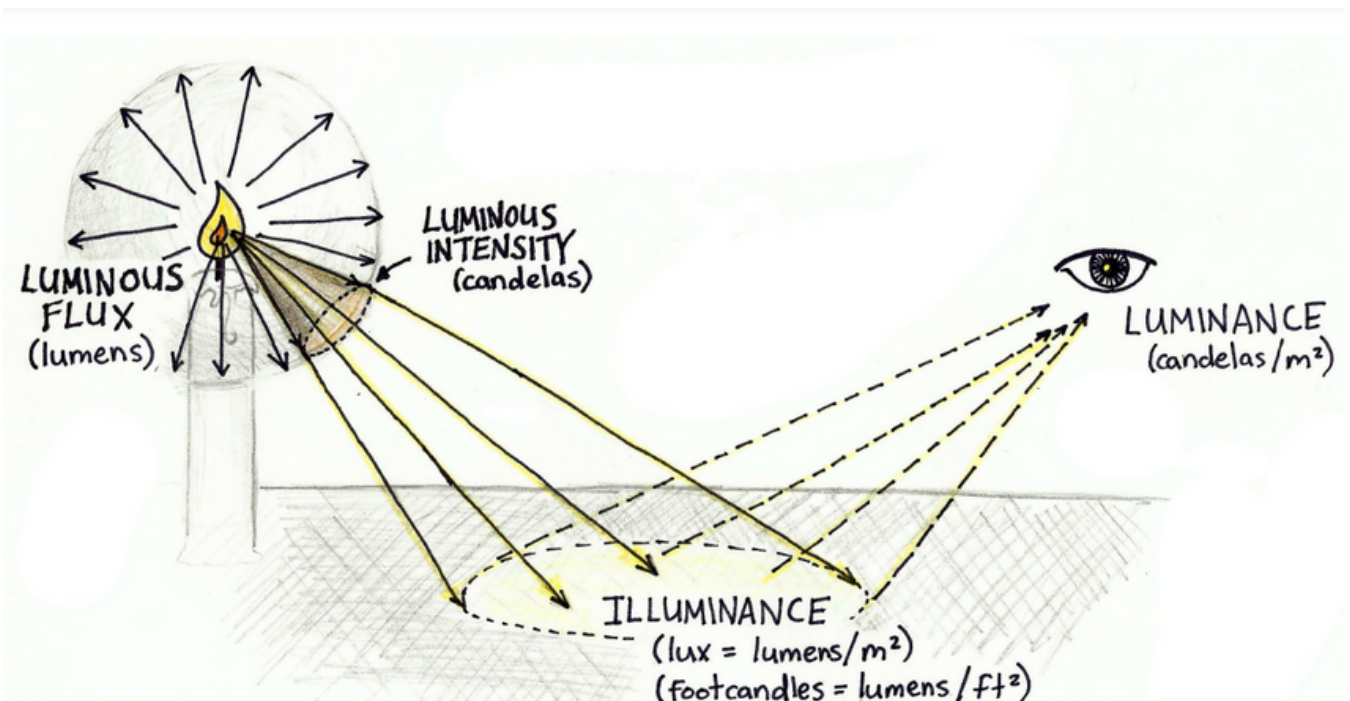


WEEK 7

NOTES & TASK

CALCULATING



$$E = \Phi / A$$

E = light intensity, illuminance (lm/m², lux)

Φ = luminous flux - the quantity of light emitted by a light source (lumen, lm)

A = area (m²)

Measuring Units Light Level - Illuminance

Illuminance is measured in foot candles (ftcd, fc, fcd) in the Imperial system or lux in the metric SI system.

- one foot candle = one lumen of light density per square foot
- one lux = one lumen per square meter
- 1 lux = 1 lumen / sq metre = 0.0001 phot = 0.0929 foot candle (ftcd, fcd)
- 1 phot = 1 lumen / sq centimetre = 10000 lumens / sq metre = 10000 lux
- 1 foot candle (ftcd, fcd) = 1 lumen / sq ft = 10.752 lux

Example of the UoE Catholic Chaplaincy Space:

18 m x 9 m = 162 sqm (A)

aim to achieve 300 lux (E)

$$\Phi = E \times A = 300 \text{ lux} \times 162 \text{ sqm} = 48600 \text{ lumens}$$

use linear fluorescent batten (T5): 2400 luminous flux

48600 lumens / 2400 = 20.25 lamps.

A: Therefore 20 lamps needed.

EXAMPLE TABLE OF ILLUMINANCE VALUES

Illuminance (lux)	Activity	Area
100	Casual seeing	Corridors, changing rooms, stores
150	Some perception of detail	Loading bays, switch rooms, plant rooms
200	Continuously occupied	Foyers, entrance halls, dining rooms
300	Visual tasks moderately easy	Libraries, sports halls, lecture theatres.
500	Visual tasks moderately difficult	General offices, kitchens, laboratories, retail shops.
750	Visual tasks difficult	Drawing offices, meat inspection, chain stores.
1000	Visual tasks very difficult	General inspection, electronic assembly, paintwork, supermarkets.
1500	Visual tasks extremely difficult	Fine work and inspection, precision assembly.
2000	Visual tasks exceptionally difficult	Assembly of minute items, finished fabric inspection.

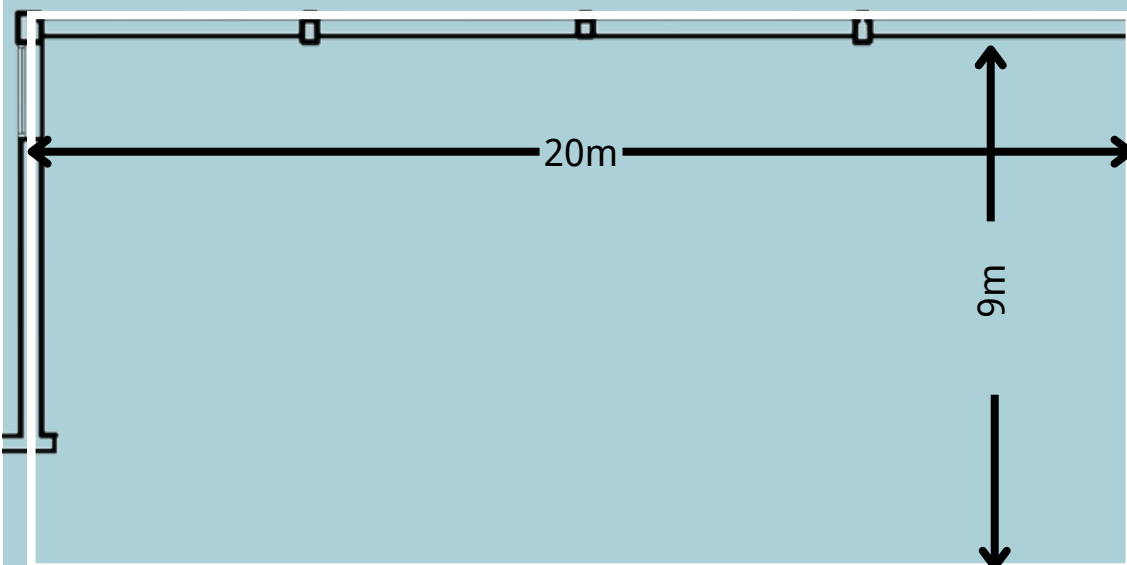
OTHER EXAMPLE OF ILLUMINANCE VALUES

Activity	Illuminance(lx, lumen/m ²)
Public areas with dark surroundings	20 - 50
Simple orientation for short visits	50 - 100
Areas with traffic and corridors - stairways, escalators and travelators - lifts - storage spaces	100
Working areas where visual tasks are only occasionally performed	100 - 150
Warehouses, homes, theaters, archives, loading bays	150
Coffee break room, technical facilities, ball-mill areas, pulp plants, waiting rooms,	200
Easy office work	250
Class rooms	300
Normal office work, PC work, study library, groceries, show rooms, laboratories, check-out areas, kitchens, auditoriums	500
Supermarkets, mechanical workshops, office landscapes	750
Normal drawing work, detailed mechanical workshops, operation theaters	1000
Detailed drawing work, very detailed mechanical works, electronic workshops, testing and adjustments	1500 - 2000
Performance of visual tasks of low contrast and very small size for prolonged periods of time	2000 - 5000
Performance of very prolonged and exacting visual tasks	5000 - 10000
Performance of very special visual tasks of extremely low contrast and small size	10000 - 20000

$$N = \frac{E \times A}{n \times F \times MF \times UF}$$

- N - is the number of luminaires required;
- E - is the required illuminance (lux);
- A - is the area to be lit;
- n - is the number of lamps per luminaire;
- F - is the lamp lumen output (lumens);
- MF - is known as the maintenance factor, which is a combination of three factors;
- UF - is the utilisation and is a function of the luminaire properties and room geometry.

CLASS TASK



My site: dining area + bar

20 m x 9 m = 180 sqm (A)

aim to achieve 150 lux (E) for dining area

$$\Phi = E \times A = 150 \text{ lux} \times 180 \text{ sqm} = 27,000 \text{ lumens}$$

MY EXTRA RESEARCH:

Common outdoor light levels at day and night:

Condition	Illumination	
	(ftcd)	(lux)
Sunlight	10000	107527
Full Daylight	1000	10752
Overcast Day	100	1075
Very Dark Day	10	107
Twilight	1	10.8
Deep Twilight	0.1	1.08
Full Moon	0.01	0.108
Quarter Moon	0.001	0.0108
Starlight	0.0001	0.0011
Overcast Night	0.00001	0.0001