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AND
NAUTICAL/NUCLEAR ANALYSIS
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# CERTIFICATION TEST REPORT

CERTIFICATION TEST REPORT
17961-1
OF
ATX20 Series (ATX-20-S, EPL-UV-20W, EPL-UV-20W-G2)
and ATX25 Series (ATX-25-S)
TO
PERFORMANCE REQUIREMENTS OF UL-783
ELECTRIC FLASHLIGHTS IN HAZARDOUS LOCATIONS

**CUSTOMER:**

Larson Electronics

9419 East US HWY 175

Kemp, TX 75143 USA

**MANUFACTURER OF TEST ARTICLE:** Larson Electronics
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**DATE:** MAY 20, 2008

**REPORT NO.:** 17961-1
**IMANNA JOB NO.:** 17961
**CUSTOMER P.O. NO.:** VERBAL
**CONTRACT:** N/A
**PAGES IN REPORT:** 8

**STATE OF FLORIDA**

ROBERT L. WHITE, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Robert L White

SUBSCRIBED and sworn to before me this 23rd day of May, 2008

Marydel Kramer

MARYDEL KRAMER
Notary Public - State of Florida
My Commission Expires Jul 15, 2008
Commission # DD 338209
Bonded By National Notary Assn.

Imanna shall have no liability for damages of any kind to person or property, including special or consequential damages resulting from Imanna's providing the service covered by the report.

IMANNA LABORATORY, Inc.
TEST BY

Robert L. White
PROJ. MANAGER

1. TEST ARTICLE

Representative samples of two different size flashlight assemblies were received. One design operates with a 20 watt light source and the other with a 25 watt light source. The different lamp sizes require different size battery packs, making the 25 watt light a larger light in overall dimensions. The flashlights are designed with separate sections that thread together and are sealed at the threaded interface. One section is the battery section, another section is the electronics section, and the third section is the lamp source section.

Photographs of the lights are shown below.

**Figure 1 View of the 20-wat and the 25-watt flashlights.**

The lights are activated by a switch placed under a flexible rubber pad that is sealed to the housing body of the flashlight. The switch is a “push-to-ON” and “push-to-OFF” switch that is not exposed to the outside atmosphere due to the seal of the rubber pad over it.

The lamp lens is covered with a slip-over rubber ring that forms a cushion around the edge of the lamp lens assembly and protects the lens from high force impacts at the edge of the lens plate.

The opposite end of the flashlight is covered with a rubber boot that forms a bridge for the light is dropped on its side. The force would be absorbed by the front lens cover and the rear end cover instead of the metal body.

The primary body structure material of the light assembly is a metal cylinder made of Aluminum. O-Ring gaskets at each threaded interface joint seals the connection from water or air intrusion.

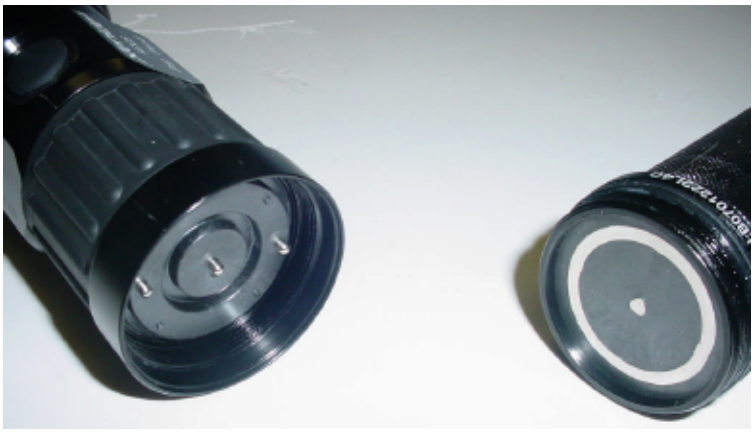

**Figure 2 View of the threaded interface and the gasket O-Ring.**

The battery connection is made with a continuous ring, a center contact and post pins so that once the contact is made, there is continuous contact of the terminals.

The light source is a Xenide® bulb that is threaded into the lamp housing. Electronics housed in the light case, activate the lamp and deactivate the lamp under severe shock impacts (lamp disconnect mechanism based on shock level) to prevent power to the bulb should internal fracture occur at the bulb. This design prevents overheating that could possibly exist if an open short occurred at the bulb location.

Each flashlight is provided with a serial number for the battery pack. The serial number is stamped on the battery section housing in White letters on the Black background. The battery pack is a rechargeable LI-ION battery. The contact for the charger connection is under the rubber cap at the end of the flashlight away from the bulb end, and is protected with a secondary rubber cover that remains on the battery pack after the end cap is removed for charger contact access.

2. PART NUMBER

Flashlight with the 20-watt lamp: ATX-20-S, EPL-UV-20W, EPL-UV-20W-G2
Flashlight with the 25-watt lamp: ATX-25-S

3. REQUIREMENTS

The flash light assemblies are to be tested to the performance test procedures contained in the UL 783, “Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations”. These requirements cover battery-operated flashlights and lanterns for use in hazardous locations, Class I, Division 1, Groups A, B, C and D; Class I, Division 2, Groups A, B, C, and D; Class II, Division 1, Groups F and G; and Class II, Division 2, Groups F and G as defined in the National Electric Code, NFPA 70. This Standard does not cover flashlights of the Explosion-proof type or of the Intrinsically Safe Type. The tests conducted are for flashlights intended for use in hazardous locations to verify the applicability of the design for future production.

4. PROCEDURE

The procedures used to accomplish the tests are specified in UL 783.

Upon receipt, the test article was inspected for damage and any obvious signs of noncompliance with the requirements of the UL 783 standard.

The flashlights were tested for the parameters listed in the UL 783 standard.

4. RESULTS

The results of the tests performed indicate that the ATX20 flashlights tested meet the performance requirements of UL 783 for all parameters with the exception of the Explosive Dust Combustion test. This test has not been conducted to date due to the difficulty of obtaining the explosive dust needed for the test.

The results of the tests performed indicate that the ATX25 flashlights tested meet the performance requirements of UL 783 for all parameters except for the maximum temperature rise and the Explosive Dust Combustion test. The 25 watt bulb generates sufficient heat to cause the surface temperature of the flashlight to exceed a 100°C upper limit at the lens directly above the lamp (actual temperature is 116°C). Additionally, the Explosive Dust test has not been conducted to date due to the difficulty of obtaining the explosive dust needed for the test.

4.1 Explosive Atmosphere

The 20-watt and the 25 watt flashlights contain the energy of induced ignitions of Propane, Acetylene, Ethylene, and Hydrogen mixed with air. Explosive mixtures of each gas in air were introduced into the flashlight at the bulb cavity and remotely ignited while

the flashlight was totally surrounded with an explosive mixture of the same gas in air. Two hundred (200) separate internal ignitions were performed for each gas. Some of the ignitions were weak and some were strong in their energy release as a result of varying the mixture from “lean” to “Optimum” to “rich” through the explosive mixture range, based on the conditions at the test site at the time of the tests. The majority of the explosions (100 minimum) were conducted at a mixture that gave the most severe ignition.

4.2 Construction – Enclosure

The enclosure shell is made of Aluminum. The lens is made of Lexan® Polycarbonate. An additional rubber ring is placed at the lens, midway the light (at the switch location), and at the battery end to absorb impact energy if dropped or mishandled.

4.3 Construction – Protection Against Corrosion

In addition to being made of Aluminum, the flashlight is Black hard anodized to further protect the unit from corrosion in harsh environments.

4.4 Construction – Cells and Batteries

The battery pack is placed in a separate cylinder that is threaded onto the flashlight bulb and electronics module. The batteries are held tightly in place in their compartment and take up the entire space of the battery module, leaving no open space for air or liquid. The battery packs are sealed devices. There is no path for short-circuiting of the batteries inside the flashlight as they are rigidly held in place inside the battery pack module. The open circuit voltage of the ATX20 or the ATX25 is a nominal 12 VDC. The lights have rechargeable batteries and may hold 12.8 VDC immediately after a full recharge. The battery packs in the flashlight are provided with short circuit protection preventing continued current flow under short circuit conditions. Short circuit protection is provided at the battery charger circuit to prevent current flow should the battery charger contacts be shorted.

4.5 Construction – Internal Conductors

Internal conductors are sized suitably for the current application of the flashlight. The electrical conductivity is carried though stainless steel pins that are approximately 1mm in diameter and are approximately 2mm long. The ampacity of the connection is higher than the 2 amps draw for the highest energy lamp.

4.6 Temperature rating

The flashlight was thermally soaked in a temperature chamber set for 40°C. After stabilizing at the set temperature, the flashlight was turned on and the temperature at the hottest spot on the flashlight (point immediately above the light source on the lens) was measured during normal operation of the flashlight. The maximum temperature on the 20-watt light was 97°C and for the 25-watt light the maximum temperature was 116°C. Both lights are given a T-rating of T4A (temperature below 120°C). NOTE: since the bulb is located inside a sealed compartment, the temperature on the exterior of the compartment was taken as the exposure temperature for the T-rating.

4.7 Drop Test – 3 feet

One sample of each of the flashlight designs (20-watt and 25-watt) was dropped from a height of 3 feet onto a smooth concrete floor. Six drops were conducted on each light using various impact positions on the flashlight. None of the drops caused a compromise in the integrity of the lamp envelope.

4.8 Drop Test – 30 feet

One light sample was dropped from a height of 5, 10, 15, 20, 25, and 30 feet on a smooth concrete floor such that the light impacted on the lens (the worst case position). The lens did not break, and the light functioned after reestablishing the lamp disconnect mechanism contacts through switch positioning. One sample was used for each drop height.

4.9 Dust-Tight Enclosure Test (Atomized water spray)

The enclosure was sprayed with atomized water by using a nozzle that produces a round pattern that is 3-4 inches in diameter when measured 12 inches from the nozzle tip. The air pressure for the suction feed was adjusted to 30 PSI and the suction height of the water was set to 6 inches. Based on the length of the longest light (14 inches) the lights were sprayed with water at a rate of 3 GPH for a period of 5 minutes using a total of more than 6 fluid ounces for the test (actual consumption was approximately 33 fluid ounces). The spray was directed at all point on the light enclosure. There was no sign of water ingress to the enclosure following the test period. The test results indicate that the enclosure can be considered to be dust tight.

4.10 Dust-Tight Enclosure (Additional Test per customer request)

An additional test, similar to the Dust-Tight Test) was conducted on the light assembly. The light was placed under a 15" head of water with the water held at +50°C for 15 minutes. During this test, the internal temperature of the light is escalated causing an internal pressure. If there are leaks in the enclosure, air bubbles will form and escape from the enclosure during the test. No bubbles were seen coming from the enclosure during the submergence test. Additionally, the light was placed under a 15-foot head of water (6.4 PSI) for a period of 15 minutes. Following the submerged pressure test, there was no sign of water ingress to the enclosure.

4.11 Impact Test

Two samples of the flashlight design were impacted by a falling weight with a 1-inch diameter steel ball face. The impact dart was dropped onto the lens of the light from a height of 6 inches. No fracture of the lens was noted after the impacts and no compromise to the enclosure was detected on the lights tested. Each light was impacted only once for the test.

4.12 Thermal Endurance to Heat

One flashlight was subjected to 28 days of thermal conditioning at a condition of 80°C and 95% RH. Following the exposure, the light was inspected for deterioration and any compromise in the enclosure. No degradation effects were observed on the tested light.

4.13 Thermal Endurance to Cold

One flashlight was subjected to 24 hours of cold storage in a chamber held at a temperature of -40°C. Following the exposure none of the plastics parts showed any signs of deterioration and the light functioned properly. No compromise to the enclosure was observed as a result of the cold storage.

5. OBSERVATIONS AND COMMENTS

The results presented herein apply only to the test specimen as prepared and as tested. All equipment used in the performance of these tests was calibrated to standards traceable to the N.I.S.T.

# INSTRUMENTATION EQUIPMENT SHEET

**Date:** Jan 7, 2008 **Job No.:** 17961 **Customer:** Larson Electronics

**Technician:** Connell **Test Area:** Explosion Test Cell

**Test Item:** Flashlight

| INSTRUMENT | MFG | MODEL | RANGE | ACCURACY | CAL DATE | CAL DUE |
|---|---|---|---|---|---|---|
| Hydrocarbon Analyzer | Summit Industries | 703D2 | 0 to 10% | 0.1% | Each Use | Each Use |
| Temperature Indicator / Controller | Omega Eng'ring | i-Series | Multi | 0.03% | 10-10-07 | 10-10-08 |
| RH Indicator | Omega Eng'ring | RH70 | 0 to 100% | 0.1% | 11-26-07 | 11-26-08 |
| Digital Multimeter | Fluke | 12 S/N: 81240025 | Multi | 0.2% | 1-20-07 | 1-20-08 |

Instrumentation Information Verified by: