Strand Lighting

FACT sheet

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EQUIPMENT TESTING FOR ELECTRICAL SAFETY

The purpose of this document is the provision of guidance and information to an appropriately qualified person who has the responsibility for discharging the duty of maintaining the safety of electrical systems under the requirements of the UK Electricity at Work Regulations 1989. It is intended to aid him or her in the selection of the most appropriate test and inspection procedures for products supplied by, or similar to those supplied by, Strand Lighting Ltd. It is not intended to provide prescriptive methods to those not skilled in the assessment and control of danger from electricity. This document must therefore only be used in conjunction with that competence and with other sources of guidance (such as referenced herein) in the assessment of risk and the development of a suitable equipment maintenance policy, with inspections and tests appropriate in nature and frequency to the environment in question.

This document is given in good faith, and is believed to be accurate at the time of printing: however, no liability can be accepted by Strand Lighting Ltd or the authors for any error or omission, how-so-ever caused. Any interpretations of laws, regulations, or published standards are given as opinions only and do not take precedence over more authoritative rulings or judgements.

The responsibility for the correct implementation of an adequate assessment of risk, and the determining of suitable procedures for inspection and testing, remains solely with the duty holder.

Introduction

The Electricity at Work Regulations 1989, which became UK law in 1990, placed a duty on every employer, and every employee who uses electrical systems, to ensure that safety hazards do not arise out of the use of electrical systems. (The term 'system' covers not only the overall electrical system, but also, as individual items, all the constituent parts, including interconnections and power source). The Regulations cover all electrical equipment, whether classed as 'portable', 'transportable', or 'fixed'. The classes of equipment type are defined, for the purposes of this document, as:-

- ***Portable Appliance*** An appliance which may be moved when in operation, or which can easily be moved while connected to an electricity supply.

- ***A Handheld Appliance*** is a Portable Appliance intended to be held in the hand during normal use.

- ***Transportable Appliance*** An appliance which may be moved, but is over 15-20Kg in weight, and/or is fitted with wheels or castors.

  Portable and transportable appliances are connected to an electricity supply by means of a plug and socket and a flexible cable. (The two classes are sometimes grouped together under the term Portable Appliances, although they are more correctly termed Moveable Appliances).

- ***Fixed Appliance*** An appliance which is fastened or secured in a specific location.

Equipment maintenance of all electrical equipment is required as part of ensuring safety. However, in instigating appropriate procedures, it would appear that equipment users have tended to concentrate on the safety aspects of 'portable appliances'. (probably because their portability renders them more liable to damage than fixed

appliances - thus involving greater risks to safety, but also possibly because they are easier to assess than fixed appliances, which may require the services of 'professional' inspectors). However, although this document does not deal in any detail with the testing of Fixed Appliances, it must be noted that they are not exempt from the requirements for maintenance.

Since the introduction of the Electricity at Work Regulations, a variety of equipment users (including users of Strand Lighting equipment) have applied 'safety tests', towards compliance with the Regulations. Test results are known to have varied. It would appear that, in some cases, undesirable test results could well be attributed to the test methods rather than to the appliance design, construction, or condition. The use of unsuitable tests, as such, may have arisen from a 'blind' obedience to test procedures specified by groups other than the Health and Safety Executive. In particular, certain test equipment manufacturers now market Portable Appliance Testers (PATs), which may be used to apply a specific series of tests to an electrical appliance. The instructions supplied with PATs may be seen as a recommended test procedure.

This document lists the various test recommendations from the Health and Safety Executive (HSE), PAT manufacturers, and the British Standards Institution. Although the main emphasis is applied to HSE recommendations, the others are given to allow comparison.

Test Requirements

1. Health and Safety Executive Requirements

Regulation 4(2), of the Electricity at Work Regulations (1989) requires that electrical systems be maintained so as to prevent danger (as far as is reasonably practicable), if failure to maintain would result in danger. This regulatory statement is interpreted and expanded in scope in the Memorandum of guidance on the Electricity at Work Regulations 1989, and in a series of Guidance Notes.

The Memorandum of guidance on the Electricity at Work Regulations states that "regular inspection of equipment forms an essential part of any preventive maintenance programme". By inference, the Memorandum also suggests that 'tests' form part of 'inspection'. However, there are no direct details given as to the nature of 'tests'.

Guidance Notes (PM 32 - The safe use of portable electrical apparatus, GS 23 - Electrical safety in schools, GS 50 - Electrical safety at places of entertainment) give recommended test procedures in some detail. The test procedures given are almost identical in nature.

2. British Standards Institution Requirements

The British Standards Institution requires certain tests to be made on appliances to prove their compliance with relevant safety standards. It could be considered that such tests should be used to prove that equipment has not 'degraded' since manufacture. However, as some tests are destructive or degrading in nature, they are not suitable for repetitive testing.

These test requirements are specific to the type and nature of the equipment under consideration, and are given in full detail in the relevant Standards documents.

3. PAT Manufacturers' Recommendations

The manufacturers of PATs tend to recommend that appliance testing follows their specified procedures. They tend not, however, to stress that the use of PATs forms only part of more complex inspection procedures. Little note is made that certain tests may be unsuitable for certain types of equipment without additional considerations.

The 'typical' specifications for PAT tests indicate that the tests have, in some cases, been derived from Standards for safety in design or construction, rather than from Health and Safety Executive maintenance recommendations.

Electrical Safety Tests - In Detail

Except where stated otherwise, tests are relevant to both Class 1 (earthed conductive casing) appliances, and Class 2 (double insulated) appliances. The appliance class must be determined before tests are commenced.

The test procedures listed are taken from the referred documents; they may in some cases not be considered suitable or complete for all types of appliance.

Tests as Recommended by the Health and Safety Executive

These maintenance procedures are given as appendices to Guidance Notes PM32, GS23, GS50. It is stated that the procedures are given for guidance only, and that different or additional tests

may be required for certain (unspecified) apparatus.

- Check that the mains cable is in undamaged condition.
- Check that the mains plug is correctly connected, with the cable clamped, and the correct fuse fitted.
- Check the condition of the mains on/off switch.
- Check the condition of accessible fuseholders.
- Check the voltage and short circuit current on any exposed output connections.

For a detachable mains cable:

- Attempt (and fail) to open the socket without tools.
- Attempt (and fail) to pull the cable from its retaining clamp.
- Check that the cable polarity is correct.

For an attached mains cable:

- Check that the cable is protected at its entry to the appliance.
- Try (and fail) to pull the cable from the appliance.
- Check that the cable cannot be rotated at its entry to the appliance.

For a Class 1 appliance:

- Inspect the appliance casing for damage.
- Test the resistance of the Protective Earth connection by passing a current of at least twice the fuse rating
- Pass level - <0.1Ω (<0.5Ω for an appliance internally fused at ≤ 3A)
- Test the resistance of the appliance insulation with a 500V AC test voltage.
- Pass level - "no fault after 5 seconds"
- Note that the test voltage is specified as being AC, rather than DC which tends to be more commonly specified for similar tests.

For a Class 2 appliance:

- Inspect the appliance casing for damage.

These instructions are expanded in Draft Guidance Note KB/TD2/J80/09.92/DH; in particular the Insulation test voltage is given as either DC or AC and routine Flash testing (using a high AC test voltage) is specifically not recommended, although a 'Flash Test' is recommended following equipment repair or if equipment damage is suspected.

Tests as Recommended by PAT Manufacturers

These tests are as recommended by two manufacturers - Megger and Seaward. The tests all make use of Portable Appliance Testers. (Data from these manufacturers are used only by way of example - no product endorsement is implied).

Note that PATs are designed for testing appliances with ratings of up to 3.2KW. Adapters are available, or may be constructed, for connecting higher rating appliances, but the Load Test and Operation Test cannot then be run.

- **Earth Bond Test** Test the resistance of the Protective Earth connection with a low AC test voltage (typically 6V) passing a current of up to approximately 40A.

  Pass level - <0.1Ω (approximately 26A passes at 0.1Ω)

  This test is not relevant for Class 2 appliances.

- **Insulation Test** Test the resistance of the appliance insulation with a 500V DC test voltage.

  Pass level - >2MΩ

- **Flash Test** Test the dielectric strength of the appliance insulation by measuring the current flow with an applied 1500V AC test voltage.

  Pass level - <3mA

Where the equipment includes RFI suppression capacitors connected across the insulation this test must be omitted unless the capacitors are rated to withstand 1500V AC.

The test voltage is increased to 3000V AC for class 2 appliances.

- **Load Test** Check that the appliance will not pass a higher than expected current when mains power is applied with a 6V AC test voltage.

  Pass level - predicted load current <13A

- **Operation Test** Test the normal operation of the appliance, and measure the power consumed.
  Pass level - ≤appliance rating

- **Fuse Test** Check that there is electrical continuity through the normal circuit of the appliance with a 100V AC test voltage. (Not on all PATs).

  Pass level - closed circuit confirmed

- **Earth Leakage Test** Measure the current flow in the appliance Earth connection during normal operation. (Not on all PATs).

  Pass level - selectable as <0.75mA, or 3.5mA

Tests as Recommended by the British Standards Institution

Only details of electrical tests are given. Each Standard also includes extensive mechanical tests. Where test voltages are given, these relate to equipment intended for operation at up to 250V. The term "insulation breakdown" refers to an uncontrollable increase in the current flowing as a result of an applied test voltage.

1. BS2754 - Construction of electrical equipment for protection against electric shock (IEC 536)

- Test the electric strength of the appliance protective insulation with a 1250V AC test voltage.

  Pass level - "flashover or insulation break down"

- Test the resistance of the appliance protective insulation with a 500V DC test voltage.

  Pass level - >2MΩ

- Measure the current flow in the appliance Earth connection during normal operation.

  Pass level - <0.75mA (unless otherwise specified)

- Test the resistance of the Protective Earth connection with a low AC test voltage (less than 12V) passing a 'heavy' current (at least 25A for an appliance fused at 13A).

  Pass level - <0.1Ω

2. BS415 - Safety requirements for mains-operated electronic and related apparatus for household and similar general use (IEC 65)

- Test the resistance of the appliance protective insulation with a 500V DC test voltage.

  Pass level - >2MΩ

- Test the electric strength of the appliance protective insulation with a 1500V AC test voltage.

  Pass level - "no flashover or insulation break down"

  The test voltage is increased to 3000V AC for class 2 appliances using single reinforced insulation.

- Test the resistance and integrity of the Protective Earth connection with a low AC test voltage (less than 6V) passing a current of 10A.

  Pass level - <0.5Ω

3. BS7002 - Safety of information technology equipment including electrical business equipment (EN 60 950, IEC 950)

- Test the resistance and integrity of the Protective Earth connection with a low AC or DC test voltage (less than 12V) passing a current of up to 25A.

  Pass level - <0.1Ω

- Test the electric strength of the appliance protective insulation with a 1500V AC test voltage.

  Pass level - "no flashover or insulation break down"

Where the equipment includes capacitors connected across the insulation (eg. RFI suppression capacitors), the test voltage should be DC.

If there is a direct current path across the insulation (eg. capacitor discharge resistor) this path should be disconnected.

Electronic components may be disconnected for the duration of this test.

The test voltage is increased to 3000V AC for class 2 appliances using single reinforced insulation.

- Measure the current flow in the appliance Earth connection during normal operation.

Pass level - <0.75mA (hand held devices), 3.5mA (other devices)

For class 2 appliances the current is measured on the casing and must be below 0.25mA

4. BS3535 : Part 1 - Isolating transformers and safety isolating transformers (EN 60 742, IEC 742)

- Test the resistance of the transformer protective insulation with a 500V DC test voltage.

  Pass level - >2MΩ

- Test the insulation resistance between the input and output circuits with a 500V DC test voltage.

  Pass level - >5MΩ

- Test the electric strength of the insulation between the input and output circuits with a 3750V AC test voltage.

  Pass level - "no flashover or insulation break down"

- Test the electric strength of the transformer protective insulation with a 1875V AC test voltage.

  Pass level - "no flashover or insulation break down".

The test voltage is increased to 3750V AC for class 2 appliances using single reinforced insulation.

- Test the insulation between turns of the windings with a 100Hz AC test voltage of twice the winding rating.

  Pass level - "no flashover or insulation break down"

5. BS4533 : Part 101 - Luminaires (EN 60 598-1, IEC 598-1)

- Test the resistance and integrity of the Protective Earth connection with a low test voltage (less than 12V) passing a current of at least 10A.

  Pass level - <0.5Ω

Note that this is different from the 0.1Ω limit imposed for other appliances, and required to meet the pass limit on a PAT Earth Bond test.

- Test the resistance of the luminaire protective insulation with a 500V DC test voltage.

  Pass level - >2MΩ (Class 1 luminaires), <4MΩ (Class 2 luminaires)

- Test the electric strength of the luminaire protective insulation with a 1500V AC test voltage.

  Pass level - “no flashover or insulation break down"

During these first two tests, components which may give 'false' results are to be disconnected. Such components are: shunt connected capacitors, capacitors between live parts and the body of the luminaire, chokes or transformers connected between live parts.

- Measure the current flow in the luminaire Earth connection during normal operation.

  Pass level - <1mA (for class 1 luminaires unless otherwise specified)

  For class 2 luminaires the current is measured on the casing and must be below 0.5mA

The Risks of Testing

The main risk during the testing of an appliance is that of damage to the appliance itself during tests which apply stressful currents or voltages, particularly if the testing is not carried out with some care.

The tests which are likely to cause problems are the high current 'Earth Bond test', and the high voltage insulation test - 'Flash test'.

The Earth Bond test (on a typical PAT) passes a current of up to 30A through the appliance Earth connection. If the test duration is excessive, this high current may cause overheating, and maybe degradation of cables and insulation, and in an extreme case could cause burning of conductors.

The Flash test (on a typical PAT) applies 1500V AC between the Live and Neutral supply connections connected together, and the Protective Earth connection. This voltage exceeds the normal rating for Class Y capacitors, such as may

be connected between supply poles and Earth as RFI suppressors. The capacitors may therefore be damaged by the test voltage. (Class Y capacitors manufactured to BS6201: Part 3: 1982, IEC 384-14: 1981 are tested to 1500V AC, but it is suggested, in the standard, that this voltage may cause damage and that any repeat testing should use a voltage of 1000V or less). The presence of RFI capacitors may also cause a Flash test to be failed because of the current flow through them. (A table of currents through different capacitor values is given at the end of this section). The presence of discharge resistors across RFI capacitors connected to Earth will have a similar result, and will almost certainly cause failure of a DC Earth resistance test.

Apart from damage to RFI capacitors, there is also a risk to sensitive electronic devices. Such devices include components connected to the Phase or Neutral connection, but with cases or mounting tabs connected to Earth. The test voltage is then applied across the device internal insulation. Other devices are relatively safe unless there is a fault within the appliance which causes the test voltage to be applied across them.

Given the voltage used for the Flash test, there is obviously a risk to the person carrying out the tests if proper precautions are not taken.

Current Flow through Capacitors

The following table (given for information only) shows the approximate current flow through selected capacitor values at 240V AC, and the potential test voltages of 500V AC, and 1500V AC. The frequency is taken as 50Hz.

Capacitor Value	240V	500V	1500V
1000pF	75µA	160µA	470µA
2200pF	170µA	350µA	1mA
0.0047µF	350µA	740µA	2.2mA
0.01µF	750µA	1.6mA	4.7mA
0.022µF	1.7mA	3.5mA	10mA
0.047µF	3.5mA	7.4mA	22mA
0.1µF	7.5mA	16mA	47mA

Note: A typical value for a capacitor connected between Phase or Neutral and Earth is 0.0047µF. If a Flash test is performed using a PAT, this capacitor value will pass a current which is close to the pass limit.

Combined mains inlet connectors and filters are commonly used in electronic equipment. Depending on the filter type, two capacitors of up to 0.0047µF may be incorporated - one between Phase and Earth, the other between Neutral and Earth. Although this does not contravene standards for earth leakage, a PAT Flash test will connect both capacitors in parallel giving a current flow in excess of the pass limit.

Conclusions

It is obvious that testing methods differ, depending on why, for what appliance, and by whom they are specified.

Portable Appliance Testers can be used to subject appliances to tests in excess of the minima recommended by the Health and Safety Executive, and although this cannot always be considered 'bad', such tests must be undertaken with care if equipment damage or misleading readings are not to result in some cases.

Recommendations

This section gives general recommendations regarding the testing of appliances or equipment supplied by Strand Lighting, with particular reference to HSE regulations and guidance.

1. Responsibility

The main responsibility for equipment maintenance rests with the 'employer', even when specific tasks are delegated to others. It is the employer's responsibility to ensure that appropriate maintenance procedures are set up, adhered to, and records kept.

2. Assessment of Maintenance Requirements

Although inspection and test procedures are relatively well defined in overall terms, specific details can only be defined following an assessment of potential risks. This particularly applies to the frequency of applying inspections and tests.

The frequency of inspection and testing is not laid down by regulation, but must be such as to prevent danger ("so far as reasonably practical") depending on the style of usage of appliances.

As a guide: test intervals might vary from 3 to 6 months for items which are used under onerous conditions, rising to 12 months (or more) for other items which are not subject to any significant 'wear and tear'.

However, reasonable test intervals can only be determined by assessing the possible risks to safety for the specific conditions of use for the equipment eg. equipment which is frequently moved will require much more frequent inspection and test than equipment which is mainly static; the high internal temperatures in a luminaire increase the possibility of risk over that of some other equipment.

Equipment which is used for hire, or on 'location', should be inspected and tested prior to despatch from store, and inspected on return.

The test frequency for a specific item of equipment may be changed if test results or an alteration in usage patterns so indicate.

3. Inspection and Test Personnel

Equipment inspection and testing must be carried out by competent personnel. It is expected that these persons have an appropriate qualification in the field of electrical practices. They must have a good knowledge and understanding of relevant safety standards. They must have a good knowledge and practical experience of electrical equipment, working practices, potential hazards, and the maintenance of personal safety and that of others. They must understand the purpose of each inspection procedure and test. They must also understand the principles of operation, and the risk involved, for each appliance.

As well as carrying out inspections and testing, the test personnel will normally be expected to assess potential risks to safety, and determine reasonable inspection and test intervals.

It is not 'reasonable' to assign inspection and testing to junior or inexperienced members of staff, nor to temporary staff unless they are appropriately qualified and experienced.

Alternatively, inspection and testing may be 'contracted' to specialist electrical testing companies, although this does not relieve the 'employer' of the ultimate responsibility for ensuring safety.

When testing appliances, the tester must have specific product knowledge to allow possible safety hazards to be identified and to prevent devices such as Earth test circuits on discharge luminaires and dimmers causing erroneous test results.

4. Test Records

As well as actually inspecting and testing appliances, the inspection and test results must be recorded as proof of testing. In the event of an accident or dispute, the records may be used to determine whether reasonable maintenance had been carried out. Maintenance records should include the required inspection and test intervals, and should indicate not only "pass" or "fail", but actual test results, and any other relevant observations. This is to allow any undesirable trend to be identified eg. an appliance which gives consistently worse test results than a similar appliance, or an appliance which is suffering a slow degradation. In addition to inspection and test results, any remedial maintenance should also be recorded.

In order to ensure that the record for each appliance may be reliably identified, each appliance must be uniquely labelled utilising a readily visible, permanent method of marking.

Note that detachable mains cables must be considered either as forming part of specific appliances or as individual appliances and must be marked accordingly.

Appliance test records should be maintained throughout the life of the appliance.

There are various methods for maintaining test records, ranging from simple written appliance log sheets to computer based systems integrated with test equipment. It is outside the scope of this document to recommend any one method.

5. Test Failures

Should a 'failure' be detected, either during the visual inspection or during electrical tests, the appliance must be subjected to the full inspection and test procedure following any repairs.

If the repairs are not to be carried out immediately following the test failure, the appliance must be clearly and unambiguously marked as

"Not to be used" (or similar), and any use of the appliance must be prevented. This prevention may be achieved either by withdrawing the appliance into a 'quarantine' store area, or by inhibiting its connection to an electricity supply. eg. by covering or removing the mains plug.

6. Test Procedures

The following recommendations are given to provide guidance in the setting up of specific test procedures to cover stage and studio lighting equipment.

6.1 Basic Inspections

Individual equipment users should be instructed to carry out 'informal' checks prior to using any appliance (eg. condition of cables, security of connectors). Any item identified as 'suspect' should then be immediately withdrawn from use and referred for more formal checks (and maintenance).

6.2 Formal Inspections and Tests (General)

Depending on the assessed maintenance requirements, visual inspections will be carried out more frequently than full electrical tests, although the results of an inspection may indicate that an electrical test is required.

As a first stage in any inspection procedure, the appliance identity must be checked, and verified against records.

Visual inspections should follow the recommendations of the HSE (as listed in section 4.1), but should also include checks for mechanical safety, and internal thermal degradation, especially for appliances such as luminaires.

Electrical tests should, as a minimum, follow the recommendations of the HSE and will require the use of Portable Appliance Testers or similar test devices.

As part of the test procedures the normal appliance operation should be checked. If the appliance rating is below 3.2KW, the PAT Operation test may be used to verify actual appliance power consumption.

The PAT Flash test is not recommended as part of normal test procedures except in certain specific cases. Following equipment repair, or if damage is suspected, a Flash Test may be appropriate. Note that a Flash Test should not be carried out more than once per 12 months on any one appliance, and that a Flash test must not be applied to dimming equipment or control systems.

When applying the PAT Earth Bond test, note that standards only require earthing for those conductive parts which might otherwise become live under a single fault condition. Certain parts of appliances may therefore not need to be connected to Earth. Examples are: luminaire lens tubes, support yokes, and colour frame runners, and some control system front panels.

Inspection and test results should be entered into records as the inspections and tests are carried out.

6.3 Specific Inspections and Tests

Inspection procedures are identified "I"; Test procedures are identified "T".

6.3.1 Extension Cables and Detachable Mains Power Input Cables

Adapters may be required for connecting extension cables and mains input cables to test equipment, depending on the type of connectors in use.

I Verify that the 'source' and 'load' connectors are undamaged, and that the cable is undamaged and of the same (or greater) current carrying capacity as the connectors (or protecting fuse).

I Carry out a visual inspection which, on at least an annual basis, should include removing connector covers to check the security of cable clamps and terminations. Check that Live, Neutral, and Earth connections are not 'crossed'.

T Run the PAT Earth Bond test, using additionally an Extension Lead tester (eg. Seaward LT1000) or similar device.

T Run the PAT Insulation test. Given the manner of use of extension cables, an annual Flash test is also recommended.

T Connect a 'standard' test load and run PAT Load and Operation tests.

Note that 'long' extension cables may fail an Earth Bond test because of the inherent resistance of the cable. Such cables may therefore be considered to contravene Electricity at Work regulation 4(1), and should not be used. (The use of multiple 'short' extension cables connected together - such that the total would exceed the Earth Bond test limit - is similarly not acceptable).

The following table gives approximate maximum lengths for extension cables of differing conductor sizes which will pass a test limit of 0.1Ω. These lengths are calculated, using 18.5mΩ/mm²/m as the resistivity for copper wire at 20C, and allowing 5mΩ for connections.

Conductor Size	Maximum Length
0.75 mm²	3.5 m
1.0 mm²	5 m
1.25mm²	6 m
1.5 mm²	7.5 m
2.5 mm²	13 m
4.0 mm²	20 m
6.0 mm²	31 m

There are potential resolutions to operational situations which might require the use of theoretically illegal extension cables.

The first would be to use extension cables of larger conductor size. A second - where substantial proportions of the total circuit wiring are intended to be made using extension type cables, (eg. to overhead lighting barrels) an experienced electrical engineer may assess the total circuit Earth loop impedance and determine that it is sufficiently low for safe appliance operation, and for correct operation of circuit protection devices in the event of a fault.

As a further alternative, where cables are intended for use solely as extension cables to luminaires (and actually restricted to this one purpose), if the pass level for all luminaire Earth Bond testing is maintained at 0.1Ω, then the cable Earth resistance limit may be increased to 0.4Ω, giving a four fold increase in the allowable lengths.

The second and third alternatives above may only be considered following a competent assessment of potential safety risks, and the ability to control them through a total electrical safety and maintenance strategy.

6.3.2. Incandescent Luminaires

Incandescent luminaires, being electrically very simple, should present no problems with regard to testing methods.

I Carry out a visual inspection. Check that the following items are secure, free from damage or deterioration, and suitable for their purpose:-

All external and internal wiring, interconnections and terminations. (Specifically check that heat has not degraded cable insulation).
All insulation, safety shields and any safety switches.
All other internal components and lampholder(s).

T Run PAT Earth Bond and Insulation tests.

Note that luminaires designed to BS4533 (EN60 598) are allowed an Earth Bond resistance of up to 0.5Ω. Although a PAT Earth Bond test will show this as a 'failure', a reading of up to 0.5Ω should be considered acceptable for luminaires up to 3KW in rating, unless records indicate a deterioration, which must be investigated.

T A Flash test may also be applied, but not more frequently than once per year.

6.3.3. Discharge Luminaires

Discharge luminaires and their associated ballast equipment often include RFI suppression capacitors connected to Earth, and power factor correction capacitors. They often also include Earth test circuits which involve resistive components connected between the phase input and Earth. Such components will almost certainly cause an apparent failure of the Insulation (and Flash) test, and should therefore be disconnected prior to testing. (A switch is fitted in many modern luminaires to disconnect the Earth test circuit). Luminaires and ballasts should be connected together during tests.

I Carry out a visual inspection as for incandescent luminaire