

ADVANCED LIGHTING TECHNOLOGIES, INC.
32000 Aurora Road, Solon, Ohio 44139 Phone: (216) 836-7250 Fax: (216) 836-7171

8 June 2012
US Nuclear Regulatory Commission
Licensing Branch
Division of Materials Safety and State Agreements
Office of Federal & State Materials & Environmental Management Programs
Washington, D.C. 20555

ATTN: Mylari Sepulveda

SUBJECT: PROVISION OF ADDITIONAL INFORMATION

REF: Byproduct License Number: 34-26659-01
Docket Number: 030-33884
Mail Control Number: 577345
NRC Letter Dated: 21 May 2012

Dear Ms. Sepulveda:

With reference to your letter dated 21 May 2012, enclosed is the information that you requested in your letter.

Attachment 1 contains our responses to your request.

If you have any questions related to this matter, please contact Tom Harding at (440) 836-7250.

Sincerely,



Sabu Krishnan
Chief Operating Officer

ADVANCED LIGHTING TECHNOLOGIES, INC.

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ATTACHMENT 1: RESPONSES TO REQUEST FOR INFORMATION

The following are our responses to the information requested in your letter dated 21 May 2012.

- "1. Section 32.14(b)(4) requires the applicant to submit information concerning the procedures for and results of prototype testing to demonstrate that the material will not become detached from the product and that the byproduct material will not be released to the environment under the most severe conditions likely to be encountered in normal use of the product. Your application you did not appear to contain information which confirms that the product will maintain its integrity in conditions likely to be encounter in normal use of the product. Please submit procedures and results for prototype testing."

No specific testing has been done for the prototype of the lamp in which the Kr-85 gas mixture will be contained as described above. However, this lamp, without the Kr-85, has been manufactured and used in its present configuration for at least the past twenty years. Lamps of this type have been in use for at least the past forty years.

The release of the Kr-85 would occur if the outer envelope of the lamp and the arc tube were both shattered. This could occur if the lamp were crushed. From our past experience, we have seen that the outer envelope usually breaks if the lamp is dropped onto or is otherwise impacted against a hard surface. However, the arc tube remains intact. The arc tube may break if it is dropped onto or impacted against a hard surface, when not in the lamp envelope.

Therefore, we conclude that in most cases, the intact lamp, and the arc tube outside of the lamp, would each have to be dropped or otherwise impacted against a hard surface separately, in order for both were to be breached.

In any case, if the lamp envelope and the enclosed arc tube were both to be breached, a maximum of only 0.15 μCi would be released.

- "2. Section 32.14(b)(5) requires the applicant to submit information concerning the quality control procedures followed in the fabrication of production lots of the product and the quality control standards the product will be required to meet. Please note that your application does not provide the information as required by Section 32.14(b)(5). Please submit information that satisfies this requirement."

Each finished arc tube containing Kr-85, and each lamp containing these arc tubes, will be tested in the same manner as lamps with no Kr-85 that are currently being produced.

Each finished arc tube is tested to be sure it will light. If there is a leak, the arc tube will not light, and it is scrapped. Each finished lamp is also tested, to see if it will light. It is also aged for a period of time, to assure that it will function properly when installed by a customer.

If the lamp and the arc tube are both broken in shipment, the Kr-85 gas mixture will leak from the arc tube before it is delivered to the customer.

Each finished arc tube containing Kr-85, and each lamp containing these arc tubes, will be tested in the same manner as lamps with no Kr-85 that are currently being produced.

Therefore, there is no significant probability that K-85 gas mixture will leak from a finished

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lamp delivered to a customer, unless the customer breaks both the lamp and the arc tube.

- "3. Section 32.14(b)(6) requires the applicant to submit information concerning the proposed method of labeling or marking each units, and its container, with the identification of the manufacturer or initial transferor of the product and the byproduct material in the product. Please submit and provide a copy identifying the information that will be included in the label."

For each lamp containing Kr-85, the glass envelope will be labeled with the model number of the lamp. The cardboard sleeve covering each shipped lamp will be labeled with the name of the manufacturer, and with the symbol, "Kr-85". Attachment 2 contains a copy of a lamp sleeve, for a lamp that will contain Kr-85.

- "4. Section 32.14(b)(7) requires the applicant to submit information for product with limit specified in 30.15, the radiation level and method measurement. In Attachment 2, Page 2 Item 5 of your application you provided information regarding the radiation level, but the method used for the measurement is not provided. Please state what type of methods were used for the measurement."

The radiation levels at the external surface, 5 cm from the external surface, and 25 cm from the external surface are too small to be measured with the survey meters used for occupational safety purposes at our facility. We have calculated these radiation dose rate levels. The calculation is based upon the following assumptions:

- (a) The Kr-85 is a point source, located at the geometric center of the arc tube.
- (b) Self-absorption in the Kr-85 gas mixture is neglected.
- (c) Absorption by the walls of the arc tube, the glass sheath surrounding the arc tube, and the lamp envelope are neglected.
- (d) The arc tube is a spheroid with an effective radius of about 0.62 cm (for the largest of the three arc tubes, which is 3 cm³ in volume)..
- (e) The smallest distance from the outside surface of the arc tube and the inside surface of the lamp envelope is about 2 cm.
- (f) Bremsstrahlung from beta radiation penetrating the walls of the arc tube, the glass sheath surrounding the arc tube, and the lamp envelope is neglected. These walls are a total of 1 mm of quartz and 2 mm of glass in thickness.
- (g) The specific activity of Kr-85 is 1.567 mrem / hr per Curie at one meter (4.232x10⁻⁷ mSv / hr per MBq at one meter), according to Table 6.1.2 on page 168 of the Health Physics and Radiological Health Handbook. Bernard Schleien (ed.), Scinta, Inc., 1992, ISBN 0-917251-05-09
- (h) The maximum activity of Kr-85 in an arc tube is 0.15 μ C.

Dose rates at various distances from the arc tube and from the lamp have been calculated to be as follows:

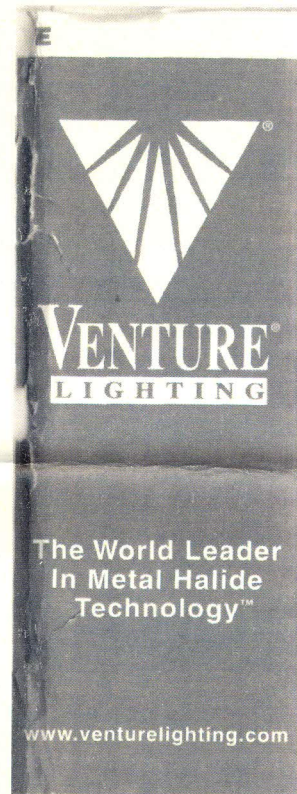
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Item	Dose Rates From Kr-85 ($\mu\text{rem} / \text{hr}$)
Arc tube surface	4.53
5 cm from arc tube surface	0.0718
25 cm from arc tube surface	0.00355
Lamp surface	0.317
5 cm from lamp surface	0.0394
25 cm from lamp surface	0.00306

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ATTACHMENT 2: COPY OF LAMP SLEEVE FOR LAMP CONTAINING Kr-85



• Enclosed Rated Lamp
E - Enclosed Rated Lamp E - Enclosed Rated Lamp

WARNING: THESE INSTRUCTIONS MUST BE FOLLOWED TO AVOID POSSIBLE EARLY FAILURE OR SHATTERING OF THE LAMP. Venture Lighting International will not be responsible for poor lamp || performance, personal injury, property damage, burns or ;(fire resulting from failure to follow these instructions.

Metal Halide lamps are constructed of an outer bulb with an internal arc tube made of quartz. The arc tube operates at high pressure and high temperature • as high as 1100 C. The arc tube and outer bulb may unexpectedly rupture due to internal causes or external factors such as a system failure or misapplication. These lamps must be operated only In enclosed luminaires which comply with UL1598 and can withstand a lamp ruptura. If in doubt, contact the luminaire manufacturer. For metal halide lamps in continuously operating systems (24 hours/day, 7 days/week), turn lamps off at least once per week for at a minimum 15 minutes. Failure to comply increases the risk of rupture.

If additional safety is desirable, use 0-rated lamps equipped with

Operate the lamp in the specified burning position with compatible electrical equipment. The ANSI code on the Venture lamp must match the code on the ballast or luminaire. If in doubt, consult with Venture Lighting or the luminaire manufacturer.

- Electrically insulate any metal bulb supports in the luminaire to avoid decomposition of glass.

- Protect lamp from direct contact with rain, sleet or snow to avoid breakage from thermal shock.

- Install lamp firmly but not forcibly into the socket to minimize loosening due to vibration. Do not use

excessive force as the glass bulb may break.

- Replace bulb if scratched, cracked or damaged.

' Enclosed Rated Lamp E • Enclosed Rated Lamp IE- Enclosed Rated Lamp

- Turn power off and let lamp cool before removal to avoid potential electrical shock and burns during lamp replacement.

- Relamp at or before the end of rated life. Beyond rated life, the risk of rupture increases, light output diminishes and energy consumption may increase. See specification sheets or catalog for life ratings.

- Specification sheets are found on the website www.venturelighting.com. Catalogs are available from Venture Lighting at the address or phone number indicated.

> **Operate Uni-Form®** pulse start metal halide lamps on pulse start ballasts with sockets that can withstand a 4000 volt pulse. The substitution of standard (non-pulse start) metal halide lamps will result in poor performance and is not recommended.

LAMP OPERATING CHARACTERISTICS

- 1) This is a discharge lamp and requires several minutes to restart and come to full brightness after a power interruption. For total load, add auxiliary (ballast) watts to lamp watts.
- 2) Color variation from lamp to lamp is an inherent

characteristic of metal halide lamps. It is further influenced by variation in the operating conditions and is not an indication of system or lamp failure. As lamps age, a gradual shift in color normally occurs.

WARNING: THIS LAMP CAN CAUSE SERIOUS SKIN BURN AND EYE INFLAMMATION FROM SHORTWAVE ULTRAVIOLET RADIATION IF OUTER ENVELOPE OF THE LAMP IS BROKEN OR PUNCTURED AND THE ARC TUBE CONTINUES TO OPERATE. DO NOT USE WHERE PEOPLE WILL REMAIN FOR MORE THAN A FEW MINUTES UNLESS ADEQUATE SHIELDING OR OTHER SAFETY PRECAUTIONS ARE USED. CERTAIN TYPES OF LAMPS THAT WILL AUTOMATICALLY EXTINGUISH WHEN THE OUTER ENVELOPE IS BROKEN OR PUNCTURED ARE COMMERCIALY AVAILABLE.

Complies with USA Federal Standard 21CFR 1040.30 and Canada Standard SOR/80-381

If the outer envelope breaks or is punctured and lamp continues to operate, immediately turn power off and remove lamp after it has cooled.

Venture Lighting International, Inc. 32000 Aurora Road Solon, OH 44139 USA 1-800-437-0111 **1-440-542-4318**

Venture Lighting Europe, Ltd. (44)61332870050

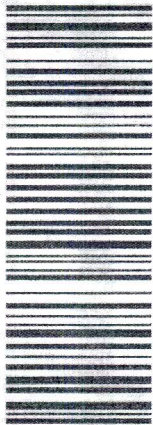
Kr85

LAMP CONTAINS MERCURY Manage in Accord with Disposal Laws See:



**VENTURE LIGHT
INTERNATIONAL,**

An Advanced Lighting Technologies Co.
32000 Aurora Road • Solon, OH 44139



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CERTIFIED MAIL

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT
OF THE RETURN ADDRESS, FOLD AT DOTTED LINE



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Attn: Mr. Alan Sepulveda
Division of Materials Safety & State Agreements
Office of Federal & State Materials & Environmental
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