essjay
Consulting Engineers

A 4/17-19 Miles St, Mulgrave, VIC 3170
E projects@essjayce.com.au
P 03 9017 3744
W www.essjayce.com.au

What type of indoor air-conditioning unit is suitable for my project?

1. Introduction

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An air conditioning system is a mechanical system that is utilised to regulate indoor temperature and humidity levels to create a comfortable indoor environment.

The air conditioning unit, in cooling mode, removes heat from the occupied space and in heating mode, supplies heat to the occupied space.

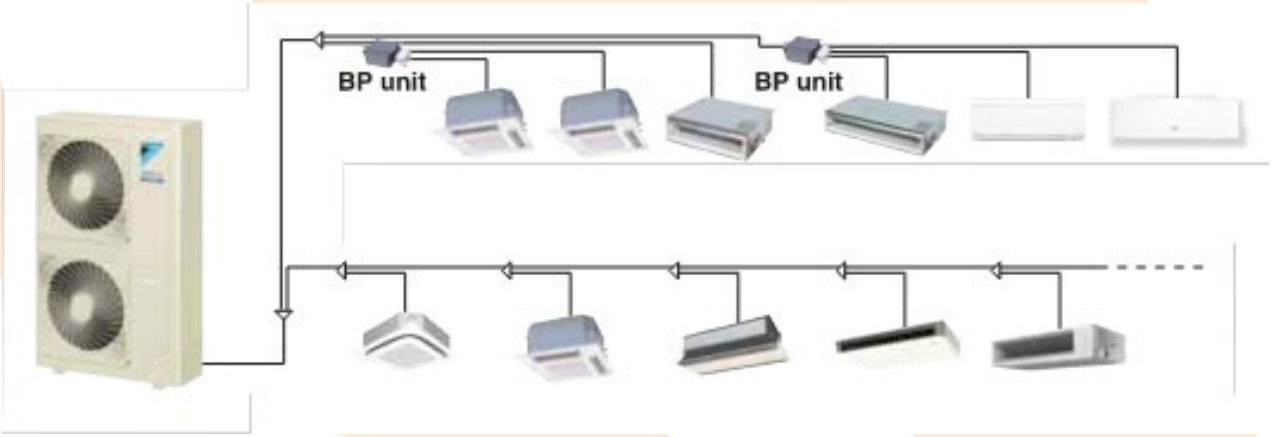
The most common type of air conditioning system used in small to medium sized buildings are of the vapour-compression refrigeration type where the medium of heat transfer is refrigerant. The most common type of refrigerant air conditioning system is the split system.

A split-type air conditioning system comprises of two main sections connected via refrigerant pipework and electrical wiring. There is the outdoor component and the indoor component.

The main components of the outdoor unit comprise of the refrigerant compressor, the heat exchange coil and the expansion valve. The main components of the indoor unit are the indoor fan and the indoor coil.

The two types of split system comprise of the following;

- Single split - an outdoor unit connected to an indoor unit or
- Multi-split / Variable refrigerant flow - an outdoor unit connected to multiple indoor units



Source: Daikin

2. Common Types of Indoor Air Conditioning Unit:

The most common types of indoor units utilised in Australia are as follows;

In-ceiling ducted indoor air conditioning unit:

This indoor unit is generally installed in the ceiling cavity.
It uses ductwork to reticulate conditioned air and grilles / diffusers to introduce this air into the space

Wall mounted indoor air conditioning unit:

This indoor unit is mounted on the wall at high level.

Ceiling mounted cassette indoor air conditioning unit:

The body of the indoor unit is mounted within the ceiling cavity and the fascia panel is exposed.

Bulkhead concealed indoor air conditioning unit:

The indoor unit is generally installed within a bulkhead with a vertical grille mounted on the surface of bulkhead in front of the unit

3. Comparison Between Common Indoor Unit Types

Refer to table below

	Wall mounted unit	Ceiling mounted cassette unit	Bulkhead concealed unit	In-ceiling ducted unit
Aesthetics	Less visually appealing as the unit protrudes from the wall	Fascia of the unit is visible and flushed with with the ceiling.	Unit is within the ceiling and is not exposed. Only grilles / diffusers are visible	Unit is within the ceiling and is not exposed. Only grilles / diffusers are visible
Location of unit with respect to the conditioned space	Unit needs to be located in the conditioned space	Unit needs to be located in the conditioned space	Unit is usually located within the ceiling cavity of the conditioned space behind grilles	Unit can be located remotely with ductwork reticulating to the conditioned space.
Area that can be conditioned by one unit	One room / enclosure. For large enclosures, more than one unit will be required	Usually used for one room / enclosure. Potential for an adjacent space to be provided with minimal conditioned air by a small duct	One room / enclosure. For large enclosures, more than one unit will be required	Larger areas and is dependent on the capacity of the unit due to the ability to have more grilles / diffusers.
Accessibility for maintenance and repairs	Easiest to maintain. Filter change is from the unit that sits lower than a ceiling cassette unit.	Easier to maintain than bulkhead concealed and ducted unit. Filter change is via the fascia of the unit, below the ceiling	Hardest to maintain. Unit is usually installed above wardrobes / low height bulkheads with minimal clearance.	Easier to maintain than bulkhead concealed unit due to available higher ceiling space.
Indoor Air Quality - cleanliness from dust	Low filtration efficiency as the filters used are low grade and designed to mainly keep the indoor unit coil's clean	Higher filtration efficiency as compared to wall mounted and bulkhead concealed units but lower than the ducted unit.	Low filtration efficiency as the filters used are low grade and designed to mainly keep the indoor unit coil's clean	Highest filtration efficiency as higher-grade filters are usually used.

Provision of outside air via the unit	No outside air can be provided through the unit. Outside air supplied directly into space and hence, minimal mixing of unconditioned outside air and return air	Minimal outside air provision through the unit. Additional outside air will need to be supplied directly to space.	Minimal outside air provision through the unit Outside air supplied through the bulkhead unit will be higher than the cassette but lesser than the ducted unit	Highest outside air compared to the other 3 types of indoor units. Hence, ducted units are generally used where higher amount of outside air required for compliance
Noise generation	Unit is mounted within the conditioned space and as such, there will some background noise generated	The panel of the unit is mounted within the conditioned space and as such, there will some background noise generated	Unit is the quietest as it is situated within the bulkhead and behind a grille	Unit is installed within the ceiling cavity and while on its own, the unit is loud, there is potential for noise attenuation
Ceiling cavity require-ments	Unit is installed on the wall, below the ceiling. Hence, ceiling cavity is not required.	The body of the unit sits within the ceiling cavity with the fascia panel flushed with the ceiling. Generally, 300 mm internal height clearance is required for the installation of the unit	The height of the unit is 200mm. Generally, 300mm internal height clearance is required for the installation of the unit.	Highest internal height clearance required in the ceiling cavity. Generally 600mm internal height clearance is required for the installation of the unit and ductwork
Cost	Lowest capital cost.	Capital cost is higher than a wall mounted unit but less than a bulkhead or a ducted unit	Including vertical grilles and bulkhead construction, the cost is generally higher than a cassette unit	Highest cost as it includes a plenum for return air and ductwork complete with grilles / diffusers for reticulation of conditioned air

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Suju James – mobile no. 0403 528 471, email - suju.james@essjayce.com.au

Alex Lee – mobile no, 0468 303 328, email - alex.lee@essjayce.com.au

Josiah Zhou – mobile no. 0416 151 506, email - josiah.zhou@essjayce.com.au