

## TECHNICAL REPORT

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Report  
issued by:



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A handwritten signature in black ink, appearing to read "Tony Parkinson", is written over a horizontal dotted line.

Tony Parkinson  
Appliances Manager

DATE: 22<sup>nd</sup> December 2006

TEST ENGINEER: Bryan M<sup>c</sup>Phee  
REVIEWED BY: Andrew Gordon

**S64265** Issue 3

### **Christmas Lighting Products: Safety Assessment**

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## Introduction

The Electrical Safety Council commissioned Intertek Research and Performance Testing (Intertek RPT) to select several Christmas lighting products for testing under the general safety provisions of the relevant standards. The project proposal details can be found in [Appendix II](#).

Eight products were purchased in total and they were sourced from high street retailers and internet companies, all with proven track records ensuring traceability (see page 3 for an overview of the products). The safety assessments have been carried out under the terms of reference in [Appendix I](#), and as such, the results are only applicable to the samples tested and the conditions of the tests. Sample variability and changes in test conditions could influence some results, and the result(s) as stated may not be representative of the mean result if a number of different samples were tested under a variety of test conditions.

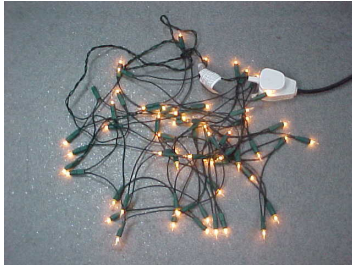
The assessments were carried out at Intertek RPT during November 2006. Report Issue 2 differs from report Issue 1 in having [Appendix III](#) covering regulatory considerations and general safety advice etc. This report Issue 3 differs from report Issue 2 in having the brand and purchase details of the products removed for confidentially purposes.

## Summary

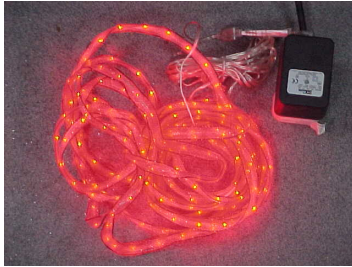
Standard marking departures were found for two of the samples, while the six remaining samples passed the Intertek RPT safety assessment with no departures being noted. However, a comment was made regarding a new innovation in lighting chain design and function built into one of the samples. Regulatory considerations and general advice for the safe use and installation of these types of product can be found in [Appendix III](#).

## Project Samples Overview

The following eight samples were purchased for testing under this project:



Sample code AA01 (shown left) and its packaging are marked with incorrect symbols for class II construction.



The product packing for sample code AH01 (shown left) does not contain standard markings warning against connecting the chain to the supply while in its packing and the type and replacement details for the lamps.

The remaining six products are shown below:



**Sample code AC01**



**Sample code AD01**



**Sample code AB01**



**Sample code AF01**



**Sample code AE01**



**Sample code AG01**

## Electrical Safety Assessments

### 60 Static fairy lights (Sample code AA01)



Figure 1 AA01

### Initial Inspection and Functional Check

The sample was undamaged and a functional check proved satisfactory.

### Electrical Safety Assessment

#### Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	Pass
Classification of luminaire	Pass
Marking	<b>FAIL</b>
Construction	Pass
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass

## Sample code AA01 - Electrical Safety Assessment Departures

### Marking

#### Clause 3.2 of BS EN 60598-1

The above clause requires that appropriate information shall be distinctly and durably marked on the luminaire, including the symbol for class II, as detailed in clause 3.2.4 of BS EN 60598-1 (see Figure 2).

An incorrect class II symbol is present on the product, the packaging label and the user instructions (see Figures 3, 4 & 5).

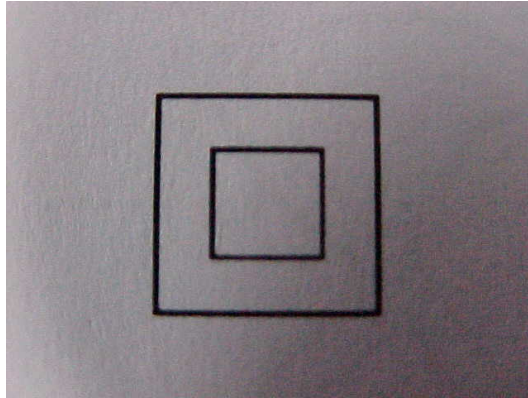


Figure 2 Example of correct class II symbol



Figure 3 Incorrect symbol on the product

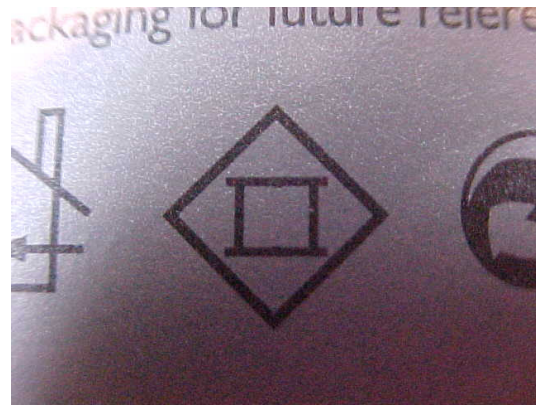


Figure 4 Incorrect symbol on the packaging



Figure 5 Incorrect symbol on the instructions

## 20 Angel lights (Sample code AB01)



**Figure 6 AB01**

### Initial Inspection and Functional Check

The sample was undamaged and a functional check proved satisfactory.

### Electrical Safety Assessment

#### Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	Pass
Classification of luminaire	Pass
Marking	Pass
Construction	Pass
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass

## 100 multicoloured alternaste twinkling lights (Sample code AC01)



Figure 7 AC01

### Initial Inspection and Functional Check

The sample was undamaged and a functional check proved satisfactory.

### Electrical Safety Assessment

#### Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	Pass
Classification of luminaire	Pass
Marking	Pass
Construction	Pass
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass

## 20 Snowman lights (Sample code AD01)



Figure 8 AD01

### Initial Inspection and Functional Check

The sample was undamaged and a functional check proved satisfactory.

### Electrical Safety Assessment

#### Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	Pass
Classification of luminaire	Pass
Marking	Pass
Construction	Pass
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass



**10 gold swirls with clear jewel lights + transformer (Sample code AE01)**



**Figure 9 AE01**

**Initial Inspection and Functional Check**

The sample was undamaged and a functional check proved satisfactory.

**Electrical Safety Assessment**

Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	NA
Classification of luminaire	Pass
Marking	Pass
Construction	Pass
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass

Transformer (for sample code AE01)

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 61558-1:1998 Safety of power transformers, power supply units and similar Part 1. General requirements and tests
- BS EN 61558-2-6:1998 Safety of power transformers, power supply units and similar – Part 2.6: Particular requirements for safety isolating transformers for general use

<b>Safety criteria</b>	<b>Results</b>
Functional check	Pass
Plug and fuse	NA
Marking and other information	Pass
Protection against accessibility to hazardous live parts	Pass
Short circuit and overload protection	Pass
Mechanical strength	Pass
Insulation resistance and electric strength	Pass
Construction	Pass
Internal wiring	Pass
Supply connection and other external flexible cables or cords	NA
Provision for protective earthing	NA
Creepage distances, clearances and distances through insulation	Pass

## 6ft Pre-lit Norwegian tree (Sample code AF01)



Figure 10 AF01

### Initial Inspection and Functional Check

The sample was undamaged and a functional check proved satisfactory.

### Electrical Safety Assessment

#### Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	Pass
Classification of luminaire	Pass
Marking	Pass
Construction	Pass
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass

## 100 “staylit” light set (Sample code AG01)



Figure 11 AG01

### Initial Inspection and Functional Check

The sample was undamaged and a functional check proved satisfactory.

### Electrical Safety Assessment

#### Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	Pass
Classification of luminaire	Pass
Marking	Pass
Construction	Pass ( <i>see comments</i> )
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass

Comments (for sample code AG01)

Each lamp holder is fitted with a “chip”, which enables the chain to remain illuminated when any of the lamps are loose, broken or even missing. The “chip” is an electronic component that ensures continuity of the series-wired circuit and keeps lamp voltages within their correct operating limits, so preventing overheating of individual lamps and a cascade failure of the remaining illuminated lamps.



**Figure 12** *“chip” in situ between contacts*



**Figure 13** *Close up of the “chip”*

## 6M LED ribbon light set + transformer (Sample code AH01)



Figure 14 AH01

### Initial Inspection and Functional Check

The sample was undamaged and a functional check proved satisfactory.

### Electrical Safety Assessment

#### Lighting chain

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 60598-1:2004 Luminaires - Part 1: General requirements and tests
- BS EN 60598-2-20:1998 Luminaires - Part 2: Particular requirements – Section 2.20 Lighting chains

Safety criteria	Results
Functional check	Pass
Plug and fuse	NA
Classification of luminaire	Pass
Marking	<b>FAIL</b>
Construction	Pass
External and internal wiring	Pass
Provision for earthing	NA
Protection against electric shock	Pass
Insulation resistance and electric strength	Pass
Creepage distances and clearances	Pass
Terminal and connections for internal and external wiring	Pass

## Sample code AH01 - Electrical Safety Assessment Departures

### Marking

#### **Clause 20.5.1.b)3 of BS EN 60598-2-20**

The above clause requires the following information to be indicated on the packing:

*“do not connect the chain to the supply while it is in the packing unless the packing has been adapted for display purposes”*

The above information is not present on the product packing.

#### **Clause 20.5.1.f) of BS EN 60598-2-20**

The above clause requires information indicating that replacement lamps must be of the same type as those delivered originally or of a type specified by the manufacturer, to be indicated on the packing.

The above information is not present on the product packing.

#### **Clause 20.5.1.g) of BS EN 60598-2-20**

The above clause requires lighting chains provided with non-replaceable lamps to be accompanied by the following information indicated on the packing:

*“the lamps are not replaceable”*

The above information is not present on the product packing.

Transformer (for sample code AH01)

The following standards were used for the electrical safety assessment. Results of the safety assessment are shown in the table below.

- BS EN 61558-1:1998 Safety of power transformers, power supply units and similar Part 1. General requirements and tests
- BS EN 61558-2-6:1998 Safety of power transformers, power supply units and similar – Part 2.6: Particular requirements for safety isolating transformers for general use

Safety criteria	Results
Functional check	Pass
Plug and fuse	NA
Marking and other information	Pass
Protection against accessibility to hazardous live parts	Pass
Short circuit and overload protection	Pass
Mechanical strength	Pass
Insulation resistance and electric strength	Pass
Construction	Pass
Internal wiring	Pass
Supply connection and other external flexible cables or cords	NA
Provision for protective earthing	NA
Creepage distances, clearances and distances through insulation	Pass



## Appendix I

### Terms of Reference for the Intertek RPT Electrical Safety Assessment

The Intertek RPT electrical safety assessment consists primarily of visual inspections and basic electrical safety tests. It relies on the test engineer's knowledge and expertise of testing a broad range of electrical products. However, the inspections and tests are based upon the latest safety standards. The headings below are taken from EN 60335-1:2002 (Safety of household and similar electrical appliances. Part 1: General requirements) and generally form the criteria for the screening test. The clause headings may change if another standard is used, e.g. EN 60598 for Luminaires.

The Intertek RPT safety assessment is most usefully applied where a product already complies with a safety standard. It is not suitable for inclusion in a technical file as a justification for CE marking under the Electrical Equipment (Safety) Regulations 1994.

**Marking and instructions** - Inspection of *pictorial* and *written warnings* on the appliance and in the instructions. Look for CE and approval marks.

**Protection against access to live parts** - Inspection for *access* to live parts after removal of *detachable parts*. **From EN 60335-1: clause 8**

**Leakage current and electric strength** - Carry out *leakage current* test and *electric strength* test. **From EN 60335-1: clause 13 and 16.3**

**Stability and mechanical hazards** - Inspect for *access* to *dangerous moving parts*.

**Mechanical strength** - Carry out *impact* and/or *drop* tests

**Construction** - Inspect for *basic* constructional requirements

**Internal wiring** - Inspect for *basic* wiring requirements.

**Supply connection and external flexible cords** - Inspect cord for marking of *cross sectional area* and *cord anchorage*. Carry out tests in cases of doubt.

**Provision for earthing** - Inspect *earthing* system and carry out *25 Amp* test if applicable.

**Clearances, creepage distances and solid insulation** - Inspect *creepage* and *clearances*, measure only in cases of doubt.

### Other tests and inspections

- **Functional check** – Carried out at rated voltage after product has stabilized.
- **Plug and fuse** - Inspect pins of plug-in devices and plugs for fuse rating, wiring and BS1363 mark

## Appendix II

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### **PROJECT PROPOSAL**

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### **Safety of Indoor Christmas Lighting**

Date: 18<sup>th</sup> October 2006

ORIGINATOR: A Gordon

#### **OBJECTIVE**

To provide a report covering the selection and testing of several Christmas lighting products for indoor use only. The report will provide information about the safe installation and maintenance of such products to support the aims of the Electrical Safety Council (ESC), in particular as a continuation of the advice given by the ESC in its press release of 11<sup>th</sup> July 2006 *Don't let unsafe electrics put an end to the festive fun.*

#### Amendments to Test Programme

Issue No / Date	Date amended	Page	Change	Agreed with
Issue 2	18 <sup>th</sup> October 2006	All	Suggestions made by client	Client by correspondence

#### Standards and Regulations Relevant

**Standards:** BS 1362, BS1363, EN 60598-1, EN 60598-2-1, EN 60598-2-4, EN 60598-2-20, EN 61558-1 and EN 61558-2-17

**Regulations:** Plugs and Sockets (Safety) Regulations and Electrical Equipment (Safety) Regulations

## **1.0 Background**

- 1.1 In recent years there has been an increase in reported incidents to UK local authority Trading Standards for Christmas lighting products, in some case involving public recall notices by major high street retailers.
- 1.2 A recent development in such products is a Christmas tree with a lighting chain attached, a so-called “plug-and-go” tree. The concept has prompted consultation between the testing bodies to agree a common standard-testing approach.
- 1.3 Attaching a traditional lighting chain to a Christmas tree introduces safety considerations where it is now considered appropriate to apply two safety standards. Previously the lighting chain would be tested under its own product standard, with no standard existing for the tree itself. Attaching the lighting chain to the tree effectively creates a general-purpose lighting product where other hazards such as stability and supply cord anchorage have to be considered.

## **2.0 Product Selection**

- 2.1 Intertek RPT would recommend including lighting chains, general-purpose lighting products and given the above considerations, a “plug-and-go” Christmas tree.
- 2.2 The products will be a mixture of Low and Extra Low Voltage with one or two products having the ASTA/BEAB certification marks.
- 2.3 Up to a maximum of eight products, these would be purchased from the following sources, in no particular order:
  - Mail order catalogues
  - High street retailers
  - Internet

Note that the products will cover a range of prices with the lower end of the scale being lighting chains from so called discount stores or “pound stores”. The upper end of the scale will be the “plug-and-go” Christmas tree.

## **3.0 Product Testing**

- 3.1 The products will be subjected to the Intertek RPT safety assessment, which is essentially a safety screening process using the latest edition of safety standards. The assessment also considers foreseeable conditions of use in terms of the safety objectives in the appropriate UK Regulations (see Appendix I for details).

## **4.0 Test Report**

- 4.1 Intertek RPT will product a single test report containing identification photographs of each product along with test results and safety issues, where appropriate. Safety issues will be covered in detail with photographs to illustrate the potential hazards, where appropriate.

## **5.0 Project Fees**

5.1 The fee for the evaluation of up to a maximum of 8 products is £650 per sample + VAT plus sample expenses. This may be broken down into the following categories:

- Product selection and purchasing
- Safety Assessment
- Production of test report

5.2 Note that a proportionate amount of post-project consultation is included in the fees. Intertek RPT reserves the right to charge post-project fees, by agreement with the client, of £80 per hour.

## **6.0 Timescales**

6.1 The project will take 15 working days to complete from receipt of samples. Start date to be agreed with client.

## Appendix III

### Regulatory Considerations and General Advice For The Safe Use and Installation of Christmas Products Under Test

#### Regulatory Considerations

The electrical products chosen for this project are covered under the following UK legislation:

- Consumer Protection Act 1987
- General Product Safety Regulations 2005
- Plugs and Sockets etc. (Safety) Regulations 1994
- Electrical Equipment (Safety) Regulations 1994

The Consumer Protection Act implements into UK law the liability for defective products Directive, known as the Product Liability Directive 85/374/EEC. However, the law in this area is under review given the implementation of the General Product Safety Regulations 2005.

The Electrical Equipment (Safety) Regulations 1994 implement into UK law the European Low Voltage Directive 73/23/EEC. Essentially, the electrical products must be safe and must have CE marking, which represents a manufacturer's declaration that the products satisfy the safety provisions of the relevant EU directives.

"Safe" within the meaning of the Regulations is that there is no risk, apart from one reduced to a minimum, that the electrical product will in any way cause death or personal injury to any person and includes the risk of death or injury to domestic animals and damage to property.

The General Product Safety Regulations 2005 also apply, in certain circumstances, to electrical equipment and contain a general safety requirement for producers to market only safe products. Under these Regulations a safe product is defined as *"any product which, under normal or reasonably foreseeable conditions of use including duration and, where applicable, putting into service, installation and maintenance requirements, does not present any risk or only the minimum risks compatible with the product's use, considered to be acceptable and consistent with a high level of protection for the safety and health of persons, taking into account the categories of consumers at risk when using the product, in particular children and the elderly"*.

Essentially electrical products must be safe, made in accordance with good engineering practice and satisfy the safety objectives of the Regulations. This may be achieved by having a product tested to a European safety standard. Compliance with such a standard provides a presumption of conformity with the safety objectives of the Regulations. At the very least, the producer of a product should carry out the following tasks when designing and marketing an electrical product:

- Compile a list of hazards, e.g. electric shock, hot surfaces, rotating blades, fire, radiation, entrapment, crushing and choking hazards
- Carry out a risk analysis to identify the hazards and categories of consumers that are likely to come into contact with the product
- Consider all foreseeable conditions of use and aim to remove potential hazards at the design stage of the product

It should be noted that CE marking under the Electrical Equipment (Safety) Regulations 1994 is based upon self-certification. Compliance with the European standards is voluntary. The producer may choose other means to demonstrate compliance with the essential safety objectives of the Regulations.

Enforcement of the Regulations is the responsibility of local authority Trading Standards.

## **Consumer Safety – General Advice for the Safe Use and Installation of Products under Test**

- (1) Read all instructions and warnings carefully

Note that user often discards product packing. This may be less likely for lighting chains, as the packaging is often considered the obvious place to store the lighting chain. Indeed, the safety standard for lighting chains EN 60598-2-20 has recently been amended to include requirements for markings that producers should apply to product packaging, namely:

- a) *Do not connect the chain to the supply while it is in the packing unless the packing has been adapted for display purposes*
  - b) *Information indicating that replacement lamps must be of the same type as those delivered originally or of a type specified by the manufacturer*
  - c) *Lighting chains provided with non-replaceable lamps shall be accompanied by the information that the lamps are not replaceable*
- (2) Do not locate any part of the product outdoors, if it is designated for “indoor use” only
- Note that the symbol for indoor use should be marked on the plug-in power supply and consists of the outline of a house with an arrow pointing inwards.
- (3) If the product is designated for “outdoor use”, ensure that either the 3-pin plug (if 230V supply) or plug-in transformer (if Safety Extra Low Voltage) is plugged into an indoor socket outlet.
- (4) Always unplug the product before changing any replaceable bulbs.
- (5) Take extreme care when changing any replaceable bulb that has a broken glass lamp
- (6) Take care when moving pre-lit trees, as the supply cord may be trapped and damaged by the tree’s base.

End of report