Glare — Unified Glare Rating (UGR)

Discomfort, visual fatigue, and stress pathways

Definition

Discomfort arising from high luminance contrasts within the field of view, predicted by UGR (source luminance, position, background).

Recommended Ranges

|  |  |
| --- | --- |
| Optimal | UGR ≤19 (classrooms). |
| Caution | UGR 19–22 (caution), >22 (avoid). |

Biological Effects

Hormones (Endocrine)

Persistent discomfort → sympathetic activation and HPA upregulation → cortisol↑.

Skin (Photobiology & Peripheral Clocks)

No direct skin effect.

Nervous System (ipRGC → SCN → CNS)

Retinal overstimulation → glutamate↑ → visual fatigue/headaches.

Attention fragmentation from bright sources → working-memory efficiency↓.

Biochemical Pathways (Mechanistic Detail)

Aversive visual input engages limbic pathways (amygdala) → HPA activation.

Photoreceptor bleaching/recovery cycles raise mitochondrial ROS; antioxidants (SOD, catalase) taxed.

Classroom Recommendations

Use diffusers/microprismatic optics; avoid direct view of high-luminance emitters.

Control reflected glare on boards/screens; coordinate luminance and CCT.

Quick Checklist

UGR verified in lighting calc.

Check reflections from whiteboards and displays at student eye positions.

References

EN 12464-1 / CIBSE LG — Glare limits.

Studies linking glare to visual fatigue and task errors.