CIBSE

Invitation to Tender (ITT)
For professional services to the CIBSE Knowledge Management Committee

Human response to lighting based on LED lighting solutions

November 2014
## Contents

1 INTRODUCTION .................................................................................................................. 3  
   1.1 Background.................................................................................................................. 3  
   1.2 Outline Requirements ............................................................................................... 3  
2 SPECIFICATION ................................................................................................................. 4  
3 PROJECT MANAGEMENT ..................................................................................................... 4  
4 TIMESCALES, COSTS & DELIVERABLES ............................................................................. 5  
5 TENDER INSTRUCTIONS TO CONTRACTORS ................................................................. 6  
6 FORMAT OF TENDER RETURN ......................................................................................... 6  
7 ASSESSMENT CRITERIA ....................................................................................................... 7  
8 TERMS AND CONDITIONS .................................................................................................... 7  

ANNEX A – CIBSE Model Research Agreement  
ANNEX B – CIBSE Standard Terms & Conditions  
ANNEX C – CIBSE Contracts Procedure Note
1 INTRODUCTION

1.1 Background

The use of LED light sources for all forms of lighting applications is escalating at a rapid rate. These implementations are fuelled by political pressure on lighting energy savings and by the rapid technological development of LED sources. This has resulted in new entrants to the lighting market by producers who have little or no experience in lighting.

There is also an increasing public concern fanned by claims about harmful effects of LED lighting which have been given extensive coverage by the popular media. These concerns need to be resolved by independent lighting studies.

Recent press articles have suggested that the whiter light from LED’s now being used for roadlighting is linked to increase risks of cancer. There is plenty of research in the medical field on this topic and a paper study of this research is required to come up with a definitive summary and conclusion in this area.

CIBSE is seeking tenders to investigate the impact on human health and wellbeing of the visual effects of colour and of flicker when using LED sources.

1.2 Outline Requirements

The key issues with LED lighting that need urgent actions are;

1. The ease with which LED’s can be embodied into a luminaire has resulted in new suppliers entering the market with little knowledge of how to make a reliable product. IEC/CIE standards are now emerging which cover safety and performance. However even then there is little understanding of the correct application of light from these new market entrants, which is leading to inappropriate installations.

2. In the haste to get products to the market the producers often make unsupported and unreliable lighting performance claims that are increasingly causing concerns to end users to such extent that they resist their usage particularly in office and road lighting, two areas of lighting which have huge opportunities for reductions in energy costs. These unsupported and unreliable product performance claims may suffer from the lack of suitable product standards and application advice.

3. LED lights are low lumen monochromatic sources and work differently to other sources. This is not particularly concerning, but what does matter are the properties of the light output. In principle we should be able to use the same criteria to judge the human acceptability of light from LEDs as we do from any other light source.

4. LED light sources do not behave like other light sources such as filament lamp or fluorescent tubes yet they are often compared for lighting effectiveness. Clearly there is need for some kind of comparison otherwise how would LEDs be assessed for use in architectural applications?

5. The need for better understanding of LED lighting characteristics is urgent. There is a clear need for LED product and application standards development to assist lighting applications and scheme design.

6. SLL lighting publications need to be updated to take account of the ‘disruptive’ nature of this new lighting technology, bearing in mind the prediction that by 2015 50% of all lighting sales will be LED based.

The scope of the proposed work is described in Section 2 and tender instructions are provided in Section 5.
The proposed work is relevant to a range of CIBSE/ SLL publications. These include the
SLL Code for Lighting
SLL Lighting Handbook
SLL Lighting Guide LG7 Office Lighting (New version to be published in 2014)

2 SPECIFICATION

The aim of this project is to investigate certain aspects of LED lighting, to assess how they
impact on humans and give quantitative indicators for acceptable measures. It should
consider the possibility of fundamental research balanced against reporting on existing work
being carried out within CIE and other organisations. It is designed to yield unbiased results
that will provide guidance and confidence to lighting designers, specifiers and the general
public on the use of LED lighting solutions. The project is intended to address five key areas:

1. Measurement of colour of LEDs currently available on the market.
2. Assessment of the role of derived colour metrics.
3. Measurement of flicker of LEDs currently available on the market.
4. Assessment of the impact of flicker on users.
5. Survey existing research into the effects of low LED light levels on circadian rhythms.

The project is divided up into the following packages of research:

Package A: Colour
- Colour appearance
- Colour rendering
- Gamut area effects
- Colour discrimination
- Colour stability
- Colour variation with spatial location

Existing criteria may not predict the visual effects of colour when using LED light sources.
This package should investigate existing research under these headings and recommend
any changes to existing practice, bearing in mind the need to maintain references to
conventional lighting technology.

Package B: Flicker
- Measurement of flicker of LED systems on the market
- Assessment of impact of flicker

Many LED drivers supply pulses of power to the LED so the light output becomes a series of
pulses. Flicker has been assessed in a number of research papers but at lower frequencies
and with a lower level of modulation. The characteristics that will ensure retro-fit LEDs do not
have major flicker problems due to a mismatch between them and existing dimmers need to
be established. Typical LED flicker at 700-800Hz at 100% modulation requires study.
Classically it would be expected that the flicker frequency would be well above the fusion
frequency of human vision, but may have effects on the perception of moving objects. The
potential impact of flicker from LED's on health and wellbeing, needs to be assessed, and
the Wilkinson/Bedocs research from the 1980’s revisited. The implications of the findings of
this study on road lighting applications should be specifically considered.
Package C: Spectrum:
  o Radiological protection issues
  o S/P ratio for use at night
  o Circadian entrainment

Radiological Protection is well understood but there may well be a need to respond to press reports about the dangers of LEDs. The Scotopic to Photopic ratio is easily calculated from the spectral power distribution of the source. The S/P ratio is important to assess a source's ability to improve mesopic vision. Mesopic enhancements are only important for peripheral visual tasks. With many LED streetlights the small source size means that better optical control is possible and so many lanterns produce much less spill light and so regions where peripheral vision may be important get less light and so there is no net benefit. This area should only be investigated when the role of peripheral visual task is better understood.

Some of the work described above overlaps with existing research so it is important that this is reviewed to ensure that there is no duplication of work already underway. It can also not be expected that any UK research will make changes to fundamental lighting measures as such changes could only be introduced with International agreement.

3 PROJECT MANAGEMENT

It is intended to let a contract or contracts for work on the three Packages to begin in February 2015. The successful contractor will be required to produce preliminary draft reports for each package for review by the Steering group, along with a final report. In addition to the report produced for the Society of Light and Lighting the contract will require a paper or papers be prepared for publication in LR&T.

It is anticipated that packages A and B will require up to six months and package C up to three months.

The project will be managed by a Steering Group appointed by the Technical and Publications Committee of the Society of Light and Lighting on behalf of the CIBSE Knowledge Management Committee (KMC). The project will be overseen by the CIBSE Research Manager, Dr Anastasia Mylona.

4 TIMESCALES, COSTS & DELIVERABLES

Each submission should identify which package or packages it covers and give an outline of the proposed approach to the research and a synopsis of the expected work required, as well as an outline of the intended reporting at preliminary and final stages, proposed papers for LR&T and any proposed contribution to SLL guidance.

The proposal should set out the proposed approach, with a CV for each participant setting out relevant information regarding the experience of the proposer, including any previous experience of working on industry guidance, including for CIBSE/SLL.

Submissions should be costed and identify and quantify any in-kind contributions offered by the proposer. A proposed timetable and fee schedule for the work should be included, based on work starting in February 2015.

The work will be overseen by a Steering Group to ensure a consistent approach is taken and allowance should be made in the timetable and costs for an appropriate level of engagement with the Steering Group, which will be undertaken by correspondence as far as possible.

The successful proposal, subject to any modifications which may be agreed prior to the award of contract, will form the basis for the research agreement. The standard CIBSE Research Agreement, standard terms and conditions and contracts procedure note are included at Annex A – C.
5 TENDER INSTRUCTIONS TO CONTRACTORS

Interested parties should provide fully costed tenders addressed to Dr Anastasia Mylona (CIBSE Research Manager) by email to MFilas@cibse.org by 12pm, on 5th January 2015. Should you have any questions regarding this ITT then please contact Dr Mylona, amylona@cibse.org

The tender process will follow the timescales below:

<table>
<thead>
<tr>
<th>Item</th>
<th>By when</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITT sent out</td>
<td>24/11/2014</td>
</tr>
<tr>
<td>Deadline for tender return</td>
<td>5/01/2015</td>
</tr>
<tr>
<td>Successful contractor appointed by</td>
<td>31/01/2014</td>
</tr>
<tr>
<td>Kick off meeting</td>
<td>February 2015</td>
</tr>
</tbody>
</table>

Requests for clarifications of the ITT documents must be made in writing, preferably by email, not later than midday on 5th December 2014. If CIBSE needs to issue any additions or clarification to these documents during the bidding period, we will do so in writing (usually by email) and send this to all those who have expressed an intention to submit proposals to all Contractors. Your organisation must bear all costs associated with the bidding process itself.

CIBSE reserves the right to let each of the work packages described in section 2 to separate contractors, or to let a contract for more than one package.

CIBSE shall be under no obligation to award a contract for all or any part of the requirement set out in this Invitation to Tender, to any supplier or at all. **We would be grateful if you could inform us as soon as possible whether or not you intend to submit a tender.** If you decide not to respond to this ITT, please let us know in writing as soon as possible, giving brief reasons.

6 FORMAT OF TENDER RETURN

**Tender Response:** Please submit 1 electronic copy and 2 hard copies of your tender response, most business file types are acceptable. All information in this ITT document set shall be treated as confidential. Tenders should show firm lump sum prices (including expenses but exclusive of VAT) in sterling for the services offered.

Submissions shall be addressed to The Research Manager, CIBSE, 222, Balham High Rd. London, SW12 9BS

The supplier shall submit a detailed proposal describing:

- The scope of work offered, amplifying on the tasks identified above and including any others not specified which the Contractor considers necessary
- A project plan with milestone deliverables, including and delivery dates and costs
- A schedule of staff time and individual day rates used to determine the prices for each of the deliverables
- The experience of the organisation in this type of work
- The proposed project team and their individual experience
- Details of how the project would be managed and monitored and risks assessed and mitigated
- Case studies and names of referees from similar projects.
7 ASSESSMENT CRITERIA

The supplier will be selected on an evaluation of their submission, which will include price, quality and experience in undertaking this type of project.

The relative weightings for the evaluation of submissions are as follows:

- Understanding of the brief 20%
- Relevant experience & track record 20%
- Technical ability and suitability 50%
- Overall quality of bid 10%

Each aspect will be scored on a scale of 1-10. CIBSE reserve the right to invite candidates for interview if necessary.

8 TERMS AND CONDITIONS

The contract will be let under the draft agreement at Annex A. Terms and Conditions will be in accordance with the CIBSE standard terms at Annex B. Should any clauses be unacceptable to the supplier this must be noted in the tender submission and alterations proposed. Annex B sets out the procedures relevant to the conduct of the contract.