

Passive Design

TO DESIGN A BUILDING UTILISING PASSIVE DESIGN PRINCIPLES IS TO MAXIMISE THE USE OF NATURAL FLOWS OF HEAT, ENERGY AND LIGHT IN ORDER TO PROVIDE COMFORT FOR THE INHABITANTS.

Good passive design is based on the principles of orientation, daylighting, ventilation, insulation thermal mass and zoning. The urban environment is responsible for over 17% of carbon dioxide emissions. This is rising due to an increased reliance on energy for heating, cooling, cooking, etc. However when properly designed it is not necessary that buildings consume this much energy to maintain a comfortable environment.

The basic idea of a passive design building is to allow in heat, daylight and air only when it is useful in achieving the desired comfort level. A well designed passive building will use very little energy to maintain thermal comfort level, and an abundance of daylight will reduce the requirement for artificial lighting during the day.

KOGARAH TOWN SQUARE

The Kogarah Town Square project uses the principles of passive design to reduce the demand on energy for heating, cooling and lighting. This will also create a more pleasant and healthier environment in which to live.

Indoor and outdoor living areas have a northerly orientation to allow maximum sunlight. The sun is allowed to penetrate the building during the winter months to provide warmth. In summer the sun is blocked by balcony overhangs, awnings and louvres. The northern orientation also provides maximum daylight for the main living areas.

Ventilation of a building is critical in summer to provide a cooling effect. The building does not need to directly face the direction of the breezes, as blades and stepping of the façade can assist in directing the breezes into and out of the building. However clear breeze paths are required through the building, with openings on two or three sides of the apartment. This is called cross ventilation. Cross ventilation works best when the maximum building depth is 15m or less between external faces.

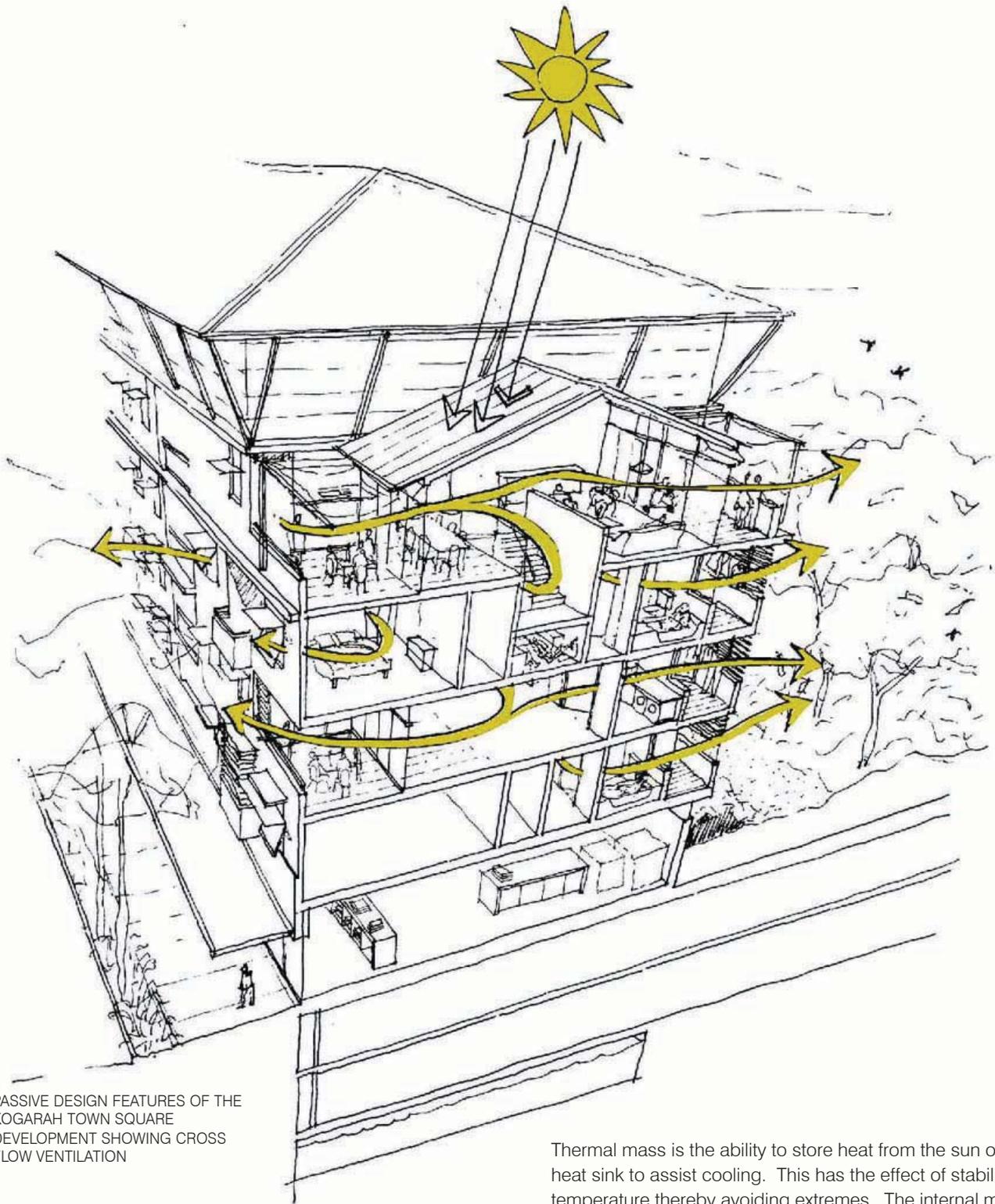
The height and spacing of urban buildings has been designed to allow penetration of winter sunlight into key public and private spaces.

In a temperate climate, insulation is very important to ensure that heat from within the building envelope is not lost in winter, and heat from outside does not penetrate inside in summer. The double brick walls have a layer of insulation in the cavity which gives the wall a rating of R1.5. The insulation in the ceiling helps resist summer heat flow through the roof and heat loss through the ceiling. A careful balance between light penetration and glazing is required to ensure heat loss/gain is minimised.



ACHIEVEMENTS

- 91% of apartments have a northerly orientation
- 85% of apartments have cross ventilation
- 65% of all bathrooms have natural daylight and ventilation
- Most kitchens are located near or on external walls to provide natural ventilation and daylight.
- Sunlight is controlled through louvres and awnings, and daylight is enhanced by the use of light shelves



PASSIVE DESIGN FEATURES OF THE KOGARAH TOWN SQUARE DEVELOPMENT SHOWING CROSS FLOW VENTILATION

Thermal mass is the ability to store heat from the sun or provide a heat sink to assist cooling. This has the effect of stabilising the temperature thereby avoiding extremes. The internal masonry walls and floor slabs are sources of thermal mass.

The built urban form has a significant effect on the ability to provide comfort through passive means. If the building is too deep, opportunities for cross ventilation and natural day lighting are significantly reduced.