

Lab Notes

Issue 7

What is Glare ?

1.00 Introduction :

This Lab Note is one of several which discusses the matter of glare in the workplace. They have been issued as a series of short and easily digestible articles rather than one long and heavy text book.

This Issue 7 Lab Note attempts to address the subject of “Glare,” and what is our current knowledge of this strange and illusive phenomena.

Other Issue numbers and titles are as follows:

Issue 2 : *The Unified Glare Rating System as a Productivity Tool*

Issue 8 : *The Control of Glare by the AS1680 Systems*

Issue 9 : *Dealing with Discomfort Glare in the Interior Workplace*

Issue 10 : *Disability Glare in the Outdoor Workplace*

2.00 What is Glare ? :

The subject of glare has fascinated researches in the field of vision since the early years of this century. Interest in vision research roughly paralleled the development of the electric lamp.

The nature of glare, even after 80 years of study, is not yet fully understood. It is still a “will-of-the-wisp” awaiting a discoverer.

Even the name does not describe the visual processes involved. In the English language, glare is differentiated into Disability Glare and Discomfort Glare. In the German language these are known as Physiologische Blendung and Psychologische Blendung. (Physiological Glare and Psychological Glare). These titles at least give some indication of the nature of the glare process.

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The word “glare” forms a part of our everyday vocabulary. We talk about “glaring at somebody” or a “glaring mistake”, yet the phenomena is not completely understood by so many people in either the engineering, the architectural, or the medical professions.

Although there was a great deal of research money spent on glare in the 1950's and 1960's, it was mainly directed towards creating a glare control system or formula which would give that company or country a commercial advantage over competitors.

3.00 Factors Relating to Glare :

It would not be unreasonable to say that the vast majority of people in the work place do not recognise a Discomfort Glare situation. However, what they do not know is that they have a headache, their eyes are sore, and they feel irritable and short tempered.

What can be said about our real knowledge of the mechanism of glare? We have the CIE definitions which distinguish between Discomfort and Disability Glare and they are defined as follows:

- * Discomfort Glare, which causes discomfort without necessarily impairing the vision of objects (definition 45-25-315)

- * Disability Glare, which impairs vision without necessarily causing discomfort (definition 45-25-320)

However it is usually considered that these are descriptions rather than definitions, and that they do not necessarily precisely define the condition which we call “Glare.”

It would appear as the result of many years of appraisal by researchers, that certain facts about glare are generally accepted.

There are four major factors which contribute to a glare situation and these are :

- * the Luminance of the light source which is the dominant component
- * the Luminance of the background
- * the size and number of glare sources
- * the relative position of the glare source

4.00 Other Descriptions of Glare :

One of the very early researchers into glare was an American optometrist Percy G. Nutting. He was the Chairman of the American Illuminating Engineering Society's Committee on Glare. In 1914 and 1915 this committee produced 13 reports on glare. In 1922 the Nutting Committee became "The Sub Committee on Glare of the Research Committee of the IES," under the Chairmanship of Louis Bell.

This Committee defined three varieties of glare -:

- Veiling Glare
- Dazzle Glare
- Scotomatic Glare

In 1924 Luckiesh and Holladay in their investigations found three types of glare, and used the 1922 Bell Committee's terminology, but they renamed Scotomatic Glare as Blinding Glare.

They also thought that Veiling Glare should be more accurately described as Veiling Brightness - :

"because glare in a restricted sense often is not involved, even though visibility is greatly reduced."

Luckiesh and Holladay also considered Blinding Glare to be "the highest degree of glare".

In the second half of the 1920's there was considerable activity in glare research both in America and England. It was the Englishman W. S. Stiles in his 1929 paper entitled "The Nature and Effect of Glare," who coined the term Disability Glare, and he also first differentiated between Disability Glare and Discomfort Glare.

4.1 Disability Glare :

The Dutch researcher J.J. Voss later described Disability Glare as - :

"the masking effect of bright light sources, on the visibility of objects elsewhere in the field of view"

The most commonly experienced example of Disability Glare is the disabling effects of the headlights of oncoming motor cars. There are other examples of course, such as the difficulty in seeing road objects when entering a tunnel.

The popular explanation of Disability Glare is that it is the result of light scatter within the ocular media of the eye, and this would explain why we see a halo of light around a glaring light source in the dark. However it does not explain why we see the entrance to a tunnel as a black hole effect against a bright sky.

This appears to be a suppression of sight, rather than the addition of light into the eye.

What we do know is, that inter ocular stray light increases dramatically with increasing age.

But to return to the “black hole” effect of the tunnel entrance. Generally people do not complain about the stray light over the tunnel entrance. They actually complain about the “dark hole”, as if there is insufficient light.

In reality the darkness is not caused by the lack of light but rather by the inability to see objects and details.

Lab Note Issue 10 discusses the methods of quantifying Disability Glare, and how these methods are applied in outdoor workplaces, such as container storage areas and mine sites.

4.2 Discomfort Glare :

J.J. Voss once described glare as - :

“a general expression for the hindrance effects on visual performance, by strong lights in the field of view.”

Voss also considers that there are two levels of Discomfort Glare. They are Relative Discomfort Glare and Absolute Discomfort Glare.

He described them as - :

“**Relative Discomfort Glare** which occurs in normal lighting conditions, when visibility of the illuminants may have a sort of distracting effect on the occupants“.

and

“**Absolute Discomfort Glare** which occurs when the general light level becomes too high, making people reach for the sunglasses.

5.00 Australian Observations :

It would appear from our Australian observations, that there are three consequences of experiencing a Discomfort Glare situation -:

- Discomfort Glare has a cumulative effect. ie. It is more troublesome at the end of a day, or after prolonged exposure. (This is distinctively different from a Disability Glare situation which is immediately evident.)
- Discomfort Glare appears to raise one’s level of irritability
- Discomfort Glare appears to lower one’s level of tolerance to other peoples’ idiosyncrasies, or to other distractions within the immediate environment

It is regrettable that all of the time and effort which has been put into Discomfort Glare research over the past fifty years, has concentrated on developing a numerical glare evaluation system, and very little effort has been expended into researching the basic mechanism of glare.

Consequently little is known of the effects of factors such as increasing age, the intake of alcohol or drugs, the effects of either physical or mental fatigue - and of course, stress. There is anecdotal evidence that these factors do accelerate the onset of the effects of Discomfort Glare, i.e. headaches, sore eyes, irritability, etc, but at this point in time this evidence is only anecdotal. The only known "cure" for the condition at the moment is rest, and the removing of one's presence from the glare source.

Unfortunately most people do not recognise Discomfort Glare as a source of stress. "Yes, I have a headache, but it will go away," is the common reply of a person when questioned, without that person not knowing or recognising the origin of the headache.

Lab Note No. 9 discusses practical methods by which the lay person can make a reasonable judgment as to whether or not a Discomfort Glare situation is likely to exist in a particular situation, and it also makes recommendations as to how such problems might be overcome.

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