

Factory Mutual Research Corporation
 1151 Boston-Providence Turnpike
 P.O. Box 9102
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4D4A0.AX
 (3613, 3611)

February 19, 1998

SUPER PELILITE, MODEL 1800
 MITYLITE MAGNUM, MODEL 2300
 VERSABRITE I, MODEL 2250
 VERSABRITE II, MODEL 2270
 SEALED HANDHELD FLASHLIGHTS
 for
 HAZARDOUS (CLASSIFIED) LOCATIONS
 from
 PELICAN PRODUCTS
 23215 EARLY AVE.
 TORRANCE, CA 90505

I INTRODUCTION

1.1 Pelican Products requested Approval of the apparatus listed in Section 1.2 to be in compliance with the applicable requirements of the following standards:

<u>Title</u>	<u>Class No.</u>	<u>Issue Date</u>
Electrical Equipment for Use in Hazardous (Classified) Locations, General Requirements	FMRC 3600	March 1989
Electric Flashlights and Lanterns for Use in Class I, Div. 2, Class I, Zone 2 Hazardous (Classified) Locations	FMRC 3613	June 1996
Electrical Equipment for Use in Class I, Div. 2, Class II, Div. 2 and Class III, Divisions 1 and 2 Hazardous Locations	FMRC 3611	April 1986

1.2 The flashlights listed in Sections 1.3 and 1.4 have been previously approved by FMRC. They were submitted for re-examination to determine ignition capabilities at elevated pressures.

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1.3 The following apparatus was evaluated as Nonincendive for Class I, Division 2, Groups A,B,C and D hazardous (classified) locations and will appear in the Approval Guide as follows:

NI/I/2/ABCD

VersaBrite I Handheld Flashlight. Model 2250*

*When used with 2"AA" Eveready Energizer E91, Duracell MN1500 or Ray-O-Vac AL-AA or 815 Batteries and Lamp Module Cat. No. 2204, P/N 1903-350-000.

VersaBrite II Handheld Flashlight. Model 2270*

*When used with 2 "AA" Eveready Energizer E91, Duracell MN1500 or Ray-O-Vac AL-AA or 815 Batteries and Lamp Module Cat. No. 2274, P/N 2273-351-000.

1.4 The following apparatus was evaluated as Nonincendive for Class I, Division 2, Groups A,B, C and D; Suitable for Class II, Division 2, Groups F and G and Suitable for Class III, Division 2 hazardous (classified) locations and will appear in the Approval Guide as follows:

NI/I/2/ABCD; S/II/2/FG; S/III/2

MityLite Magnum Sealed Handheld Flashlight. Model 2300*

*When used with 2 "AA" Eveready Energizer E91, Duracell MN1500 or Ray-O-Vac AL-AA or 815 Batteries and Lamp Module Cat. No. 2304, P/N 2303-351-000.

Super PeliLite Sealed Handheld Flashlight. Model 1800*

*When used with 2 "C" Eveready Energizer E93, Duracell MN1400 or Ray-O-Vac AL-C or 813 Batteries and Lamp Module Cat. No. 1804, P/N 1803-350-000.

II DESCRIPTION

2.1 **General** - The flashlights listed in Sections 1.3 and 1.4 are handheld portable battery powered flashlights. The MityLite Magnum Model 2300 and Super PeliLite Model 1800 are sealed for underwater usage and contain a vent valve for pressure relief. The Models 2250, 2270 and 2300 contain two "AA" batteries and the Model 1800 contains two "C" batteries. The batteries in each flashlight are series connected. All models are activated by the rotation of the bezel.

2.2 **Lamp Assemblies** - All models utilize lamp assemblies manufactured by Carley Lamp and specified as follows:

<u>Model</u>	<u>Carley P/N</u>	<u>Pelican Products</u>	
		<u>Cat. No.</u>	<u>P/N</u>
2250	787	2204	1903-350-000
2270	1114	2274	2273-351-000
2300	1080	2304	2303-351-000
1800	841	1804	1803-350-000

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III EXAMINATION AND TESTS

Representative samples of the apparatus listed in Sections 1.3 and 1.4 were examined and tested by Factory Mutual Research Corporation (FMRC) to determine their acceptability for use in the specified hazardous locations. The examination included enclosure pressure testing, ignition testing, temperature evaluation and dust-exclusion testing, as well as a review of the manufacturer's documentation and the unit's physical construction. All were satisfactory and are summarized in the following sections. All data is on file at FMRC along with other documents and correspondence applicable to this program.

3.1 Nonincendive Examination - Nonincendive equipment acceptability is based on the inability of the apparatus to release sufficient electrical or thermal energy under normal operating conditions to cause ignition of specific hazardous atmospheres.

3.1.1 Enclosure Pressure Test - Pressure testing was conducted on a series of six samples to determine the maximum internal pressure prior to venting. The test was conducted on a fully assembled model void of batteries. This test is required only for sealed flashlights. The results are as follows:

<u>Model</u>	<u>Maximum Venting Pressure</u>
MityLite Magnum, 2300	3.4 psi
Super PeliLite, 1800	2.2 psi

The above models utilize a threaded cover to actuate the lamp. A second set of tests was conducted to verify that there is no ejection of the cover or parts of the device. With the batteries in place, the threaded cover was unscrewed two turns past the extinguishing point of the lamp. Pressure was applied until venting occurred. There was no rupturing of the lens, cover, or any other parts.

3.1.2 Make/Break Evaluation - Spark ignition testing was conducted using a 21% hydrogen-in-air mixture at 1.1 times the maximum recorded venting pressure. A series of six tests on a battery set was conducted in its intended configuration for each battery type and manufacturer. A fresh set of batteries was used for each test. Results are as follows:

3.1.2.1 Models 2300, 2250 and 2270 - The test circuit consisted of two fresh "AA" cells with no lamp resistance in the circuit. The gas mixture was pressurized to 3.74 psi. A series of six tests were conducted using Duracell MN1500 cells, Eveready Energizer E91 cells and Ray-O-Vac AL-AA cells. Results were satisfactory in that there was no ignition of the test gas.

3.1.2.2 Model 1800 - The test circuit consisted of two fresh "C" cells with no lamp resistance in the circuit. The gas mixture was pressurized to 2.40 psi. A series of six tests were conducted using Duracell MN1400 cells, Eveready Energizer E93 cells and Ray-O-Vac AL-C cells. Results were satisfactory in that there was no ignition of the test gas.

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3.1.3 Drop Test - Fully assembled representative samples of each model were dropped six times onto a concrete floor from a height of 3 ft. (0.9m). The direction of the unit was varied so as to impact the floor on all sides. The results are satisfactory in that there was no separation or ejection of the batteries or any damage which would affect safety in the Division 2 hazardous location.

3.1.4 Temperature Evaluation

3.1.4.1 VersaBrite II Model 2270 and MityLite Magnum Model 2300 - Temperature evaluation for VersaBrite II Model 2270 and MityLite Magnum Model 2300 are based on testing conducted under FMRC J.I. 2Z3A8.AX. The maximum temperature was measured on the lamp and referenced to a 40°C ambient.

VersaBrite II Model 2270	Temperature Code = T3A (180°C)
MityLite Magnum Model 2300	Temperature Code = T3A (180°C)

3.1.4.2 VersaBrite I Model 2250 and Super PeliLite Model 1800 - Temperature evaluation was based on testing for T4 Classification according to component size and ambient temperature. Testing was conducted by placing a lamp assembly in a mixture of diethyl-ether and powering the lamp with a fresh set of batteries. Results were satisfactory in that there was no ignition of the test gas.

VersaBrite I Model 2250	Temperature Code = T4 (135°C)
Super PeliLite Model 1800	Temperature Code = T4 (135°C)

3.2 Class II, III Evaluation - The enclosures of the MityLite Magnum, Model 2300, and Super PeliLite, Model 1800, were evaluated for dust-exclusion and temperature. Testing as follows:

3.2.1 Impact Test - A fully assembled representative sample of each model was subjected to an impact of 2.7 Joule. The impact was obtained by dropping a 4 lb (1.8 kg) weight from a height of 6 inches (150 mm) onto the lens, vent and side of vent. Results were satisfactory in that no damage occurred to the sample that would impair the enclosures ability to pass the subsequent dust exclusion test.

3.2.2 Normal and Cold Drop Test - Fully assembled samples of each model were subjected to a drop test at room temperature as described in Section 3.1.3. Additional samples were subjected to a drop test at a temperature of -25°C. The lens caps were loosened two turns past the extinguishing point of the lamps and samples were dropped 3 times at a different angle from a height of 3 feet onto a concrete floor. Results were satisfactory in that no damage occurred to the sample that would impair the enclosures ability to pass the subsequent dust exclusion test.

3.2.3 Dust-Exclusion Test - A Model 2300 and Model 1800 fully assembled enclosure was suspended in a circulating dust atmosphere of 200 mesh talc while connected to a vacuum pump adjusted to draw a vacuum of 20 mBar on each sample. The lens caps on both samples were loosened two turns past the extinguishing point of the lamps. The test was continued for eight hours at an average air extraction rate of 18.1 volumes per hour for the Model 2300 and 15.2 volumes per hour for the Model 1800. At the conclusion of the test, excess dust was removed from the sample exteriors and the samples opened. Results were satisfactory as the enclosures excluded the entry of dust.

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3.2.4 **Temperature Testing** - Measurements were taken on the lens under a one inch layer of dust. The maximum recorded temperatures, when adjusted to an ambient temperature of 40°C, are 84.3°C for the Model 2300 and 80.5°C for the Model 1800. There was no charring of the dust as a result of this test. No additional temperature code is required.

3.2.5 **Mold Stress** - One complete sample of Model 2300 and Model 1800 (void of batteries) was placed in a full circulating air oven at a temperature of 94.1°C for 7 hours. After allowing the samples to cool to room temperature, it was determined that there was no damage to any parts, external or internal.

IV MARKING

Marking is molded onto the body of the flashlight and meets standard requirements as illustrated by the attached labels.

V REMARKS

5.1 Only the specific batteries and lamps tested shall be used with this apparatus. The batteries are to be installed according to the manufacturer's instructions.

5.2 Only fresh batteries should be used when cells are replaced.

5.3 Batteries and lamps must not be replaced in a hazardous area.

5.4 Tampering or replacement with nonfactory components may adversely affect the safe use of the system.

VI FACILITIES AND PROCEDURES AUDIT

The manufacturing site in Torrance, CA is examined on a periodic basis with regard to facilities and quality control procedures. Results are satisfactory in that the level of performance assures continued product quality as originally Approved herein.

VII MANUFACTURER'S RESPONSIBILITIES

7.1 The documentation listed in Section VIII is applicable to this Approval and is on file at Factory Mutual Research Corporation. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FMRC. The Approved Product - Revision Report, FMRC Form 797 shall be forwarded to Factory Mutual Research Corporation as notice of proposed changes.

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VIII DOCUMENTATION

The following documentation is applicable to this Approval and is on file at Factory Mutual Research Corporation.

<u>Document No.</u>	<u>Revision</u>	<u>Title</u>
1903-300-000	A	Gas Pellet

Super PeliLite - Model 1800

1800-001	B	Label
1800-000	F	Assembly
1801-946-000 ^{au1}	<i>ER</i>	Body
2001-946-000	-	Plug Valve
1804-401-000	C	Foam Pad
S22	B	Lanyard Slide & End
1203-2	B	End Cap
1803-920-100	C	Lens
1803-350-000	PR	Cat. # 1804 Lamp Module
1803-321-000	A	O-Ring
1803-331-000	E	Battery Retainer
2103-300-110	A	Lanyard
1803-341-000	C	Spring, Battery Contact
1803-945-110	B	Shroud
2003-347-000	B	Spring Purge Valve
2003-346-000	-	Disc Relief Valve
2003-322-000	A	O-Ring Relief Valve

MityLite Magnum - Model 2300

2300-001	B	Label
2300-010-110	I	Assembly
2303-351-000	E	Lamp Module, Cat # 2304
3113-301-000	-	Plug Valve
2303-321-000	B	O-Ring
2003-346-000	-	Disc Relief Valve
2003-322-000	A	O-Ring Relief Valve
2303-342-000	B	Contact Pad
2303-343-000	PR	Washer
2303-925-000	B	Shroud
2303-331-000	E	Retainer
2003-347-000	B	Spring Purge Valve
2303-920-100	B	Lens
2301-920-000	H	Body

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<u>Document No.</u>	<u>Revision</u>	<u>Title</u>
<u>VersaBrite I & II - Models 2250 & 2270</u>		
2200-001	C	Label
2250-000-000	E	Cut-Away Drawing - Model 2250
2270-010	D	Cut-Away Drawing - Model 2270
2203-342-000	PR	Ring - Model 2250
2273-342-000	A	Ring - Model 2270
2203-343-000	C	Eyelet, Hinge
2403-344-000	C	Jumper Contact
2200-010	D	Case
2200-020	G	Cap
1971-925-110	A	Shroud - Model 2250
2271-925-110	B	Shroud - Model 2270
1903-920-100	C	Lens - Model 2250
2303-920-100	B	Lens - Model 2270
2203-341-000	B	Spring, Battery Contact
1903-341-000	D	Spring - Model 2250
2273-341-000	D	Spring - Model 2270
2501-923	C	Goose-Neck
2203-350-000	C	Lamp Module, Cat # 2204 - Model 2250
2273-351-000	PR	Lamp Module, Cat # 2270 - Model 2270
1903-321-000	A	O-Ring - Model 2250
2303-321-000	A	O-Ring - Model 2270
2501-924	PR	Cover
2003-345-0000	-	Eyelet, Contact - Model 2270

IX CONCLUSION

The apparatus described in Section 1.2 meets Factory Mutual Research Corporation requirements. Approval is effective when the Approval Agreement is signed and received by FMRC.

EXAMINATION AND TESTS BY: Cheryl A. Gagliardi, John J. Woolley, Curt D. Mace

ORIGINAL TEST DATA: Project Data Record 4D4A0.AX

ATTACHMENTS: Model 1800 Label Drawing - Dwg. 1800-001, Rev. B
Model 2300 Label Drawing - Dwg. 2300-001, Rev. B
Models 2250 & 2270 Label Drawing - Dwg. 2200-001, Rev. C

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