	Form 313 I (12-81) CFR 30	U.S. NUCLEAR REGULATORY	COMMISSION		APPLICATION FOR: eck and/or complete as appropriate)
	APPLICATION	FOR BYPRODUCT MATER INDUSTRIAL	IAL LICENSE		a. NEW LICENSE
See a	ttached instructions for de	etails.			b. AMENDMENT TO:
Comp	leted applications are file	ed in duplicate with the Division of	Fuel Cycle and Material Safety,	X	06-20804-01
Washi	ngton, DC 20555 or app.	ety, and Safeguards, U.S. Nuclear Re lications may be filed in person at th n, D. C. or 7915 Eastern Avenue, Si	he Commission's office at		c. RENEWAL OF: LICENSE NUMBER
. AP	PLICANT'S NAME (Institu	3. NAME AND TITLE OF PEREGARDING THIS APPL	ICAT	ION	
	Brandhurst		Ronald G. Ha		CODE - NUMBER EXTENSION
TEL	(203) 798-1	131	(203) 798-11		CODE - NOMBER EXTENSION
(Ao		DRESS (Include Zip Code) spondence, notices, bulletins, etc.,	5. STREET ADDRESS WHE (Include Zip Code)	RE LI	CENSED MATERIAL WILL BE USED
	87 Sand Pit	Road	87 Sand Pit	Ro	ad
	Danbury, CT		Danbury, CT		
		CE IS NEEDED FOR ANY ITEM	the state of the s	-	
	DIVIDUAL(S) WHO W	ILL USE OR DIRECTLY SUPER	IVISE THE USE OF LICENS		
(S		uired training and experience of each in	ndividual named below)	-	TITLE
	FI	JLL NAME			11166
	Ronald G. H	arper	Vice President		
-	DIATION PROTECTION	OFFICER	Attach a resume of person's t 16 and 17 and describe his res		g and experience as outlined in Items bilities under Item 15.
		8 LICENS	ED MATERIAL		
L I N E	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
10.	A	В	С		D
1)	Hydrogen	GTLS	See Item 8E		See Item 8E
2)	3 (Tritium)				
3)					
4)					
			LICENSED MATERIAL	Log	A SECURITY OF THE PROPERTY OF
1)	See attac		Che	ok No. 090	
21			Arac Fee	Catagory 3P	
41	DO.		Тур	Check Roo'd. 3/31/87	
3)	REC	02150347 B70423		named the desired transfer	manufacture of the state of the
	REC 06-	21 LIC30 870423 20804-01 PNU		named the desired transfer	Completed 9/3/187

		9.	STORAGE OF	F SEALED SOURCE	ES	
L-ZEO.	CONTAINER AND/OR DEVICE IN WHICH EA SOURCE WILL BE STORED OR USED. A.		AND REAL PROPERTY OF THE PERSON NAMED IN COLUMN 2 IN C		MANUFACTURER B.	MODEL NUMBER
(1)	Not Applic	able				
(2)						
(3)						
(4)						
	I	10 RAI	DIATION DET	ECTION INSTRUM	FAITC	
	TYPE	MANUFACTURER'S	MODEL	NUMBER	-	DELIGIES AND ADDRESS OF THE PARTY OF THE PAR
1-2mg	OF INSTRUMENT	NAME	NUMBER	AVAILABLE	RADIATION DETECTED (alpha, beta, gamma, neutron)	SENSITIVITY RANGE (milliroentgens/hour or counts/minute)
(1)	Α	В	С	D	E	F
	Not Applic	able				
(2)						
(3)						
(4)						
			TION OF INST	RUMENTS LISTE	D IN ITEM 10	
L 8.	CALIBRATED BY SE	RVICE COMPANY		Db. CALIBRATE	D BY APPLICANT	
	NAME, ADDRESS, A	ND FREQUENCY		Attach a separat	te sheet describing meth	od, frequency and standards
				used for calibrat	ting instruments.	
	Not Applic	able		No:	t Applicable	
						-
	TYPE	12. PER	SONNEL MON	SUPPLIER	S	
	(Check and/or completed A	e as appropriate.)		(Service Company)	-	EXCHANGE FREQUENCY C
□ (1) FILM BADGE					☐ MONTHLY
_			Not Applicable			
□ (2	DOSIMETER (TLD)	CENCE			OUARTERLY	
(3)	OTHER (Specify):					OTHER (Specify):
-						
Įmoj.	13. FACILITIES	AND EQUIPMENT (Che	eck were approp	oriate and attach an	notated sketch(es) ar	nd description(s).
L a.	LABORATORY FAC	CILITIES, PLANT FACILIT	TIES, FUME HOO	DDS (Include filtratio	n, if any), ETC.	
	REMOTE HANDLIN	IES, CONTAINERS, SPEC G TOOLS OR EQUIPMEN	TAL SHIELDING	(fixed and/or tempora	ary), ETC.	
		TECTIVE EQUIPMENT, E		e attached		
hoad 61.	RESTINATIONT PAG	TECTIVE EQUIPMENT, E	-	E DISPOSAL		
a. NA	ME OF COMMERCIA	L WASTE DISPOSAL SER				
		ic License 06				
DE	COMMERCIAL WAST	E DISPOSAL SERVICE IS	NOT EMPLOYED	D, SUBMIT A DETAIL	PE AND AMOUNT OF	METHODS WHICH WILL ACTIVITY INVOLVED. IF ANUFACTURER, SO STATE
,						
ARCHI E	(1 to 0 to 1 to 1 to 1 to 1 to 1 to 1 to					

		9.	STORAGE O	F SEALED SOURC	ES		
Z = - L	SOURCE WILL BE STORED OR USED.			MODEL NUMBER			
(1)	Not Applic	able			Б.	C.	
(2)							
(3)							
(4)							
		10 001	DIATION DET	ECTION INSTRUM	PAITA		
T	TYPE	MANUFACTURER'S	MODEL	NUMBER	RADIATION	CENTRAL	
1-2m0	OF INSTRUMENT	NAME B	NUMBER	AVAILABLE	DETECTED (alpha beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute)	
(1)	Not Applic	able					
(2)							
(3)							
(4)							
	The state of the s	11. CALIBRA	TION OF INST	RUMENTS LISTED	D IN ITEM 10		
□ a.	CALIBRATED BY SE			Db. CALIBRATE	THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAM	**************************************	
	Not Applica	able	SONNEL MON	used for calibrati	Applicable	od, frequency and standards	
-	TYPE			SUPPLIER	3	EVOLUNIOS EDECUENO	
- 11	Check and/or complete	e as appropriate.)		(Service Company)		EXCHANGE FREQUENC	
□ (2)	FILM BADGE THERMOLUMINESCI DOSIMETER (TLD)	ENCE	Not A	pplicable		☐ MONTHLY ☐ QUARTERLY	
_	OTHER (Specify):					OTHER (Specify):	
	13. FACILITIES A	ND EQUIPMENT (Che	ck were approp	riate and attach ann	notated sketch(es) ar	nd description(s).	
] a.] b.] c.	STORAGE FACILITIES REMOTE HANDLING	LITIES, PLANT FACILIT ES, CONTAINERS, SPECI 3 TOOLS OR EQUIPMENT TECTIVE EQUIPMENT, E	TES, FUME HOO AL SHIELDING T, ETC.	DS (Include filtration	n, if anyl, ETC.		
NA	AE OF COMMERCIAL	WACTE DIODOGAL CONT		DISPOSAL			
NAN		waste Disposal SERVIC License 06-)			
BEI	OMMERCIAL WASTE	DISPOSAL SERVICE IS	NOT EMPLOYED	MATES OF THE TYPE	E AND AMOUNT OF	METHODS WHICH WILL ACTIVITY INVOLVED. IF INUFACTURER, SO STAT	

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe 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.
 - Radioactivity measurement standardization and monitoring techniques and instruments.
 - 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 onthe-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.

e. LICENSE FEE REQUIRED (See Section 170,31, 10 CFR 170)	b. CERTIFYING OFFICIAL (Signature)		
Amendment Fee \$60.00	c. NAME (Type or print) Ronald G. Harper		
(1) LICENSE FEE CATEGORY: 3P	d. TITLE Vice President		
(2) LICENSE FEE ENCLOSED: \$ 60.00	e. DATE 3/19/87		

NRC FORM 313 I (12-81)

GPO 886-426

87 Sand Pit Road, Danbury, CT 06810 Telephone: (203) 798-1131 • Fax (203) 798-1574

SUPPLEMENT TO APPLICATION FOR AMENDMENT TO LICENSE NO. 06-20804-01

I Item 8E - Use of Licensed Material

Amend License:

- a) to change licensed premises to lower level, 87 Sand Pit Road, Danbury, CT 06810, as shown on attached drawing SK1
- b) item 6A from 12,5000 Curies to 60,000 curies possession limit for sealed sources installed in signs with a maximum of 30 curies per single source or device
- c) item 6A Physical Form to add BETALIGHT devices as follows:

Туре	Description	Min. Hydrogen 3	Max. Hydrogen 3
Light, Aiming Post	Trilux, orange MOD Drawing OS2331GA		2.40 curies
Light Marker	Trilux, green MOD Drawing OS2347GA		1.93 curies
Lamp unit	Trilux, orange MOD Drawing OS5251A		2.40 curies
Personal Marker	White, SRDL Drawing D1234001L	as an as	.25 curie
Map Reader Assembly	SRL Drawing C1231001 through 5, 7, 10, 11, 13, 14		5.00 curies

Type	<u>Description</u> <u>M</u>	Min.Hydrogen 3 per unit	Max.Hydrogen 3 per unit
Peglight V	Green betalight source		0.5 curie
Peglight	Blue betalight source		2.0 curies
Peglight	Orange betalight source		1.4 curies
Route Marker - I	Single betalight source of the following colors, or a combination of the followin colors: Green, Orange, Blue, Yellow or White	 ng	4.5 curies
Route Marker - II	Single betalight source of the following colors, or a combination of the followin colors: Green, Orange, Blue, Yellow, or White	ng	4.5 curies
Light, Aiming Post	Trilux, green MOD Drawing OS2330GA		1.93 curies
Marker MP 107	Disc-shaped Betalight mounted by flexible silicone adhesive within a 3-part polycarbonate which is then protected by a rubber moulding		5.0 curies
V Betalight Torch	Disc-shaped Betalight mounted by flexible silicone adhesive within a 2-part polycarbonate housing, which is clipped int rubber housing fitted with ca steel-reinforced holding ring lanyard	e to ap,	5.0 curies

Type	Description	Min.Hydrogren 3	Max. Hydrogen 3
		per unit	per unit
Box Sign 060	Box, 445 mm x 108 mm x 20.3 mm		12 curies
Box Sign 070	Box, 420 mm x 190 mm 20.3 mm		20 curies
Box Sign 080	Box, 220 mm x 108 mm x 20.3 mm		10 curies
Box Sign 005	Size, 190.5 mm x 76.2 mm x 16 m		5 curies
Box Sign 006	Size, 82.5 mm x 53.3 mm x 16 m		6 curies
Box Sign 008	Size, 132.0 mm x 53.3 mm x 16 m	m	4 curies
Box Sign 009	Size, 132.4 mm Top edge 95.3 mm Bottom edge 63.2 mm Height 16.0 mm Depth	-	3 curies
Box Sign 021	Size, 190.5 mm x 76.2 mm x 16 m	m	9 curies
Box Sign 025	Size, 190.5 mm x 49.5 mm x 16 m	m	5 curies
Safety Tenv Exit Sign	Beta light exit sign constructed in accordance with SRDI drawing no. 40113		21 curies
Beatlux-E	Beta light exit sign, constructed in accordance with SRDI drawing No. 1633001-12	-	25 curies
Marker MP 182	Cylindircal Betalight sealed to reflector in hermetically sealed polycarbonate housing	0.25 curie	5.0 curies
Marker MP 166	Cylindrical Betalight embedded in transparent silicone rubber within moulded polycarbonate housing	0.20 curie	5.0 curies
Marker DB 145	Cylindrical Betalight mounted with flexible silicone adhesive and hermetically sealed in polycarbonate housing	0.10 curie	0.5 curie
Marker MP 152	Hemispherical Betalight mounted by flexible silicone adhesive within 3-part polycarbonate housing, which is then protecte by a rubber moulding		5.0 curies

Above products are manufactured by Saunders-Roe Developments Ltd., Millington Rd., Hayes Middlesex, England UB 3 4MB and/or Saunders-Roe Developments Inc., PO Box 5536, 2580 Landmark Drive, Winston-Salem, North Carolina 27113.

87 Sand Pit Road, Danbury, CT 06810 Telephone: (203) 798-1131 • Fax (203) 798-1574

III Item 13 - Facilities and Equipment

Amend facilities description as follows:

The warehouse facility and offices will be located on the ground floor of a two story industrial/commercial building located at 87 Sand Pit Road, Danbury, CT., 06810, and area zoned for industrial use. The warehouse will be equipped with intrusion alarms and fire detectors connected to a central monitoring station.

The facility will not contain any manufacturing operations. Only receiving, storage and shipping operations will be conducted.

Warehouse area will comprise a total of 900 square feet. Access to the warehouse and offices will be under the sole control of the Chief Operating Officer and/or the Brandhurst Radiation Protection Officer.

Fire protection is provided by the paid fire department of the City of Danbury.

The total volume of the warehouse area is 8000 cubic feet. A ventilation fan(s) will be installed to achieve 5 to 6 air changes per hour. Radiological protection analysis of this ventilation rate is addressed in the comments relative to Item 15 of the Application.

87 Sand Pit Road, Danbury, CT 06810 Telephone: (203) 798-1131• Fax (203) 798-1574

I Item 8E - Use of Licensed Material (Cont'd)

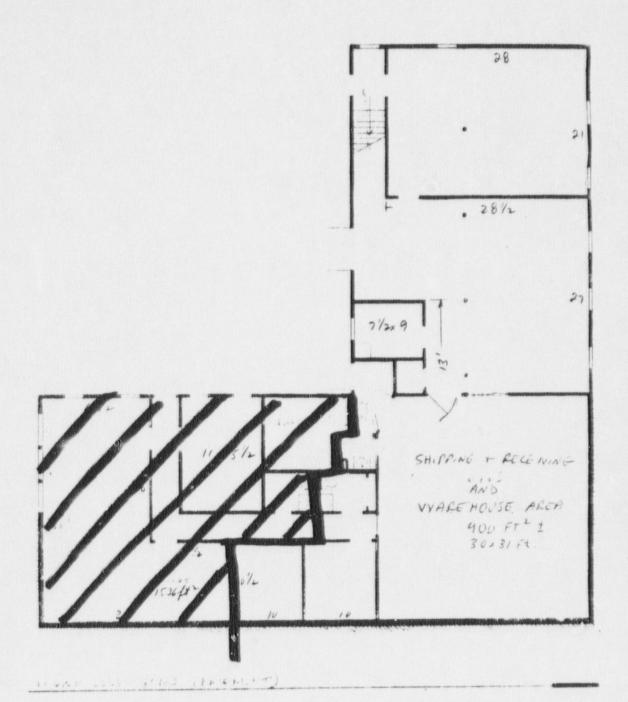
(Amend License.)

d) Item 6B Sealed Sources to add the following gaseous tritium light sources (Betalights):

Type or Model No.	Configuration	Min. Activity per glass capsule	Max. Activity per glass capsule
Α.	Annular, both cylindrical and squa or rectangular	are 0.05 curie	5.0 curies
В.	Radial, single pip.	0.05 curie	5.0 curies
F.	Axial, single pip.	0.05 curie	5.0 curies
M.H.	Cylindrical Laser cut end, no pip.	0.005 curie	0.7 curie
Q.	Special Shape, single pip.	0.5 curie	5.0 curies
R.H.	Square or rectangular Laser cut end. No pip.	0.003 curie	0.7 curie
R.	Rectangular, single pip.	0.05 curie	5.0 curies
S.	Sphere single pip.	0.05 curie	5.0 curies

Re Item 8D - Max Activity from 25 curies per device to a maximum of 30 curies per device.

All of the above products are presently licensed to Saunders-Roe Developments Inc., 2580 Landmark Drive, Winston Salem, North Carolina under North Carolina license No. 034-534-1 and are manufactured by Saunders-Roe Developments Ltd., Millington Rd., Hayes, Middlesex, England UB3 4NB.



PREMISES OF
BRANDHURST CORP
87 SAND PIT ROAD
DANBURY CT 06810

5K-1 3/18/87

87 Sand Pit Road, Danbury, CT 06810 Telephone: (203) 798-1131* Fax (203) 798-1574

IV Item 15 - Radiation Protection Program

(A) Amend Estimate of Dose Rate to Non-Radiation Workers as Follows:

Condition

- 1) Normal Storage:
 - a. Storage area gross volume 8000 ft. 3
 (Total tritium content per sign. 10 ci min to 25 ci max.)
 - b. Maximum tritium inventory 60,000 Ci.
 - c. Maximum number of sealed sources in inventory: 45,000 sources (contained in 3000 signs)
 - d. Tritium release per sealed source .05 microcuries in 24 hours maximum.
 - e. Ventilation rate 5 changes/hour.
 - f. Tritium oxide 2%.
 - g. Residence time 40 hours/week continuously for one (1) year.
 - h. Maximum allowable dose01 rem/year as per 10 CFR 32.24 Column 11.
 - i. Dose equivalent .17 rem/millicurie.
 - j. Inhalation intake of standard man 10⁷ cc in 8 hour day.

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The basic formula is:

Dose - Concentration x inhalation intake x dose equivalent

Concentration from 1 source = (Oxide Content)(Leak Rate)
(Room Volume) (Ventilation Rate)

= (.02)(.05uCi/24 hrs.)(1.13 x 108cc)(5/hr)

= $\frac{12.48 \times 10^{-5} \text{uCi}}{17 \times 10^{8} \text{cc}}$

= 7.2 x 10⁻¹⁴uCi/cc

 $= 7.2 \times 10^{-17} \text{mCi/cc}$

Dose from 1 source = $(7.2 \times 10^{-17} \frac{\text{mCi}}{\text{cc}})(\frac{10^{7} \text{cc}}{8 \text{ hrs.}})(.17 \frac{\text{rem/mCi}}{\text{year}})$

- .3 x 10⁻⁷ rem/yr

 $= .03 \times 10^{-6}, rem/yr$

Dome from 45,000 sources = 1.35x 10"3 rem/yr.

In excess of 300,000 light sources could be stored in the warehouse described above before the maximum allowable dose was reached.

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Ref.Item 15 Page 15 of 17

2) Breakage of Sign and Release of Tritium.

Due to the robust design of the sign (as confirmed by tests conducted in accordance with ANSI N540) and the fact that the signs contain a minimum of 10 and a maximum of 15 GTLS, it is extremely unlikely that all tubes in a sign will rupture simultaneously thereby releasing all tritium contained in the sign.

Therefore, the analysis set forth below assumes a single tube of maximum tritium content is broken, releasing the tritium into the same storage area as described in (1).

Tritium Released: 248 Ci. (Tube Type CT/60-65/140)

Oxide Content: 29

Maximum Permissable Dose: .5 rem/year as per 10 CFR 32.24 Column III.

87 Sand Pit Road, Danbury, CT 06810 Telephone: (203) 798-1131• Fax (203) 798-1574

Ref. Item 15 Page 16 of 17

Initial Concentration = (oxide content) (tritium released)
room volume

=
$$(.02 2.48 \times 10^3 \text{mCi})$$

 2.26×10^8

$$=$$
 \times 10⁻⁵ mCi/cc

Total Intake assuming no ventilation

- = (concentration) (breath volume for standard man)
- = $(.021x \ 10^{-5} \ \text{mCi/cc} \ \frac{(10^{7}\text{cc})}{8 \ \text{hrs}}$
- = .267 mCi/hr.

Now since the room containing the released tritium is being ventilated at a constant rate of 5 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:

Tc = 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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Ref. Item 15 Page 17 of 17

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

Thus with 5 air changes per hour, the mean residence time is .2 hour.

Therefore,

Total Intake = .267 mCi/hr x .2 hr.

= .053 mCi

Using the Dose Equivalent for 40 hour residence:

Total Dose = (Dose Equivalent) (Total Intake)

- # .17 rem/mCi x .053 mCi
- = .009 rem per year.

The above Total Dose is one fifty-fifth (1/55) the level of .5 rem/year given in Column III of the table in 10CFR32.24 as specified in 10CFR32.23 (d).

From the above calculation, it is shown that in excess of 20 complete breakages of an entire sign per year could occur under the conservative room conditions considered, before the limits of 10CFR32.24 were reached. The possibility of such a breakage rate is extremely remote.

03214 6/89

BETWEEN: C. James Holloway, Chief License Fee Management Branch Office of Resource Management

John E. Glenn, Chief Nuclear Materials Safety & Safeguards Section B Division of Radiation Safety and Safeguards

LICE	INSE I	FEE TRANSMITTAL			
Α.	REG	ION I			
	1.	APPLICATION ATTACHED			
		Applicant/Licensee:	Brandhurst Corp.		
		Application Dated:	3-19-87		
		Control No.:	107012		
		License No.:	06-20804-01		
	2.	FEE ATTACHED			
		Amount: \$\\$\\$\\$			
		Check No.: 090			
	3.	COMMENTS			
			SIT		
			Signed DLJ		
			Date 3-26-87		
В.	LICE	ENSE FEE MANAGEMENT BRANCH	2/1		
	1.	Fee Category and Amount:	3P Suport/Distribution 60		
	2.	2. Correct Fee Paid. Application may be processed for:			
		Amendment			
		Renewa1			
		License			
			SY CO		
			Signed O. Cimberley		

Date

REGION I FORM 213 (MARCH 1987)