Lab Notes

Issue 4

Why Tri-Phosphor Lamps are Unsuitable for Hospital Lighting

Introduction

Following the introduction of the higher efficacy triphosphor lamps in the early 1980s, a large number were quickly installed into commercial installations, including many hospitals. This was not only the case in Australia, but also in other countries such as Britain and New Zealand.

As a consequence of this, there was much commercial pressure brought to bear for these lamps to be written into the new Australian / New Zealand Standard on Hospital Lighting AS/NZS 1680.2.5.

This matter was duly considered by the Standards Australia Committee LG/1, but after much long and very careful deliberation, it was decided not to include these triphosphor lamps as being acceptable for use in clinical observation areas.

The 1970s Trials

In the early 1970s very extensive trials were carried out at the Royal Prince Alfred Hospital in Sydney, in order to ascertain which tubular fluorescent lamps were acceptable to assist in the early positive recognition of cyanosis.

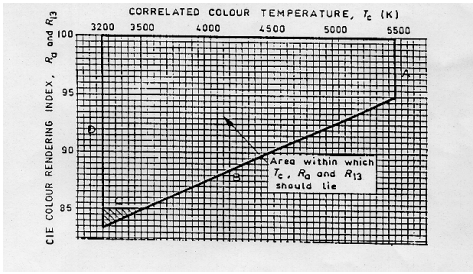

Figure 1. - Colour rendering (Ra) limits

Cyanosis is a condition where human beings "turn blue" for the want of oxygen, and it is generally accepted that the cyanosis point is equivalent to 93% oxygen saturation of the blood.

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These 1970s trials led to the adoption of a set of lamp colour temperature and Colour Rendering (Ra) limits in the then Australian Standard AS 1765 - 1975, (Refer Figure 1), and in Australia to the widespread adoption of the Colour 37 lamp as the standard lamp for clinical observation of the cyanosis condition.

Now in the 1990s

The problem with the Colour 37 lamps however is that although they have very high colour rendering, their luminous efficacy (lumens per watt) is relatively low, and because of this low efficacy the more efficient triphosphor lamps are widely used as replacement lamps for them.

It is generally recognized in medical literature that the detection of cyanosis requires adequate light in the 640nm to 660nm wavelength, and this means that light sources which lack energy in this spectral band, will lead to the blood having a false darker appearance. Similarly light sources with an excess of energy in this spectral band will give the blood a lighter appearance, thus giving a false impression of a cyanosis condition.

The difficulty faced by the LG/1 Standards Committee therefore, was that this current range of triphosphor lamps had an unacceptably low level of energy in this critical spectral 640nm to 660nm band.

Recent new experimentation work conducted at the Royal North Shore Hospital in Sydney, NSW, and in conjunction with the School of Optometry at the University of New South Wales, has shown that only a small change in the formulation of the phosphorous in the current triphosphor lamps would be needed, to make these lamps acceptable for the Standard.

We understand at the time of writing, October 1997, that the NEC Company has produced a range of tubular fluorescent lamps which meets the AS1680.2.5, Ra, CCT specification. (Refer Figure 2.)

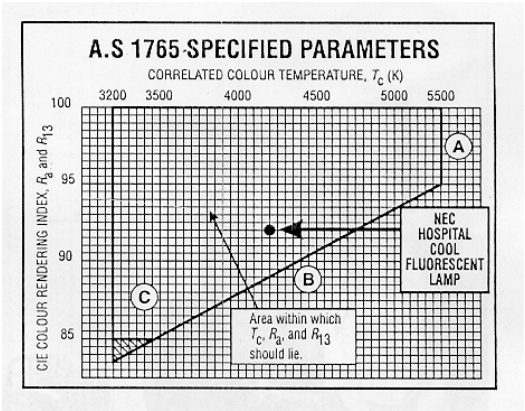

Figure 2.

This lamp is called, the NEC "Hospital Cool Fluorescent" lamp. The manufacturer claims for the 37 watt version 81.1 lumens per watt efficacy which is a considerable improvement on the old 40 watt colour 37 lamp which yielded only 43.3 lumens per watt.