



Factors Affecting Visual Performance

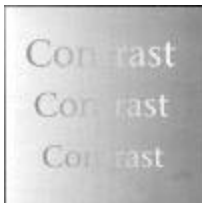
Our ability to perform a visual task depends on how well our eyes perceive the details of the task. Factors determining the visibility of task details include size, luminance, contrast and glare. These factors are interrelated.

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Size: Making objects larger, or moving them closer to our eyes, makes them easier to see. We need less light to perform a task when detail size is increased.



Luminance: Visual performance requires sufficient light. The optimum level of luminance needed to perform a task depends on the nature of the activity, e.g. -- using a keyboard or reading newsprint.



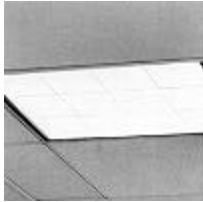
Contrast: Luminance variation, or contrast, allows us to distinguish a visual task from its surroundings. As shown in the example, greater contrast between letters and their background improves readability.



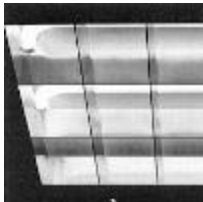
Glare: Bright light which interferes with visual perception is called glare. An overly bright area in our field of vision reduces our ability to perceive visual information needed for task performance.

Different Types of Glare

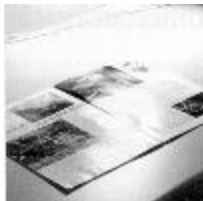
Glare caused by a bright object directly in our field of vision is called *direct glare*. Glossy or polished surfaces, which reflect the image of a bright object, produce *reflected glare*.



A bright light source within our field of view produces high angle direct glare. *To the left is an example of a luminaire causing high angle glare in the distant view of a worker.*



A bright light source visible almost directly overhead produces low angle direct glare in or peripheral vision. Our eyebrows help shield our eyes from this type of glare. *To the left is an example of a luminaire causing low angle glare in a worker's peripheral view.*



A glossy surface can reflect a mirror-like image of overhead lighting directly into one's eyes. This distracting reflected glare reduces contrast between a task and its surroundings.

The glossy surface of this magazine has produced reflected glare so severe the printed text can no longer be read.



Bright light sources or images of distant objects reflected in VDT screens create screen glare, a major cause of both reduced VDT task visibility and VDT operator visual discomfort. *Inappropriate direct lighting has produced screen glare on this monitor. The bright patches of reflected light will distract the operator and reduce the contrast of characters on the screen.*

Luminance Variation vs. Glare

Large differences of surface luminance in our field of view cause glare and impair our vision. On the other hand, a work environment with no luminance differences would be flat, dull and unattractive. Optimally, an office interior should be lighted to strike a balance between totally uniform luminance and glare-producing extremes.



Shadowing and Modeling

Hard direct light--as opposed to soft, diffused indirect light--produces shadows. Bad shadowing creates distracting contrast and prevents us from seeing task details. Good shadowing creates modeling, defining texture and revealing shape and form. Depending on the location of direct light sources, visual performance can be reduced due to shadows cast by occupants, partitions or other objects in the work area.



Shadows caused by direct light falling on a person's hands result in uncomfortable luminance variation and reduced light for performing the visual task



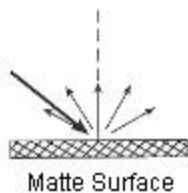
Controlled shadowing, or modeling, can increase visual comfort by giving a space definition and revealing interesting details. Without shadowing, the form of the circular object on the left is ambiguous. The shadowing on the object on the right clearly indicates a sphere



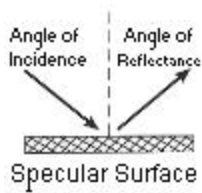
The shadows on these vases create visual interest and reveal information that would not be apparent if the lighting were totally uniform, soft and diffused.

Reflectance and the Visual Task

Different materials and surfaces reflect incident light in different amounts and patterns. Matte white paint, for example, reflects a high percentage of light but in a diffuse pattern. Clear glass reflects a low percentage of light but in a mirror-like image. Given the diversity of materials and their reflective properties, finding the ideal lighting solution can be challenging.



Matte Surface: Light falling on a matte reflective surface bounces off in a diffuse pattern. Common matte surfaces include rough brick, concrete, white plaster, flat paint, low gloss plastics and unfinished wood.



Specular Surface: A glossy or specular surface reflects light like a mirror. Specular materials include enamel paint, glass, stainless steel, polished plastics, polished stone and oiled wood.

Workplace Lighting Alternatives

Work spaces can be illuminated with direct lighting from overhead luminaires, indirect lighting bounced off the ceiling or other surfaces, and with task lighting for specific areas.



Demonstration workspace with direct lighting only



Individual workstation with direct lighting only.



Demonstration workspace with direct lighting and task lighting.



Individual workstation with direct lighting and task lighting.



Demonstration workspace with indirect lighting only.



Individual workstation with indirect lighting only.



Demonstration workspace with indirect lighting and task lighting.



Individual workstation with indirect lighting and task lighting.

For More Information

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