U.S. Department of Transportation

National Highway Traffic Safety Administration

ODI RESUME

OFFICE OF DEFECTS INVESTIGATION

NHTSA

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Investigation: PE 10-013
Date Opened: 04/30/2010 **Date Closed:** 09/02/2010
Investigator: Bruce York-B
Approver: Richard Boyd
Subject: Fire In Grote LED Clearance/Marker Lamps

MANUFACTURER & PRODUCT INFORMATION

Manufacturer: GROTE INDUSTRIES, LLC
Products: Grote LED Clearance/Marker Lamps Manufactured in 2006
Population: Confidential

Problem Description: Moisture can enter the subject LED lamp housing. Excessive moisture in the housing that does not dissipate can lead to the failure of the lamps, including overheating, melting, and, potentially, a fire.

FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	3	0	3
Crashes/Fires:	0	0	0
Injury Incidents:	0	0	0
Fatality Incidents:	0	0	0
Other*:	0	121	121

***Description of Other:** Warranty Claims

ACTION / SUMMARY INFORMATION

Action: This Preliminary Evaluation has been closed. See attached report for additional information.

Summary:

The subject Grote Clearance / Marker lamps have not demonstrated that they represent an unreasonable risk to motor vehicle safety. In the past five years of operational exposure ODI is only aware of 124 failures representing a failure rate of less than .02%. In the year leading up to this investigation ODI is only aware of 13 failures of the subject lamps. Of 124 failures ODI is not aware of any where the burning lamp resulted in damage to the vehicle beyond just the lamp. These lamps are often mounted on aluminum surfaces that help prevent the burning lamp from causing damage to the vehicle.

At a very early stage in the subject lamps exposure life Grote took steps to address the potential failures modes of the subject lamps. Grote made the necessary design changes to the lamps to prevent lamps from being susceptible to water intrusion. With these design changes Grote appears to have acted responsibly in proactively identifying and remedying potential design issues with the subject lamps even when the failure rates were very low. In light of these findings, a safety-related defect trend has not been identified at this time and further use of agency resources does not appear to be warranted. The closing of this investigation does not constitute a finding by NHTSA that no safety-related defect exists. The agency reserves the right to take further action if warranted by the circumstances.

For more detailed information, please see the attached closing report.

PRELIMINARY EVALUATION CLOSING REPORT

SUBJECT: 2004 through 2006 Grote LED Clearance Marker Lamps (Part #4724, 4746)

PE No.: 10-013 **Date Opened: 30-Apr-10** **Date Closed:**

BASIS: One fleet report of fire occurring on three subject lamps.

THE ALLEGED DEFECT: Moisture can enter the subject LED lamp housing. Excessive moisture in the housing that does not dissipate can lead to the failure of the lamps, including overheating, melting, and, potentially, a fire.

VEHICLE POPULATION: Confidential

DESCRIPTION OF COMPONENT: The subject component is a 3 inch Light Emitting Diode (LED) Thin Line Clearance / Marker Lamp (Part Numbers 4724, 4746). The lamp features a field replaceable lens, encapsulated potting for total circuit-board protection, an anti-torque design to protect against over-tightening and lens cracking and has a design voltage of 12.8 volts. An exploded view of the lamp is shown in Figure 1. Clearance / Marker lamps are used to enhance the conspicuity of motor vehicles on the public roads so that their presence is perceived and their signals understood, both in daylight and in darkness or other conditions of reduced visibility.

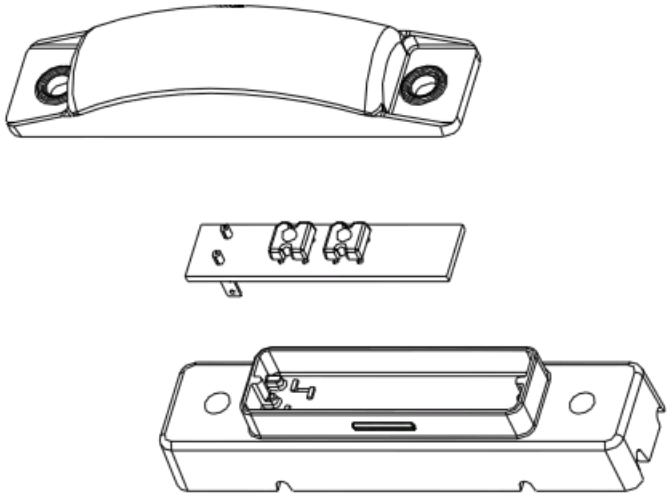


Figure 1. Clearance / Marker Lamp (4724, 4746)

FAILURE MODES: LED marker lamps utilize a solid state light source. These lamps are therefore inherently more durable than incandescent lamps. However, like all electronic components, LED's must be protected from moisture intrusion.

Similar to incandescent lamps, the integrity of the harness-to lamp connection is key to optimum system performance. To achieve long LED life, heat generated by operation of the lamp must be properly dissipated. This is controlled by circuit and mechanical design, and is easily achieved within the confines and power levels of marker lamps.

Thus, the primary concern for product durability is protection from moisture intrusion. Moisture intrusion into the lamp may cause corrosion of the conductors on the circuit board, which can create an open circuit, resulting in an inoperative lamp. Moisture intrusion may also cause residue from moisture and contaminants across conductors, which may create a short, increasing current draw and temperature.

The causes for moisture intrusion into the lamp include improper physical dimensions created during manufacture or an improper quantity or application of grease at time of manufacture. The incorrect dimensions may result in inferior seals around the terminals, allowing a path for moisture intrusion into the lamp. The improper quantity or application of grease may result in the lamp to the plug interface not sealing properly, which may result in moisture around the terminals. Corrosion of the terminals may create an open circuit or a moisture path into the lamp.

GROTE FAILURE ANALYSIS: In May of 2005 Grote was aware of 197 warranty claims for melted or burned lamps. These claims were from a population of lamps sold from product launch in March 2003 thru May 2005 and represented a warranty claim rate of less than 0.03%. Of the 197 claims 91 came from one fleet. Grote began a test program in the summer of 2005 to determine the reason for the failures. Figure 2. Shows the test setup. Testing found the primary causes for the failures were related to poor lamp to electrical connector fits that allowed moisture to enter the lamps and create short circuits. The connectors that were not mating well to the Grote lamps were not manufactured by Grote. Following testing Grote contacted the manufacture of the connectors and recommended design changes to the product so that it would mate more uniformly with their lamps. As well, Grote made a series of design changes to their lamps that would allow for a better mate with the connector and also provide for better sealing against moisture intrusion.

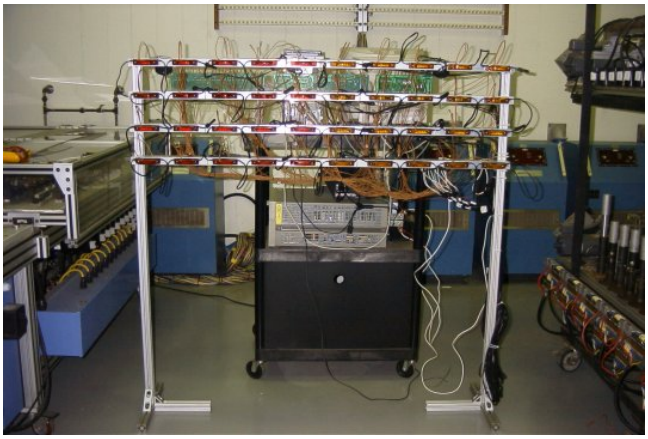


Figure 2. Clearance / Marker Lamp Test Setup

WARRANTY: Analysis of Grote warranty data for calendar years 2005 thru 2010 has identified 121 warranty claims that are potentially related to the alleged defect condition in the subject lamps. The data indicate that the alleged defect condition has occurred at very low rates, with the lamp warranty claim rate at less than 0.02% for the subject vehicles.

PREVIOUS RECALLS: A recall (10V-038) was released by Thor Industries in January 2010 that describes how certain Grote LED Marker Lamps (Part Number 4709) manufactured during the 2006 calendar year could possibly melt or burn. The recall describes how, in the case of vehicles manufactured by Thor Industries, the lamps could end up not being installed properly and as a result could allow moisture to enter the lamps and cause short circuits. The lamp failures were the result of improper installation and not a defect with the lamp itself. This failure mode was not experienced by other vehicle manufacturers who installed the same lamps. The 4709 LED lamps are different than the subject 4724 and 4746 lamps. The 4709 lamps have a sealed lens that is not removable while the subject lamps have a removable lens. The potting processes, electrical terminals, and electrical connector interfaces are all different. For these reasons, it was found that the recall on the 4709 lamps was in no way applicable to the subject lamps.

STATUS:

Problem Experience	ODI	MFR	Total
Owner Reports	3	0	3
Field Reports	NA	0	0
Warranty Claims	NA	121	121
Collision Incidents	0	0	0
Injury Incidents	0	0	0
Injuries	0	0	0
Fatal Incidents	0	0	0
Fatalities	0	0	0

CORRESPONDENCE: On May 27, 2010, NHTSA mailed an Information Request (IR) letter to Grote. Grote responded by letter dated July 16, 2010. The IR and Grote's response to the IR are available at NHTSA's public web site www.safercar.gov.

WARNING SYMPTOMS: Warning signs that a lamp might be failing include cracks in the lamp, moisture in the lamp, discoloration of the lamp, excessive current drawn by the lamp, not properly seated in mount or bracket, or diminished lamp output. These signs suggest that moisture may have entered the lamp fixture and that a short circuit is possible.

ODI ANALYSIS: This investigation was opened based on one complaint from a transportation fleet alleging 3 Grote LED clearance/marker lamp had failed. The lamps had melted or burned. Similar Grote LED clearance/marker lamps had recently been recalled (10V-038) by Thor Industries on four of their models built in the 2006 - 2008 Model Years. In the recall notice, Thor Industries explains that there was a material change that occurred on the recalled lamps that could result in a variation in material strength.

A Preliminary Evaluation (PE) was opened to determine if the subject clearance / marker lamps created a situation where a fire could initiate at the lamp and then spread to the remainder of vehicle the lamp was installed on.

Analysis of ODI and Grote data from 2005 thru 2010 has identified 3 complaints and 121 warranty claims that are potentially related to the alleged defect condition in the subject vehicles. The data indicate that the alleged defect condition has occurred at very low rates, with the marker lamp warranty claim rates at less than two one-hundredths of a percent (0.02%). Further analysis of the failure data shows that there have been no failures of the marker lamps that resulted in any sort of fire that spread from a burned lamp to any portion of the vehicle in over 5 years of service.

ODI reviewed the testing that Grote conducted in the summer of 2005. Grote had initiated this testing with a very low warranty rate of less than 0.03%. This testing resulted in Grote indentifying some design issues that could lead to moisture entering the lamps and potentially causing short circuits. The design issues were remedied by Grote and to date the failure rate on the subject lamps remain very low at less than 0.02%.

REASON FOR CLOSING:

The subject Grote Clearance / Marker lamps have not demonstrated that they represent an unreasonable risk to motor vehicle safety. In the past five years of operational exposure ODI is only aware of 124 failures representing a failure rate of less than 0.02%. In the year leading up to this investigation ODI is only aware of 13 failures of the subject lamps. Of 124 failures ODI is not aware of any where the burning lamp resulted in damage to the vehicle beyond just the lamp. These lamps are often mounted on aluminum surfaces that help prevent the burning lamp from causing damage to the vehicle.

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Bruce B. York

Safety Defects Engineer — Date: 9/1/10

I Concur:

Bruce York

Chief (Acting), Medium & Heavy Duty Vehicle Division — Date: 9/1/10

Richard Boyd

Director (Acting), Office of Defects Investigation — Date: 9/1/10