



<b>Health and Safety Executive</b>		<b>Sector Information Minute</b>	
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Target Audience:  
All FOD Inspectors

## **ELECTRIC SHOCK RISK DURING MAINTENANCE/REPAIR OF WARNING STROBE LIGHTS ON VEHICLES**

This SIM alerts inspectors to the findings of an investigation of electric shock to a maintenance fitter at an ambulance station. The conclusions of the investigation will have implications for workers in all sectors which operate vehicles fitted with strobe lights.

### INTRODUCTION

1 This guidance follows an investigation into an incident involving a blue light strobe system on an emergency ambulance. Similar systems will be found on other emergency vehicles, eg police and fire vehicles. They may also be used in alternative colours for warning purposes in other applications, eg aviation and construction plant.

2 The guidance in this SIM is not intended to cover risks from other warning light systems which are based on a halogen light and rotating mirror. These are distinct from strobes, which operate at high voltages.

### BACKGROUND

3 A maintenance craftsman working at an ambulance station sustained an electric shock, leading to supra ventricular tachycardia, whilst repairing a blue light unit. The ambulance service are under pressure to meet tight response times for emergency calls, therefore maintenance staff are required to repair and turn round vehicles as soon as possible.

4 The particular ambulance involved in the incident was fitted with a Tomar 776 strobe power pack. This power pack can operate at low or high intensity and a normal flash rate of 140 FPM, or pursuit rate of 340 FPM. The unit contains a energy storage capacitor which is connected to the negative battery terminal and hence to the vehicle body. The ambulance service involved operates the strobes in low intensity mode.

5 The Health and Safety Laboratory (HSL) examined a strobe unit supplied by the ambulance trust, and concluded that carrying out work on the lamps, wiring or the strobe

unit, whilst the strobe is powered, or whilst the strobe capacitor retains a charge, may present a greater risk than similar work carried out on a domestic electricity supply.

6 HSL estimate that the probability of ventricular fibrillation, and possibly death, following electric shock from the charged capacitor, to be 0-5%, with the higher value being likely if the unit is, or had recently been, operating in high intensity mode.

7 When disconnected from the supply, the voltage present on the strobe storage capacitor and the associated wiring (eg to each of the strobe lights) will normally decay to a voltage of 50 volts, or less, within a few minutes. This should not be relied on for safety purposes, because a single component failure could allow the charge to remain at a dangerously high voltage for an extended period of time. In such cases, there would be no outward indication of the presence of this hazardous voltage, unless testing was undertaken.

## PRECAUTIONS

8 Employers should carry out a risk assessment for all work which takes place on, or near, strobe lighting systems (Management of Health, Safety and Welfare Regulations 1999 (Management Regulations) reg.3). The assessment should include all conductors which can be energised at hazardous voltages, eg the strobe unit, the wiring to the strobe lights, any connections and terminal blocks within the wiring and the strobe fittings themselves.

9 A safe system of work should be drawn up for potentially hazardous work associated with strobe lighting systems (HSW Act s.2, Management Regulations reg.5, Electricity at Work Regulations 1989 (EAW Regulations) reg.4). Employers should refer to manufacturers' instructions for specific details. The safe system of work should consider the following:

(1) prior to starting work, the strobe power supply unit should be isolated from all possible sources of supply. Care must be taken to ensure that the means of isolation is able to prevent energisation from the usual source of supply and from any alternative source of supply such as a second vehicle battery, or a plug-in depot/workshop supply, or a ground power supply unit, etc. The means of isolation should also have the meaning assigned under EAW Regulations reg.12. This will, in particular, require that inadvertent reconnection of any source of supply is prevented by secure means;

(2) following the above mentioned isolation(s), sufficient time must be allowed for the energy in the capacitor to decay to a safe level. One manufacturer recommends 10 minutes. Alternatively, to discharge residual energy, a discharge plug, containing a suitable resistor, may be used. Manufacturers will be able to advise on appropriate methods for their equipment;

(3) following either method, confirmation that energy has been discharged, should be obtained before any conductors, which may be energised at hazardous voltages, are approached. This may be done by testing, noting that the voltage detector used for this purpose must be suitable for use at the maximum dc output

voltage of the strobe power pack, and that the voltage detector should be tested immediately before and after use; and

(4) it may be practicable to attach warning labels to, or near, the strobe unit, the strobe lights and any other point of access to conductors which could be energised at hazardous voltages.

10 All employees who may work on, or near, the strobe unit, the strobe lights and any other point of access to conductors which could be energised at hazardous voltages, and their line managers should receive information, instruction and training in the risks involved and the precautions necessary (HSW Act s.2, Management Regulations regs.10 and 13 and EAW Regulations reg.16).

11 Compliance with the safe system of work should be monitored by supervision (HSW Act s.2, Management Regulations reg.5).

#### ACTION BY INSPECTORS

12 Inspectors should be aware of the above incident and the findings of the HSL investigation. This should be raised at visits to appropriate services employers, typically, police, Fire Service, ambulance NHS trusts and some private ambulance operators. Precautions at these premises should be evaluated.

13 The Sector believes that there are many suppliers of strobe lighting systems. Where information supplied by the manufacturer is found to be inadequate, details should be obtained to support a product safety visit to the supplier. A SAPID Form 1 should then be completed and sent to PI Supplier.

#### ENFORCEMENT MANAGEMENT

**14 Actual risk:** In a worst case scenario, ie where work is taking place on or near to any conductors associated with a strobe light system and there is no clear safe system of work, as outlined above, there is a risk of **serious personal injury** with likelihood **possible** of **single casualties**.

**15 Benchmark:** Where an adequate safe system of work exists and is followed, the permitted level of risk is **remote** or **nil/negligible**.

16 The risk gap should be determined using Table 2.1 of the EMM.

**17 Standards:** The requirement to disconnect electric apparatus from supply, or otherwise make dead is considered to be an **established standard**.

**18 Strategic factors:** The initial enforcement expectation may lead to improvement notice (IN), with consideration of prosecution. The Sector considers that, as this hazard has only recently come to general attention, advice or IN should normally be appropriate.

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