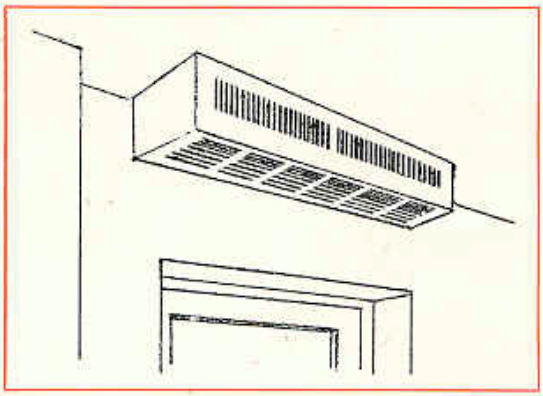
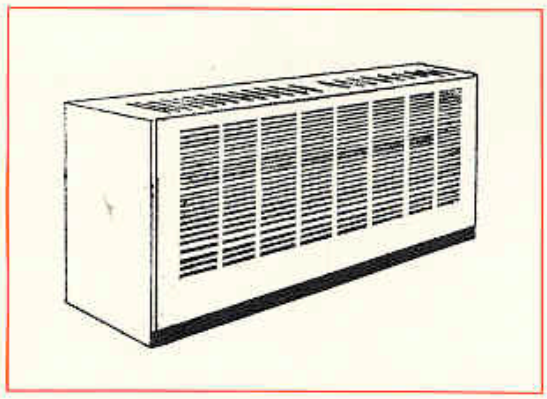
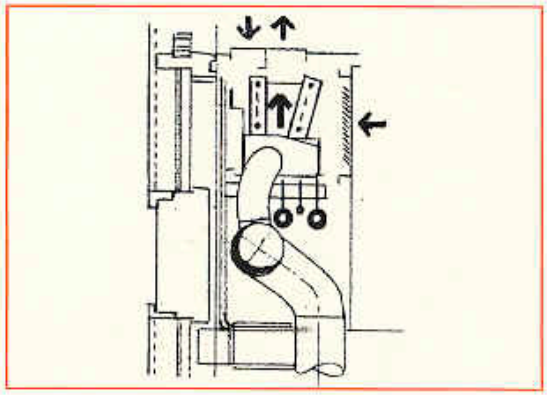






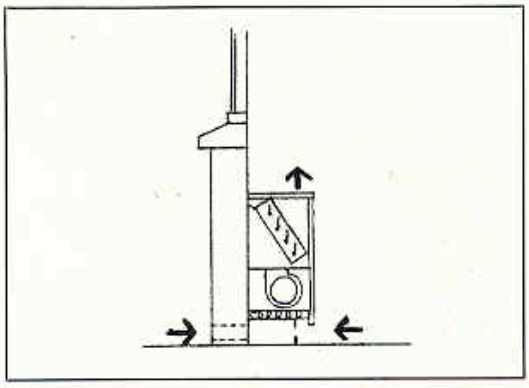
Induction units

The great simplicity of the induction system lies in the fact that the central plant only needs to supply the fresh air required for ventilation. It does not, as in traditional systems, have to handle large quantities of air simply as a heat transfer medium. The source of heating and cooling in the induction system is transferred to finned coils, fed with chilled or heated water, which form part of the room unit. The room unit takes the form of a cabinet which can be arranged for under-window fixing or mounting at high level. Primary air to the cabinet is supplied from the small high velocity ducts of the central system. The air is first discharged into a silencing compartment and from there is ejected upwards through a row of miniature nozzles. The strong induction effect into the jets causes room air to be drawn sideways into the grille on the front of the cabinet and over the heat transfer coil. With a suitable choice of nozzles, the amount of induced air can be as much as seven times the quantity of primary air. Thus for a basic supply rate of 1 air change/h, the actual recirculation rate will be 8 changes/h.

The induction unit has no moving parts and this simplifies maintenance and makes it quiet in operation. The heating or cooling effect of the unit can be regulated from the water supply valves or by an air by-pass around the coil.

Generally units have one set of water supply connections. A recent variation is to handle all the winter load with the heated primary air. Certain multiple pipe solutions also exist.

The induction system is particularly suitable for large multi-storey blocks where a substantial part of the heating and cooling load arises from large glazing areas along the perimeter. Building costs are reduced by the small primary ducts and water piping, and the main plant room also occupies less area. For any project needing over 100 room units the induction system offers an attractive and economical solution.



Fan-coil units

Essentially the fan-coil unit is a cabinet containing a finned heat exchange coil - supplied with heated or chilled water from the central plant - and a fan which can either recirculate all room air, or can draw part (or all) of its air from outside.

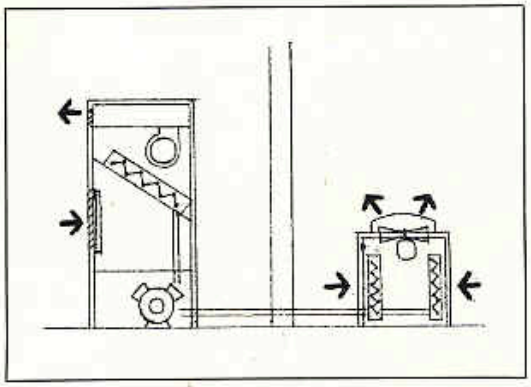
The units are normally placed on the outer walls under windows, although there are models designed for horizontal suspension near the ceiling. They can also be built into enclosures integral with the structure where the architectural design demands it.

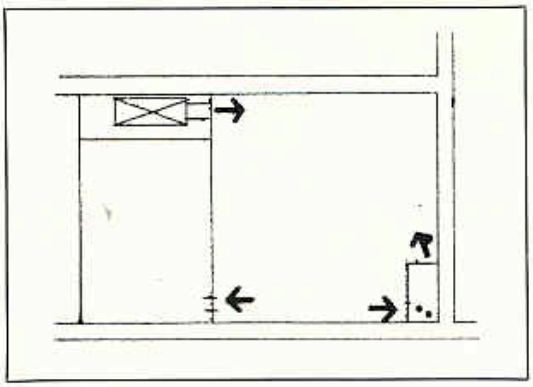
Where the units are designed for recirculating room air only, a central fresh air supply plant can be used as a source of filtered air with controlled moisture content. This primary air can be either introduced at the unit itself, or through independent diffusers.

Units generally have one set of water connections to supply chilled water in summer and hot water in winter, although certain multiple pipe arrangements are possible.

The room temperature can be thermostatically controlled by valves on the water connections.

The fan-coil system - without a separate primary air supply - is one of the lowest cost solutions to perimeter air conditioning. Since only piping is used for the distribution of heating and cooling media from the central plant, builders' work is greatly reduced making the system particularly suitable for existing buildings.





Unit air conditioners and heat pumps

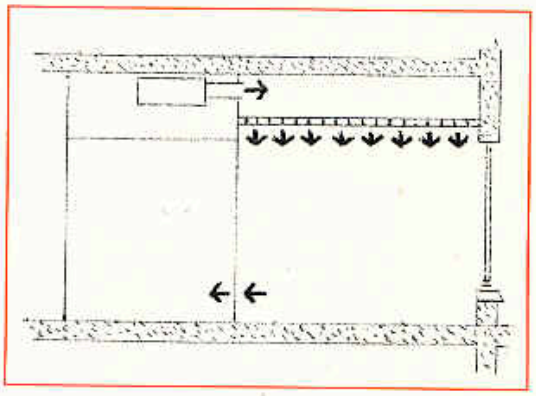
The components of the unit air conditioner comprise the fan, compressor, cooling coil, condenser, heater and filter. Unit air conditioners range in size from small room models with a capacity of one-third ton of refrigeration to as high as 100 tons, although 50 tons is the normal limit. The larger units, which can be used to serve a number of rooms through duct connections, can have either a self-contained water-cooled condenser, or a separate air cooled condenser.

Units are made for window mounting (on sizes up to 2 tons), as floor-standing cabinets, or as cabinets for wall and ceiling fixing.

With unit air conditioners use can be made of the heat pump principle, as the refrigerant circuits on many unit conditioners are arranged for reverse cycle operation. This reversal of the refrigerant from the condenser to the evaporator takes heat either from the outside air or from the cooling water - depending on the type of system - and transfers it to the room.

Unit systems have a wide range of applications and are lower in first cost than central systems.

Individual room units may be arranged for operation on a constant temperature, two-pipe water circuit to simultaneously provide heating or cooling at any unit as required. Units may be switched off in unoccupied areas, and arrangements may be made to operate isolated units outside normal working hours.

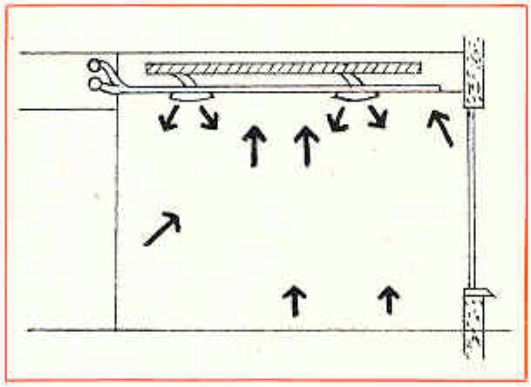


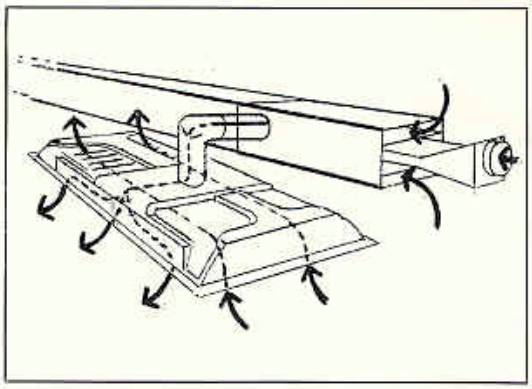
Ventilating ceilings

The perforated ceiling as a means of air distribution has the advantage of limiting the number of sub-ducts required for carrying the air, and does away with the need for separate air diffusers.

In the ventilating ceiling system, a plenum void is formed between the structural ceiling and the perforated sub-ceiling. Air supplied to the void is discharged uniformly from the whole ceiling area and this enables high air change rates to be used without producing appreciable room turbulence. The system is not limited by room height or load, and it offers considerable freedom in arranging partitioning.

The ceiling itself, through a suitable choice of materials, can form part of the room acoustic treatment, and will give increased fire protection to the building structure.





Radiant panel-air systems

To reduce the load on the air conditioning system, the ceiling itself can be used as a heating or cooling panel. Normally the type of ceiling employed is one of suspended aluminium tiles heated or cooled by contact with a pipe grid. The tiles are perforated and backed with a mineral fibre blanket to give heat insulation and high sound absorption, thus improving the acoustic conditions in the room. The pipe grid is supplied with heated or chilled water from the central plant room.

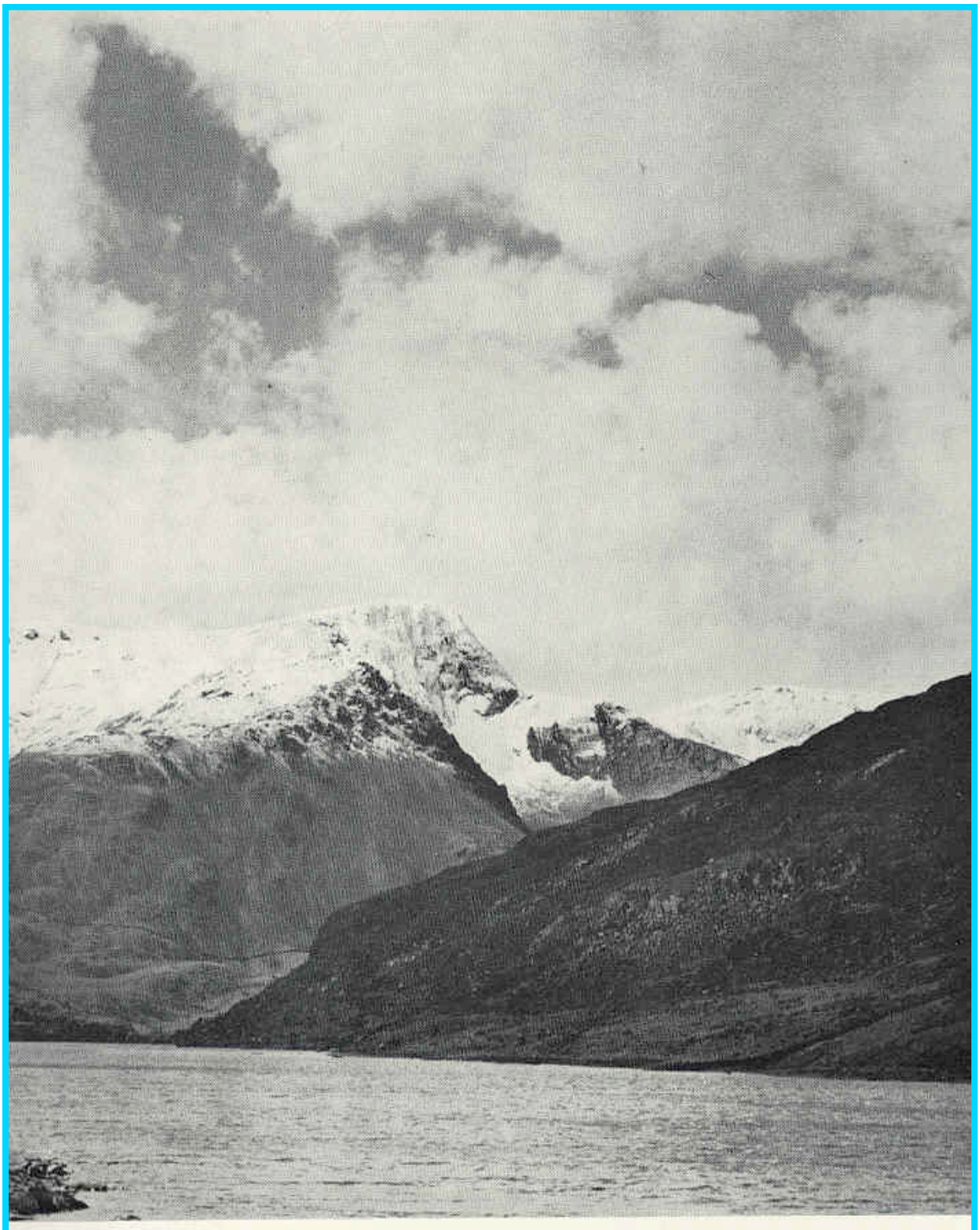
The air supply rate can generally be reduced to the basic fresh air requirements, and moisture gain from the occupants can be offset by supplying dehumidified air.

Integrated air-lighting systems

With the continuing rise in illumination levels, heat generated by lighting in the interior zones of a building is becoming a major part of the refrigeration load. A device which makes use of this heat and prevents its dissipation into the room is the integrated air-light fitting.

This fitting, which is compatible with most modular ceiling systems, combines the room lighting with the air inlet and extract points. Heated air from around the lights and associated gear is taken into the ceiling void by the return air: from here it can be induced through mixing boxes into the cooled supply duct to serve the same purpose as a zone reheater or second heated-air supply duct. The system is therefore considerably simplified.

Another use for the heat collected from lighting is in the supply of the perimeter zones of a building during winter.



Section 3 / Air conditioning applications

BRITISH PETROLEUM HEAD OFFICE BUILDING, LONDON *This building, forming part of the London Barbican scheme, consists of two low-level blocks and a 30-storey tower block. 3500 induction units are used to air condition the perimeter rooms of the tower block; other areas use high velocity dual-duct, and traditional low velocity systems. Four water tube boilers give a total heat output of 52 MBtu/h, and the cooling power of the refrigerating plant totals 1750 tons. Architects: Joseph F. Milton, Cashmore & Partners. Consultants: G. H. Buckle & Partners. Main contractor: John Laing Construction Ltd.*

Multi-storey buildings

Modern multi-storey office buildings present environmental problems which can only be met by continuous air conditioning throughout the year.

Solar gain through the large glazing areas is high and rooms exposed to sunshine need cooling while at the same time those in shadow need heating. Interior zones, with high artificial lighting loads, need cooling even in winter.

Openable windows are made impossible because of the building height, street noise and dust.

The ideal solution is, of course, an air conditioning system giving individual control of heating and cooling in every room, but economics often preclude this.

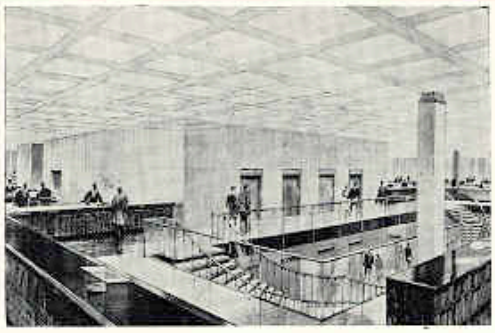
In practice little space is available for the main air shafts and distribution ducts; the system and its equipment must take up the least possible floor area. In addition, the system must be designed to leave freedom in placing the internal partitioning.

The particular requirements of the multi-storey building can be met by the single- or dual-duct, high-velocity system; also by perimeter induction, fan-coil or heat pump units. Air conditioning techniques can employ ventilating ceilings or integrated air/light fittings.

ENGLISH ELECTRIC HOUSE GAIETY SITE, LONDON
This building is air conditioned throughout by a dual-duct high velocity air system.

Architects: Adams, Holden & Pearson.

Consultants: Oscar, Faber & Partners.



13/23 FENCHURCH STREET, LONDON. OFFICE BUILDING, BANKING HALL, AND SHOPS FOR FENCHURCH STREET PROPERTY LTD.

Air conditioning is provided throughout this 24 storey office block by a high velocity, non-changeover induction system employing 1600 units with 650 tons of refrigeration.
Conditioned ventilation air and chilled water is distributed to room units from a central plant room located on the roof.
A pneumatic control system provides individual room temperature regulation.

Architects & Consultants: City of London Real Property Co. Ltd.

Main Contractors: Trollope & Colls Ltd.

LONDON COLLEGE OF PRINTING AND GRAPHIC ARTS

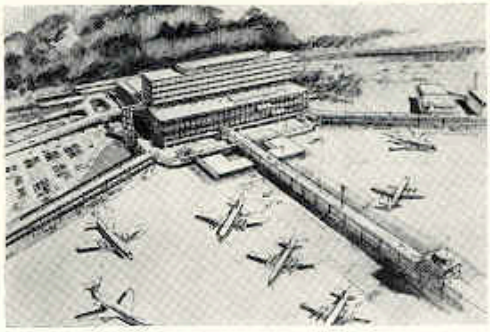
Part of the Elephant and Castle redevelopment project, this new L.C.C. teaching centre for the printing trade consists of a 4-storey workshop and a 16-storey teaching block. Specialised rooms throughout the building are air conditioned and separate extract systems are used for the foundries and spray shops. In addition to the heating and air conditioning, Brightside installed cold water and gas lines.
Architects: Hubert Bennett, FRIBA.
Consultants: Sir Joseph Rawlinson, CBE, M.Eng, MICE. formerly Chief Engineer to the L.C.C.
Main contractor: Tersons Ltd.

ADMINISTRATIVE OFFICES, ESSEX RIVER BOARD, CHELMSFORD.

This office block is served by a high velocity all air system employing both single and dual duct mixing boxes, with electrostatic air filtration and automatic room control, to provide winter heating and summer ventilation.

Architects & Consultants: E. R. Collister & Associates.

Main Contractor: Holland & Hannen & Cubitts (Great Britain) Ltd.



LONDON (GATWICK) AIRPORT EXTENSION.

These additions to the Terminal and Operations buildings of Gatwick Airport, doubling its present size, are planned for an annual passenger throughput of 2½ million in 1970. Brightside installed plenum ventilation to the main building and concourse area, as well as the new restaurants. An interesting feature is the air conditioned reception area with television interview lounge.

Architects: Yorke Rosenberg Mardall.

Co-ordinating Consulting Engineers: Sir Frederick Snow & Partners

Main Contractor: Bernard Sunley & Sons.

Shops and department stores

Because of their extremely variable occupancy and high internal heat loads for lighting displays, shops and stores have a need for air conditioning.

The smaller premises can often be dealt with satisfactorily by separate self-contained units, or by a central self-contained unit with short distribution ducts and diffusers.

Large department stores demand central systems to provide for the extensive floor areas and variable requirements of different floors. Distribution ducts may use the high-velocity technique – this is particularly suitable when adapting an existing building to air conditioning – or may have independent air handling units on each floor supplied with chilled water and fresh air from the central plant.

Special features of air conditioning for shops include doorway air curtains and separate systems for restaurants, food halls, kitchens and hairdressing salons.

The design of shop air conditioning must take account of such variable factors as increased occupancy during sales, variation in the display lighting, and the rearrangment of departments.

LEWIS'S LTD. MANCHESTER. This departmental store is served by single duct high velocity ventilation systems which distribute a total of 200,000 ft³/min of fresh air to the building after passing it through electrostatic air filters and capillary cell washers. The hairdressing salon illustrated has an independent high velocity system.

Clean rooms and Laboratories

The specialised requirements of the modern research and development laboratory demand steady temperature and humidity, and a low atmospheric dust content. Laboratory air pressure may also need to be stabilised. Besides the normal sources of heat gain, the laboratory has the additional loads of its thermal and electrical equipment. Further, the extraction of contaminants from fume cupboards must be counterbalanced by the supply of extra outside air and all this must first be purified by the air conditioning plant.

Brightside contracts for laboratory air conditioning have included spectrographic rooms, metals research, engine test houses and animal rooms as well as the more general-purpose laboratories.

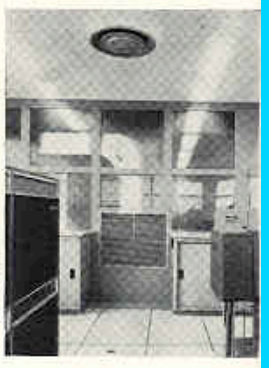
In the clean room – or white room – the degree of air purity is the critical factor in the work being carried out: any contamination by dust particles can be disastrous. The air conditioning plant must therefore be designed to produce exacting standards in respect of dust content as well as the normal requirements of temperature and humidity. It is important to control the air pressure and distribution pattern. The occupants themselves must also conform to rigid requirements of clothing and movement, and the building must be constructed to special standards.

LEY'S MALLEABLE CASTINGS CO. LTD. DERBY. A high velocity dual-duct system provides a controlled environment in this laboratory. Architects: Morrison & Partners.

Computer centres

The concentration of electronic equipment in a computer installation gives rise to high heat output. If this were not efficiently removed, damage to the apparatus would result. Air conditioning is therefore a necessary adjunct to any computer.

The requirements are to limit the temperature rise of the components and to protect them from dust whilst at the same time providing a comfortable working environment for the staff. The air conditioning plant must be able to function continuously day and night throughout the year.



ROWNTREE COMPANY LTD. YORK. Accurate control of room temperature and humidity together with the required degree of air cleanliness is achieved by use of a water-cooled packaged unit conditioner fitted with high efficiency filters, steam heater and humidifier serving an overhead ductwork distribution system.

DEBENHAMS LTD., GUILDFORD.
Mechanical services comprise plenum heating, extract ventilation, domestic hot water services, boiler plant with fuel storage, calorifiers, and automatic smoke and fire alarm systems. The basement car park is fitted with an automatic gas analyser to maintain the concentration of exhaust fumes below a safe level.
Architects:
George Baines & Syborn, A.R.I.B.A.
Consultants:
G. E. Wild, AMIHVE, AM Inst.W., MIEC, AM Inst.R., A. Inst.F.
Main Contractor:
James Longley & Co. Ltd., Crawley.

WATSON HOUSE, FULHAM, LONDON.
This new research centre for the North Thames Gas Board is equipped with an extensive range of air conditioning, ventilation and dust extraction systems. Areas served include laboratories, testing rooms, exhibition hall and a cinema. Of particular interest are the special systems installed for the flue testing plant and for the controlled temperature room.
Architects & Consultants:
E. R. Collister & Associates.
Main Contractor:
Trollope & Colls Ltd.

NAAFI, KENNINGTON, LONDON.
Desired conditions of temperature, humidity and air cleanliness are maintained by a full air conditioning system which protects computer equipment from extremes of temperature and the presence of dust, while providing comfortable working conditions for operating personnel. Plant comprises two refrigeration compressors with air cooled condenser and direct expansion cooling coil, high efficiency filters, aerosol humidifier, electric heaters and supply fan set with distribution ductwork and outlets.