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1. Grosvenor Place Project, Sydney, NSW (Australia)

Architect:	*Harry Seidler & Associates*
Mechanical Engineer:	*D S Thomas, Weatherall & Associates*
Contractor:	*Concrete Constructions*
Occupancy date:	*1987*

The significant features which reduce the energy consumption of Grosvenor Place are:
- an efficient facade
- efficient artificial lighting
- efficient engineering services systems

Grosvenor Place is a major office tower of some 80000 m^2 net rentable area, forty four floors in height, providing some of the most valuable views of Sydney Harbour.

The building consists of two arced wings positioned about the building core to maximise the advantage of the views.

The design brief for the building included requirement for a low energy consuming prestige development capable of providing service to discerning tenants into the next Century.

Facade

The building facade has been developed to reduce heat gain by radiation and heat gain and loss by conduction. A system of external shades was developed by the Architect to reduce solar gains on a constantly changing arced facade, whilst maintaining almost full floor to ceiling glazing to maximise views and daylight penetration. Each window sgment of the building is provided with a fixed shade whose attitude angle, commensurate with orientation, varies from vertical to the east and west, to horizontal to the north.

Shading analyses were undertaken using a solar scope and computer based modelling to determine the degree of multiple floor shading for varying sun angles.

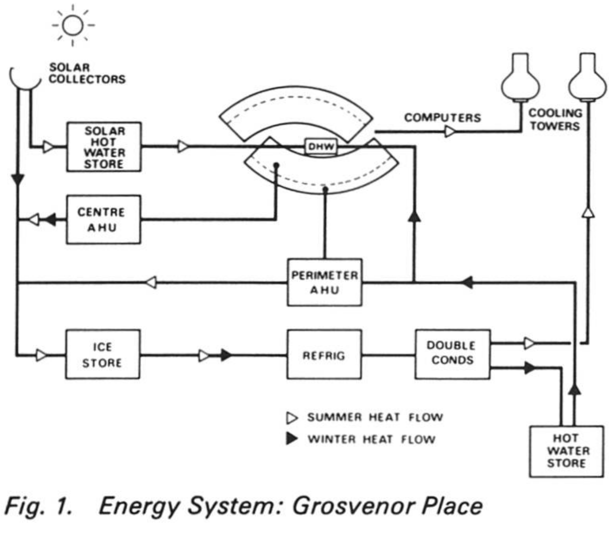

Fig. 1. Energy System: Grosvenor Place

The window module consists of en evacuated double glazed unit with tinted external pane and clear internal pane.

Lighting System

The lighting system throughout the office tower is very low energy consuming by virtue of the use of very efficient fittings and lamps.

The benefits are twofold. Tenant's operating accounts are significantly reduced and the energy required to remove the heat from the lighting system is of net benefit over a whole year in Sydney's climate.

Engineering Services

The thermal efficiency of the building's envelop and the energy efficiency of lighting systems have been complemented by energy and cost efficient engineering services.

The energy efficiency of commercial developments like Grosvenor Place is not necessarily of prime importance. The provision of superior quality services to tenants whilst minimising the total owning cost to the owner is the engineering design aim. Having set a standard for internal environment and service, cost efficiency is related to the energy efficiency with which that standard of amenity is provided. However, the other factor which must be considered is the cost of the energy purchased.

With the design of Grosvenor Place, its comparative reduction in energy will save money, but also the relocation of electrical maximum demand by the use of thermal storage will reduce the cost of its consumed energy.

Air Conditioning

Features of the engineering system include the following:

Variable Air Volume System

Variable air volume to internal zone areas and fan assisted variable air volume to perimeter zone areas provide high air circulation rates at low air transport energy costs.

High Quality Air Filtration

Eletrostatic filters for thorough cleaning of return air and outside air will enhance the internal environment and markedly reduce cleaning costs.

Adequate Thermal Capacity

Adequate capacity is provided for quality internal temperatures and freshness under the most arduous external conditions and with very high rates of tenant equipment heat loads.

Small Independently Controlled Sub-Zones

Typical floors will contain 24 perimeter zone terminals and 16 interior zone terminals, each with its own independent thermostat.

These zones are achieved by a pulsing air handling system eliminating mixing air streams of different temperature or reheating.

High Fresh Air Quantities

Air Conditioning systems and ventilation systems will be provided with fresh air rates generously exceeding Australian Standard rates.

Low Cost After Hours Operation

Fully temperature controlled air conditioning will be provided at very low cost using the operating flexibility of the main supply fans and the off peak nature of the Central Energy Plant.

Central Energy Plant

The Central Energy Plant provided for the project supplies heating and cooling to the air conditioning systems.

Minimising of Maximum Electrical Demand

The installation of thermal storage will result in a year round reduction in the contribution made by thermal plant to the project's Maximum Electrical Demand, such that the return on capital invested in equipment is very high.

The installation also allows for the optimising of the efficiency of operation of refrigeration compressors and results in a reduction in the diesel generating capacity required for emergency standby.

Reduction of Energy Consumption

The design basis of the plant is to profitably use all of the energy available in the building and to reduce utility energy consumption.

– Heat from sources such as occupants, lighting, commercial equipment, lift machines, etc., is reclaimed to overcome Winter season facade losses.

– Heat rejected from refrigeration systems is only rejected to atmosphere via the cooling towers if sufficient heat has already been stored for later use.

The Central Energy Plant eliminates the wasteful conventional operating technique of rejecting interior zone heat via the cooling towers concurrent with purchasing heating energy to overcome facade losses.

– Heat ist not discarded using fresh air cycles unless the heat is not required for space heating and then only if the fresh air cycle can provide heat removal without excessive air transport energy costs.

– Supplementary winter space heating is provided by highly efficient low temperature operation of solar collectors. The collectors also provide year round domestic hot water production.

– Variable mass flow media systems provide flows of chilled water and heating water to match instantaneous loads at optimum energy consumption.

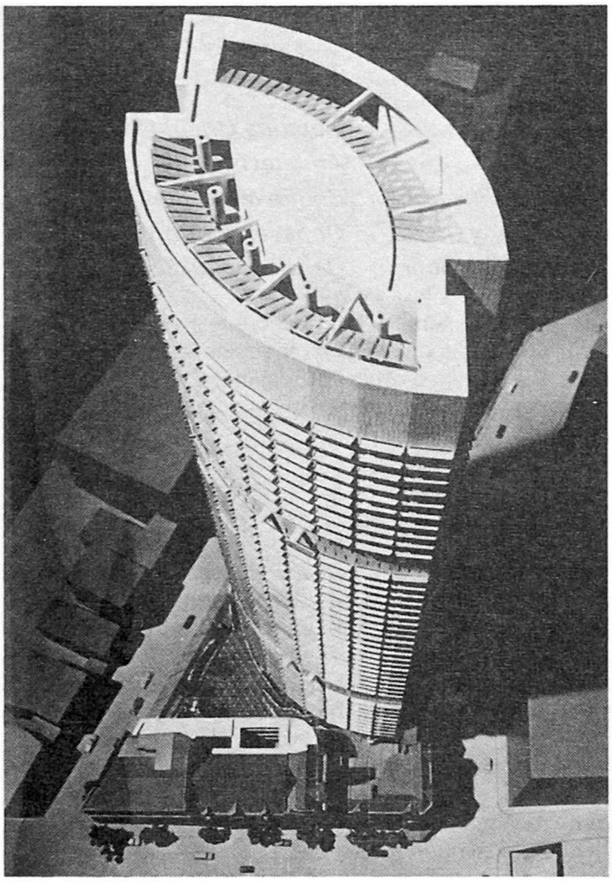

Fig. 2. Grosvenor Place Building

Energy Management System

The air conditioning and central energy plant are controlled and monitored by a micro processor based Energy Management System using high speed Direct Digital Controls.

The Energy Management System is programmed to maximise adherence to set points with high speed of response and to maximse the usefulness of each unit of energy produced.

Summary

The energy consumption of Grosvenor Place will be approximately 37 % less than other major buildings. The cost of energy consumed will be 60 % less by virtue of the energy conservation and electrical demand control techniques.

(G. Shingles)