	Gallenkamp Chamber Cliffco Low Temperature Chamber Digitron Monitoring
Pressure (reduced)	" " "	B.C.L. Pressure Chamber Edwards Vacuum Monitoring
Impact	Test Level 4,X	Steel Plate
Vibration	Test Level 3	Derritron Vibration Equipment and monitoring
Immersion	" " "	Water bath using Gallenkamp temperature control Digitron monitoring.



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SUMMARY REPORT OF TEST RESULTS

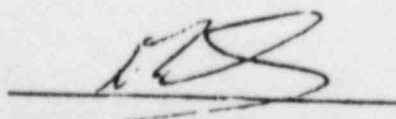
DEVICE SERIES NO. B-100, MODEL NO. B-100A

SERIAL NOS. 1 AND 2

<u>Test</u>	<u>Procedure</u>	<u>Result</u>
Discoloration	Doc. 82-5 Rev. 0 Para. 7.1	Pass
Temperature	Doc. 82-5 Rev. 0 Para. 7.2	Pass
Thermal Shock	Doc. 82-5 Rev. 0 Para. 7.3	Pass
Pressure (Reduced)	Doc. 82-5 Rev. 0 Para. 7.4	Pass
Impact	Doc. 82-5 Rev. 0 Para. 7.5	Pass
Vibration	Doc. 82-5 Rev. 0 Para. 7.6	Pass
Immersion	Doc. 82-5 Rev. 0 Para. 7.7	Pass

Brightness Readings

	<u>Before Testing</u>	<u>After Testing</u>
Sample (1)	283 μ l	281 μ l
Sample (2)	267 μ l	266 μ l

Inspector 

Date Feb. 9, 1983



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Calculation of Allowable Tritium Activity in Soak Tests

Using Scintillation Test Sample of 1 ml.

Nuclear Chicago Scintillation Counter Model Delta 300

BACKGROUND

1. Measure the background count on a scintillation vial with scintillation cocktail alone over a 10 minute time period and calculate background count per min. - B.

CALIBRATION

2. Take a standard vial containing a weighed amount of a tritium standard solution supplied and calibrated by Amersham International, so known activity = S disintegration per min.
3. Measure the standard vial over a 1 minute period giving Sr counts per minute.
4. Calculate efficiency of counter = $E = \frac{Sr - B}{S}$

MEASUREMENT OF SAMPLE

5. Transfer 1 ml. of test sample of total value V mls into a scintillation vial with cocktail and measure over a 1 minute period - C cpm.
6. Calculate net cpm = (C - B) cpm.
7. Calculate disintegrations per minute for sample = (C - B) E
8. Total activity of sample, when t = Test Soak Time in hours
ta = Actual Soak Time in hours

is given by:- $(C - B) E \frac{V}{1} \frac{t}{ta}$ d.p.m.



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9. The maximum allowable activity after soak test is 50 nCi per light source of which there are 12 in each device giving

$$\begin{aligned} 12 \times 50 &= 600 \text{ nCi} \\ &= 600 \times 2220 \text{ d.p.m.} \\ &= \underline{1.33 \times 10^6 \text{ d.p.m.}} \end{aligned}$$

10. The maximum allowable count rate is therefore given by

$$(C - B) E V \frac{t}{ta} = 1.33 \times 10^6$$

$$\text{i.e. } (C - B) = \frac{1.33 \times ta}{E V t} \times 10^6 \text{ c.p.m.}$$

STATISTICAL ANALYSIS

11. When the sample count approaches that of the background a statistical analysis of the combined rates is necessary.

As the sample count rate and background count rate are measured over different periods (1 min. for the sample, 10 mins. for the background) the standard deviation, sigma, is given by:-

$$\begin{aligned} \text{sigma} &= \frac{\text{sample count rate over 1 min.}}{1^2} + \frac{\text{Background count in 10 mins}}{10^2} \\ &= \frac{C}{1^2} + \frac{10 B}{100} \end{aligned}$$

$$\text{sigma} = C + B/10$$

Thus for a one sigma error the net count rate is

$$C \pm C + B/10$$

When this is close to $B \pm B$ (assuming B is greater than 30), a three sigma error is needed, i.e.

if $C + 3 C + B/10$ is below $\frac{1.33 \times ta \times 10^6}{E.V.t}$ the items can be passed.



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HOT/COLD IMMERSION TEST REPORT

Sample I.D.: Series B-100, Model No. B-100A

Test Description: Hot/Cold Immersion

Test Parameters:

- a. Soak Time Required(t) 0.25 hr.
Actual (ta) 0.50 hr.
- b. Soak Volume (V) 10,000 mls.
- c. Scintillation Machine Efficiency (E) 0.454
- d. Maximum allowable activity per ANSI: 50 nCi/source
- e. Maximum allowable activity per ANSI for sample tested
12 sources x 50 nCi/source = 600 nCi.
- f. Maximum allowable test CPM (Ref. Document 82-6, page 4)
$$(132 \times 10^4) \times \frac{E}{V \times \frac{t}{t_a}} = 120 \text{ CPM}$$
- g. Background reading 261 CPM.

<u>Test</u>	<u>Sample Quantity</u>	<u>Nett C.P.M.</u>	<u>Pass or Fail</u>
Cold	1	< Bkg.	Pass
Cold	2	< Bkg.	Pass
Hot	1	< Bkg.	Pass
Hot	2	< Bkg.	Pass

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24 HOUR SOAK TEST REPORT

Sample I.D.: Series B-100, Model No. B-100-A

Test Description: 24 Hour Test

Test Parameters

- a. Soak Time: Required (t): 24 hours, Actual (ta): 24 hours.
- b. Soak Volume (V): 2000 mls.
- c. Scintillation Machine Efficiency (E): 0.454
- d. Maximum allowable activity per ANSI: 50 nCi/24 hrs./source.
- e. Maximum allowable activity per ANSI for sample tested:
12 sources x 50 nCi/source = 600 nCi.
- f. Maximum allowable net test CPM (ref. Document 82-6 pg. 4)
$$(132 \times 10^4) \times \frac{E}{V \times \frac{t}{t_a}} = 300 \text{ C.P.M.}$$
- g. Background reading: 232 C.P.M.

<u>Sample No.</u>	<u>Sample Quantity</u>	<u>Nett C.P.M.</u>	<u>Pass or Fail</u>
1	1	237 - 232 = 5	Pass
2	1	< Bkg.	Pass

Inspector

Date Feb. 9, 1983



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CALIBRATION

<u>Instrument or Equipment</u>	<u>Calibration Frequency</u>	<u>Date of Last Calibration</u>
1. Nuclear Chicago Scintillation Counter	Monthly	4.15.83
2. Mecan Photomultiplier	Before each use	As required
3. Brightness Standard	Quarterly	2.2.83
4. Marr Weatherometer	Annually	
5. Digitron Temperature Monitor	Annually	1.6.83
6. Edwards Vacuum Monitor	Annually	1.6.83
7. Derritron Vibrator	Annually	



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LIQUID SCINTILLATION TEST TAPES

Devices Series B-100, Model No. B-100-A

Cold & Hot Test

	4	4
	1.00	1.00
STAND	29,312	29,654
	29,719	30,074
		STAND

	3	3
	1.00	1.00
HOT(1)	125	240
	134	261
		BKG

	2	2
HOT(2)	1.00	1.00
	200	195
	215	211
		COLD
		(1)

	1
1.00	COLD
173	(2)
186	

1.00	STAND
27,888	
28,276	

24 Hour Test

	4
	1.00
STAND	29,776
	30,226

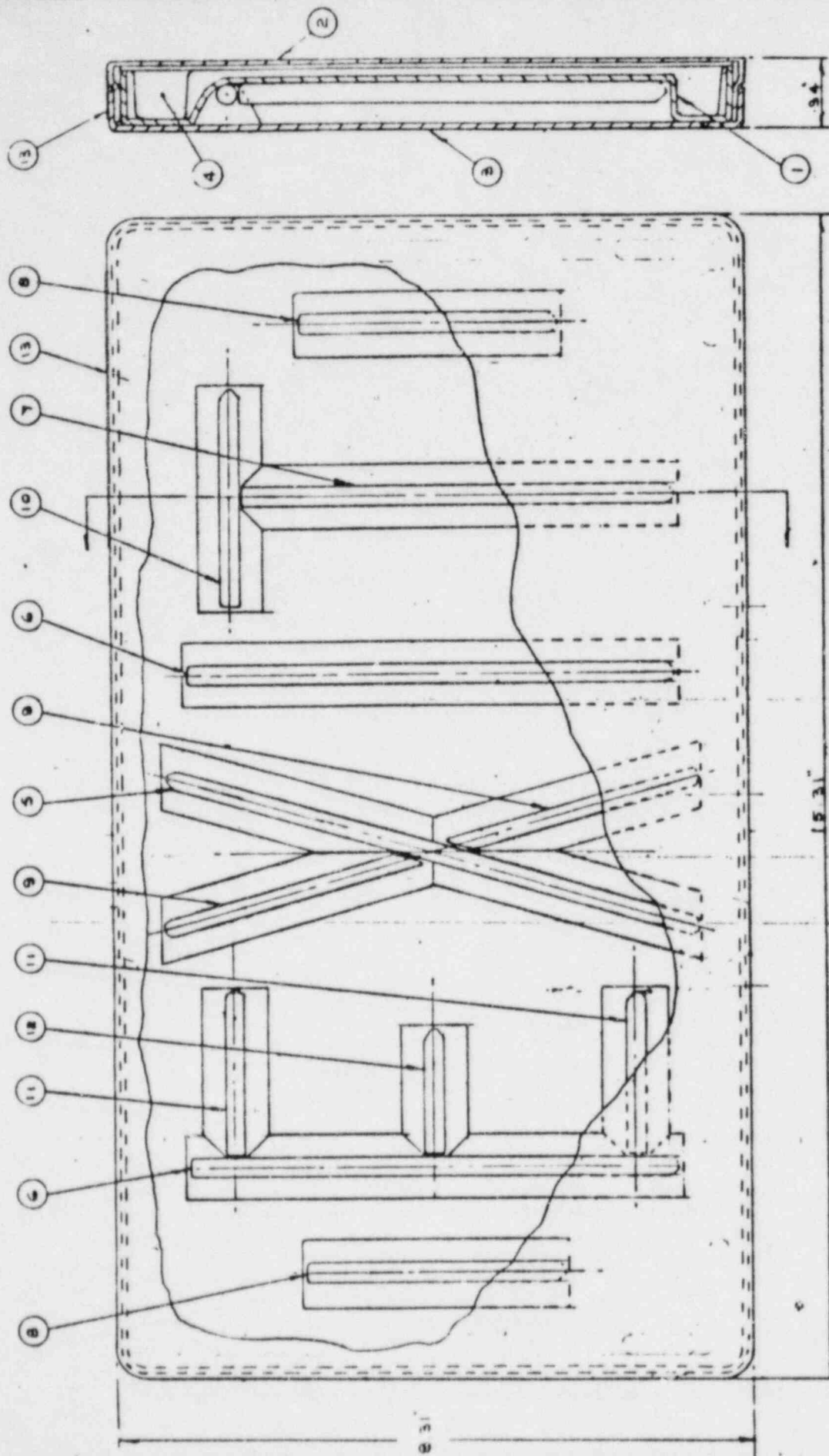
	3
	1.00
BKG	218
	232

	2
24 HR	1.00
(1)	205
	237

	1
24 HR	1.00
(2)	165
	183

	1
STAND	27,602
	27,992

LET	MODIFICATION	DATE



NOTES

ILLUMINATION COLOUR - YELLOW GREEN.
 DESIGN COLOURS TO USING REGULATION 100.00
 AND U.S. STATE INDUSTRIAL CODE RULE 55.
 EACH UNIT WILL BEAR A DATE OF MANUFACTURE.
 MAXIMUM TRITIUM CONTENT 50 CURIES.
 GENERALLY LICENSED UNDER U.S. STATE LICENSE NO. -
 CLASSIFICATION Y SEC 1333x33

DESIGN	RHA	TOLERANCES UNLESS OTHERWISE STATED	DEC TO 3 PLACES DIM TO 3 PLACES DEC	TITLE B100-A LIGHT MODULE ASSY
CHG				
SCALE	1:1	MATERIAL	BRANDHURST CO. LTD. WELLINGTON ROAD HIGH WYCOMBE, BEDS.	CHG NO. P1624
DATE	2-1-61	FINISH		

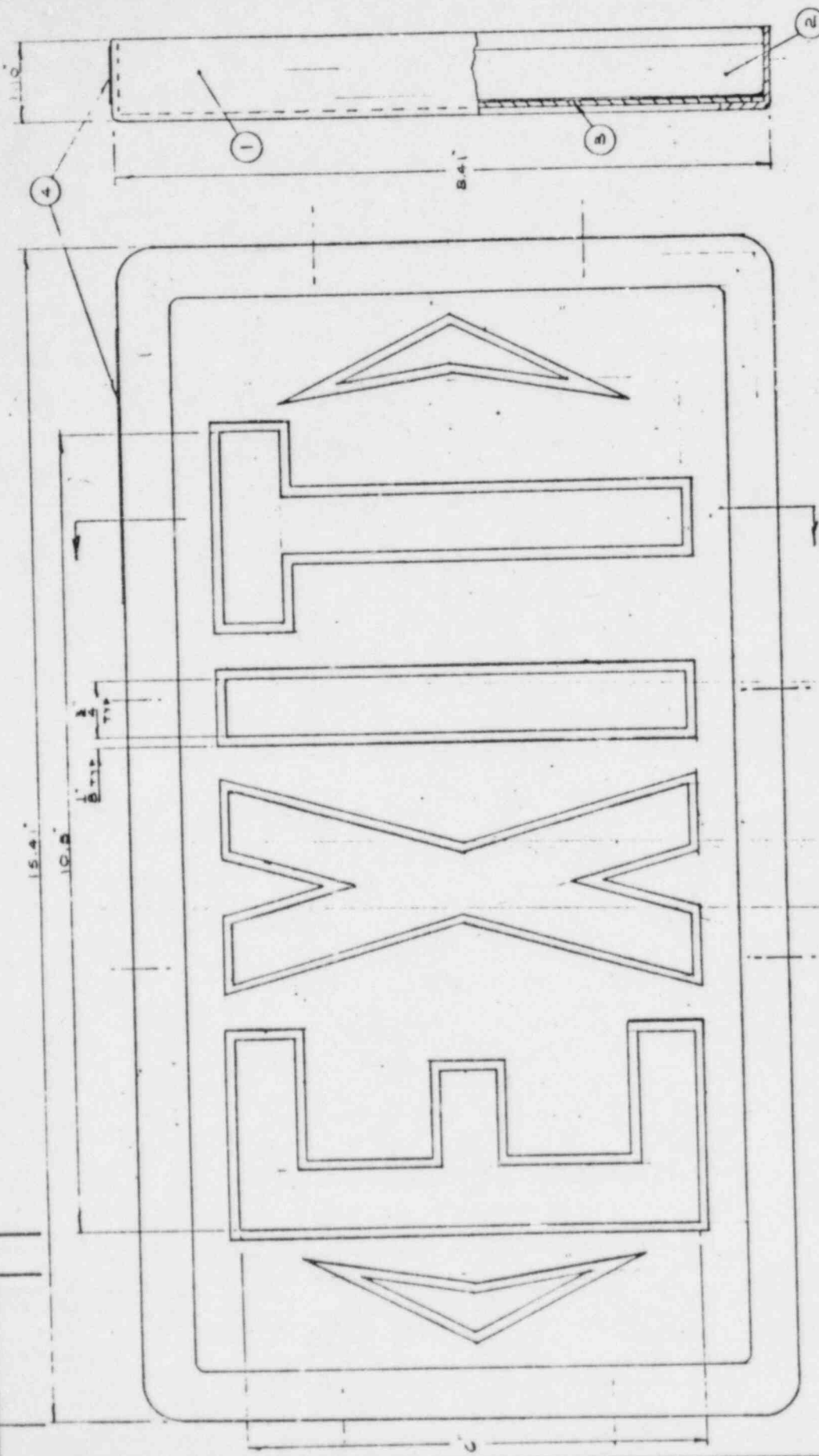
THIRD ANGLE PROJECTION

SHEET 1 OF 1

ITEM NO.	DRAWING NO.	DESCRIPTION	NO. OFF.	REMARKS	STOCK NO.
1	P 1619	REFLECTOR	1	1.5mm STYRENE, SILVERED	
2	P 1632	BACK PLATE	1	1.5mm BLACK ABS R20	
3	P 1633	COVER	1	1.5mm CLEAR RIGID PVC	
4	P 1634	PACKING	1	1.5mm STYRENE	
5	P 1635	MICROLIGHT CT/68-72/175	1		
6	P 1636	" CT/68-72/160	2		
7	P 1637	" CT/68-72/145	1		
8	P 1638	" CT/68-72/ 85	2		
9	P 1639	" CT/68-72/ 85	2		
10	P 1640	" CT/68-72/ 70	1		
11	P 1641	" CT/68-72/ 55	2		
12	P 1642	" CT/68-72/ 45	1		
13	P 1652	LABEL - U.S.N.R.C.	1		

			DRAWN. <i>DKA</i>	TOLERANCES UNLESS OTHERWISE STATED.		SURFACE TEXTURE —	TITLE. PARTS LIST FOR	
			CKD.				B100-A LIGHT MODULE AS	
			SCALE. —	MATERIAL.	—	BRANDHURST CO. LTD. WELLINGTON ROAD, HIGH WYCOMBE, BUCKS.	DRG. No. P 1624	
SUE	MODIFICATION	DATE	DATE 20-6-82	FINISH	—			

LET	MODIFICATION	DATE



NOTES
 BACKGROUND COLOUR - RED OR GREEN STANDARD OTHER COLOURS OPTIONAL
 LETTERING - 1/2" CLEAR EXTERIOR, 1/8" WHITE OUTLINE
 ILLUMINATION - LATTER COLOUR YELLOW GREEN
 MINIMUM INITIAL AVERAGE BRIGHTNESS (SEE MALL ACTIVITY) 180 MICROLUXES
 TOTAL LIFE TO HALF BRIGHTNESS 6-7 YEARS
 DESIGN COUPONS TO REQUIREMENTS OF USMNC REGULATIONS
 10 C.F.R. AND N.Y. STATE INDUSTRIAL CODE RULE 39
 EACH UNIT WILL BEAR A DATE OF MANUFACTURE
 MAXIMUM TRITIUM CONTENT 25 CURIE
 GENERALLY LICENSED UNDER N.Y. STATE LICENSE NO.
 CLASSIFICATION - T50C B33X33

DRWING	DATA	TOLERANCES UNLESS OTHERWISE STATED	DEC TO 3 PLACES .018 TO 3 PLACES .003	TITLE B100-A
COO				SIGN ASSEMBLY
SCALE	1:1	MATERIAL	BRANDHURST CO LTD WELLINGTON ROAD	DWG No
DATE	10-4-61	PREP	MOH WYCOMBE BOOKS	P1625

4

$$2.4 \text{ kg} + 2.4 \text{ kg} = 4.8 \text{ kg}$$

BRANDHURST SAFETY SIGN

Produced by Brandhurst Inc.

Robin Hill Corporate Park
Route 22, Patterson, NY 12563

Patents Pending

N.Y. State License No: 2341-3196 GL
Maximum Tritium (H3) content 25 curies

Model B100

S/N.

Mfg Date

REMOVAL OF THIS LABEL IS PROHIBITED

The receipt, possession, use and transfer of this device is subject to a general license and the regulations of the USNRC or of a State with which the NRC has entered into an agreement for the exercise of regulatory authority. DO NOT OPEN THE SIGN MODULE unless specifically licensed by the NRC or an agreement State. DO NOT ABANDON OR DISPOSE OF THIS SIGN except by transfer to persons specifically licensed by the NRC or an agreement State. Use of this sign prohibited if there is any indication of failure of, or damage to containment of radioactive material.



CAUTION RADIOACTIVE MATERIAL
REMOVAL OF THIS LABEL IS PROHIBITED

1 1/2"

3"
2 1/6"

MAT: - PVC, SELF ADHESIVE

		DRAWN. <i>RHA</i>	TOLERANCES UNLESS OTHERWISE STATED.		SURFACE TEXTURE	TITLE.	
		CKD.				LABEL, U.S.N.R.C.	
SIZE WAS $\frac{3}{4} \times 3 \frac{1}{4}$	14-3-83	SCALE. <i>HTS</i>	MATERIAL.	AS ABOVE	BRANDHURST CO. LTD. WELLINGTON ROAD, HIGH WYCOMBE, BUCKS.	DRG. No. ISSUE A	
MODIFICATION	DATE	DATE 29-6-82	FINISH			P1652	

STATE OF NEW YORK
RADIOACTIVE MATERIALS LICENSE

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Pursuant to the Labor Law and Industrial Code Rule No. 38, and in reliance on statements and representations heretofore made by the licensee designated below, a license is hereby issued authorizing such licensee to transfer, receive, possess and use the radioactive material(s) designated below; and to use such radioactive materials for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations, and orders now or hereafter in effect of all appropriate regulatory agencies and to any conditions specified below.

Licensee		3. License Number 2341-3196 GL
1. Name	Brandhurst Incorporated	4. Expiration Date January 31, 1986 5a. Reference No. b. Amendment No. 1 ---
2. Address	Robin Hill Corporate Park, Hugin Building Route 22 Patterson, New York 12563	
6. Radioactive materials (element and mass number) A. Hydrogen 3	7. Chemical and/or physical form A. Sealed Source (Brandhurst Company Limited Model CT/XX-XX/XXX)	

CONDITIONS

9. Authorized use. (Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.)

Condition 6.A.

- (1) The licensee is authorized to sell, lease and distribute self-luminous safety devices listed below in Condition 9.6.A.(2) to persons generally licensed, pursuant to the State of New York Industrial Code Rule No. 38 (12 NYCRR 38), Section 38.41 Tables and appendix, "Table 3-General Licenses", Item(b) or equivalent regulations in other Agreement States and to Title 10 Code of Federal Regulations, Part 31, in Non-Agreement States. Devices shall be manufactured, tested and labelled in accordance with statements, representations, procedures and Conditions of this License and licensee's specific License No. 2340-3196.

STATE OF NEW YORK
RADIOACTIVE MATERIALS LICENSE

Page 2 of 4 Pages

3. License Number 2341-3196 GL

5a. Ref. No. 1 b. Amend. No. ---

CONDITIONS

(2) Luminous Device : Series B-100
Legend : Any (Demountable cover)
Source : Specified in Condition 7.A. herein
Maximum Activity: 25 Curies

0. The licensee shall comply with the provisions of the State of New York Industrial Code Rule No.38, "Ionizing Radiation Protection" (12 NYCRR 38), effective July 10, 1978.
1. Licensed material shall be used by, or under the supervision of, Ronald G. Harper(Radiation Safety Officer).
2. The licensee shall not open and/or repair Sealed Sources or remove Sealed Sources from the Devices.
3. The licensee is not authorized to repair, modify, dismantle or affect any changes in the Devices nor modify or alter labels affixed thereto except as otherwise approved by this Department.
4. Devices authorized for distribution herein may be installed or removed by the general licensees from locations or equipment possessed and used by them within their installations.
5. Licensee shall furnish each person to whom he transfers a generally licensed device in:

State of New York a copy of 12 NYCRR 38 Section 38.41 Tables and appendix., "Table 3-General Licenses", Item(b).

Non-Agreement States a copy of Section 31.5, 10 CFR 31, Sections 30.34 and 30.51 through 30.63, 10 CFR 30; Sections 20.402 and 20.403, 10 CFR 30, and Appendix D., 10 CFR 20.

Agreement States a copy of current appropriate regulations.

- 6.A. Each device distributed under this License shall bear a durable, clearly visible and legible label or labels containing, unless otherwise specified by the Condition of this License, the statement:

"Receipt, possession, use, and transfer of this device are subject to a general License or equivalent and regulations of the U.S. Nuclear Regulatory Commission or an Agreement State."

FOR THE NEW YORK STATE DEPARTMENT OF LABOR

by _____

Date _____

STATE OF NEW YORK
RADIOACTIVE MATERIALS LICENSE

Page 3 of 4 Pages

3. License Number

2341-3196 GL

5a. Rel. No.

1

b. Amend. No.

CONDITIONS

Continued:

B. Each device distributed under this License shall bear a durable, clearly visible and legible label or labels containing the device model and serial number, the radiation symbol in colors magenta or purple on a yellow background, the words, "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL," the quantity, identity and date of measurement of the radioactive material, and the name of the distributor of the device.

C. Each label required by this Condition shall bear the statement "Removal of this label is prohibited".

The licensee shall report all transfers of devices distributed under this License to persons generally licensed pursuant to Industrial Code Rule No. 38, Section 38.41, "Table 3-General Licenses", Item(b). Such reports shall identify each general licensee by name and address, the type of device transferred, and the quantity and type of radioactive material contained in the device. The report shall be submitted within 30 days after the end of each calendar quarter in which any such device is transferred to a generally licensed person.

All transfers to:

State of New York, Department of Labor, Division of Safety and Health, Radiological Health Unit, 2 World Trade Center, New York, New York 10047.

Transfers to hospitals and institutions in State of New York to:

State of New York, Department of Health, Bureau of Radiological Health, Empire State Plaza, Tower Building, Albany, New York 12237, or to City of New York, Department of Health, Bureau for Radiation Control, 377 Broadway, New York 10013, respectively.

Transfers to Non-Agreement States to:

U.S. Nuclear Regulatory Commission, Material Safety and Licensing Division, Washington, DC 20555.

Transfers to Agreement States to:

Appropriate State Regulatory Agency.

FOR THE NEW YORK STATE DEPARTMENT OF LABOR

by

Date

STATE OF NEW YORK
RADIOACTIVE MATERIALS LICENSE

Page 4 of 4 Pages
2341-3196 GL

3. License Number _____
1
5a. Ref. No. _____ b. Amend. No. _____

CONDITIONS

8. The licensee shall not transfer possession and/or control of radioactive material or products containing radioactive material as a contaminant except to an authorized or specifically licensed recipient.
9. None of the Conditions of this License shall be construed as authorizing distribution of radioactive materials to persons exempt from licensing (general public), which can only be authorized by the U.S. Nuclear Regulatory Commission pursuant to Title 10, Chapter 1, CFR, Part 150, Section 150.15, Subdivision(a), Paragraph(6).
10. Except as specifically provided otherwise by this License, the licensee shall receive, possess, use and transfer radioactive materials in accordance with statements, representations and procedures contained in his application dated February 18, 1983 and April 26, 1983, with attachments, and related documents listed below. The Department's regulations shall govern the licensee's statements in applications or letters, unless the statements are more restrictive than the regulations.

Date July 11, 1983

DOSH - 2410 (6-78) GLK:ea

FOR THE NEW YORK STATE DEPARTMENT OF LABOR

by George L. Kasyk

George L. Kasyk, Associate Radiophysicist

For: Joseph F. Drayton, Director

BRANDHURST B-100 SERIES LIFE SAFETY SIGNS

INSTALLATION INSTRUCTIONS

GENERAL

Remove protective cover and select legend
Replace cover and legend over light module
ensuring correct orientation of legend.
Fill holes not required for mounting with
screws provided (SLOTTED HEAD)

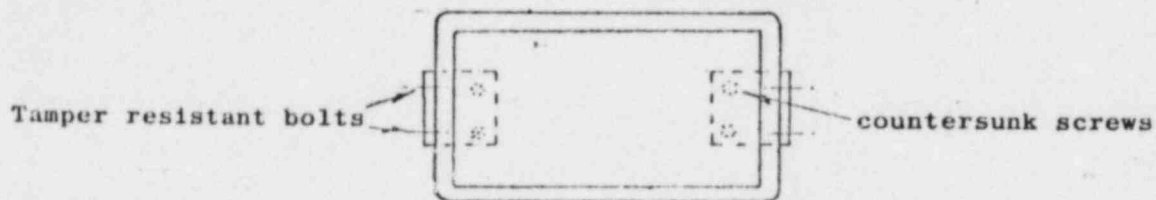
SURFACE MOUNTING

Using template on back of packaging, mark
four holes on wall.

Drill and plug wall as necessary.

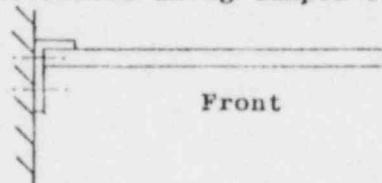
Fix standard mounts to wall using countersunk
wood screws provided.

Place sign between mounts and fix using tamper
resistant bolts provided.



END MOUNTING

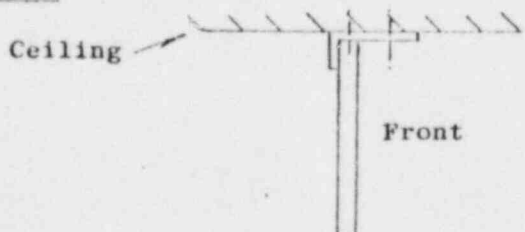
Fix one standard bracket to end of sign as
indicated using tamper resistant bolts.



Position sign and bracket against wall and
mark screw holes.

Fill holes not required for mounting with
screws provided (SLOTTED HEAD)

CEILING MOUNTING



Position sign and brackets against ceiling and
mark screw holes.

Fill holes not required for mounting with screws
provided (SLOTTED HEAD)

RESPONSIBILITIES OF RADIATION PROTECTION OFFICER

- (1) Arrange for inspection of all received goods for gross external damage, and institute Clean-Up Procedures if necessary.
- (2) Assure that all B100 signs are stored in the metal storage cabinet.
- (3) Restrict access to the Storage Cabinet only to individuals engaged in the receipt, inventory, and shipment of B-100 signs.
- (4) Arrange for transfer of damaged or inoperative signs to Brandhurst Inc., Robin Hill Corporate Park, Patterson, N.Y.
- (5) Maintain or arrange for others to maintain required records of all shipments of B100 signs.
- (6) Prepare Quarterly reports of shipments of all B100 signs and forward same to the USNRC.



U.S. Patent 2,841,000

BRANDHURST INCORPORATED

Hugin Building, Robbin Hill Corporate Park
Route 22, Patterson, N.Y. 12563

Gentlemen:

In accordance with the regulations of the State of New York, this will advise you that the enclosed devices have been shipped under General License number: 2341-3196 GL

The above license permits Brandhurst to distribute products containing tritium gas light sources, whereby the customer or end user is not required to apply for a specific license to receive and use a product containing byproduct material.

A copy of the pertinent sections of New York State Regulations, Code Rule No. 38, covering the products shipped to you are attached.

Please note that in some States, registration of receipt by the end user may be required. We attach a list of those States requiring registration at this time, with addresses of the office having jurisdiction, and blank registration form.

For General Licensees located in New York State, compliance with Industrial Code Rule 38, attached, is required. Registration using the enclosed form is required in New York State. General Licensees in other States are to comply with either the regulations of the U.S. Nuclear Regulatory Commission in non-agreement States, and appropriate regulatory agencies in the Agreement State having jurisdiction.



BRANDHURST INCORPORATED

Abstract from: State of New York Industrial
Code Rule 38: Table 3

Hugin Building, Robbin Hill Corporate Park
Route 22, Patterson, N Y 12563

Item (b) — Certain measuring, gaging or controlling devices.

(1) A general license is hereby issued to own, receive, acquire, possess and use radioactive material when contained in any device designed for use in detecting, measuring, gaging or controlling thickness, density, level interface location, radiation, leakage or qualitative or quantitative chemical composition, or designed for producing light or ionized atmosphere, when such devices are manufactured or imported in accordance with the specifications contained in a license or permit issued to the supplier by the commissioner, the State Department of Health, the New York City Department of Health, the United States Nuclear Regulatory Commission or any agreement State and authorizing distribution under the general license of this item or its equivalent, provided that:

(i) Such devices are labeled in accordance with the provisions of a license which authorizes the distribution of the devices.

(ii) Such devices bear a durable label containing the following or a substantially similar statement which contains the information called for in the following statement:

"The receipt, possession, use and transfer of this device, Model _____
Serial No. _____, are subject to a general license or equivalent and regulations of the United States Nuclear Regulatory Commission or of a State with which the Nuclear Regulatory Commission has entered into an agreement for the exercise of regulatory authority. This label shall be maintained on the device in a legible condition.

Removal of this label is prohibited.

Caution — Radioactive Material

(Name of Supplier)"

(The model, serial number and name of the supplier may be omitted from this label provided they are elsewhere specified in labeling affixed to the device. Devices licensed and distributed prior to the effective date of this Part (rule) may bear labels previously authorized.)

(iii) Such devices are installed when on the premises of the general licensee by a person authorized to install such devices under a license or permit issued to the installer by the commissioner, the State Department of Health, the New York City Department of Health, the United States Nuclear Regulatory Commission or any agreement State, if a label affixed to the device at the time of receipt states that installation by a licensee is required. The requirement of this item does not apply while devices are held in storage in the original shipping containers pending installation by a licensee.

(2) Terms and conditions. Every person under this general license shall comply with the following requirements:

(i) No such person shall dispose of by abandonment or otherwise, any such device except by transfer to a person who holds a license or permit to receive such device issued by the commissioner, the State Department of Health, the New York City Department of Health, the United States Nuclear Regulatory Commission or any agreement State, or in case the device remains in use at a particular location, the transferor shall give the transferee a copy of the requirements of this item and any safety documents identified in the label on the device and upon transfer notify the commissioner indicating the registration number, manufacturer's name, model and serial number of device transferred, the name and address of the transferee and name and qualifications of transferee's radiation safety officer.

(ii) Such person assures that all labels affixed to the devices bearing the statement "Removal of This Label is Prohibited" are maintained on the devices and shall comply with all instructions contained in such labels as a condition of his general license.

(vi) Such person shall comply with the requirements specified in section 38.36, subdivision (a), paragraphs (1) and (2) of this Part (rule) and such other requirements as the commissioner may determine to be applicable but otherwise such person shall be exempt from the requirements of sections 38.19 through 38.36 of this Part (rule).



BRANDHURST INCORPORATED

Hugin Building, Robbin Hill Corporate Park
Route 22, Patterson, N.Y. 12563

INSTRUCTIONS TO CUSTOMER OR INSTALLER

Some States require a record of sign installations. If signs are installed in the States listed below, please complete the lower part of this form and mail it to the address shown. (Serial No. information is shown on the Packing Slip).

LIST OF AGREEMENT STATES

Division of Radiological Health
Environmental Health Adminis.
Room 314, State Office Building
Montgomery, ALABAMA 36130

Arizona Atomic Energy Commission
2929 W. Indian School Road
Phoenix, ARIZONA 85017

Div. of Radiological Health
Arkansas Department of Health
4815 West Markham
Little Rock, ARKANSAS 72201

Radiological Health Section
Department of Health
714 P Street, Rm. 498
Sacramento, CALIFORNIA 95814

Occupational and Radiological
Health Division
Department of Public Health
4710 East 11th Avenue
Denver, COLORADO 80220

Radiological Health Services
Department of Health &
Rehabilitative Service
1317 Winwood Blvd.
Tallahassee, FLORIDA 32301

Radiological Health Unit
Department of Human Resources
47 Trinity Avenue
Atlanta, GEORGIA 30334

Radiation Control Section
Idaho Department of Health
and Welfare
Statehouse
Boise, IDAHO 83720

Bureau of Radiation Control
Division of Environment
Dept. of Health & Environment
Building 740
Tulane Field
Topeka, KANSAS 66620

Radiation Control Board
Bureau of Health Services
Dept. of Human Resources
275 East Main Street
Frankfort, KENTUCKY 40621

Division of Radiation Control
Natural Resources and Energy
Dept. of Conservation
P.O. Box 14690
Baton Rouge, LOUISIANA 70808

Division of Radiation Control
Dept. of Health & Mental Hygiene
201 W. Preston Street
Baltimore, MARYLAND 21201

Radiological Health Unit
State Board of Health
Jackson, MISSISSIPPI 39205

Division of Radiological Health
State Department of Health
301 Centennial Hall South
P.O. Box 95007
Lincoln, NEBRASKA 68599

Consumer Health Protection Services
Room 103 Kinkead Bldg.,
Capital Complex
Carson City, NEVADA 89710

Radiation Control Agency
Division of Public Health Services
State Dept. of Health & Welfare
State Laboratory Building
Nixon Drive
Concord, NEW HAMPSHIRE 03301

Occupational Health & Radiation
Protection Division
Environmental Improvement Agency
State of New Mexico
P.O. Box 2348
Santa Fe, NEW MEXICO 87503

Radiation Protection Section
Division of Facility Service
Box 12200
Raleigh, NORTH CAROLINA 27605

Division of Environmental
Engineering
Radiological Health Program
State Department of Health
1200 Missouri Avenue
Bismarck, NORTH DAKOTA

Radiation Control Service
Division of Health
Department of Human Resources
1400 South West Fifty Avenue
Portland, OREGON 97201

Division of Occupational
Health & Radiation Control
Rhode Island Department
of Health
Cannon Building
75 Davis Street
Providence, RHODE ISLAND 02908

Bureau of Environmental Health
Department of Public Health
727 Cordell Hall State
Office Building
Nashville, TENNESSEE 37219

Division of Occupational Health
and Radiation Control
Texas Department of Health
Resources
Austin, TEXAS 78756

Radiation Control Unit
DSHS MS LD-11
Olympia, WASHINGTON 98504

Radiological Health Unit
NY Dept. of Labor
2 World Trade Center
New York, NY 10047

Registration of Brandhurst Signs

distributed under N.Y. State License No. 2341-3196 GL by Brandhurst Inc.,
Hugin Building, Robbin Hill Corporate Park, Route 22, Patterson, N.Y. 12563.

Serial No(s) _____ Date Installed _____
Installed at: Co. Name _____
Address _____
City, State _____



BRANDHURST INCORPORATED

Hugin Building, Robbin Hill Corporate Park
Route 22, Patterson, N Y 12563

CLEAN-UP PROCEDURES FOR DAMAGED OR INOPERATIVE TRITIUM EXIT AND SAFETY SIGNS

- a. If the sign has sustained puncture damage, leave the area immediately. If there is a window, this should be opened before leaving. It is not necessary to leave the area upon discovering an inoperative sign.
- b. Do not return to the area for at least three (3) hours, after which time literally all of the tritium gas in the tritium lights will have been dispersed to a safe level.
- c. Use disposable plastic gloves to handle the damaged or inoperative sign and broken parts. Place the sign and parts in a sealable plastic bag. Contact Brandhurst, Robbin Hill Corporate Park, Route 22, Patterson, N.Y. 12563 (914) 878-2033 for information concerning disposal.
- d. The surface where the breakage occurred should be washed down thoroughly with detergent and water. Hands must be washed thoroughly after this cleaning-up operation. The rags or paper towels used for cleaning up shall also be placed in the plastic bag.

RE: ITEM 16 - FORMAL TRAINING IN RADIATION SAFETY

Since the B100 sign has been specifically licensed by the NY State Department of Labor for transfer to persons generally licensed, no formal training in radiation safety is required for individuals engaged in the receipt, possession and redistribution only.

Recognizing the requirement for handling of the signs in accordance with various provisions of 10 CFR, the Radiation Protection Officer will assume overall control of the receipt, possession, and redistribution of the signs.

Commensurate with procedures required for other valuable electrical products maintained in inventory, Brandhurst signs will be received, stored, and re-shipped by responsible individuals.

RE: ITEM 17 EXPERIENCE

16915