



EMERGENCY AND EXIT - LIGHTING MODULE

TRAINING PRESENTATION

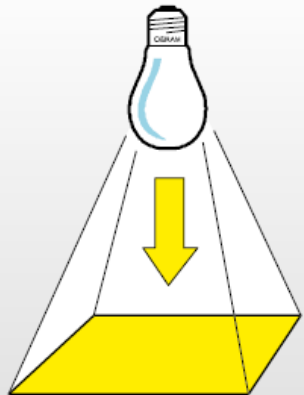
BASICS OF LIGHTING



Luminous flux

Luminous flux is the light output of a light source.

Unit: 1 lumen (lm)



Illumination

Average illumination of a surface is luminous flux per unit area.

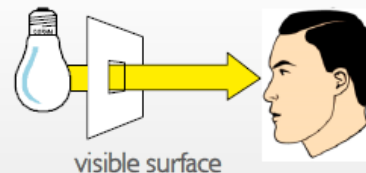
$$\text{Lux} = \frac{\text{Lumen}}{\text{m}^2}$$



Light intensity

Light intensity is the measure of light output in a specified direction.

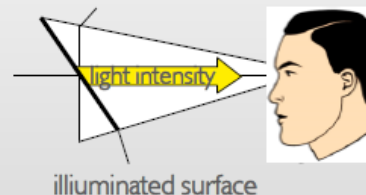
Unit: candela (cd)



Luminance

Luminance is the measure of the brightness of a surface upon the eye.

Unit: 1 candela/m² (cd/m²)



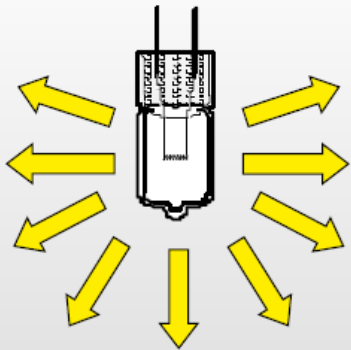
Luminance depend on the surface size seen and the light intensity, reflected by the surface regards the eye

BASICS OF LIGHTING

Luminous flux

Measures total amount of light (flux) emitted from a light source in all directions.

Unit: Lumen (lm)



Halogen
50W lamp
1200 lumens

Light intensity

Measures the amount of light emitted in a specific direction.

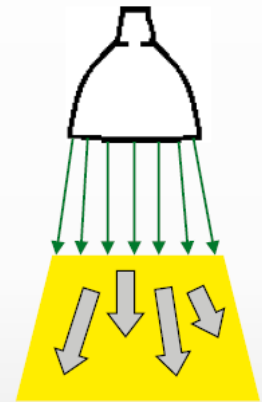
Unit: candela (cd)



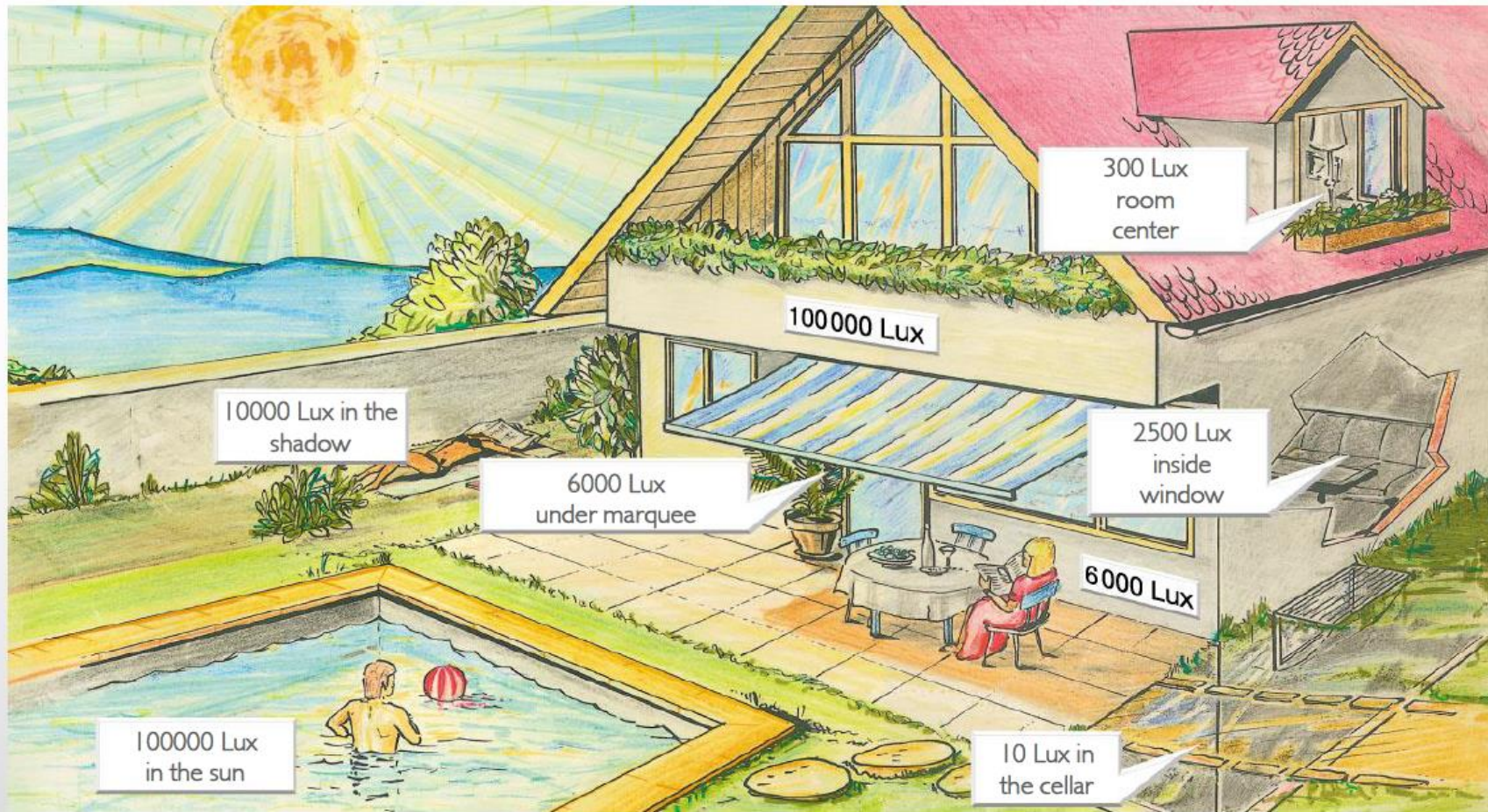
Dichroic
50W lamp
1430 to 15,000 cd depending
on beam angle

ILLUMINATION (LUX)

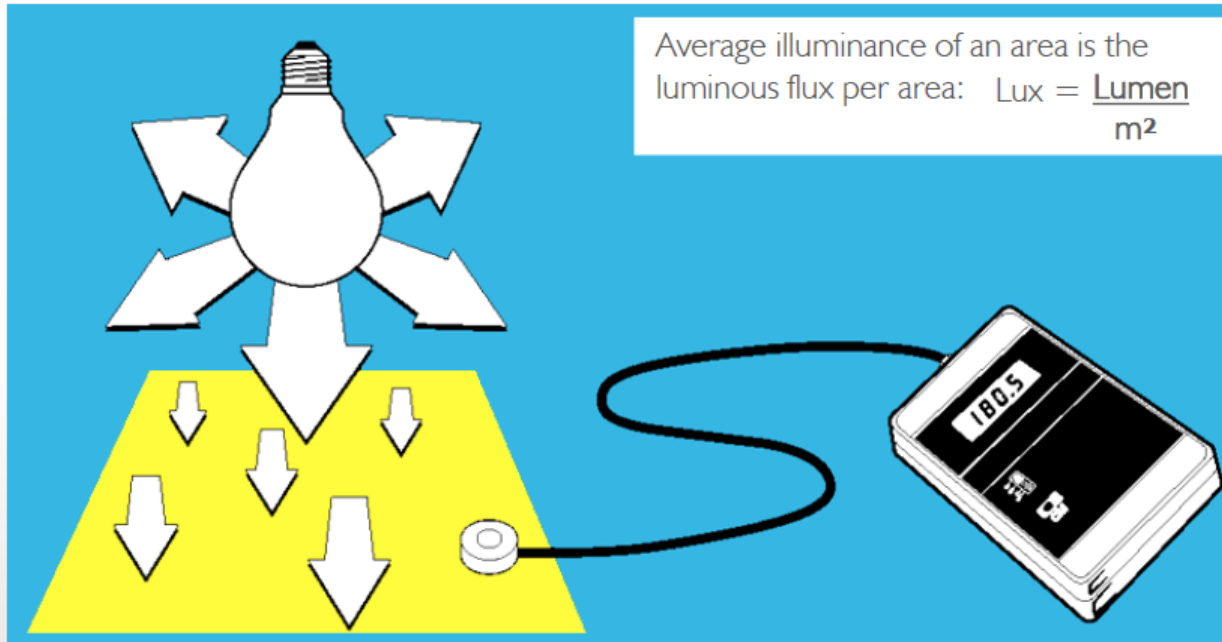
- The amount of light that falls on a surface or plane is commonly referred to as the “lighting level”
- Measures the number of Lumens falling on each square meter of the surface (lm / m^2)
- Lux can be measured, or can be calculated from the Candela value and distance
- Unit - Lux (lx)
- For emergency lighting 0.2 lux and 1.0 lux for stairwells
- New Zealand also works according to a 1.0 lux for emergency lighting



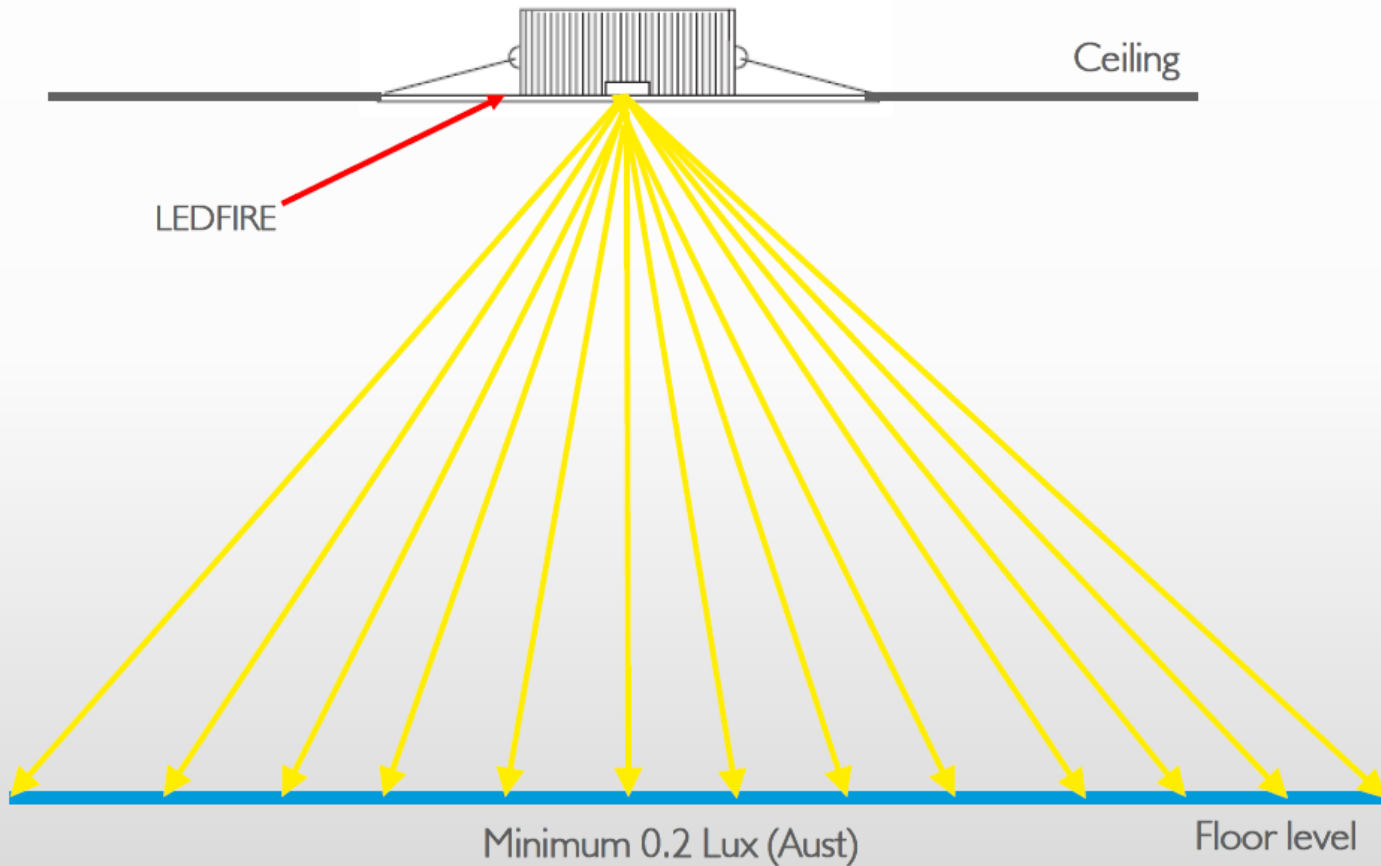
ILLUMINATION (LUX)



ILLUMINATION (LUX)



EMERGENCY LIGHTING ILLUMINATES AN AREA TO A MINIMUM LIGHT LEVEL IN LUX

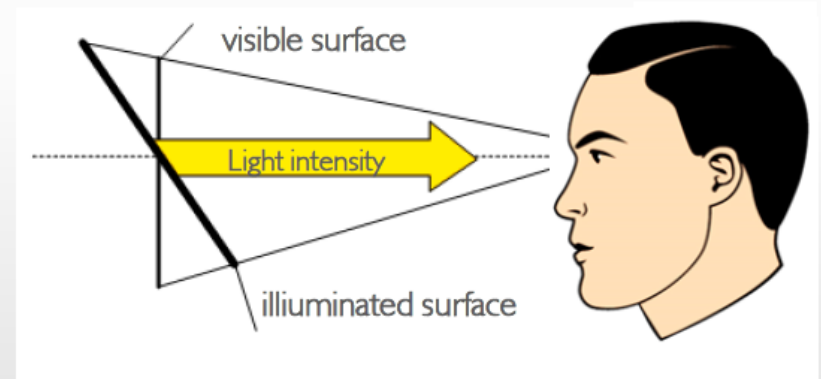
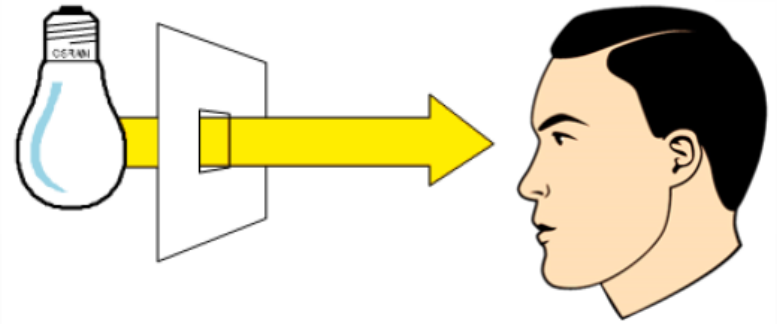


BASICS OF LIGHTING

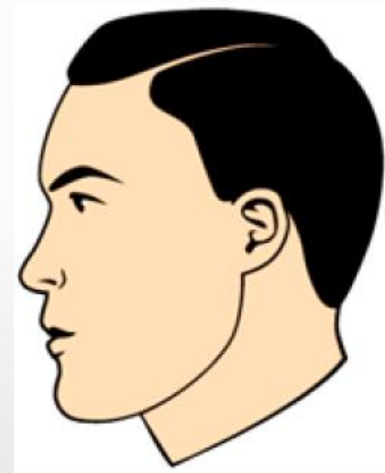
Luminance is the measure of the brightness of a surface upon the eye.

Unit: Candela/cm² (cd/cm²)

Luminance depends on the surface size seen and the light intensity, reflected by the surface in regards to the eye.



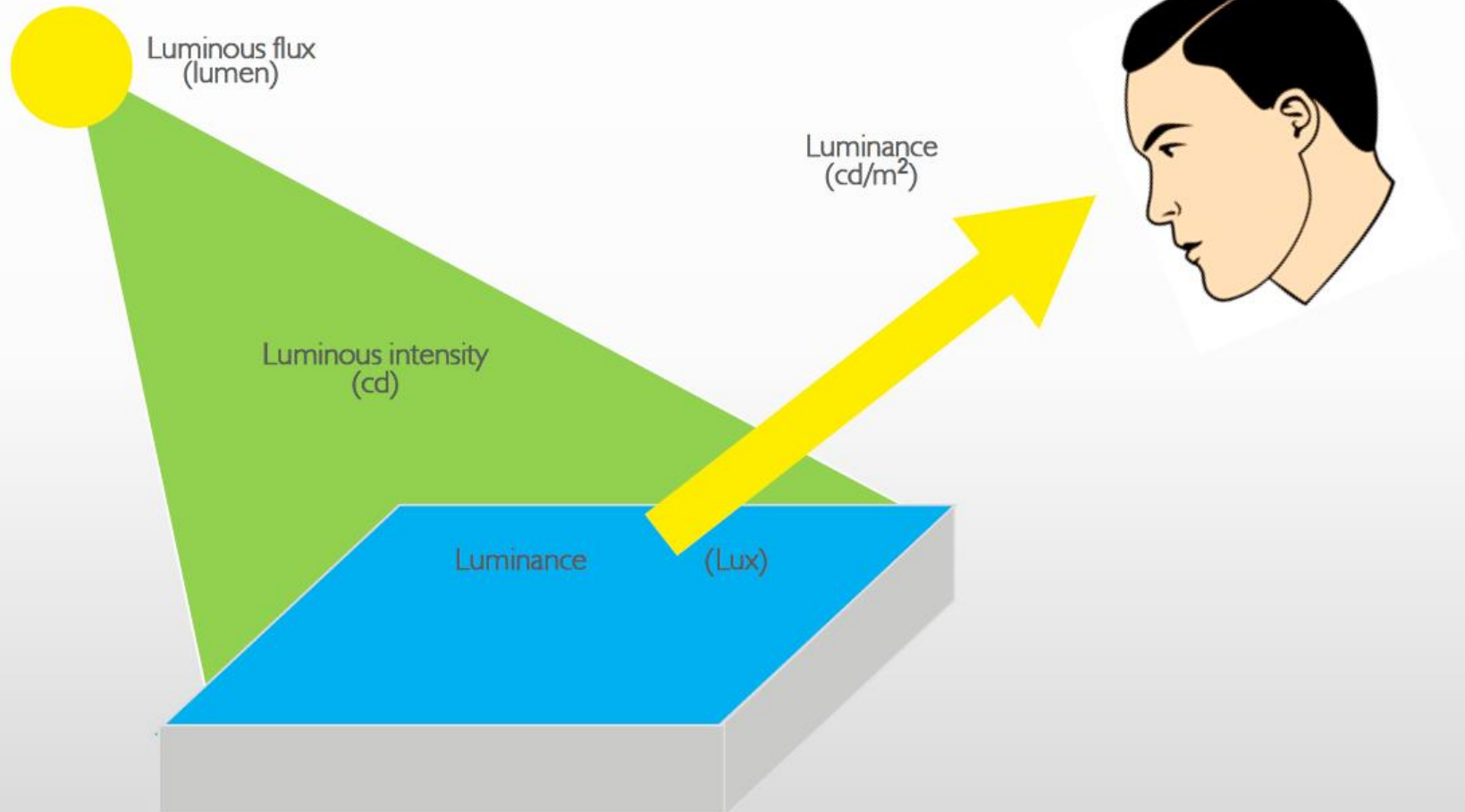
EXIT LIGHTING RELIES ON THE LUMINANCE AND THE SIZE OF THE GRAPHICS TO BE SEEN AT DISTANCES (VIEWING DISTANCE)



The viewing distance is shown on the exit sign.

Exit lights have a viewing distance printed on the face of the exit. Therefore the maximum distance you are permitted to mount the unit from another unit is this distance.

UNIT OF LIGHT (RECAP)



EMERGENCY AND EXIT LIGHTING TERMINOLOGY

- **Emergency lighting** ¹ - Lighting for use when the supply to the normal lighting fails; it includes emergency escape lighting, illuminated emergency exit signage, high-risk task-area lighting and standby lighting.
- **Escape Route**- Route designed in the event of an emergency.
- **Escape Route Lighting** – That part of emergency lighting provided to ensure that the routes of escape can be effectively identified and safely used and that obstructions within the escape route are visible.
- **Illuminated emergency exit signage** ¹ -Those parts of an emergency lighting scheme intended to communicate the path of travel to a required exit by displaying appropriate images.
- **Emergency luminaire** ¹ - A luminaire which is designed for use in an emergency lighting system.
- **BCA** ¹ – Building Code of Australia

BUILDING CODE OF AUSTRALIA (BCA)

- The BCA sets the rules and regulations for the construction of all types of buildings in Australia.
- It determines when emergency and exit lighting is required within a building.
- The BCA has several classifications of buildings and structures based upon the nature of their use and size.
- Section A3 shows the classifications of buildings and structures.
- Section E4 – Emergency Lighting Exit Signs and Warning Systems
 - Provides designer/building owner with information required for the correct installation of emergency and exit lighting in path of travel to an exit and other areas for different classes of buildings.
 - The importance of emergency lighting is to ensure safe egress from building.
 - Emergency egress lighting is installed in building to provide visual conditions which are designed to alleviate panic, and permit safe and orderly evacuation of the building occupants in the event of an emergency, coupled with the failure of normal lighting.

OPERATING MODES

MAINTAINED Mode:

Lamp(s) are operated under normal operating conditions.

In the event of mains failure the emergency pack takes over.

The lamp(s) operates normally and under emergency conditions.

NON - MAINTAINED Mode:

Lamp(s) are not operative under normal operating conditions.













In the event of mains failure the emergency pack operates the lamp.

SUSTAINED Mode (also known as COMBINED Mode):


A two lamp fitting.

One lamp operates under normal conditions.

The second lamp is operative only under emergency conditions and operates in a non maintained mode.

EMERGENCY LUMINAIRE TYPE	NORMAL OPERATION (i.e. MAINS OPERATING)	EMERGENCY OPERATION (i.e. MAINS FAILED)
NON-MAINTAINED (CLAUSES 1.4.35 AND 1.4.36)	 or 	 or 
MAINTAINED (CLAUSES 1.4.30 AND 1.4.31)	 or 	 or 
COMBINED NON-MAINTAINED (i.e. 'SUSTAINED') (CLAUSES 1.4.8 AND 1.4.9)		
COMBINED MAINTAINED (CLAUSES 1.4.8 AND 1.4.9)		

LEGEND:

○ = Non-energized lamp
 = Energized lamp

¹ Australian Standard AS/NZS2293.1

PICTOGRAPHS

- In the 2006 edition of the BCA specifies the new AS2293.1 2005. This new Emergency Lighting Standard specifies the “Running Person” pictogram.
- The new BCA took effect on 1st May 2006.
- Significant changes from the previous editions of AS2293.1 include:
 - Replacement of word EXIT with a pictogram
 - Inclusion of detailed restrictions on use of arrows
 - Revision of viewing distances for Exit Signs
 - Adoption of terminology from AS/NZS 60598.2.22



Straight On From Here



Left From Here



Right From Here

INSTALLATION OF EMERGENCY LIGHTING

In addition to the spacing imposed by the classification of the emergency lighting, AS/NZS 2293 specifies additional requirements for the installation of direct lighting emergency fittings.

- These are:
 - An emergency escape luminaire shall be sited within 2 m of the approach side of each doorway requiring an exit sign.
 - Within 2 m of the intersection of the centre-lines of intersecting corridors.
 - Within 2 m of the intersection of centre-lines at each change of direction.
 - Within 2 m of any change of floor level, on the low side.
 - At stairs so that each flight of stairs receives direct light.
 - At each exit door intended to be used in an emergency.

EMERGENCY LIGHTING CLASSIFICATION AND SPACING

- Any light fitting used as a emergency lighting luminaire must be tested and certified by a NATA or similar Test Laboratory.
- Additional to the specific requirements for escape lighting shall be installed within the designated area, either in accordance with:
 - (a) calculations of illuminance complying with Clause 5.4.2.3. or
 - (b) the spacing rules set out in Clause 5.4.2.2;

SPACING RULES

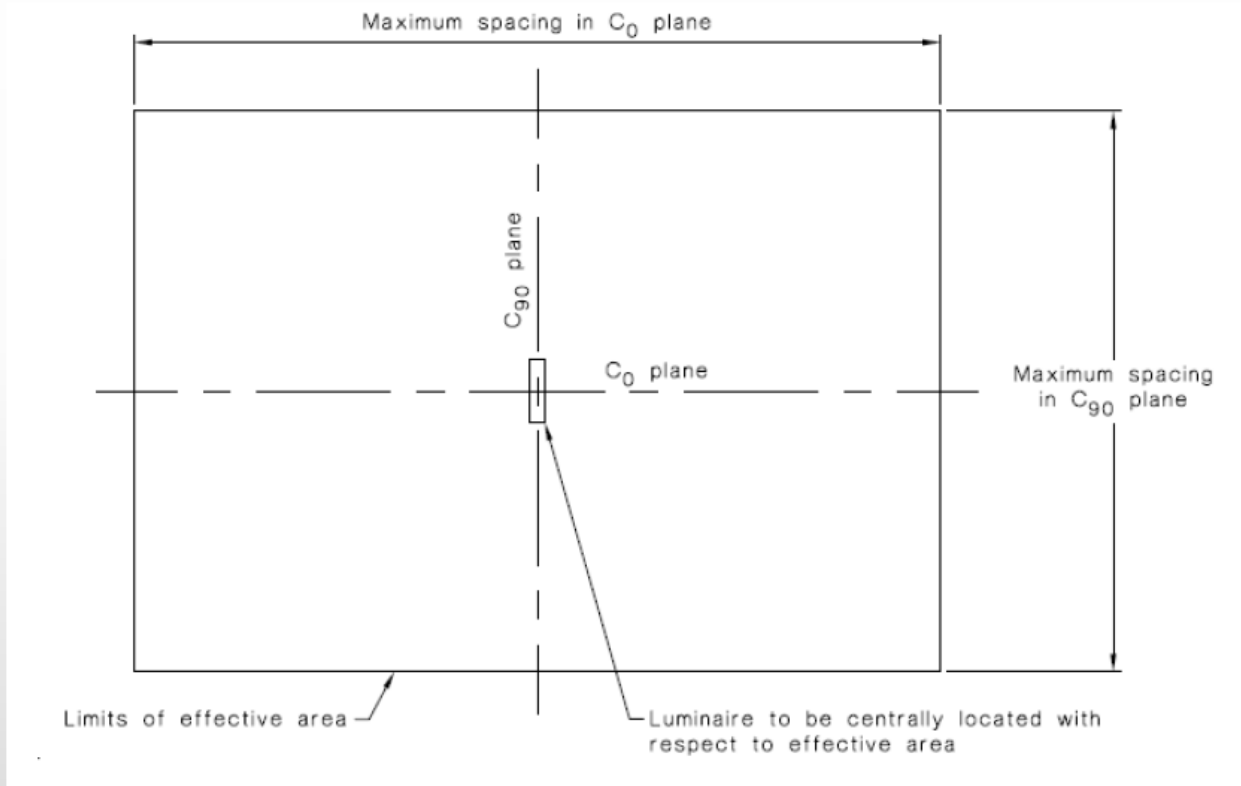
The maximum spacing's between adjacent emergency escape luminaires and between emergency escape luminaires and adjacent walls or other surfaces forming the boundary of the designated area shall not exceed the relevant values determined as follows:

- **Spacing between luminaires** The horizontal spacing between adjacent luminaires shall not exceed the maximum spacing given in tables in the Standard.
- **Spacing between luminaires and walls** The spacing between emergency escape luminaires and any adjacent wall or other boundary defining the limits of the designated area shall be not greater than half the spacing

CALCULATION OF ILLUMINANCE

- Emergency escape luminaires shall be installed throughout the designated area in such a manner as to ensure that the calculated horizontal illuminance at floor level is not less than 0.20 lux.
- The calculations shall be made either manually or by the use of computer software from point-by-point calculations based on the inverse square law of illumination, taking into account only the light that reaches the floor directly from the emergency escape luminaires.
- A light loss factor of 1 shall be assumed for the calculations.
- Calculations shall be made for a grid of points, spaced not more than 2 m apart, covering the designated area, excluding areas within 0.5 m of the walls or other surfaces forming the boundary of the designated area.
- Calculated illuminance values shall be presented to not less than two significant figures.eg 0.20 lux
- Luminaire photometric data shall comply with AS 1680.3, and shall be applicable to the test conditions specified in Appendix C of AS 2293.3.
- The calculations shall be carried out and the design certified by persons who are competent in lighting design.

THE EFFECTIVE AREA OF THE EMERGENCY LIGHT



¹ Australian Standard AS/NZS2293.1

MAXIMUM SPACING'S FOR CLASS D LUMINAIRES

Luminaire ⁽²⁾ classification	Maximum spacings (see Clause 5.4.2.2) ⁽¹⁾ , m															
	Mounting height, m															
	2.1	2.4	2.7	3	3.3	3.6	4	4.5	5	6	7	8	9	10	15	20
D1	3.4	3.1	2.5	1.6												
D1.25	4.0	3.8	3.4	2.9	2.0											
D1.6	4.6	4.54.3	3.9	3.4	2.7											
D2	5.2	5.2	6=5.0	4.8	4.4	4.0	3.1									
D2.5	5.8	5.8	5.7	5.6	5.4	5.1	4.5	3.4								
D3.2	6.5	6.6	6.6	6.5	6.4	6.2	5.8	5.1	4.1							
D4	7.2	7.3	7.3	7.3	7.3	7.2	6.9	6.5	5.8	3.1						
D5	7.8	8.0	8.1	8.2	8.2	8.2	8.0	7.7	7.3	5.7	1.6					
D6.3	8.6	8.8	9.0	9.1	9.2	9.2	9.2	9.0	8.7	7.7	5.7					
D8	9.4	9.7	9.9	10.1	10.2	10.3	10.4	10.3	10.2	9.5	8.3	6.1				
D10	10.2	10.6	10.9	11.1	11.3	11.4	11.5	11.6	11.6	11.2	10.3	8.9	6.7			
D12.5	11.5	11.5	11.8	12.1	12.4	12.5	12.7	12.9	13.0	12.8	12.3	11.3	9.9	7.6		
D16	12.1	12.6	13.0	13.3	13.6	13.9	14.1	14.6	14.6	14.6	14.4	13.8	12.9	11.5		
D20	13.1	13.6	14.1	14.5	14.8	15.1	15.5	15.8	16.1	16.4	16.3	16.0	15.4	14.5		
D25	14.2	14.7	15.3	15.7	16.1	16.5	16.9	17.3	17.7	18.1	18.3	18.2	17.9	17.3	7.7	
D32	15.4	16.1	16.7	17.2	17.6	18.0	18.5	19.1	19.5	20.2	20.6	20.7	20.6	20.3	14.6	
D40	16.7	17.4	18.0	18.6	19.1	19.6	20.1	20.8	21.3	22.1	22.7	23.0	23.1	23.1	19.4	
D50	18.0	18.7	19.4	20.1	20.7	21.2	21.8	22.5	23.2	24.2	24.9	25.4	25.7	25.9	23.7	15.2

@ 2.7 m ceiling height.

D20 - 14.1 m apart

D40 - 18.0 m apart

¹ Australian Standard AS/NZS2293.1

TESTING REQUIREMENTS

Initial Test (Commissioning)

- Once allowed the charge the battery, operate the emergency luminaires and exit signs from their battery supply by simulating failure of the monitored supply. The luminaires and exit signs shall remain illuminated for not less than the required in-service duration of 120 minutes.
- Restore the emergency luminaires and exit signs to normal condition and check that the battery charger operation indicator functions correctly

Discharge Test (6 months)

- Operate the emergency luminaires and exit signs from their battery supply by simulating failure of the monitored supply. The luminaires and exit signs shall remain illuminated for not less than the required in-service duration of 90 minutes.
- Restore the emergency luminaires and exit signs to normal condition and check that the battery charger operation indicator functions correctly.

Twelve Monthly Procedures

The following procedures shall be carried out at intervals of not more than 12 months:

- (a) Carry out all the checks listed at the 6 month interval.
- (b) Clean all light-emitting and reflecting surfaces of emergency luminaires and exit signs.
- (c) A visual check shall be made to ensure that the emergency luminaires and exit signs operate in correct relationship to the normal lighting in the designated area.

After changing a battery a 120 minute discharge test is required.

RECORD KEEPING

- Record all Service Reports.
- A manufacturer's hard bound log book, or an alternative system approved by the Responsible Authority (building surveyor), is required for the recording of maintenance information.
- This log book must be kept on site and must be available for inspection and audit by a representative of the Responsible Authority.



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the electrical evolution

THANK YOU

TRAINING PRESENTATION