

The Effect of Source Brightness on Perceived Illumination

A summary of

The Penn State Study

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THE NEED FOR THE STUDY

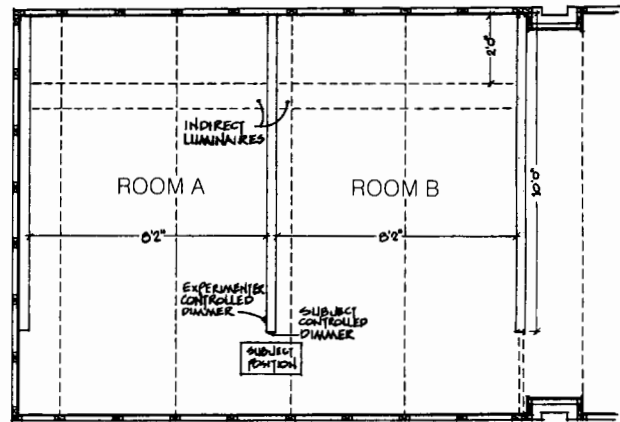
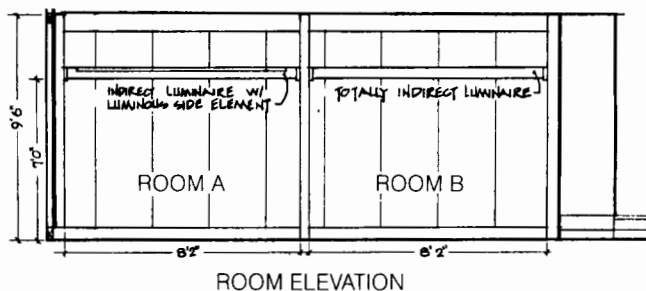
In recent years, low-brightness and indirect luminaires have been used increasingly to minimize glare and veiling reflections.

However, anecdotal observations indicate that the physical comfort these fixtures attain can be offset by a corresponding psychological discomfort: a disorientation caused by not knowing where the light is coming from and a perception that whatever the measured light may be, it's inadequate to work by.

Peerless Lighting felt the need to evaluate the effect of source brightness on perceived illumination. The Penn State study quantifies the influence of different levels of source luminance at high, medium and low levels of workspace illumination.

THE TEST ROOM

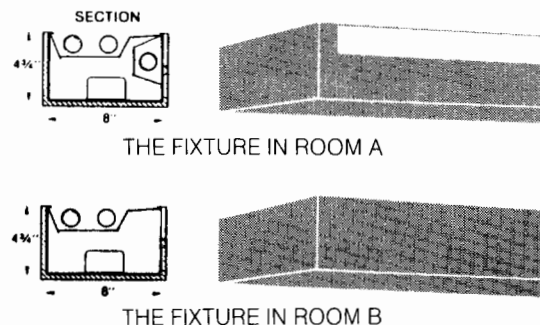
The study was conducted in a 16' x 20' space at Penn State in University Park. The room was divided into two identical test spaces designed to simulate typical work spaces. Each test space contained a desk and a chair. All finishes were neutral off-whites and grays. The ceilings, walls and desk tops had a 75% reflectance, the floor had a 25% reflectance.



ROOM PLAN

THE FIXTURES

Each space was fitted with an indirect lighting fixture. The fixtures were identical except that the luminaire in test room "A" had a luminous side element that could be controlled independently from the fixture's output. The luminous lens on the fixture in room A did not affect the light distribution at any level of brightness and could be dimmed from 1250 fl. to zero when viewed from the subject's position.



THE FIXTURE IN ROOM B

THE SUBJECTS

The researchers tested 34 college subjects selected by the university's psychology department. Some of the subjects wore glasses or contact lenses.

THE TEST PROCEDURE

The subjects participated one at a time. Each sat facing both test rooms while the experimenter preset an illumination level in test room B and preset a luminance level on the lens in the fixture in test room-A. The subject then adjusted the illumination level in room A until it matched the overall brightness of room B.

Room B, the room with the totally indirect luminaire, was pre-set at either 30, 50 or 70 foot candles— low, medium and high light levels for workspaces. There were five pre-set luminances for the lens on the fixture in room A: 300, 500, 700, 900 and 1200 fl. (As points of reference, a bare fluorescent lamp has a surface luminance of around 4000 fl. The top setting, 1200 fl., borders on glare.)

The researchers presented each subject with 15 different illumination/luminance combinations in random order. After each adjustment by the subject, the researcher readjusted the illumination in room A to 25% above or 25% below the level in room B in order to avoid leading the subject.

The researchers then applied sophisticated evaluation techniques such as Factor Analysis and Analysis of Variance.

THE RESULTS

In short, the results of the study indicate that an indirect lighting fixture with a low level of visible source brightness will create a higher level of perceived illumination than an indirect fixture that has no visible light source.

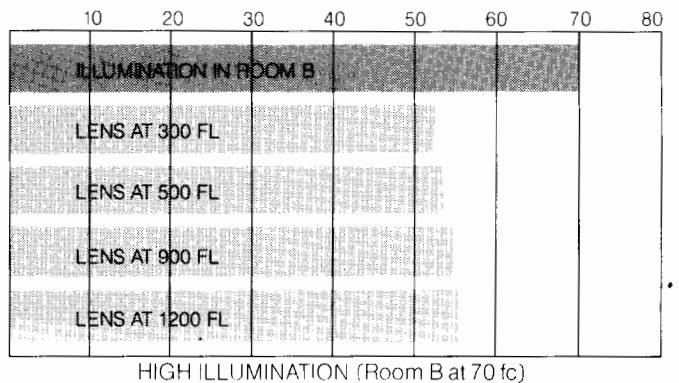
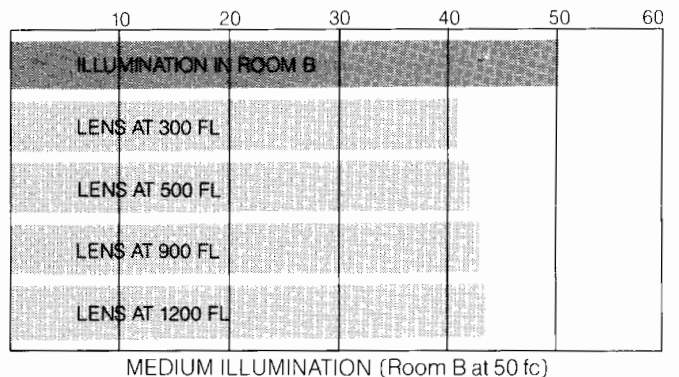
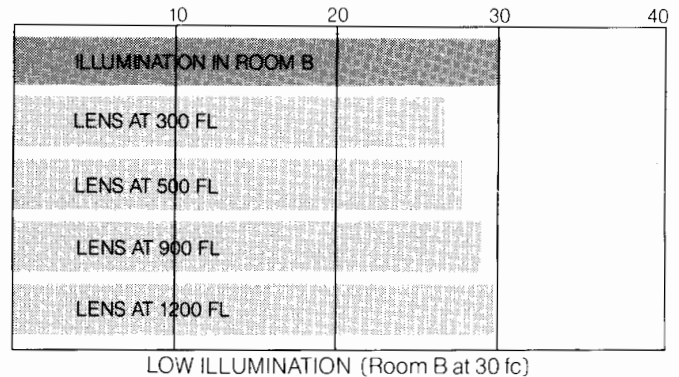
The test states "the simplest conclusion that can be drawn from the data is that the existence of the lens does indeed affect the perception of overall brightness in a space." The higher the overall room illumination level, the more pronounced the effect of the lens becomes.

To quote the report, "this suggests that we only need a little bit of light coming off the lens to generate an effect on the perception of brightness and that too much light will inhibit the effect."

PERCEIVED ILLUMINATION LEVELS FROM THE PENN STATE TEST

These charts show the relationship between the actual illumination provided by the totally indirect fixture in test room B and the perceived illumination levels in test room A. The bars represent the footcandles generated by the visible-lens luminaire after the subject adjusted its level to match the fixture in room B.

The basis of these charts is the 't' test values obtained through factor analysis of all data.



PEERLESS

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Copies of the complete research study and product literature on indirect lighting systems with controlled source-brightness lenses available on request.

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