

# Robust Street Furniture Limited

## SPECIFICATION FOR THE “TROJAN PAVEMENT LIGHT” ©

### Introduction

**RSW Partnership**, in year 2003, was appointed by a large Unitary Local Authority to undertake a major High Street regeneration project. Part of the design required the procurement and installation of over three hundred In-Pavement lighting fittings.

Because of the nature and location of the project, the Client laid down stringent requirements for the pavement lighting scheme, including:

- Low maintenance cost.
- Low running cost
- Low surface temperatures
- Minimal projection above the paved surface
- Able to withstand intermittent heavy vehicle traffic
- Light output to be sufficient to provide a spectacular visual effect to the public along the High Street
- Able to withstand a wet marine environment.
- Reasonably priced to fall within the project budget.

Following a prolonged and detailed survey of the European industrial lighting market in an attempt to find suitable exterior, decorative and cost effective luminaries to comply with Client's requirements, RSW Partnership were disappointed with the products on offer. It was found that many manufacturers, although offering equipment purporting to be suitable in all technical respects for the environment and application specified, none of them actually performed satisfactorily.

After agreeing to make some minor modifications to their standard product, a manufacturer was eventually appointed. Unfortunately, after taking delivery and installing the first batch of luminaries, corrosion defects began to appear which made the luminaries totally unsuitable for purpose.

Left with a project to complete, and with all of the underground services installed and a Client insisting that the scheme be completed, RSW Partnership had to take a pro-active approach. Knowing that no replacement luminaries were commercially available, RSW Partnership undertook a research and development programme to design a completely new luminaire.

### Desk Top Research and Development

With the previous knowledge gathered during the examining of other manufacturers offered product, RSW Partnership were able to identify the deficiencies and merits of available pavement lighting equipment currently on the market. This overall study process enabled RSW Partnership, with their

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engineering knowledge and AutoCAD facilities, to design and develop a revolutionary luminaire that is able to meet the most stringent requirements of aggressive environments and stated applications.

## The Problem

The one defect that seemed to affect most equipment examined was the ability to maintain its water resistance.

Because of their location and the fact that the public were likely to have physical contact with the luminaries, robust electrical safety engineering was essential to prevent ingress of moisture and prevent nuisance tripping of residual current protective devices.

One other problem noticed with most equipment examined was the vast number of components making up these luminaries. Many of the units examined were built from alloy castings and finished with a sprayed on protective coating. Both these components were, in RSW Partnership's opinion, and evidenced, readily susceptible to deterioration and degradation.

## Design of the "Trojan Pavement Light" ©

The starting point for the design was the need to accommodate the completed fitting into the previous manufacturers' mounting base and connect to the existing electrical services installation.

Armed with information gathered over the years, RSW Partnership set down the guidelines for the prototype luminaire. The following were resolved:

### Materials

Due to the harsh environment, austenitic stainless steel was chosen. Grade 304 was preferred as this is suitable for machining and has a high resistance to corrosion. The self-finish of the steel and the polishing following manufacture provides the benefit that no additional protective coating is necessary.

### Selection of Components

To assist with the prevention of moisture ingress, the entire body and lens mount is constructed from only two billets of raw materials. This approach has eliminated many possible points of moisture ingress. When many components need to be joined with gaskets, compounds and the like there is a potential weakness in the seal, particularly after several dismantling and re-assembly cycles whilst carrying out maintenance and repairs.

It was also decided to keep the internal components to a minimum to reduce tooling and assembly time. The lighting array is retained by a single plastic circlip, which can be inserted or removed without the use of any special tools.

### Lens

Following a disturbing experience with glass lenses used in other manufacturer's equipment it was decided to fit 18mm thick Macron lenses. This material has excellent durability, can be machined to shape and is beyond destruction from excessive traffic or vandalism. It is a feature of these luminaries that the surface finish of the lens is flush with its housing to eliminate the possibility of water collecting over the lens, freezing in cold weather and creating a potential slip hazard.

### Watertight Seal

There is only one joint in the entire body of the housing where water ingress would normally be possible. This joint is between the body holding the lighting array and the bezel housing the lens. The seal is achieved by use of a polypropylene gasket clamped between the two sections using a five point set screw system. The gasket is housed in a recess formed in the lens and sits over a raised

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knife-edge machined into the main body. The assembly can be dismantled and reassembled several times before there is need to replace the gasket and this is due to the precise indexing of the gasket over the raised knife.

## Electrical Components

Due to the need for low surface temperatures, high light output and low maintenance the choice of light source was LEDs.

Although LEDs have a very long life cycle before failure it was decided to opt for an array rather than a single source or a few high intensity LEDs. Following a series of tests the optimum distance from the lens was established. The distance was selected to provide an even spread of light from the array whilst obtaining maximum total light output. A system is incorporated into the internal body of the housing to retain the array at its set point during normal operation or excessive vibration, thus ensuring the light source is constant and stable throughout its entire lifetime of about 25 years.

Even though moisture ingress is eliminated by the design, as an added precaution to overcome improper use or poor maintenance practice, the entire LED assembly is encapsulated during manufacture in a hard setting, non-conductive and water-resistant resin.

The voltage of the first production batch was 230volt A.C but 110v, 24v and 12v are available at no additional cost. The advantage of the 230v version is the reduced installation cost as many individual luminaires can be wired in parallel on a single circuit without any deterioration in performance due to voltage drop. Because all the 230v cable is contained in underground service ducts and no contact with conductors is possible from the surface, the distribution system is entirely safe.

The connection between the LED array and the hard-wired flexible cord, which connects the luminaire to the distribution system is effected using push fit insulated connectors. The connectors are fully contained within the sealed steel body and therefore, are not subject to outside elements. It is recommended that each luminaire be fitted with a length of flexible cord during assembly eliminating the need for any dismantling of the luminaire once on site.

The flexible cord entry into the body of the luminaire through an IP 68 rated compression gland that incorporates a tapered thread. The bottom of the housing is tapped to receive the gland and once tightened to a torque of 3Kn force the connection is fully watertight.

## Validation

“TROJAN PAVEMENT LIGHT” © luminaire has not been fully tested by an independent certified testing laboratory. Such testing will be conducted during the first quarter of 2007 and the results will provide a fully IP 68 rating.

## Results

RSW Partnership has tested the robustness of the design of these luminaires with both bench and field-testing.

### Immersion in Water Test

The results of the bench test proved that the luminaires were totally free from any moisture ingress after 14 days of total immersion in 1.2 meters of water.

### Dynamic Test (field)

The field test, dynamic load, was carried out by applying a slow moving vehicular load of 7 tonnes over the installed luminaire for 4 hours at 10 traverses per hour.

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## **Static Test (field)**

On several occasions the static load was applied for 15 minutes.

## **Inspection (workshop bench)**

The luminaire tested was removed from the test site and without any inspection or adjustment subjected to the same bench test as described above. After testing was complete the luminaire was dismantled and inspected; no superficial damage was observed and no moisture ingress was present.

## **Product Sales**

### **Product Sales**

RSW Partnership [www.rswpartnership.co.uk](http://www.rswpartnership.co.uk) are a practice that provides professional services to the construction sector and as such, is not set up to retail a manufactured product. With the product development stage completed a private limited company has been formed, Robust Street Furniture Limited, (enquiries to: [enquiries@robuststreetfurniturelimited.co.uk](mailto:enquiries@robuststreetfurniturelimited.co.uk)) to sell the “**TROJAN PAVEMENT LIGHT**” © and other robust street furniture capable of meeting the demands of heavy public usage.

### **Robust Street Furniture – Manufacture, Supply and Installation Guarantees to provide Uplighters**

- Totally water tight and dust tight to IP 68
- No distortion after loading up to 7Kn
- No internal maintenance required
- Constant light output throughout the life of the LED array (expected 25 years.)
- No corrosion of the stainless steel body (including in marine environments)
- Shatterproof lenses
- 6 different colour outputs
- 4 different supply voltages.
- Suitable for indoor and outdoor locations