



DEPARTMENT OF TRANSPORTATION

Federal Motor Carrier Safety Administration

[Docket No. FMCSA-2021-0187]

Parts and Accessories Necessary for Safe Operation; Pi Variables, Inc Application for an Exemption

AGENCY: Federal Motor Carrier Safety Administration (FMCSA), DOT.

ACTION: Notice of final disposition.

SUMMARY: FMCSA announces its decision to grant a limited 5-year exemption to Pi Variables, Inc. (Pi Variables) to allow Pi-Lit Smart Sequential Road Flares (LED flares) to be deployed when commercial motor vehicles (CMVs) are stopped upon the traveled portion of a highway or the shoulder of a highway for any cause other than necessary traffic stops. The Federal Motor Carrier Safety Regulations (FMCSRs) require one of the following warning devices to be deployed when a CMV is stopped upon the traveled portion of a highway or the shoulder of a highway for any cause other than necessary traffic stops: three bidirectional emergency reflective triangles; at least 6 fusees or at least 3 liquid-burning flares. The vehicle must have as many additional fusees or liquid-burning flares as are necessary to satisfy the regulatory requirements. Other warning devices may be used in addition to, but not in lieu of, the required warning devices, provided they do not decrease the effectiveness of the required devices. The Agency has determined that granting the exemption would likely achieve a level of safety equivalent to or greater than the level of safety provided by the FMCSRs.

DATES: This exemption is effective [INSERT DATE 5 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER] and ending June 27, 2028.

FOR FURTHER INFORMATION CONTACT: José R. Cestero, Vehicle and Roadside Operations Division, Office of Carrier, Driver, and Vehicle Safety, MC-PSV,

Federal Motor Carrier Safety Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590-0001; (202) 366-5541; jose.cestero@dot.gov.

Docket: For access to the docket to read background documents or comments submitted in response to the notice requesting public comments on the exemption application, go to www.regulations.gov at any time or visit Room W12-140 on the ground level of the West Building, 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., ET, Monday through Friday, except Federal holidays. To be sure someone is there to help you, please call (202) 366-9317 or (202) 366-9826 before visiting Docket Operations. The on-line Federal document management system at the beginning of this notice.

I. BACKGROUND

FMCSA has authority under 49 U.S.C. 31136(e) and 31315(b) to grant exemptions from certain parts of the FMCSRs. FMCSA must publish a notice of each exemption request in the Federal Register (49 CFR 381.315(a)). The Agency must provide the public an opportunity to inspect the information relevant to the application, including any safety analyses that have been conducted. The Agency must also provide an opportunity for public comment on the request.

The Agency reviews safety analyses and public comments submitted and determines whether granting the exemption would likely achieve a level of safety equivalent to, or greater than, the level that would be achieved by compliance with the current regulation (49 CFR 381.305). The decision of the Agency must be published in the Federal Register (49 CFR 381.315(b)) with the reasons for denying or granting the application and, if granted, the name of the person or class of persons receiving the exemption, and the regulatory provision from which the exemption is granted. The notice must also specify the effective period (up to 5 years) and explain the terms and conditions of the exemption. The exemption may be renewed (49 CFR 381.300(b)).

II. Pi VARIABLE'S APPLICATION FOR EXEMPTION

Pi Variables applied for an exemption from 49 CFR 393.95(f) to deploy LED flares in place of bidirectional emergency reflective triangles, fusees or liquid-burning flares when CMVs are stopped upon the traveled portion of a highway or the shoulder of a highway for any cause other than necessary traffic stops. Pi Variables stated that LED flares provide an advantage over liquid-burning flares and fusee flares as the latter can create a significant fire hazard, pollute water runoff, generate health hazards related to inhalation of fumes, and cannot be used in the setting of a spill of flammable material. A copy of the application is included in the docket referenced at the beginning of this notice.

Section 393.95(f) of the FMCSRs requires warning devices be deployed when a CMV is stopped upon the traveled portion of a highway or the shoulder of a highway for any cause other than necessary traffic stops. The regulation requires the use of either three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125, or at least 6 fusees or 3 liquid-burning flares while the vehicle is stopped. The vehicle must also have as many additional fusees or liquid-burning flares as are necessary to satisfy the requirements of § 392.22, which specifies how the hazard warnings are to be displayed while stopped. Section 393.95 also permits the use of other warning devices in addition to, but not in lieu of, the required warning devices, provided those warning devices do not decrease the effectiveness of the required warning devices.

The LED flares are comprised of a series of wirelessly interconnected individual LED warning devices. Each warning device is illuminated by an array of LEDs which, combined with other warning devices, provide four different options to adjust the flash pattern: two sequential, one simultaneous, and one with steady burn. Pi Variables notes

that every LED flare can support 50,000 lbs. of load while also meeting the IP 67 code¹ for ingress protection against water and dust. A carrying case and two different options to power the LED flares are provided: lithium-ion rechargeable batteries or AA alkaline batteries.

In its petition, Pi Variables stated that the benefits of deploying LED flares include the prevention of fire danger, pollution, and health conditions. Pi Variables stated that this alternative would maintain a level of safety that is equivalent to, or greater than, the level of safety achieved without the exemption.

III. SUMMARY OF COMMENTS

On February 18, 2022, FMCSA published a notice in the Federal Register (87 FR 9419) requesting public comment on Pi Variables' application for exemption. The Agency received comments from one individual who generally opposed granting the application and four comments in support of the application subject to conditions.

One commenter generally discouraged the use of LED flares, expressing concerns about longevity and battery life. The remaining four comments in favor recommended the use of LED flares due to environmental impact, health and fire danger concerns from fuses and liquid burning flares.

IV. FMCSA DECISION GRANTING EXEMPTION

A. Equivalent Level of Safety Analysis

FMCSA has evaluated the Pi Variables exemption application and the comments received. For the reasons discussed below, FMCSA believes that granting the exemption to allow LED flares to be deployed as an alternative to the bidirectional emergency reflective triangles, fuses, and liquid burning flares required by the FMCSRs

¹ International Electrotechnical Commission (IEC), Ingress Protection (IP) Rating Guide <https://www.iec.ch/ip-ratings>

is likely to achieve a level of safety equivalent to or greater than the level of safety provided by the regulation.

In 1999, the Texas Transportation Institute (TTI) published a report titled “Work Zone Lane Closure Warning Light System.”² Researchers investigated motorists’ understanding of various designs of LED flares and their perceived usefulness in a simulated work zone at night. The research was conducted at TTI’s proving ground facility at the Texas A&M University Riverside Campus. The LED flares used for the study were wired lights that flash in a sequence to delineate the taper on work zones. The proving ground study simulated a nighttime work zone with a left lane closure, tangent, flashing arrow panel, and prototype warning light system. The focus of the research was to study the effect of flashing LED flares and approach speeds upon motorists’ reaction to, and possible preference for, the LED flares. Field studies of the LED flares were also performed at night to determine if the system would yield significant operational or safety benefits in actual work zone applications.

Results from the proving ground and field studies showed that the flashing LED flares used in the work-zone lane closure were perceived positively and were not confusing to the motoring public. The field-study also found that the prototype LED flares encouraged motorists to vacate a closed travel lane farther upstream from the work zone. Accordingly, Pi Variables’ LED flares may provide similar safety benefits alerting drivers to a stopped vehicle while encouraging them to vacate the lane and navigate around the stopped vehicle.

In 2011, the University of Missouri with the support of the Federal Highway Administration’s Smart Work Zone Deployment Initiative Program conducted a study³ to

² Finley, M.D., G.L. Dudek. *Work Zone Lane Closure Warning Light System*. Draft Report 3983-1. Texas Transportation Institute, College Station Texas, September 1999. Available at time of publication at <https://static.tti.tamu.edu/tti.tamu.edu/documents/3983-1.pdf>

³ Sun, C., P. Edara, Y. Hou, and A. Robertson. *Final Report: Cost-Benefit Analysis of Sequential Warning Lights in Nighttime Work Zone Tapers*. University of Missouri, Columbia, MO. June 2011.

investigate the effectiveness of flashing LED flares on work zones during nighttime. The Sequential LED flares used for the study were wireless lights that flash in a sequence to delineate the taper on work zones. The effectiveness of sequential lights was investigated using controlled field studies. Traffic parameters were collected at the same field site with and without the deployment of sequential lights. Three surrogate performance measures were used to determine the impact of sequential lights on safety. These measures were the speeds of approaching vehicles, the number of late taper merges and the locations where vehicles merged into open lane from the closed lane. The result of this study indicates that sequential LED flares, like those designed by Pi Variables, had a net positive effect in reducing the speeds of approaching vehicles, enhancing driver compliance, and preventing passenger cars, trucks and vehicles at rural work zones from late taper merges.

With respect to longevity of LED flares under normal use, the Agency notes that Pi Variables reported that its LED flares have a life span of more than five years and include IP certification and crush strength. The IP certification is a rating system, defined by IEC/EN 60529⁴, of a product's ability to withstand liquid and dust intrusion. Pi Variables also subjects its LED flares to a crush strength test to establish the compressive force or crush resistance of the enclosure material.

Additional advantages of LED flares over the regulatorily required emergency equipment include: (1) activation when removed from their storage case (a useful safety feature at the time a driver exits the vehicle to deploy the LED flares during the night); (2) run-time for LED flares of more than 20 hours, while flares can burn for about twenty minutes; (3) the compact design and weight of LED flares that provide stability to the

⁴ International Electrotechnical Commission (IEC) 60529, Degrees of protection provided by enclosures (IP Code), Edition 2.2 published on August 29, 2013, https://webstore.iec.ch/preview/info_iec60529%7Bed2.2%7Db.pdf

devices during windy conditions; and (4) the safe use of LED flares near chemical or fuel spills.

A few commentors expressed concern about the potential for self-discharge of the batteries in the LED flares while they are stored without use in the truck. We note that the FMCSRs control for proper function of LED flares. Emergency equipment is an inspection item under § 396.11 as required by the FMCSR's. As such, if the LED flares are not functioning properly due to self-discharge during storage, the driver must complete a driver vehicle inspection report at the completion of the workday, and the motor carrier must ensure that the defect is corrected prior to vehicle re-dispatch.

For these reasons, the Agency believes that granting the use of LED flares as an alternative to emergency equipment currently specified in 49 CFR 393.95(f) will likely provide a level of safety that is equivalent to, or greater than, the level of safety achieved without the exemption. When compared to the bidirectional emergency reflective triangles, fusees, or liquid-burning flares, the Pi Variables LED flares provide drivers with an equivalent visual alert that (1) encourages vehicles to reduce speed near stopped CMVs, (2) directs vehicles to merge into another lane when lanes are closed, and (3) is not confusing for the motoring public. Additionally, Pi Variables' LED flares are safer for use where roadside fire hazards are present.

V. TERMS AND CONDITIONS

Exemption Period

The Agency hereby grants Pi Variables an exemption for a 5-year period, beginning June 27, 2023 and ending June 27, 2028 unless rescinded earlier by FMCSA.

A. Conditions of Exemption

1. This exemption is limited to Pi Variables' Pi-Lit LED flares and does not apply to any other LED flare system/technology.
2. During the exemption period, motor carriers operating CMVs may use Pi-Lit

LED flares in orange or red LED color in lieu of the bidirectional emergency reflective triangles, fusees, and liquid-burning flares specified in § 393.95(f).

3. Motor carriers deploying Pi-Lit LED flares under this exemption must deploy at least 3 flares within the time period and in the manner specified for deployment in 49 CFR 392.22.

4. The Pi-Lit LED flares must conform to the performance requirements specified in Underwriters Laboratories, Inc., UL No. 912, Highway Emergency Signals, Sixth Edition, May 11, 2018 for resistance to rain, wind, and dust, and minimum illuminance.

5. Interested parties possessing information that would demonstrate that motor carriers utilizing Pi-Lit LED flares are not achieving the requisite statutory level of safety should immediately notify FMCSA by email at *MCPSD@DOT.GOV*. The Agency will evaluate any such information and if safety is being compromised or if the continuation of the exemption is not consistent with 49 U.S.C. 31136(e) and 31315(b), will take immediate steps to revoke the exemption.

B. Preemption

In accordance with 49 U.S.C. 31313(d), as implemented by 49 CFR 381.600, during the period this exemption is in effect, no State shall enforce any law or regulation applicable to interstate commerce that conflicts with or is inconsistent with this exemption with respect to a firm or person operating under the exemption. States may, but are not required to, adopt the same exemption with respect to operations in intrastate commerce.

C. Termination

FMCSA does not believe that motor carriers, drivers, and CMVs covered by the exemption will experience any deterioration of their safety record. However, should this occur, FMCSA will take all steps necessary to protect the public interest, including revocation of the exemption without prior notice. The exemption will be rescinded if: (1)

motor carriers and/or CMVs fail to comply with the terms and conditions of the exemption; (2) the exemption has resulted in a lower level of safety than maintained before it was granted; or (3) continuation of the exemption would not be consistent with the goals and objectives of 49 U.S.C. 31136(e) or 31315(b).

Robin Hutcheson,
Administrator.

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