



August 22, 2000

Mr. James D. Kennedy
Research & Development Manager
Empco-Lite
909 Grace Street
Elgin, Illinois 60120

Refer to: HSA-1

Dear Mr. Kennedy:

Thank you for your April 14 letter requesting Federal Highway Administration (FHWA) acceptance of various traffic control devices for use in work zones on the National Highway System (NHS). You requested that we review tests including your company's warning lights mounted on Type II and Type III barricades and Vertical Panels as manufactured by Bob's Barricades of Florida. Accompanying your letter was a report from E-Tech Testing Services, Inc., a detailed description and drawing of each device, and videos of the crash tests. You requested that we find the lights and channelizing devices acceptable for use on the NHS under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Introduction

The FHWA guidance on crash testing of work zone traffic control devices is contained in two memoranda. The first, dated July 25, 1997, titled "Information: Identifying Acceptable Highway Safety Features," established four categories of work zone devices: Category I devices were those lightweight devices which could be self-certified by the vendor, Category II devices were other lightweight devices which needed individual crash testing, Category III devices were barriers and other fixed or massive devices also needing crash testing, and Category IV devices were trailer mounted lighted signs, arrow panels, etc. The second guidance memorandum was issued on August 28, 1998, and is titled "INFORMATION: Crash Tested Work Zone Traffic Control Devices." This later memorandum lists devices that are acceptable under Categories I, II, and III.

A brief description of the devices for which you are requesting acceptance follows. Drawings of each are enclosed for reference.

- A) Type II Barricade: The legs are 32 mm x 32 mm x 11 gauge mild steel angle iron attached at the top with 12.7 mm diameter x 25.4 mm long hex cap screws with nuts and lock washers. The top and bottom panels are 203 mm wide 14 gauge steel. The panels are attached to the legs with 6.35 mm x 19 mm long hex cap screws with nuts and lock washers. An Empco-Lite warning light Model 499 Type A & C was attached to the top of the barricade via a 12.7 mm diameter cadmium plated steel bolt and a

38.1 mm diameter, 19 mm high cup washer. The typical length of the bolt is 95.25 mm. The total mass of the tested barricades 15.6 kg each.

- B) Type III Barricade: The legs are 38 mm x 38 mm x 4.8 mm mild steel angle iron supports. Affixed to the upright supports are three 203 mm wide, 22 mm thick hollow core extruded plastic panels using 7.9 mm x 38.1 long hex cap screws with nuts and lock washers. An Empco-Lite Warning light Model 212 Type B was attached to the top of the barricade via a 12.7 mm diameter cadmium plated steel bolt and a 38.1 mm diameter, 19 mm high cup washer. The total mass of the tested barricades 25.5 kg each.
- C) Vertical Panel: The legs are 32 mm x 32 mm x 11 gage mild steel angle iron. Two 305 mm wide, 4.8 mm thick plastic panels are affixed to the legs. An Empco-Lite Warning light Model 499 Type was attached to the top of the barricade via a 12.7 mm diameter cadmium plated steel bolt and a 38.1 mm diameter, 19 mm high cup washer. The total mass of the tested vertical panels was 12.2 kg each.

Testing

Full-scale automobile testing was conducted on Bob's Barricades Type II barricade and vertical panels with Empco-Lite warning lights attached. Two stand-alone examples of the device were tested in tandem, one head-on and the next placed six meters downstream turned at 90 degrees, as called for in our guidance memoranda.

The crash testing is summarized in the table below:

Test Number	19-0101-001	19-0101-002	19-0101-003
Test Article	Type II	Type III	Vertical Panel
Height to Top of Rails	1092 mm	1524 mm	1067 mm
Width of Barrier unit	610 mm	1524 mm	305 mm
Test Article Mass (each)	15.6 kg	25.5 kg	12.2 kg
Empco-Lite model #	Model 499 A & C	Model 212 Type B	Model 199
Mass of warning light	1.95 kg	2.07 kg	1.95 kg
Vehicle Inertial Mass	818 kg	817 kg	815 kg
Impact Speed, Head-on	102.5 km/h	102.5 km/h	101.1 km/h
Impact Speed, 90 Deg.	101.8 km/h	99.0 km/h	98.3 km/h
Velocity Change, Head-on	0.2 m/sec.	1.0 m/sec.	0.8 m/sec.
Velocity Change, 90 Deg.	0.2 m/sec.	1.0 m/sec.	0.8 m/sec.

Vehicle crush	Grill & hood dents	Grill & hood dents	Grill & hood dents
Occupant Compart. Intrusion	None	None	None
Windshield Damage Head-on	No contact	Moderate cracking	No contact
Windshield Damage 90 Deg.	No contact	No contact	No contact

Findings

Damage to the vehicle was limited to dents to the grill and hood. The test articles did not show potential for penetrating the occupant compartment. The results of this testing met the FHWA requirements and, therefore, the devices listed above are acceptable for use as Test Level 3 devices on the NHS under the range of conditions tested, when proposed by a state. Please also note that our acceptance of Type II barricades extends to Type I barricades of the same design except that the lower rail is not reflectorized.

In addition, Empco-Lite warning lights are acceptable for use on these channelizing devices as shown in the following table:

	Type II Barricades	Type III Barricades	Vertical Panel
Empco-Lite model #s	Model 499 A & C Model 199	Model 212 Type B Model 499 Model 199	Model 199 Model 499 A & C
Mass of warning light	1.95 kg	2.07 kg	1.95 kg

Model 499 and 199 warning lights are interchangeable by virtue of their similar weight and construction, and may be substituted on Type III barricades because they are lighter than the light tested with the Type III barricade. Empco-Lite “Y2K” lights may be substituted for any of the above as their 1.2 kg mass is less than any of the tested lights. Note that all warning light attachments shall use the 38.1mm diameter, 19mm high cup washer to reduce the possibility of separation.

Please note the following standard provisions which apply to FHWA letters of acceptance:

- ! Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices (MUTCD).
- ! Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- ! Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- ! You will be expected to supply potential users with sufficient information on design and

installation requirements to ensure proper performance.

- ! You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- ! To prevent misunderstanding by others, this letter of acceptance, designated as number WZ-48, shall not be reproduced except in full.
- ! Some features of these lighted barricades may be patented products and considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are selected by the contractor for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are specified for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed.

Sincerely yours,



Frederick G. Wright, Jr.
Program Manager, Safety



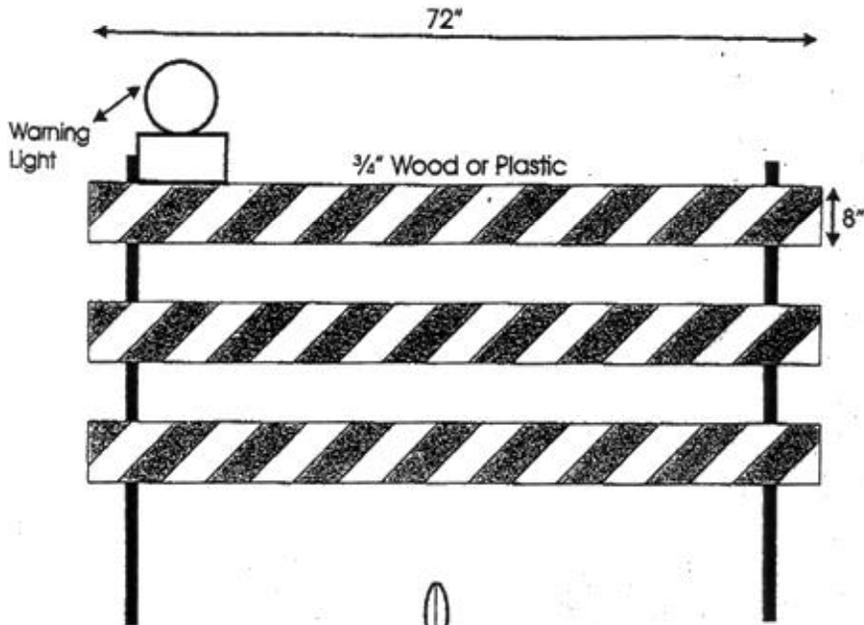
C. Illustrations



Specifications:

- 4 Galv. Barricade Legs, Warning Light,
- 2 Plastic or Steel top Panels with Pre-stripped
Hi-Intensity Sheeting, Bolts, Washers and Nuts

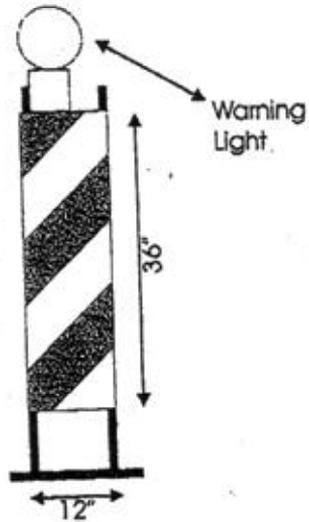
Illustration C-1. Type II Bob's Barricade (1 of 1)



Specifications: 1 Warning Light,
3 - 6' X 8" Wooden or Plastic Panels
with Pre-Striped High Intensity
sheeting
2 - Galv. Legs 2" X 2" X 3/16" square
tubing



Illustration C-2. Type III Bob's Barricade (1 of 1)



- Specifications:
- 1-Warning Light
 - 4 Galv. Barricade Lt
 - Prestriped-High Inte
 - 2 Plastic or steel pc
 - Bolts, Washers, and



Illustration C-3. Bob's Barricade Vertical Panel (1 of 1)



TYPE "A" and "C" BARRICADE WARNING LIGHTS

MODEL 100 - 2

- Patented lexan nut attached lens to upper case
- Eliminates the need for washers and self tapping screws

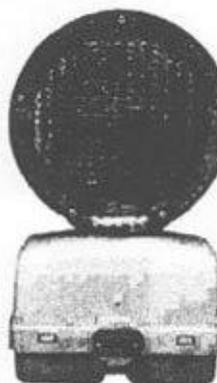
MODEL 100

New Lexan ring and washer using self tapping screws

- Eliminates corrosion problems with metal parts
- Uses same size screw as lens halves
- Hi tech design for fast repair of damaged lenses
- Strengthens the light thus making this the strongest barricade light available

A
N
D

MODEL 400



Upper case design eliminates the need for the rubber neck ring.

- LENS:** 7" Polycarbonate Fresnel design with 5/8" reflector ring Meets S.A.E. Standards J576B and J594D Available in Amber, Red, Green, Blue and Clear Polycarbonate reflectors are available upon request
- HOUSING:** Model 100 - Hi-density polyethylene - UV stabilized Model 400 - Hi-impact polypropylene - UV stabilized Available in Yellow, Orange, Green, Red, Black and White Custom molded case identification and/or hot stamp imprinting available upon request Ultraviolet stabilized case materials assure outdoor durability.



Totally enclosed unit, no live prot hybrid circuit using the latest state of the art electronic components. Reverse polarity protected. Available in flashing and steady burn & or 12 volt with or without photo electric switch. Standard flash rate is 60x 10 FPM and on line is a minimum of 10% of the flash cycle. Special purpose circuits with various flash rates and or times are available upon request.

solid-state circuitry provides extended battery life, improved trouble-free performance.

- WARRANTY:** The electronic circuit is guaranteed for a period of two years from date of purchase against defects in materials and workmanship. EMPCO as its option, will repair or replace defective product, returned freight prepaid within the warranty period. Both the 100 and 400 models are packed in 140 per carton. In addition, each carton contains one (1) switch on, ten (10) nuts and one wrench. Weight per carton: 28 pounds.
- PACKAGING:** The standard tamper proof mounting bolt is 1/2" x 3-3/4" with a pyramid shaped head. Half moon and 5 sided nut or hex head bolts in various lengths and bolt protectors are available upon request.
- HARDWARE:**

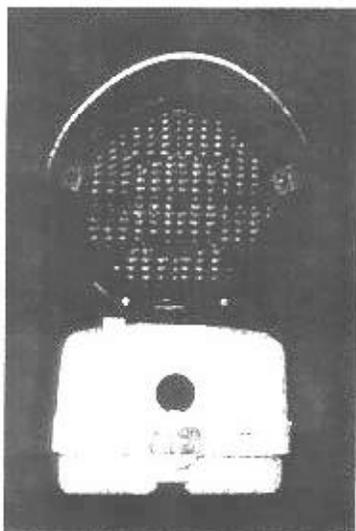


Wrenches use standard 1/2" socket drive allowing fast attachment of lights to barricade.

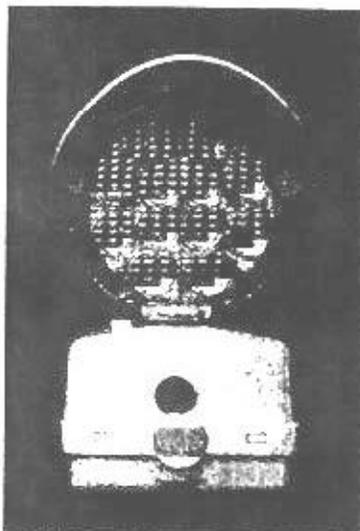


DIVISION OF ELGIN MOLDED PLASTICS CO.

212 LED LIGHT



Alert motorists of
upcoming stopping
areas



Alert motorists of
upcoming construction
zones

HIGHLIGHTS:

- Provides a greater brightness than standard barricade lights
- Batteries will last approximately 24 days as tested with 2 Rayovac® HD batteries
- Uses an LED "Hi-Intensity" ("B") Light circuit. It uses only 20% of the current of what a regular 957 incandescent bulb uses.
- Exceeds ITE purchase specifications for Type "A" warning lights.
- Tested and exceeds Type "B" specifications.

EMPCO-LITE DIV.

Elgin Molded Plastics Inc., 909 Grace Street, Elgin, IL 60120
(847) 931-2455 • 800-548-5483 • FAX (847) 931-2454

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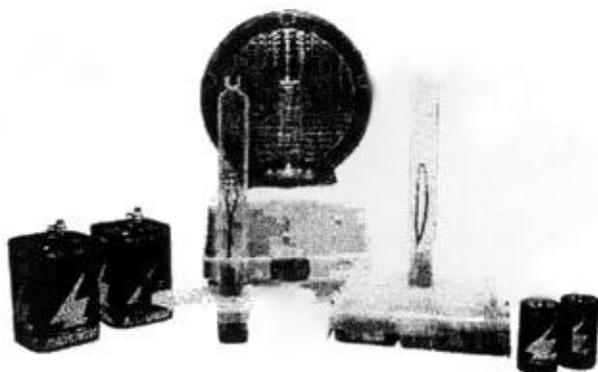
Illustration C-4. Empco-Lite General Product Information (2 of 5)



Empco-Lite®

DIVISION OF ELGIN MOLDED PLASTICS CO.

LED Barricade Breakaway Candle



Model 499L

(for use with two 6 volt lantern batteries)

Model 444L

(for use with four D-cell batteries)

Highlights of new Breakaway Design for Models 444 and 499:

- Protects expensive LED circuitry when head assemblies are damaged
- Reduce Repair and Maintenance Costs
- Increase your Income with the many benefits of LED technology
- Provide added safety to the motoring public from this long-lasting and bright light
- Exceeds I.T.E. Purchase Specifications and MUTCD for Types A and C Barricade Lights
- New Lens design has built-in stop to eliminate wire damage
- Tested by Calcast ITL #0115--1B/C99

See the Difference:

EMPCO-LITE DIV.

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Illustration C-4. Empco-Lite General Product Information (3 of 5)