

Task A

Part 1

- 1) $(60 \times 24) / (7 (60 + 24)) = 2.4$ Room index 2.4
- 2) 0.46
- 3) $200 \times 1440 / 5200 \times 0.46 \times 0.75 = 160$ lamps
- 4) $8 - 1 = 7$ S value $= 1.5 \times 7 = 10.5$

Task B

Part1-

Sound is a mechanical wave of energy that travels through a medium which is air. The surrounding air molecules are disturbed when an object vibrates, which leads to a repetitive pattern of compression and expansion. From the vibration's source, these compressions and expansions radiate outward to create what are known as sound waves.

The frequency of a sound is a measurement of the time it takes for particles to vibrate back and forth as the sound wave travels through a medium, this measurement is taken in hertz (hz) where one hertz represents one cycle per second. The human ear perceives sound waves at different frequencies, which affects how high or low they sound. Higher-pitched sounds are associated with higher frequencies, and lower-pitched sounds are associated with lower frequencies.

Alternatively, wave length can be described as the separation between two consecutive in-phase points in a sound wave, or, to put it another way, the separation between two consecutive wave crests or troughs. Usually, this is expressed in metres. Because wavelength and frequency are inversely correlated, wavelength decreases as frequency rises and vice versa. Sound waves cause compression and rarefaction in the materials they pass through. Particles are closer together in a compression and more widely separated in a rarefaction. The sound wave's wavelength directly affects how far apart successive compressions or rarefactions occur.

Sound waves' frequency and wavelength have a significant impact on how buildings are designed inside and their supporting infrastructure. In order to design spaces that are functional, acoustically comfortable, and supportive of the needs and activities of building occupants, architects, designers, and engineers must carefully take these factors into account. For example, when designing a room for a property, the architect would have to

take into consideration the dimensions of the room and the expected sound, this could be due to the way that sound behaves and passes through the room.

Lower frequencies have longer/higher wavelengths which requires larger spaces in order to avoid resonance build up of sound pressure levels. Standing waves and resonance can happen when a room's dimensions match the sound's wavelength, this may cause some frequencies in the space to be either amplified or attenuated, which could cause an uneven distribution of sound and acoustic issues.

Furthermore, the materials used for the internal design need to be considered as different materials will have different sound reflections, with this the size of the room should impact the materials used. Noise reduction coefficient materials will be assigned where best suited in the property. These factors also need to be considered when constructing partition walls. If the wall needs to be able to block sound then it would need to be constructed of a denser material such as concrete or brick, these materials are generally used as they are able to block out sounds over a large range of frequencies. Another common method of constructing partition walls is out of plasterboard, which does have the benefit of absorbing sounds. Although as tracked or studed walls are often hollow this means that at certain frequencies the sound is able to resonate, in order to prevent this the walls can be double boarded or damping materials can be added as filling these air gaps restricts the walls ability to resonate sound. To fill these gaps materials such as fibre glass insulation or acoustic panels can be used.

When deciding what type of insulation to use on a property, the variation of sound needs to be assessed and used to determine what insulation to use. This is because the suppression of noise, measured in decibels per inch of insulation can vary on the frequency. A noise with a low frequency is approximately 1 decibel per inch of insulation this means these sounds can penetrate through easily compared to 4 decibels for noises with higher frequencies as these sounds are more easily blocked or absorbed. Therefore, the correct selection of insulation used on a property is essential, there are many different types of insulation with varying properties which can block or absorb sound. For example, fiberglass insulation is excellent at absorbing higher frequency sounds due to its porous structure. On the other hand, longer wavelengths of lower frequency sounds can be more effectively attenuated by thicker, denser materials like mass-loaded vinyl or mineral wool. In addition to this, there are other factors that affect the insulations capabilities such as air gaps and density of the product which can heavily impact its performance.

Part 2

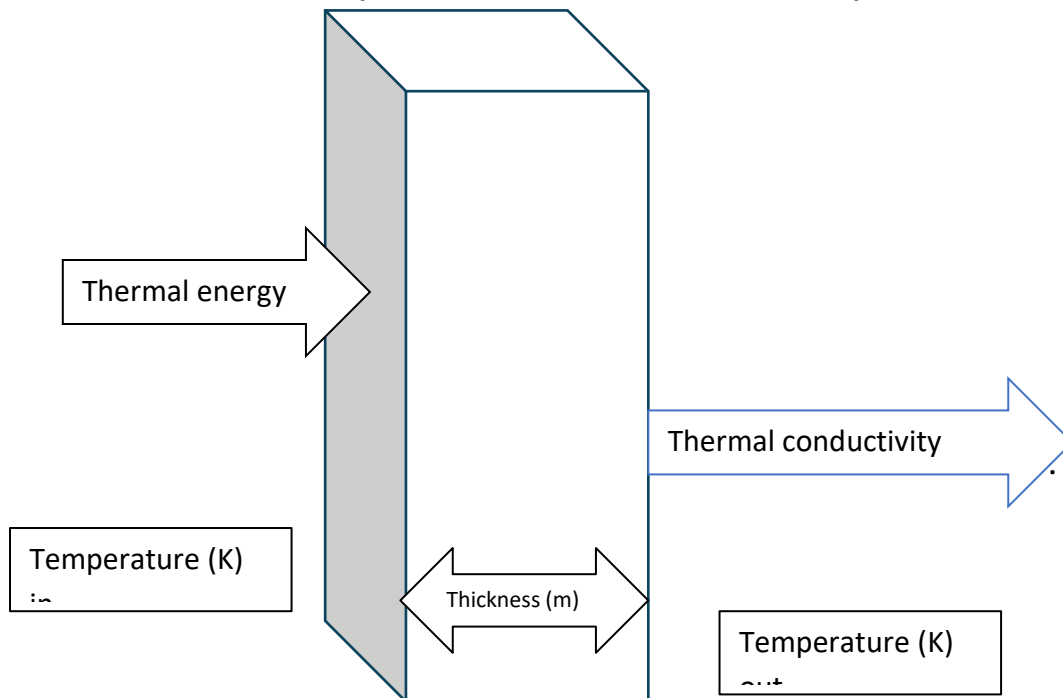
(a)

Thermal transmittance, also known as the U value, is a measurement of how much heat travels through a material or assembly over an area for a specific temperature difference. The U value will assess how quickly heat moves through structures such as windows, walls, floors and roofs. Thermal transmittance evaluations are essential as they provide the thermal performance of building envelopes and with this information you can ensure the build can have the necessary materials to prevent heat loss. The thermal resistance, shown as the R-value is the measurement of a materials ability to resist the flow of heat, it shows the quantity of heat passed from one material to another. Because it aids in determining the thermal performance of building components, thermal resistance is a crucial parameter in the design and construction of buildings. The U and R value are essential while calculating heat loss through building fabric as they are inversely related. As thermal resistance measures how building fabric may slow down the transfer of heat and thermal transmittance measures the rate of how heat transfers through material. This means that as one of these measurements increases the other decreases and this then allows you to select the best suit insulation type to use.

(b)

Material type affects thermal conductivity as different materials have different molecular structures which affects the rate of heat transfer through an item, more dense materials or materials with atoms which are closer together are better and transferring heat as there are more particles per volume, an example of this would be pure metals they are good conductors of heat because of their dense molecular structure. On the other hand, materials which are less dense such as plastics are not good at transferring heat due to their lack of free charge carriers. As well as material type, distance also affects a materials thermal conductivity as the thicker or longer the material is then the longer it would take for heat to transfer through the material, a larger surface to transfer heat through also means a larger thermal

resistance which inversely collates to the thermal conductivity of a material.



UTILISATION FACTOR SHEET

Description of fitting	Typical outline LOR	Basic downward LOR%	Ceiling	0.7			Reflectances 0.5			0.3		
			Walls	0.5	0.3	0.1	0.5	0.3	0.1	0.5	0.3	0.1
			Room index									
Aluminium industrial reflector, aluminium or enamel high-bay reflector		70	0.6	0.39	0.36	0.33	0.39	0.36	0.33	0.39	0.35	0.33
			0.8	0.48	0.43	0.40	0.46	0.43	0.40	0.46	0.43	0.40
			1.0	0.52	0.48	0.45	0.52	0.48	0.45	0.52	0.48	0.45
			1.25	0.56	0.53	0.50	0.56	0.53	0.49	0.56	0.52	0.42
			1.5	0.60	0.57	0.54	0.59	0.57	0.53	0.59	0.57	0.53
			2.0	0.65	0.62	0.59	0.63	0.60	0.58	0.63	0.59	0.57
			2.5	0.67	0.64	0.62	0.65	0.62	0.61	0.65	0.62	0.60
			3.0	0.69	0.66	0.64	0.67	0.64	0.63	0.67	0.64	0.62
			4.0	0.71	0.68	0.67	0.69	0.67	0.65	0.69	0.66	0.64
			5.0	0.72	0.70	0.69	0.71	0.69	0.67	0.71	0.67	0.66
Near-spherical diffuser, open beneath		50	0.6	0.28	0.22	0.18	0.25	0.20	0.17	0.22	0.18	0.16
			0.8	0.39	0.30	0.26	0.33	0.28	0.23	0.27	0.25	0.22
			1.0	0.43	0.36	0.32	0.38	0.34	0.29	0.31	0.29	0.26
			1.25	0.48	0.41	0.37	0.42	0.38	0.33	0.34	0.32	0.29
			1.5	0.52	0.46	0.41	0.46	0.41	0.37	0.37	0.35	0.32
			2.0	0.58	0.52	0.47	0.50	0.48	0.43	0.42	0.39	0.36
			2.5	0.62	0.56	0.52	0.54	0.50	0.47	0.45	0.42	0.40
			3.0	0.65	0.60	0.56	0.57	0.53	0.50	0.48	0.45	0.43
			4.0	0.68	0.64	0.61	0.60	0.56	0.54	0.51	0.48	0.46
			5.0	0.71	0.60	0.65	0.62	0.59	0.57	0.53	0.50	0.48
Recessed louvre 0.23 trough with optically designed reflecting surfaces		50	0.6	0.28	0.28	0.25	0.23	0.28	0.25	0.23	0.28	0.25
			0.8	0.34	0.31	0.28	0.33	0.30	0.28	0.33	0.30	0.28
			1.0	0.37	0.36	0.32	0.37	0.34	0.32	0.37	0.34	0.32
			1.25	0.40	0.38	0.35	0.40	0.37	0.35	0.40	0.37	0.35
			1.5	0.43	0.41	0.38	0.42	0.40	0.38	0.42	0.39	0.38
			2.0	0.46	0.44	0.42	0.45	0.43	0.41	0.44	0.42	0.41
			2.5	0.48	0.46	0.44	0.47	0.45	0.43	0.46	0.44	0.43
			3.0	0.49	0.47	0.46	0.48	0.46	0.45	0.47	0.45	0.44
			4.0	0.50	0.49	0.48	0.49	0.48	0.47	0.48	0.47	0.46
			5.0	0.51	0.50	0.49	0.50	0.49	0.48	0.49	0.48	0.47

Lighting layout using louver lighting

