

# Entertainment Lighting and Future Lighting Regulation:

# Current Ecodesign Regulations – Sections Relevant to Entertainment Lighting

A Briefing Document prepared by the Association for Lighting Production and Design (ALPD) and the Professional Lighting & Sound Association (PLASA) <u>www.thealpd.org.uk</u>, <u>www.plasa.org</u>

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# **1. INTRODUCTION**

The current Ecodesign regulations (the 2021 GB regulations, as transferred from the EU) include a number of sections that are important for allowing the continued use of key lighting fixtures in the entertainment lighting sector (theatre, live events, concerts, television and film).

As BEIS acknowledged in its February 2023 Ecodesign consultation, this sector is keen to transition to lower-energy lighting fixtures and is doing so at a good pace. However the exemptions allowing the continued use of existing equipment are important for a number of reasons, particularly in allowing the continued use of existing equipment which though notionally 'inefficient' does not use large amounts of energy because of its use pattern, and in allowing equipment to be replaced in a phased way without creating needless waste from having to scrap serviceable existing equipment.

The exemptions are also important given the financial disruption to this sector through the years of the Covid pandemic, during much of which parts of the sector (theatre / live performance in particular) were entirely shut down. It will take time for the industry to fully recover from this financially, which will disrupt planned upgrade programmes.

In some cases, the exemptions are critical because for some very particular specialist entertainment lighting fixtures, more efficient LED replacements are not yet available, not because of a lack of will but because of challenges of physics and optical design – plus the disruption to research and development caused by the pandemic and ongoing supply chain issues.

Further details of the type of lighting equipment used in entertainment lighting and the need for these exemptions can be found in the document prepared for BEIS in February 2022, which can be downloaded here: <u>https://bit.ly/3HMsYxe</u>. We would strongly encourage you to read that document as a companion to this one if you have not done so, since it contains information that in some cases has not been repeated here.

However, because of the way that the EU agreed to the exemptions proposed by the entertainment lighting sector (in several 'waves' with adaptations called for over time, and with the final text then reached in a closed negotiation between EU countries in which BEIS represented the UK), the sections that are relevant to entertainment lighting are not all collected together in one place in the current regulation and its annexes, and in some cases are not specifically identified as being there for entertainment lighting equipment. In other words, there is no single 'exemption for entertainment lighting.'

Given that the UK has indicated its intention to continue to allow the current exemptions for entertainment lighting as it introduces its updated Ecodesign regulation over the next few years, but that there is no specific 'exemption for entertainment lighting' written in to the current regulation, it seems important to clearly identify the sections that are relevant to and impact entertainment lighting. This document sets out to do that.

However it also aims to continue the discussion started with BEIS at the Entertainment Lighting Workshop held at the National Theatre in February 2022,



about whether there might be a better way of framing these exemptions, both to allow the regulation to be written with more clarity and to better 'future proof' the regulation so as not to preclude the use of any disruptive new lighting technologies that might appear during its lifetime. That discussion can be found in Section 4.

As ever, we welcome discussions on all these topics, and are happy to provide any further information that might be required in order to support the continued creation of spectacular, unique, memorable, powerful, emotive, beautiful lighting for entertainment – a field in which Britain is a world leader, its lighting designers in demand around the planet for work such as this:





# 2. SCOPE

Note: all section references are to the current GB Ecodesign Regulation for Lighting 2021, as found here: https://www.legislation.gov.uk/uksi/2021/1095/contents/made

Some entertainment lighting fixtures are excluded from the current regulation by being out of the regulation's scope. We believe this should be considered as part of maintaining the 'exemption for entertainment lighting'.

#### Part 2 section 2-2-b

To be in scope a light source must have: (b)a luminous flux < 500 lumen per mm<sup>2</sup> of projected light-emitting surface area as defined in Schedule 1;

#### Commentary:

This scope range excludes many of the high-intensity discharge ('arc') lamps that entertainment lighting uses. They generate a high light output from a very small 'spark' of light and so exceed this limit.

Many entertainment lighting fixtures have traditionally used this kind of lamp because they provide a high light output in a rugged package. However such fixtures have relatively high running costs because the lamps have a limited working life and so have to be replaced regularly.

Because of this, this type of lighting fixture is being replaced with lighting fixtures using integrated LED light sources very rapidly – or, at least, as rapidly as budgets and current supply constraints allow. This involves replacing the entire fixture, because the vastly different optical and electronic designs for arc lamps vs LED light sources means that drop in replacement light sources are not available for existing fixtures. The current fixtures are serviceable, and replacing them prematurely would just lead to the needless creation of waste.

Arc lamps will also be impacted by changes to the RoHS regulation regarding mercury, of which these lamps contain trace amounts. They currently have an exemption allowing their continued use under RoHS until Feb 2027. The entertainment lighting industry is currently trying to establish whether it is likely to have completed its transition away from arc fixtures by 2027 or whether it will require an extension beyond that to complete this transition – this is likely to be the case, but not for much longer beyond that.

We feel that maintaining this exemption to Ecodesign, and also keeping Ecodesign and RoHS in step with regard to this type of light, will continue to encourage this transition in a reasonable time-frame without forcing serviceable equipment to be rendered obsolete prematurely.

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### Part 2 section 2-2-c/d

To be in scope a light source must have (c)a luminous flux between 60 and 82,000 lumen; and

(d)a colour rendering index (CRI) > 0.

#### Commentary:

This excludes light sources with very low or very high light outputs. For entertainment lighting the upper band is more relevant, particularly for very high output fixtures used in the largest stadium concerts or large fixtures used in film lighting. These fixtures and the light sources they use (traditionally tungsten or arc lamps) are very specialist and unlikely to find a use in any other lighting application. Some fixtures with this kind of very high light output are currently problematic to replace with LED-source equivalents because 'bright' LEDs are often composed of multiple smaller LED modules which dramatically changes the optical design of the fixture and in some cases changes its light output characteristics in ways that are not acceptable for the applications for which it is used. It is very hard to obtain a single shadow from a high-output LED fixture, for example, because it actually contains many separate sources of light as it requires multiple LEDs to produce the same output as a single legacy source.

Again, because these traditional fixtures often have high running costs caused by the need to change their lamps regularly, there is a strong cost incentive to move to LED fixtures if they are available or as they become available, and the switch is being made when possible or as finance allows. However it may not be possible to force this transition to occur more quickly, particularly where replacements are just not yet available.

As an aside, we would note here that there continues to be a slight uncertainty in the current regulation about whether the light measurement is of the light source or the complete lighting fixture, particularly for lighting fixtures using integrated LED light sources which may not be easily divisible from the complete lighting fixture. This affects a number of these exemptions, but particularly this one since the light output from a complete lighting fixture will always be lower than from its light sources, because of the unavoidable losses as light passes through an optical system of lenses.



# **3. EXEMPTIONS**

Note: all section references are to the current GB Ecodesign Regulation for Lighting 2021, as found here: https://www.legislation.gov.uk/uksi/2021/1095/contents/made

We believe that in order to maintain the current 'exemption for entertainment lighting' within a future regulation written in a format similar to the current one, all of the individual exemptions detailed below would need to be maintained.

#### Schedule 4 Para 2c:

[battery powered equipment]
(c)light sources and separate control gears in battery-operated products, including—

(i)torches;
(ii)mobile phones with an integrated torch light;
(iii)toys with included light sources;
(iv)desk lamps operating only on batteries;
(v)armband lamps for cyclists;
(vi)solar-powered garden lamps;

Commentary:

This section was not created specifically for entertainment lighting, but does cover the many battery powered entertainment lighting fixtures that have been created for film/tv production work or event lighting. Battery power, particularly coupled with wireless control, allows fixtures to be deployed rapidly across sites without the complication and additional risks of installing cable.

There is a natural drive to make these fixtures as efficient as possible in order to maximise their operating time.

#### Schedule 4 Para 3-2-b:

(b)image capture and image projection (including photocopying, printing (directly or in preprocessing), lithography, film and video projection, holography);

#### Commentary:

This section was not created specifically for entertainment lighting, but does cover the increasing use of projection in entertainment lighting. Some uses of entertainment lighting could also be interpreted as image projection which may make this exemption more broadly relevant.

#### Schedule 4 Para 3-2-I:

(l)light sources with a beam angle of less than 10° and intended for spot-lighting applications requiring a very narrow light beam;

#### Commentary:

This section covers narrow beam angle lighting fixtures, which does include many lighting fixtures (whether using a separate light source – traditionally tungsten – or now increasingly an integrated LED light source) used in entertainment lighting, where the light has to travel a long distance from the lighting position to the stage to illuminate the performance from the correct angle.



#### Schedule 4 Para 3-2-m:

(m)halogen light sources with cap-type G9.5, GX9.5, GY9.5, GZ9.5, GZX9.5, GZY9.5, GZZ9.5, K39d, G9.5HPL, G16d, GES/E40 (low voltage (24V) silver crown only), GX16, GX16d, GY16, G22, G38, GX38, GX38Q, P28s, P40s, PGJX28, PGJX 36, PGJX50, R7s with a luminous flux > 12 000 lm, QXL, designed and marketed specifically for

(i)scene-lighting use in film studios, TV studios, and photographic studios; or

(ii)stage-lighting use in theatres, discos and during concerts or other entertainment events;

#### Commentary:

This section was written by and specifically for the entertainment lighting industry. It covers tungsten lamps currently used in entertainment lighting, generally identifying them by their lamp base type (ie. the connection between the lamp itself and the socket it inserts in to in the lighting fixture) rather than specific lamp models. This is because any given lamp might exist in a number of forms (575W or 750W, high output/short life vs lower output/longer life, for example); a list attempting to identify every individual lamp would quickly become unmanageable.

The lamp bases defined are for the most part only used for entertainment lighting applications, with the exceptions of the GES/E40 lamp base and the R7 lamp base, which is why those two are further qualified, and then all are further qualified by the need for them to be marketed for entertainment lighting only.

As noted in our February 2022 document, though tungsten is generally described as being inefficient compared to newer light source types, in entertainment lighting the actual power consumed by these fixtures is relatively low because of their usage patterns: when used in a show the fixtures are often dimmed below full, rarely are all of the fixtures on at the same time, and the fixtures are only used during performance times or occasionally for rehearsals. In many venues (particularly smaller venues – amateur theatres or village halls, say), there may only be a small number of performances during a year. The Feb 22 document includes examples of the power use of a typical performance vs the potential power use (the total connected load of the lighting rig); it is always a small percentage.

Tungsten has been the standard fixture type for theatres almost since lighting moved to electricity. The infrastructure of almost every theatre is designed around it. It is well understood, and tungsten fixtures are easy – and relatively inexpensive – to maintain. Theatres often have perfectly serviceable tungsten lighting fixtures dating back decades.

Forcing a rapid switch to LED is hugely problematic because it involves not only the replacement of established and low-maintenance-cost existing fixtures with expensive LED fixtures (with a few exceptions, drop-in LED replacement lamps are not available because of the different optical designs required), but also often the need to replace a building's entire lighting control infrastructure, as well as the need for upskilling of the theatre crew in terms of lighting set-up and fixture maintenance. Some very large theatres have completed this transition to LED – the National Theatre, for example. Others are working towards it as funds allow, though this is challenging after two years of shutdown. Many simply can't afford to, particularly since their usage patterns mean the high purchasing costs will never be recouped through power saving – and the new fixtures, being full of



complex electronics – are unlikely to offer the decades-long working lives of the fixtures they are replacing. Plus with everyone in the same position, redundant tungsten fixtures now have nowhere to go, becoming obsolete products.

We continue to believe that allowing the continued supply of lamps to let these products to continue to be used presents the 'greenest' path forward taking into account product life and potential waste generation compared to the relatively limited amounts of energy these tungsten fixtures consume in use.

The forcing point is likely to be lamp manufacturers abandoning the manufacture of these products, which is happening at a rapid place. At the moment the most used lamps (particularly the G9.5HPL) still have manufacturers committed to them. We would strongly argue that this 'natural death' be allowed to play out without being hurried along by regulation. There is a very, very low risk of these exemptions being abused to allow tungsten to continue to be supplied to the wider market since the lamps that are still available are so specialist that it would be hard to find a domestic/commercial use for them – plus the exemption precludes this by defining their use. In addition there are effectively no new tungsten entertainment lighting fixtures now being launched, so this exemption is largely about allowing the continued use of existing fixtures.

#### Schedule 4 Para 3-2-n:

(n)colour-tuneable light sources that—(i)can be set to at least the colours listed in the following table;

(ii)have for each of these colours, measured at the dominant wavelength, a minimum excitation purity of the values in that table; and

(iii)are intended for use in applications requiring high-quality coloured light;

Blue	440nm — 490nm	90%
Green	520nm — 570nm	65%
Red	610nm — 670nm	95%

#### Commentary:

This section was substantially revised by the entertainment lighting industry, since the original definition of the red, green and blue wavelengths was felt to be too narrow and would have precluded the creation of the kind of high-quality colourtuneable LED lighting fixtures that have established themselves as standard tools in entertainment lighting over the last decade. In this case it is highly efficient LED luminaires themselves that are in need of exemption, since the regulations are written around white light, not the coloured light used in entertainment.

Part of the challenge to the legislation here has always been that lighting fixtures which create colour by mixing together a number of different colours of light ('additive' fixtures) will generally always measure as being less efficient when outputting white light than a lighting fixture that uses a single white LED source.

However, when mixed to colours these additive fixtures quickly become more efficient than the white LED source fixture. To create colour from the white LED source, some colour has to be filtered from the beam ('subtractive' colour mixing), usually using variable glass filters of cyan, magenta and yellow, so an amount of



white light is being generated but a lesser amount of red (say) light is ultimately delivered to the stage. Whereas with an additive LED fixture, only its red colour set is now being used and so it is using less power overall, since it is only generating the precise colour that is actually needed at that moment.

In entertainment lighting, it has been established for some years now that just using red, green and blue colour emitters gives a poor white light because of gaps in the spectrum left where the three emitter colours do not overlap properly. Initially a fourth wide spectrum LED – amber or white – was added to fill in the gaps. Now this is being approached with more subtlety and with the ability to give finer control of colour by adding additional colour emitters, commonly now seven or eight, ten in the case of a few fixtures. It is these types of fixtures which led many theatrical lighting designers who had originally rejected LED fixtures for their inability to accurately render objects with complex colour, such as costumes or human skin, to revise their opinion – in effect to discover that they hadn't disliked LED in general, but poor quality LED fixtures in particular, and that good quality LED fixtures could happily work as part of their artistic lighting palette.

This exemption attempts to make some allowance for these fixture types, which don't compete well in 'white light' measurements but are actually more efficient overall when being put to their intended use and used to generate a variety of colours. The high percentage figures for red and blue were designed to have a high enough purity of the primary colours to ensure that it was a true colour mixing fixture, not just a fixture designed to adjust around white while trying to take advantage of the exemption. The lower figure for green is because primary green is less used than primary red and blue, and because the human eye has a peak sensitivity in green and so needs more energy in green in order to create a mix that looks white. However, these figures do not really reflect the complexity of additive colour mixing fixtures using multiple separate colour sources - generally the regulation as a whole is quite white light-centric. No allowance is made for for some of the other colours commonly used in these colour 'recipes' - lime green, for example, or deep blues or deep reds both of which are relatively inefficient on their own but do make useful and very obvious contributions to the colour quality of the resulting colour mixes - a 'quality of light is quality of life' judgement, rather than just an efficiency judgement.

The exemption as is stands requires that to be exempt, a fixture is capable of producing highly saturated colors, thus ensuring that it cannot be misused by white light luminaires which only offer limited range of colour temperature control. It serves its purpose for entertainment lighting, but a future revision might usefully deal with the complexities of creating light other that white light.



#### Schedule 4 Para 3-2-u:

(u) single capped fluorescent lamps (CFLni) having a diameter of 16 mm (T5), 2G11 4 pin base, with

(i)CCT = 3,200K and chromaticity coordinates x = 0.415 y = 0.377; or (ii)CCT = 5,500K and chromaticity coordinates x = 0.330 y = 0.335, specifically designed and marketed for studio and video applications for traditional filmmaking;

#### Commentary:

This section was created by the entertainment lighting industry, particularly the film lighting sector, working with the EU. It was designed to protect specialist film lighting fixtures using fluorescent lamps. Such fixtures have historically been used as lighting within confined spaces on small sets, where their compact size and low heat were not obtainable with other traditional light sources, or as floodlighting for large expanses of scenery or, particularly, the green screens used as the neutral background into which special effects are later inserted.

Users are rapidly moving to LEDs for these purposes, since they offer advantages of lower power use (particularly relevant when used in large quantities) and greater consistency from fixture to fixture. However the LED fixtures are more expensive than the traditional fixtures, and again it is necessary to replace the entire fixture since drop-in replacement light sources are not available; cost is the factor slowing this transition, but it is clearly happening.

We understand there is a desire to remove the exemption for double-capped T5 fluorescent light sources in the next Ecodesign revision. The fluorescent light sources defined here are different, created specifically for this application (and more expensive a as a result). The risk of these sources being used for other applications is low. They will also be affected by changes to RoHS (again, because of their mercury content) which may finally end their use. Ecodesign and RoHS would ideally be in step with each other with regard to these sources.



#### Schedule 4 Para 3-2-w:

(w)light sources which—

(i)are specifically designed and exclusively marketed for scene-lighting use in film-studios, TVstudios and locations, and photographic-studios and locations, or for stage-lighting use in theatres, during concerts or other entertainment events; and

(ii)meet at least one of the following specifications-

(aa)LED with power  $\geq$  100 W and CRI > 90;

(bb)GES/E40, K39d socket with changeable Colour Temperature down to 1,800K (undimmed), used with low voltage power supply;

(cc)LED with power  $\geq$  180 W and arranged to direct output to an area smaller than the lightemitting surface;

(dd)incandescent light source that is DWE type and has 650 W power, 120 V voltage and pressure screw terminal;

(ee)LED with power  $\geq$  100 W that allows the user to set different correlated colour temperatures for the emitted light;

(ff)LFL T5 with G5 cap with CRI ≥ 85 and CCT 2,900, 3,000, 3,200, 5,600 or 6,500 K;

#### Commentary:

During the very final round of negotiations on EU Ecodesign, this section became effectively the odds-and-ends 'dumping ground' for various light sources which had somehow been omitted from the earlier sections. In the final draft of the EU regulation, the EU actually introduced an inadvertent, we believe, change to (ii), which entertainment lighting had to work to have corrected before the final regulation was released (and had to then ensure that this corrected version was the one moved to be GB law). In terms of clarity of the regulation, all of the light sources described here would perhaps be better moved to other sections, eg:

- Tungsten light sources (GES/E40 K39d low voltage, DWE) to Schedule 4 Para 3-2-m.

- LFL T5 fluorescent fixture to Schedule 4 Para 3-2-u

with the notes included on those sections above equally relevant to these light sources.

Doing that would then allow this section to more clearly serve its original intended function, which was to deal with hight output LED light sources designed to function in optical systems where the light has to be collected from as small an area as possible to then be channelled through a precisely controlled optical system with a focal plane or gate, as is the case with theatrical spotlights that have to throw light over long distances in a highly controllable manner, and to deal with LED fixtures with high CRI light sources (giving better quality colour rendering) which are inherently less efficient than lower quality light sources. Those considerations remain vitally important ones for entertainment lighting fixture design.



#### Schedule 4 Para 3-3:

(3) CLS and CSCG designed and marketed specifically—(a)for—

(i)scene-lighting use in film-studios, TV-studios and locations, and photographic studios and locations; or

(ii)stage-lighting use in theatres, discos and during concerts or other entertainment events;

(b)where these are also designed for connection to high speed control networks (utilising signalling rates of 250,000 bits per second and higher) in always-listening mode,

are exempt from the requirements on standby  $(P_{sb})$  and on networked standby  $(P_{net})$  in paragraphs 1 and 2 of Schedule 3.

#### Commentary:

This text was written by the entertainment lighting industry to reflect the specialist application of lighting fixtures in live performance – in effect that lighting fixtures have to always be able to respond instantaneously, for exampl, so that the lights flash to full exactly in time with the beat of the climax of the music.

Lighting fixtures for other applications often conserve power by going into a 'sleep' mode with their control electronics running more slowly, such that they can respond to a command to change output – but only with a slight delay that would not be acceptable in entertainment lighting applications. Because entertainment lighting fixtures cannot use this technique they will have a slightly higher 'standby' power use.

The 'high speed control networks' section describes the standard entertainment lighting control protocol (DMX512, plus variations of the same operating over Ethernet) and was intended to ensure this exemption could not be abused by other lighting markets, who have no need of such control protocols and would not want to waste money implementing it.

We understand that the intent is to remove P-on from the next generation of this regulation, but have heard no discussion about the other 'P' values described in the current regulation.

It is worth noting here that users and manufacturers are starting to understand the importance of 'standby' power, particularly standby power when a fixture is not actually emitting light, since this power use will add up over time and, as the overall power use of a lighting rig is reduced by adopting more efficient technologies, will actually become a bigger percentage of the total power use than now. Manufacturers are starting to implement lower power 'hibernation' modes that users can select remotely during periods of time when an instantaneous response is not required (outside of show performance times, say) – here as in other areas entertainment lighting is doing its best to minimise power use wherever it can.

However, come show time the need for entertainment lighting fixtures to be able to respond instantaneously remains the same.



# 4. POSSIBLE SIMPLIFICATION

If you know the history of the discussions with the EU from 2018 onwards, it is easy to understand why this 'rats nest' of exemptions covering entertainment lighting came about. If you don't, you wonder why the exemptions are so scattered across the document, particularly when in some cases disparate exemptions are describing very similar light sources and so really should be together. In every case the exemptions are very particular to very specific light sources or to very specific light source technologies, in a way that would potentially be problematic to any future, as yet unknown, radical new lighting technology.

We proposed to the EU on several occasions that it would be simpler and clearer to define the exemption based on use by a particular sector ('lighting for live or recorded entertainment events') or for equipment designed specifically for a particular sector. They declined to adopt that approach.

We would like to propose the same thing again now. In particular, we would like to propose the approach of defining the exemption for lighting equipment designed specifically for entertainment lighting, or light sources designed specifically for such equipment. Suitable standards for identifying such equipment already exist – for example, EN60598-1 and EN 60598-2-17: Luminaires for Stage Lighting, Television and Film Studios (Outdoor and Indoor), or the older British standard that preceded the EU versions, or the IEC60598-1 and IEC60598-17 international versions..

We note that parts of the text used to identify lighting fixtures in the Feb 2022 BEIS Ecodesign consultation (page 9) come from the EN60598 standard that forms the basis of these specialist sub-standards – in other words, there appears to already be a recognition that these standards provide a useful basis for the equipment to be covered by the new Ecodesign regulation. It seems to us that it is not a very big step to using the more specific sub-standards to exempt light sources or lighting fixtures in a very clean, clear way – a very practical version of the simplification that seems to have been a driving goal stated by Government from shifting the GB regulations away from the EU versions.

There will of course be a concern that this approach could be open to abuse by other sectors of the general lighting market. We believe that the bar for achieving these standards is high, and so expensive, and therefore unlikely to be a worthwhile route to regulation evasion for more general (and lower cost) lighting products.

There could also be a concern that this approach would allow the entertainment lighting sector to abuse the regulation. But as we hope is clear the sector, led simultaneously by lighting designers and equipment manufacturers, is working very hard to transition to more energy efficient light sources, moving as rapidly as technology and budget allow. The entertainment lighting industry's goal is to provide both leadership and inspiration to others when it comes to reducing power use. We seek these exemptions not to abuse them, but to allow a transition that is considered, affordable and takes into account environmental considerations beyond just power use.

We are, as ever, happy to discuss this further at any time.



# 5. SUMMARY

We believe that this document identifies the specific sections of the current (GB2021) Ecodesign regulations that, taken together, provide an exemption for entertainment lighting.

We hope that this will assist you in your stated aim of maintaining this exemption when creating the updated GB Ecodesign regulation.

We would welcome the opportunity to comment on that as you formulate it and, as always, are happy to provide any other information you may require.

We thank you for your time.





#### ALPD

The Association for Lighting Production and Design is the body representing all those who work in or are interested in the creation of lighting, video and projection for live performance and events. It is an association that welcomes lighting and video designers, technicians and programmers across the full range of performance lighting disciplines. Formed in 1961, the Association today has a membership of just under 1,000 ranging from internationally recognised names at the top of the industry, through to students and the emerging practitioners of tomorrow.

https://www.thealpd.org.uk



#### PLASA

PLASA is the lead international membership body for those who supply technologies and services to the event and entertainment industries. The organisation supports its members in the areas of business, technical, safety and regulatory issues. Its commercial division produces the industry publications L+Si and L&SA, while its PLASA Show in London and regional Focus events provide businesses with the opportunity to showcase their technology and services.

https://www.plasa.org

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Lighting Design Credits, page 3, left to right by row: London 2012 Olympics Opening Ceremony (Patrick Woodroffe), Coldplay (Paul Normandale), An Inspector Calls (Rick Fisher), Six (Tim Deiling), Les Misérables (David Hersey), War Horse (Paule Constable), Strictly Come Dancing (David Bishop), Stormzy (Tim Routledge), Harry Potter and the Cursed Child (Neil Austin), with thanks to all the photographers.

[ENDS]

