SAFETY LIGHT CORPORATION
4150-A OLD BERWICK ROAD, BLOOMSBURG, PA 17815
717-784-4344 TWX 510-655-2634

"SECTION COPY"

20 February 1986

U.S. Nuclear Regulatory Commission
Region I
631 Park Ave.
King of Prussia, PA 19406

ATTN: Dr. John Glenn

RE: License No. 37-00030-09G.

Dear Dr. Glenn:

We respectfully request amendment to Condition 10 of the above referenced license to include the following devices:

DRAWING #	DRAWING #	DRAWING #
600-1B-1S*	616-05*	758H
600-1B-1S1	616-03	343
602-06*	758-14-1A*	577
602-09	758-14-1	
604-11*	758-B*	
604-07*	758-D3	
604-05*	758-D4	
604-04		

These devices contain a maximum of 10 Curies each of tritium gas and are the same products listed in Condition 10 of our USNRC License 37-00030-10G for aircraft use. Materials, construction and manufacturing procedures used will remain the same, howev.. prototype testing and reports (two sets of reports enclosed) were conducted in accordance with American National Standard N540 - Classification of Radioactive Self-luminous Light Sources to properly reflect conditions that the devices will be subjected to in their intended end application.

It should be noted that the devices with an asterisk (*) are the devices physically subjected to the prototype testing. The devices without an asterisk are essentially similar in basic design and construction to the devices tested, however represent either a smaller size housing and/or shorter tritium source and are equal to or superior in structual integrity. Over the past twenty plus years that Safety Light Corp. has been manufacturing aircraft markers for general distribution to aircraft companies, there have been very few instances of tritium sources breaking within the product during handling, distribution and end use.

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In addition to the above listed devices, we also request amendment to Condition 10 to include the following devices containing tritium gas:

DRAWING #	Maximum Total Activity
2091	5 Ci
2092	5 Ci
2088	5 Ci
2090	25 Ci
2040	25 Ci

These particular devices represent new designs or modifications to old designs that effect their structural integrity. Enclosed please find two copies each of product engineering drawings and prototype test reports for the newly designed products.

All the devices to be included in Condition 10 will be installed generally on building structures and in ambient environs. The devices will be used in means of egress, pathway, safety and emergency signage or marker type applications.

None of the above devices will exceed 25 Curies of tritium, which is the maximum amount already allowed under this license for devices used within enclosed structures for the intended use described herein. Under ordinary conditions of handling, storage and use of the devices, the tritium gas contained within the device will not be released or inadvertently removed, therefore it is unlikely that any person will receive in any period of one calendar quarter, a dose in excess of 0.125 REM. Under accident conditions associated with handling, storage and use of the devices, it is unlikely that a person would receive a dose in excess of 15 REM.

Accordingly, all labeling, quality control procedures and related information pertinent to manufacturing and distribution of these devices is incorporated by reference and is contained in previous application of USNRC License No. 37-00030-09G, dated 24 October 1983. We believe that the information contained herein is evidence that general distribution of these devices meets the intent of Section 31.5 of 10 CFR 31 or equivalent provisions of the regulations of any Agreement State.

/. . . Continued

Please find enclosed a check for $230.00 to cover the amendment fee listed in 10 CFR 170.31(3)(J).

We trust that this information will suffice to permit you to review our request for General License coverage of these devices. Please do not hesitate to contact the undersigned if any information requires clarification.

Very truly yours,
SAFETY LIGHT CORPORATION

Jack Miller
President

JTM:cwl

enclosures

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawings #600-1B-1 & 600-2B-1

1.0 INTRODUCTION:

Tests to demonstrate a T3GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 600. The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at a maximum Tritium content of 5 Curies.

2.0 Description:

The ANSI tests prescribed for Isolite® Device Model # 600 requires a performance test level of 3 for the temperature, thermal shock, reduced pressure, impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ± 10 °C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27 °C ± 10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -30°C and 65°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 65°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -30°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 157 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 2 times from 1 meter distance elevation.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 10 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C $\pm$3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 50°C and allowed to remain there 15 minutes. The markers were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 2 times. The temperature of the baths did not change more than $\pm$3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium devices.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the device. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium devices.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 600, meets and exceeds the requirements for a T3GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst. engr. 12/20/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing # 602

1.0 INTRODUCTION:

Tests to demonstrate a T6GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 602. The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at maximum Tritium content of 10 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® device Model # 602 requires a performance test level of 3 for the temperature, thermal shock,and reduced pressure tests,and a test level of 4 for the impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ±10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ±10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -55°C and 80°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 80°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -55°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 87 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation, and 2 times from 2 meters.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 60 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C $\pm$3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 80°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 5 times. The temperature of the baths did not change more than $\pm$3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium sources.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the source. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium sources.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 602, meets and exceeds the requirements for a T6GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst engr. 12/30/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing # 604 (-05,-07,-011)

1.0 INTRODUCTION:

Tests to demonstrate a T6GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 604. The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at maximum Tritium content of 10 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® device Model # 604 requires a performance test level of 3 for the temperature, thermal shock, and reduced pressure tests, and a test level of 4 for the impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ±10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ±10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -55°C and 80°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 80°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -55°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 87 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation, and 2 times from 2 meters.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 60 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C $\pm$3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 80°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 5 times. The temperature of the baths did not change more than $\pm$3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium sources.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the source. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium sources.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 604, meets and exceeds the requirements for a T6GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst engr. 12/20/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing # 616 (-03, -05)

1.0 INTRODUCTION:

Tests to demonstrate a T6GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 616. The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at maximum Tritium content of 10 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® device Model # 616 requires a performance test level of 3 for the temperature, thermal shock, and reduced pressure tests, and a test level of 4 for the impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ±10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ±10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -55°C and 80°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 80°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -55°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 87 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation, and 2 times from 2 meters.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 60 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C ±3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 80°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 5 times. The temperature of the baths did not change more than ±3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium sources.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the source. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium sources.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 616, meets and exceeds the requirements for a T6GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst. engr. 12/2/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing #758-14-1A

1.0 INTRODUCTION:

Tests to demonstrate a T4GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 758-14. The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at a maximum Tritium content of 5 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® Source Model #758-14 requires a performance test level of 3 for the temperature, thermal shock, reduced pressure, impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ± 10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ± 10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -30°C and 65°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 65°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -30°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 157 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 30 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C ±3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 65°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 2 times. The temperature of the baths did not change more than ±3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium devices.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the device. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium devices.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 758-14, meets and exceeds the requirements for a T4GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst. engr. 12/2/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing #758-B1

1.0 INTRODUCTION:

Tests to demonstrate a T4GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 758-B1. The devices are to be used for marking means of egress, pathway, safety and emergency sinage or marker type applications, at a maximum Tritium content of 5 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® Source Model#758-B1 requires a performance test level of 3 for the temperature, thermal shock, reduced pressure, impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ± 10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ± 10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -30°C and 65°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 65°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -30°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 157 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 30 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C ±3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 65°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 2 times. The temperature of the baths did not change more than ±3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium devices.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the device. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium devices.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 758-B1, meets and exceeds the requirements for a T4GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst. engr. 10/29/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing #2088

1.0 INTRODUCTION:

Tests to demonstrate a T4GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 2088 . The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at a maximum Tritium content of 5 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® Source Model # 2088 requires a performance test level of 3 for the temperature, thermal shock, reduced pressure, impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ± 10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ± 10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -30°C and 65°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 65°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -30°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 157 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 30 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C $\pm$3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 65°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 2 times. The temperature of the baths did not change more than $\pm$3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium devices.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the device. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium devices.

4.0 Conclusions

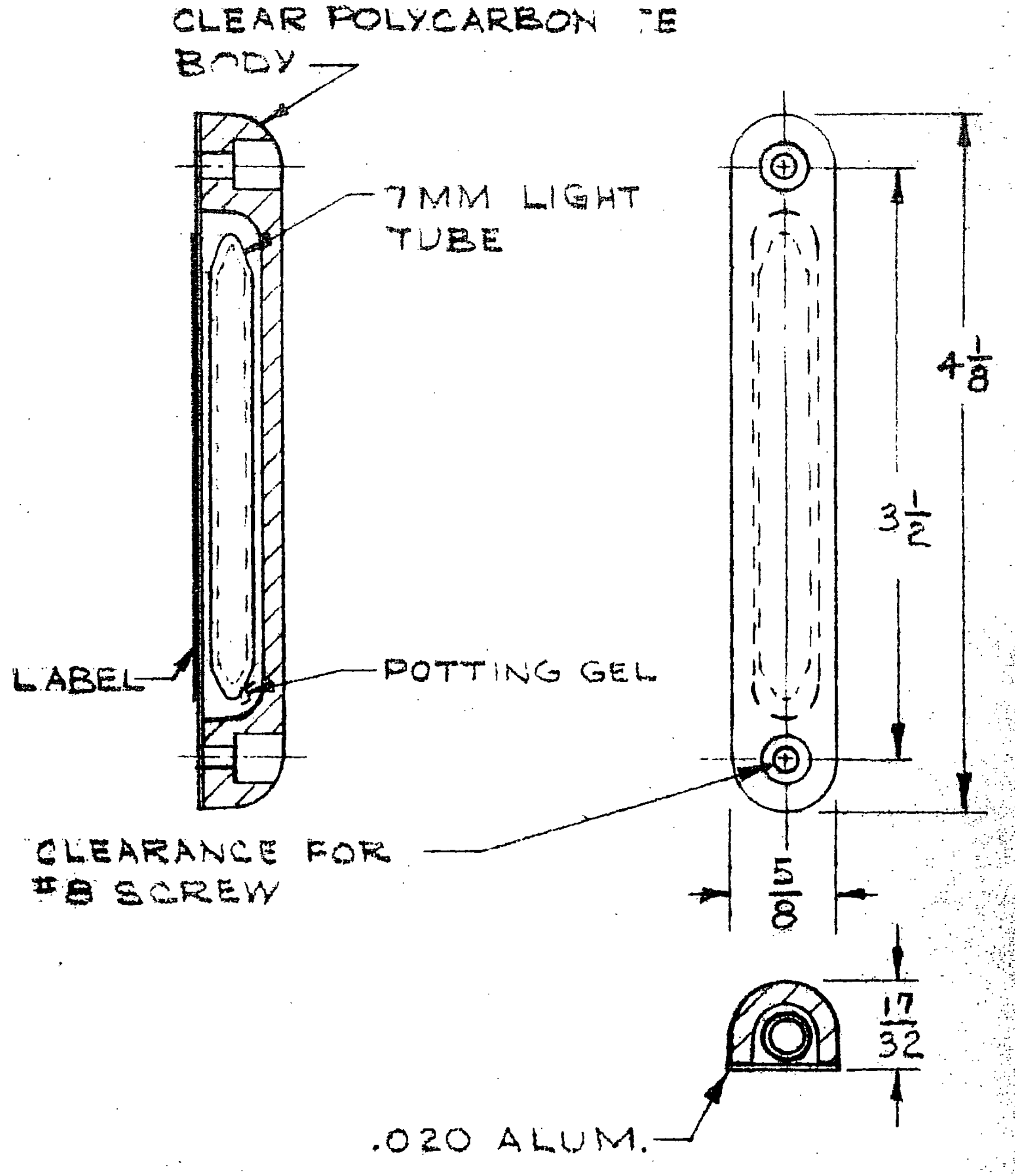
In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 2088 , meets and exceeds the requirements for a T4GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst. engr. 12/30/85

REVISIONS | DATE | AP'R'D | BY | REV.

DWG. NO. 2088



MAX. 5 Ci

DEPT.

SAFETY LIGHT CORPORATION
BLOOMSBURG, PENNA.

MATERIAL	TOLERANCES		
SPEC.	FRACTIONS ± 1/64" ANGLES ±	D'W'N BY REH	TITLE AISLE MARKER ASSEMBLY
	DECIMALS UNLESS OTHERWISE NOTED ±	C'K'D BY	
THICKNESS	DECIMAL DIMENSIONS TO 5" ±	APPR'D BY JTM	
	DECIMAL DIMENSIONS 5" TO 10" ±	DATE 2-14-86	
FINISH	DECIMAL DIMENSIONS 10" AND UP ±	SCALE HALF	
	THREAD CLASS ___ FIT	REF. DWG. 2084	DWG. NO. 2088 REV.
	DO NOT SCALE DWG.		SUPERSEDES

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing # 2090

1.0 INTRODUCTION:

Tests to demonstrate a T6GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 2090. The devices are similar to SLC device model #2040 and will be used for marking means of egress, pathway, safety and emergency exit signage or marker type applications, at maximum Tritium content of 25 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® device Model #2090 requires a performance test level of 3 for the temperature, thermal shock, and reduced pressure tests, and a test level of 4 for the impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ±10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ±10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -55°C and 80°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

[1] U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 80°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -55°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 87 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation, and 2 times from 2 meters.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 60 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C $\pm$3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 80°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 5 times. The temperature of the baths did not change more than $\pm$3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium sources.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the source. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium sources.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 2090, meets and exceeds the requirements for a T6GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.

Scott Lawvere, asst. engr. 12/30/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing #2091

1.0 INTRODUCTION:

Tests to demonstrate a T4GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 2091 . The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at a maximum Tritium content of 5 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® Source Model #2091 requires a performance test level of 3 for the temperature, thermal shock, reduced pressure, impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ± 10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ± 10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -30°C and 65°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 65°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -30°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 157 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 30 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C $\pm$3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 65°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 2 times. The temperature of the baths did not change more than $\pm$3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Padioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium devices.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the device. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium devices.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 2091 , meets and exceeds the requirements for a T4GC classification of the ANSI N540 standard.

Scott Lawyere, asst. engr.

Scott R Lawyere, asst engr. 12/20/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing #2092

1.0 INTRODUCTION:

Tests to demonstrate a T4GC classification have been performed on Safety Light Corporation's (SLC) Isolite® device model number 2092 . The devices are to be used for marking means of egress, pathway, safety and emergency signage or marker type applications, at a maximum Tritium content of 5 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® Source Model #2092 requires a performance test level of 3 for the temperature, thermal shock, reduced pressure, impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ± 10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ± 10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -30°C and 65°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 65°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -30°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 157 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 30 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C $\pm$3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 65°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 2 times. The temperature of the baths did not change more than $\pm$3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium devices.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the device. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium devices.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 2092 , meets and exceeds the requirements for a T4GC classification of the ANSI N540 standard.

Scott Lawyere, asst. engr.

Scott A. Lawyere, asst engr. 12/30/85

SAFETY LIGHT CORPORATION
4150A Old Berwick Road
Bloomsburg, Pa. 17815

ANSI N540[1] Tests to Safety Light Product
Reference Drawing # 2040

1.0 INTRODUCTION:

Tests to demonstrate a T6GC classification have been performed on Safety Light Corporation's (SLC) Isolite® Replaceable Light Module 2040 with an acrylic window instead of polycarbonate as first licensed and referenced in NR-579-D-101-G, dated 9/21/83 andwill be used for marking means of egress, pathway, safety and emergency exit signage or marker type applications, at a maximum Tritium content of 25 Curies.

2.0 Description:

The ANSI test prescribed for Isolite® device Model #2040 requires a performance test level of 3 for the temperature, thermal shock,and reduced pressure tests,and a test level of 4 for the impact, vibration, and immersion tests. The tests described were run consecutively on the same devices, and were performed at 23°C ±10°C, at a barometric pressure of 710-790 mmHg, and a maximum of 80% relative humidity. Two sample devices were subjected to the test sequence. At the end of each test, the devices were examined visually, and checked with a Tritium monitor for possible Tritium gas leakage.

2.1 Discoloration

The devices were exposed to the light of an S4 lamp, filtered by a Corex D filter, at a distance of 20 centimeters, for 12 hours. The test was conducted in air with a temperature of 27°C ±10°C, and a relative humidity of 95-100%. When examined by photometer, there was less than 20% loss.

2.2 Temperature Test

The devices were subjected to temperatures of -55°C and 80°C for one hour at each temperature. The devices were cooled to the low temperature in less than 45 minutes and heated to the high temperature in less than 5 minutes. At the conclusion of each test, the devices remained within the test enclosure until they reached ambient temperature.

1 U.S. Department of Commerce, National Bureau of Standards, American National Standards N540-1975; Classification of Radioactive Self-Luminous Light Sources, NBS Handbook 166, Washington, D.C., January 1976.

2.3 Thermal Shock Test

The devices were subjected to the temperature of 80°C for no less than 15 minutes. In approximately 5 seconds the devices were transferred to a cold chamber held at -55°C for 15 minutes, and then removed to ambient temperature.

2.4 Reduced Pressure Test

The devices were placed in a vacuum chamber and the pressure reduced to 87 mmHg absolute, for 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period.

2.5 Impact Test

The devices were dropped onto a .75 inch thick rigid steel plate which was lying on a flat concrete floor. The devices were allowed to free fall and impact the steel plate in a random manner 20 times from 1 meter distance elevation, and 2 times from 2 meters.

2.6 Vibration Test

The devices were secured on the table of a vibration test machine having the capability of providing simple harmonic motion with an amplitude of 0.075 centimeters and a maximum total excursion of 0.15 centimeters. The frequency was varied uniformly between 10 and 55 Hertz, and returning to 10 Hertz in approximately 1 minute. The test was conducted for 60 minutes.

2.8 Immersion Test

The devices were immersed in a cold water bath maintained at 0°C ±3°C for 15 minutes and then transferred within 5 seconds to a hot water bath maintained at 80°C and allowed to remain there 15 minutes. The devices were then transferred back to the cold water bath in less than 5 seconds and allowed to remain for a further 15 minutes. This cycle was repeated 5 times. The temperature of the baths did not change more than ±3°C during the test cycles. Upon completion of the immersion test, the radioactivity of the water in the hot and cold baths was analyzed by liquid scintillation counting.

3.0 Evaluation

Determination of compliance with the performance test requirements was made on both devices in accordance with the procedures described below. After completion of the test sequence, the devices were evaluated by the following criteria in addition to the evaluation specified for the individual tests.

3.1 Visual Evaluation

The devices were examined visually for any evidence of failure, visible leakage, or degradation. Apart from slight surface indentations and scratches, no evidence of failure, visible leakage, or degradation was noted.

3.2 Brightness Evaluation

The devices were measured both before and after testing by photometer. There was less than 20% loss of luminosity.

3.3 Loss of Radioactive Content Evaluation

3.3.1 Hot and Cold Bath Evaluation

The liquid scintillation analysis results from the hot and cold baths in Section 2.8 indicated that the liquids in each bath did not exceed the 50 nanocurie limit for gaseous tritium sources.

3.3.2 24 Hour Soak Test

Each device was soak tested for 24 hours in a volume of water approximately equal to 10 times the volume of the source. After the devices were removed, the water was analyzed by liquid scintillation testing. The analysis results did not exceed the 50 nanocurie limit for gaseous tritium sources.

4.0 Conclusions

In view of the excellent condition of the devices at the conclusion of the tests, we conclude that the device, SLC drawing and part number 2040, meets and exceeds the requirements for a T6GC classification of the ANSI N540 standard.

Scott Lawvere, asst. engr.