IIB Module 4M19 Coursework **(RETURN TO MRS EVERETT'S OFFICE)**

Detailed notes for task L1 Illumination and daylight factor

Task (as outlined in main handout on Environmental Measurement)

Select a suitable lecture room (LR5 or LR6) where you can take readings undisturbed. First measure the daylight factor at desk-top level on two lines across the room, one at a main window, one between windows. (The daylight factor is the ratio of illuminance on a horizontal plane at a point in the room to the unobstructed diffuse sky illuminance outside – simultaneous readings in overcast weather are desirable.) Compare with methods of calculating daylight factors, and comment.

Next, survey the actual desk-top illuminance across the room, at different times of day, with artificial lighting, etc., and note subjective responses. Compare with standard recommendations for such rooms.

Equipment : 2 digital luxmeters, walkie-talkie set.
References : (refer to H1).
The SSL Lighting Handbook, Chartered Institution of Building Services Engineers, 2008.

1. Detailed notes

The "daylight factor" is defined as a ratio of (i) the illuminance on a horizontal plane at working height (desk-top level) at a point in a room, to (ii) the unobstructed illuminance on a horizontal plane outside the building – both for a diffuse sky, so no direct sunlight allowed. So you need to measure (i) and (ii) simultaneously (since illuminances can fluctuate markedly) – which may be effected by the walkie-talkie set. For (i) there must obviously be no artificial light on in the room, and the windows should be closed (note how clean they are). Light can be internally reflected, from walls and ceilings, on to the lux meter – take care not to obscure any major light paths. For (ii) you need to be well away from buildings, to catch light on a horizontal plane from a hemisphere of cloudy sky.

Choose two lines across the room for daylight factor determination, one centred on a main window, one between windows. Present results in graphical form. You could compare with methods of calculating daylight factors (Environmental Data sheet) at a couple of well-spaced points (estimating such factors as reflectance of walls etc.); compare measurements with recommendations; and comment. (No one student should do more than 2 daylight-factor calculations, but it is more interesting to calculate daylight factors at a few points, rather than consider the "average" factor in the room.)

The second part of the task is more to do with illuminance magnitudes at work-top level than with daylight factors. You could choose several distinct circumstances – bright day with no artificial light, dull day with some lights, full artificial lighting at night. Is there reasonable illuminance everywhere? How do things compare with standard recommendations? What do users themselves think about light levels? How could the lighting system be improved, e.g. to remedy deficiencies or save energy?

You should take readings at lunchtime and/or in the early evening, when you can control the lights and take readings undisturbed, but you may wish to return to the room to capture the feedback from the occupants.

2. Equipment available

Two digital luxmeters. Walkie-talkie set.

Calibration of the luxmeters against a standard is not vital for the daylight factor (ratio) measurements – but you should check that the two meters agree reasonably over a range of conditions. Try not to obscure any significant light source. For absolute illuminance measurements calibration against a standard is desirable but not easily effected.

The MATLAB software on the DPO system may be useful for plotting contours, etc. (especially if illuminances have been read on a grid of points).

3. **Write-up**

Keep the write-up brief. It will probably be sensible to give a sketch plan of the room with North direction shown. Concentrate on the graphs of daylight factor across the room, and how they compare with expectation and calculations.

4. **References**

(a) New Metric Handbook; Planning and Design Data, Butterworths Architectural 1990 [Folio AH32 in CUED Library] (pp. 412-8 enclosed)

(b) The SSL Lighting Handbook, Chartered Institution of Building Services Engineers, 2008.

(c) BRE Design for lighting [Folio GU52 in Library] (some extracts enclosed).