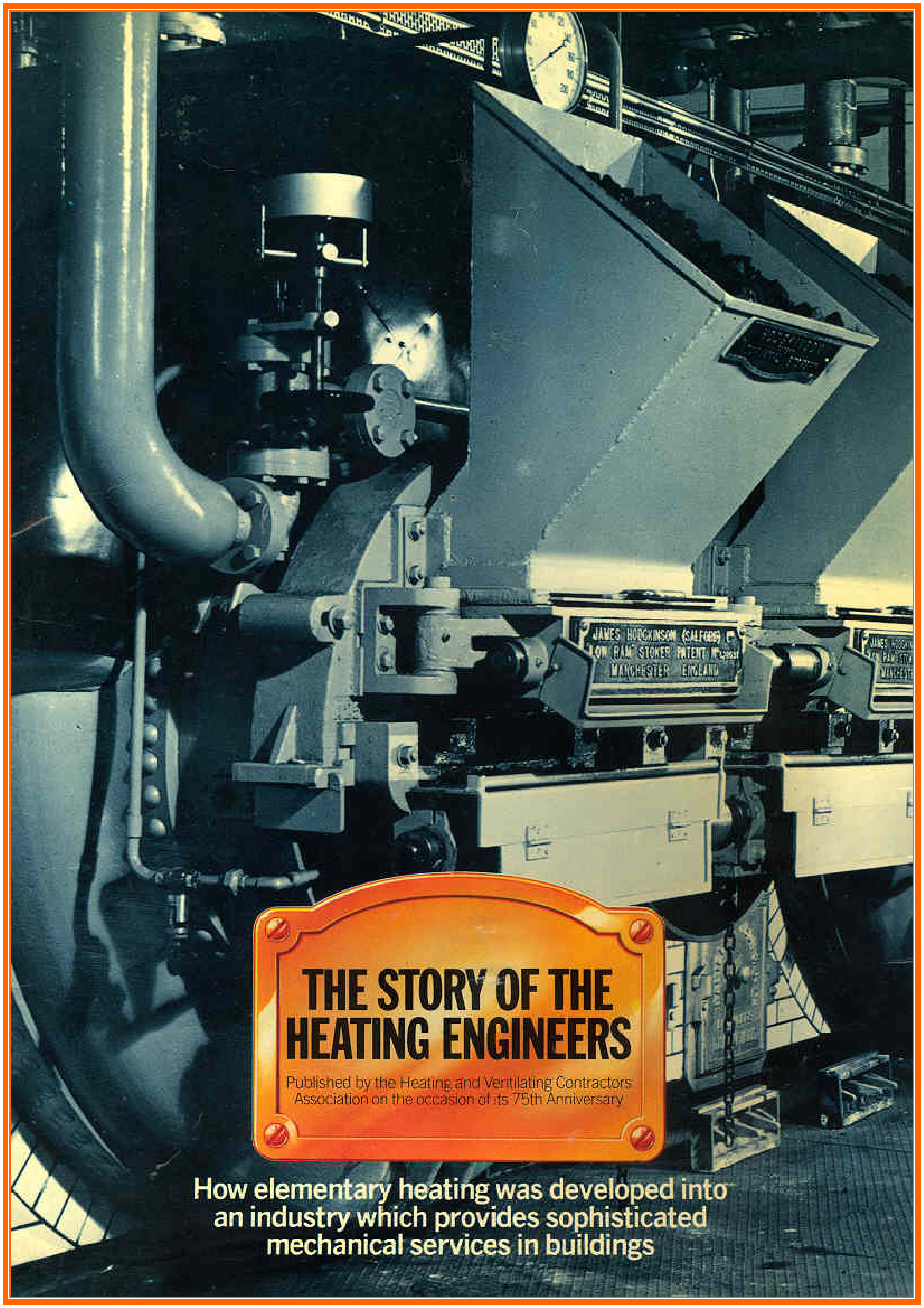
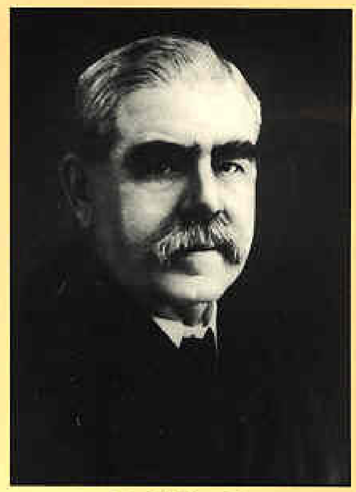


This brochure celebrating the 75th Anniversary of the founding of the HVCA was published in 1979.

Three pioneers of the heating industry

Charles Sylvester
1774-1828

George Haden
1788-1856



David Nesbit
1855-1929
founded the association in 1904

Presidents

1904/09 D. M. Nesbit,
Ashwell & Nesbit, London
1909/11 J. H. Clements,
Clements Jeakes, London
1911/12 C. Ingham Haden,
G. N. Haden, Trowbridge
1912/14 J. G. Walker,
Henry Walker, Newcastle
1914/15 Chas. R. Honiball,
C. R. Honiball, Liverpool
1915/18 Ernest Griffiths,
Ernest Griffiths, Liverpool
1918/19 Frank Biggin,
Brightside, Sheffield
1919/20 W. Nelson Haden,
G. N. Haden, London
1920/22 Stanley J. Benham,
Benham & Sons, London
1922/25 Ernest S. Beal,
Deane & Beal, London
1925/27 P. M. B. Grenville,
J. Jeffreys, London
1927/29 James Elliott,
Elliott, Ellis, Manchester
1929/32 F. A. Norris,
Norris Warming, London
1932/34 R. C. Ching,
Comyn Ching, London
1934/35 Harry Walker,
Henry Walker, Newcastle upon Tyne
1935/37 J. L. Musgrave,
Richard Crittall, London
1937/39 W. Mumford Bailey,
Mumford Bailey & Preston, London
1939/41 Walter Charles,
Ashwell & Nesbit, Leicester
1941/42 G. Nelson Haden,
G. N. Haden, London
1942/43 J. Eric Steel,
Steels Engineering, Sunderland
1943/44 W. L. Swain,
Young, Austen & Young, London
1944/45 A. Anthony Scull,
Arthur Scull, Bristol
1945/46 C. P. How,
Brightside, Birmingham
1946/47 J. B. W. Boyd,
James Boyd & Sons, Paisley
1947/48 J. H. Caramel,
Norris Warming, London
1948/49 F. C. Michell,
Deane & Beal, London
1949/50 R. E. Otter,
J. S. Wright, Birmingham
1950/51 Colin S. K. Benham,
Benham & Sons, London
1951/52 J. W. Cooling,
J. Jeffreys, London
1952 J. M. P. Hamilton,
Sulzer Bros, London
1952/54 J. N. Saunders,
Saunders & Taylor, Manchester
1954/55 Ian Mackenzie,
Mackenzie & Moncur, Edinburgh
1955/56 R. Duncan Wallace,
Rosser & Russell, London
1956/57 William A. Mee,
Z. D. Berry, London
1957/58 A. G. Winch,
J. H. Nicholson, London
1958/59 J. W. L. Beaven,
Beaven & Sons, Gloucester
1959/60 W. S. Richards,
Brightside, Sheffield
1960/61 W. Roy Cox,
Richard Crittall, London
1961/62 P. J. Gardner V.C.
J. Gardner, London
1962/63 Edwin Osborne,
C. B. Jackson, London
1963/64 F. R. Colton,
J. S. Wright, Birmingham
1964/65 Brian Hickmott,
Norris Warming, London
1965/66 C. Muir Gibson,
S. Gibson & Sons, Kilmarnock
1966/67 C. S. Taylor,
J. G. Proger, Cardiff
1967/68 Sir Alan Pullinger,
G. N. Haden, London
1968/69 J. H. Evans,
F. Evans & Sons, Birmingham
1969/70 J. Michael Cooling,
J. Jeffreys, London
1970/71 M. R. H. Austen,
Young, Austen & Young, Manchester
1971/72 Geoffrey Stringer,
H. C. Stringer, Huddersfield
1972/73 D. Russell Naylor,
Rosser & Russell, London
1973/74 E. Norman Ludlow,
Thomas Ash, Birmingham
1974/75 S. Neuman,
Andrews-Weatherfoil, Slough
1975/76 Peter How,
How Group, Coventry
1976/77 Derek Hyam,
Haden Young, London
1977/78 E. F. Starnes,
Thorn Benham, London
1978/79 A. G. Manly,
A. G. Manly, London
1979/80 N. J. Pople,
Marryat Jackson Norris, Bristol
1979/80 Senior Vice-President
B. W. Wright,
Barrett & Wright, London
1979/80 Junior Vice-President
W. D. Fisher
Fisher Group, Birmingham

The Heating and Ventilating Contractors' Association was founded in 1904. Some 85 years earlier one of the industry's pioneers, Charles Sylvester, in his treatise 'The Philosophy of Domestic Economy as Exemplified in the Mode of Warming, Ventilating, Washing, Drying and Cooking' was proclaiming that science should direct its resources to increasing domestic comfort and happiness.

But it was not to the home that the early arts of heating and ventilating were applied. Rather it was to an incongruous admixture of buildings ranging from prisons, poor law institutions and lunatic asylums, to museums, schools and churches.

Only in the past thirty years has the real potential of the industry begun to flower. And today the compelling need for energy conservation adds a new dimension to its multifarious and often intriguing role.

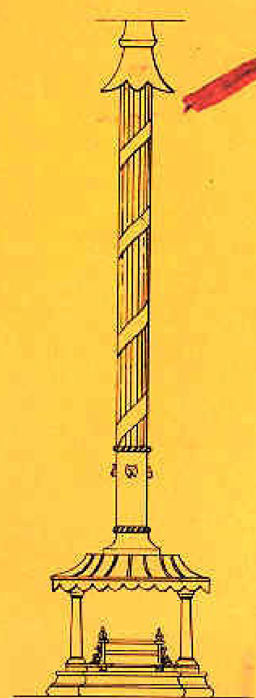
This booklet traces the story of the development and diversification of the industry and the part played by its Association over the past 75 years.

Alfred Manly

Alfred Manly, President
1 July 1979

HEATING AND VENTILATING CONTRACTORS' ASSOCIATION
Meeting of the Council with Past Presidents, April 1979

THE COUNCIL SEATED CLOCKWISE Tim Battle JONATHAN LEWIS LEGG Bryan Ford* ROBERT HIGGS DAVID KETTLES Albert McVean Allen Mathieson Gerry Parker Michael Austen Peter How Don Fisher Colin Taylor Peter Stratton JOHN BEER Bernard Wright GEOFFREY CUTTING Alfred Manly (President) DONALD EDWARDS Ernest Starnes Jim Pople Bryan Grindrod Fred Perryman Harold Coombes Keith Angood Edgar Poppleton Bryan Scoffield Norman Jones Lionel Bugler Geoffrey Stringer Geoff Clarke David Russell Derek Moxom Enid Peacock Eddie Lapidge *Observer from Electrical Contractors' Association **COUNCIL MEMBERS NOT PRESENT** Bill Belshaw Geoffrey Granter Jim Schooledge Mike Stanley John Woodall **PAST PRESIDENTS NO LONGER ON THE COUNCIL, STANDING LEFT TO RIGHT** Cecil How Bill Richards Derek Hyam Michael Cooling Jim Evans LILLIAN CONWAY (PAST SECRETARY) Walter Charles Charles Gibson Edwin Osborne Freddie Colton Donald Naylor Roy Cox John Beavan Phillip Gardner V.C. **PAST PRESIDENTS NOT PRESENT** Colin Benham John Cooling Norman Ludlow Ian Mackenzie Steve Neuman Sir Alan Pullinger Jack Saunders Leonard Swain Raymond Otter Brian Hickmott NOTE: NAMES IN CAPITALS ARE STAFF



Memorandum this 5th day of Feby 1847 between John Lee Benham of 19 Wigmore Street, Cavendish Square. Stove Grate Manufacturer of the one part and William Williams, of Park Square, Regents Park, Esquire MP one of the Members of the Committee of the Reform Club of the other part.

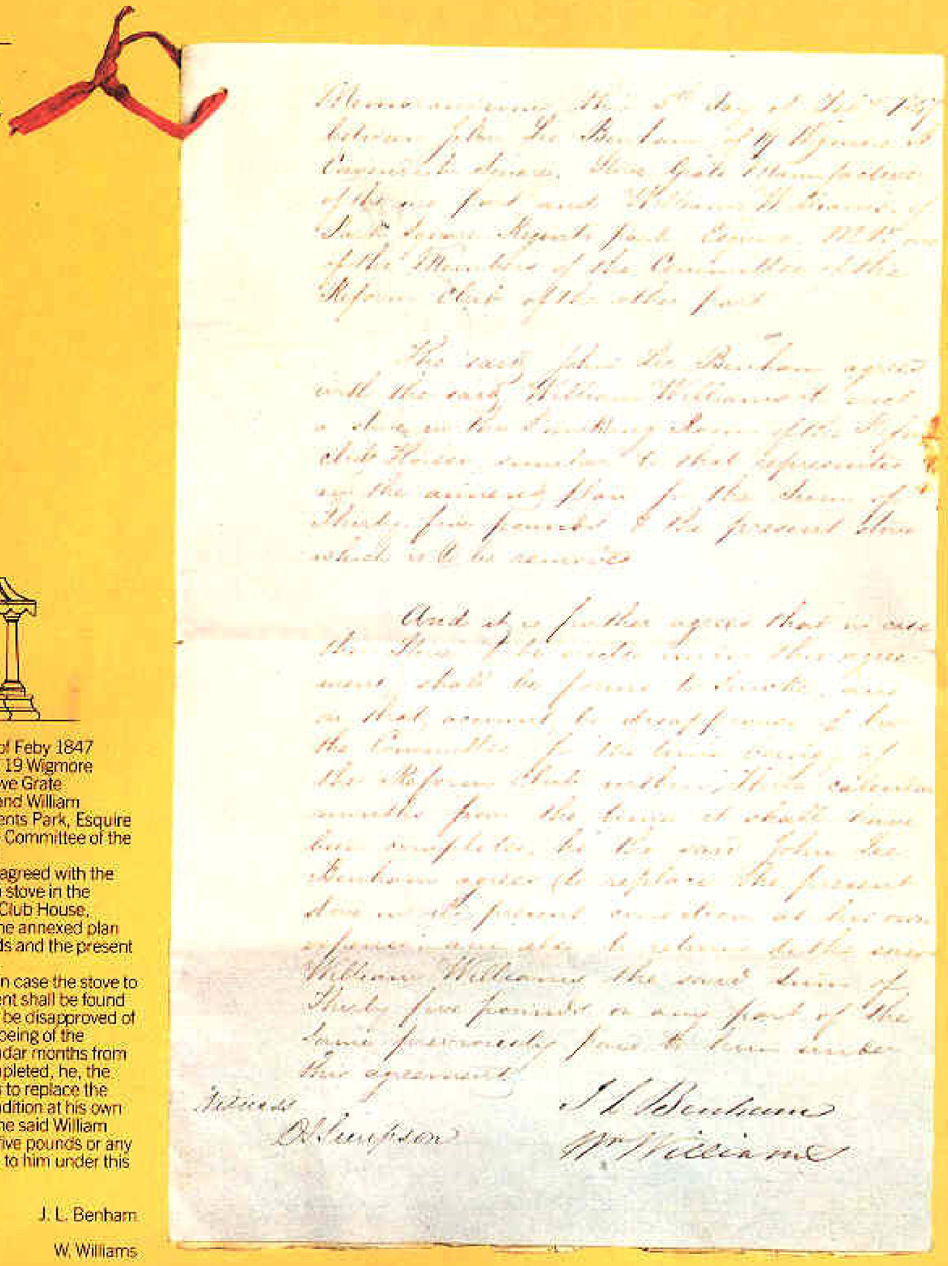
The said John Lee Benham agreed with the said William Williams to erect a stove in the Smoking Room of the Reform Club House, similar to that represented in the annexed plan for the sum of Thirty five pounds and the present stove which is to be removed.

And it is further agreed that in case the stove to be erected under this agreement shall be found to smoke, and on that account be disapproved of by the Committee for the time being of the Reform Club within three calendar months from the time it shall have been completed, he, the said John Lee Benham, agrees to replace the present stove in its present condition at his own expense and also to return to the said William Williams the said sum of thirty five pounds or any part of the sum previously paid to him under this agreement.

J. L. Benham

Witness D. I. Simpson

W. Williams



WHEN CENTRAL HEATING WAS A (RARE) LUXURY

It is as well to start at the beginning. And the conventional beginning is always the warm baths and floor heating of the Romans.

But the industry of to-day was conceived in the early 1700's and was festered by the boilers and steam of the industrial revolution. The early pioneers were men of inventive mind and enterprise. Essentially they were engineers and iron founders who branched out as 'heating apparatus manufacturers'.

The key to initial success was the development of a good patented warm air heating stove. Travelling on horseback or by stage coach the principals of the early firms of heating engineers marketed their products all over the country quoting itemised competitive prices for the design and installation of their systems.

In retrospect it may seem ironic that religion, learning, poverty, madness and crime should lie behind the stock of public buildings that awaited the attentions of the heating engineer. He applied himself to the earnest task of heating churches, schools, museums, poor law institutions, lunatic asylums and prisons.

Literally thousands of churches were heated and many of the original warm air systems operate to the present day. Heating standards were low and inside temperatures of 52°-57°F (11°-14°C) were regarded as luxury.

It is a reflection on Victorian times that when boiler heated water began to replace stove heated air as the heating medium, one heating engineer demonstrated that hot water could be pumped round a prison by the prisoners and he designed and supplied a hand crank and treadmill for the purpose.

There was no central heating in the home. The British stuck obstinately to their inefficient open fires. Cheap coal burned in the grate, smogging the atmosphere from myriad chimneys. Stately homes were the exception. Indeed the Royal apartments at Windsor Castle were fitted with a warm air stove installation in 1826.

By this time steam engines were taking over from water power to drive the machinery in the then thriving textile industry. It was a short step to convey the steam to other parts of the mill, not only for space heating, but also to heat the process water and dry the cloth. This must be one of the first examples of the application of the arts of heating to industrial processes. But apart from a minor boom in greenhouse heating, industrial applications (which now account for a sizeable slice of the industry's output) remained rare.

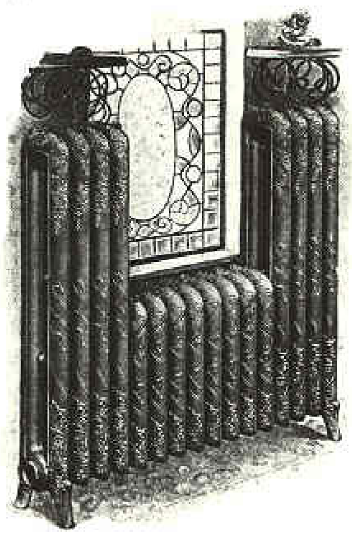
Shipwork was another 'late developer'. But a heating engineer's scientifically planned system of heating, cooking and ventilation made a notable contribution to the discovery of the North West passage in 1819 by helping the crew to live healthily in Arctic waters for two years.

In many respects progress was slow. It was not until 1910 that a British hotel could boast of being the first in the world to have private bathrooms with central heating in every room.

Moreover, the scientific principles of heating took time to develop. There was no formalised training and few textbooks. Apprentices learned their trade from their master. Standards depended upon the empirical understanding and initiative of the individual engineer. Some were very good but others were very bad. Poor design produced ineffective systems and stoves were known to explode with catastrophic effect.

One important trend began to emerge in the 19th century, namely the separation of manufacture from installation. The early heating engineers frequently used local labour to install their equipment and later started to sub-contract the work. Then some firms began to relinquish manufacture to specialise in contracting. There thus emerged the specialist heating and ventilating contractor offering a design and erection service to the client and purchasing his equipment from manufacturers.

Later as we shall see, a further separation took place when specialist designers established themselves although to-day about half of the industry's work is still contractor-designed.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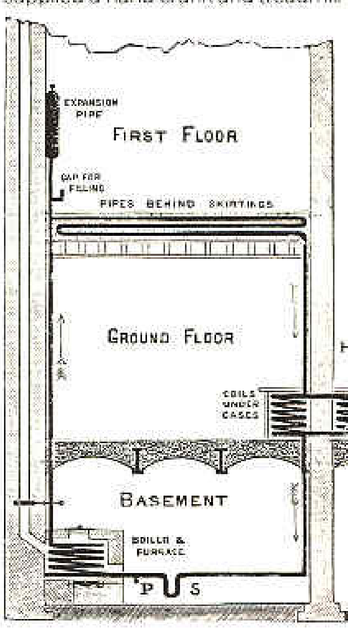

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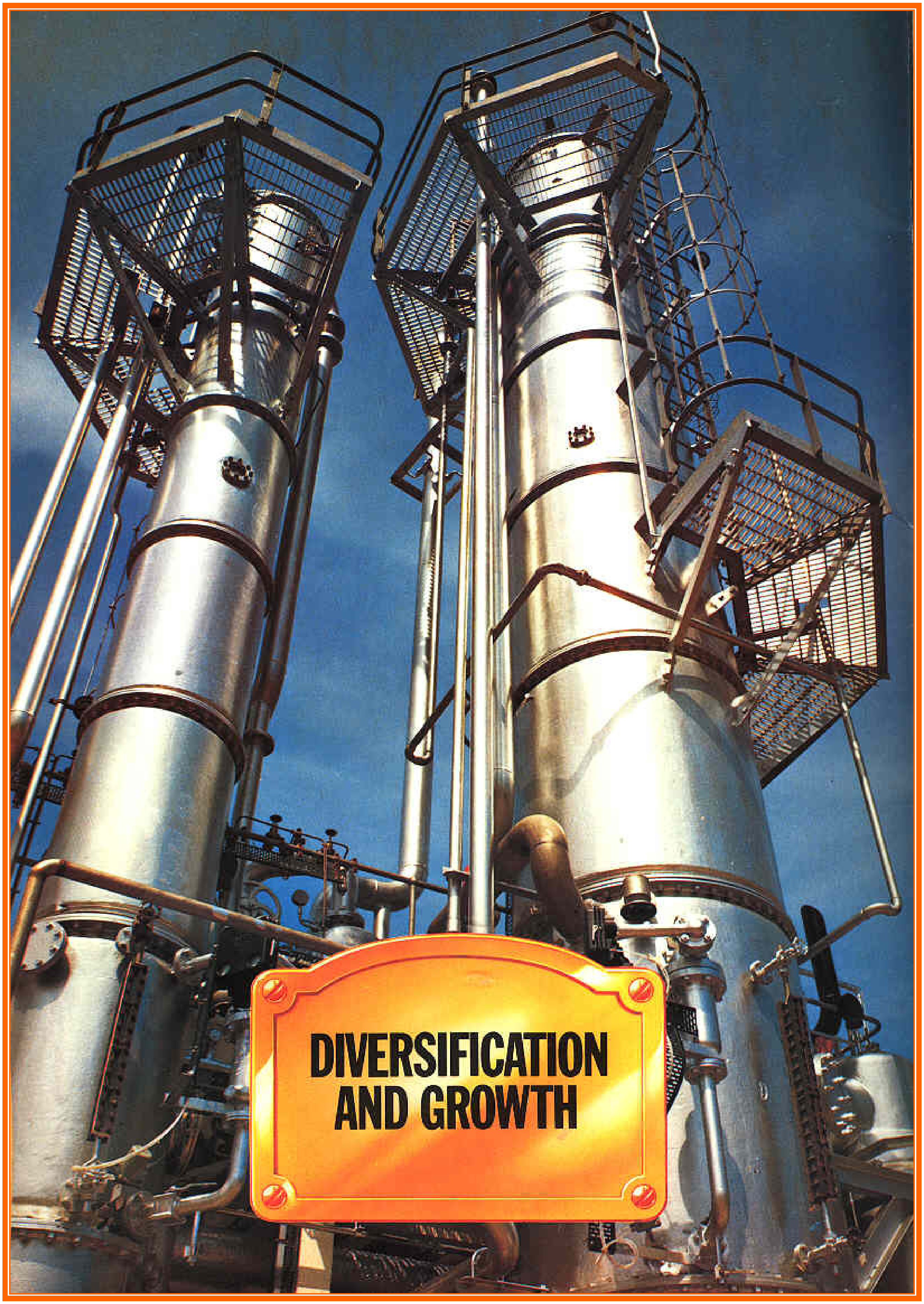
1 This ornate, cast iron radiator was typical of those used for low pressure steam at the turn of the 19th century

2 Mr. A. M. Perkins of London patented his high pressure hot water heating system in 1831. Today, sealed systems for domestic heating are designed on the same principle

3 St. Pancras Station and Hotel (seen in the distance) were completed in the 1870s at a cost of £1 million and £438000 respectively. The elementary nature of the heating and ventilation (warm air flues in halls and open fires) can be judged by the successful tenders of £4072.16s and £968.12s respectively


DIVERSIFICATION
AND GROWTH

The increase in the membership of the HVCA and in the industry's professional body (the Chartered Institution of Building Services) provide a simplistic yardstick of the expansion of the industry. The actual story of its diversification and growth is much more fascinating. It is an amalgam of advancing technology, rising living standards and changing and growing demands from buildings, building owners and industrial and commercial processes.

Fundamental to all developments has been the perfection of methods of creating and holding internal environments to fine limits of temperature, humidity and purity. Whereas central heating was a rare (and often crude) luxury in 19th century buildings, environmental control is a vital necessity in many 20th century buildings.

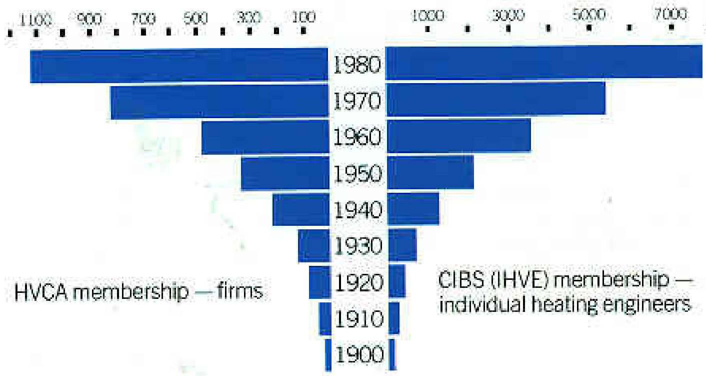
It was perhaps significant that the world's first scientifically designed air conditioning system was installed in a printing works in Brooklyn, New York, in 1902. Today, there are many industrial processes and much industrial equipment for which strict environmental control is essential.

Examples range from pharmaceutical manufacture and assembly of electronic equipment to computer installations, micro-technology and sophisticated telephone exchanges. The frozen food industry relies uniquely on refrigeration for its success. Materials like paper, textile fibres and tobacco are hygroscopic, adjusting their moisture content to the relative humidity of the surrounding air and their manufacture demands humidity control. High speed printing machinery will not print or register properly unless the paper is in controlled room conditions.

In operating theatres air conditioning provides the clinical conditions that reduce the risk of cross-infection. Indeed, the whole complex of engineering services which support a modern hospital can account for half the building cost compared with less than a fifth in the 1920s.

Of course, human comfort is still the mainspring of much of the demand for the industry's services. But comfort is by no means the sole consideration. There is ample proof that productivity, health and temper all improve with good environmental conditions. It is indeed surprising that the House of Commons, at times that most intemperate debating chamber, was not fully air conditioned 'to encourage' the reverse of hot heads and cool feet' until it was rebuilt in 1950.

Even in Britain's reasonably temperate climate, buildings with a high occupancy rate such as department stores, assembly halls



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Opposite Page Historic skills applied to new processes, in this case penicillin production. The twin stacks are part of the solvent recovery plant

1 One of the components of the sophisticated air conditioning system installed during the rebuilding of the House of Commons

2 Compressed air, CO_2 and steam generators which form part of a mechanical services system that controls the annual production of some 1.5 million hecto-litres of lager at a brewery and theatres need air conditioning or at least mechanical ventilation. In the 19th century, inadequate natural ventilation-systems were compounded by the gas-lighting, each jet 'exhaling' as much carbon dioxide as ten or more people. Going to the theatre was more of an ordeal than a pleasure when the house was full.

Just as television (with its air conditioned studios) has dominated the entertainment industry after the second world war, so the motion picture industry was in the position of dominance after the first world war. Cinemas had to have extract ventilation (signified by a 'fan working' sign) but the money lavished on artistic interiors could have been better applied to environmental control. Later standards did improve and the super-cinemas were air conditioned. The market was, however, speculative and bankruptcies among cinema promoters confirmed the industry's opposition to 'pay when paid' clauses under which the building contractor undertakes to pay the sub-contractor if and when the client pays him.

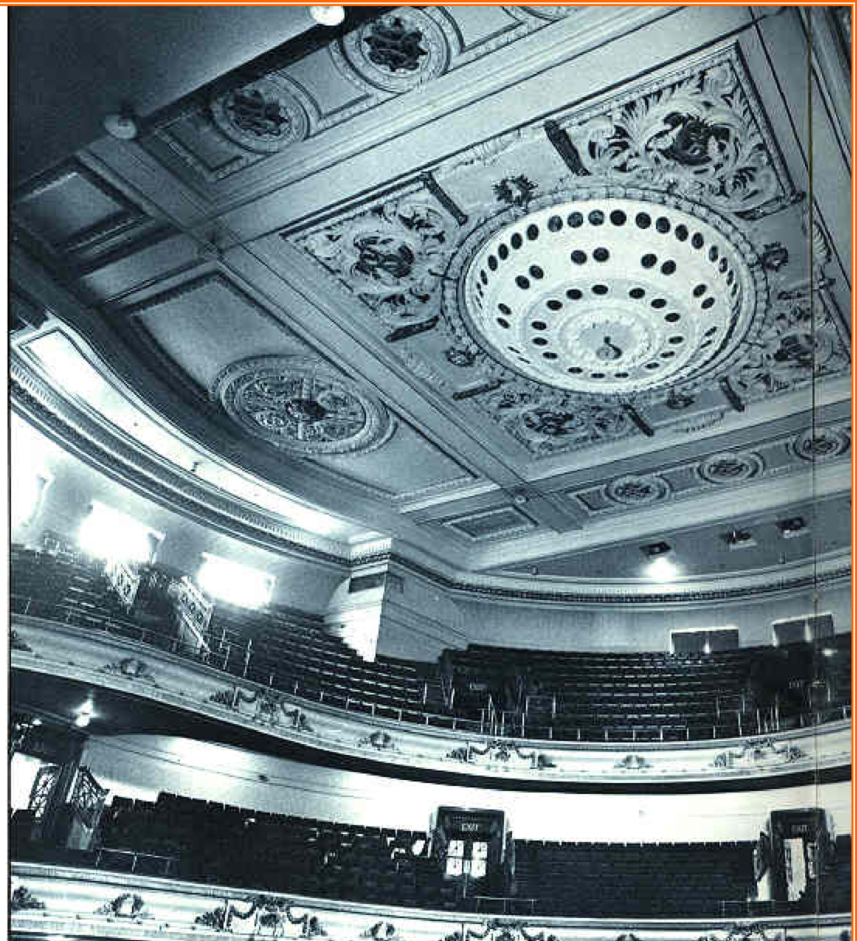
Defence works and munition factory building for two world wars had their impact on the industry. In the 1914-18 war one heating contractor was designing and commissioning shell filling machines. In the second world war the industry converted oil-fired furnaces to burn creosote pitch and improved the ventilation of many a passenger and merchant vessel to make it suitable for use as a troop ship.

Vulnerability to air attack gave a significant impetus to air conditioning. Strategic operations rooms and defence works were housed underground and air conditioning or forced ventilation was imperative.

Much of the building programme since 1945 has been concentrated on projects containing a large element of engineering services such as hospitals, laboratories, universities, hotels, shopping centres, places of entertainment and high rise buildings of various kinds.

An important stimulus came in the 1960s with the boom in domestic work. With central heating then in less than 5 per cent of homes the vast potential of this market had long been recognised. The industry had failed to tap it because it could not gather together the necessary marketing resources. The competing fuel interests, anxious to off-load their surplus capacities, could and did. Unfortunately, they generated the market beyond the capacity of competent installers. 'Cowboy' firms sprang up lacking both experience and financial integrity. The position has now greatly improved and the Association played a prominent part in raising standards.

Legislation passed in the 1960s laying down minimum standards of heating to be provided in offices, shops and factories provided yet a further stimulus. In contrast to the 52°-57°F (11-14°C) once regarded as luxury a minimum of 60.8°F (16°C) was made the requirement after the first hour for work not requiring serious physical effort. In practice higher temperatures are usually provided and in the home acceptable standards are higher still. When relaxing, people have come to expect around 70°F (21°C) although the tendency is to notch the thermostat a few degrees lower since the rapid rise in fuel prices in the 1970s.



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1 Improved ventilation can be provided unobtrusively. In this case a new central feature to the ceiling conceals the air terminals.

2 Domestic central heating has been booming since the 1960s.

3 Swimming pools are now heated to significantly higher standards. The industry also provides ventilation, humidity control, water treatment and filtration.

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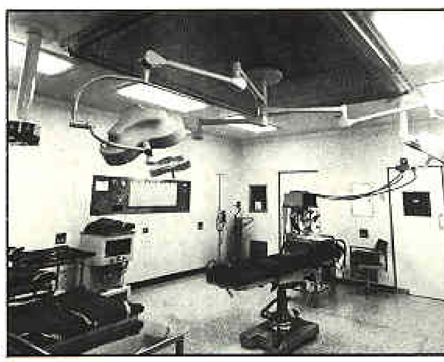

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4 Rearing cool turkeys. Evaporative cooling units immediately lower the temperature of air brought in through the adjustable ridge inlets.
Fans extract it.

5 Modern airports make heavy demands upon the industry's skills.

6-9 Operating theatres and laundries old and new.

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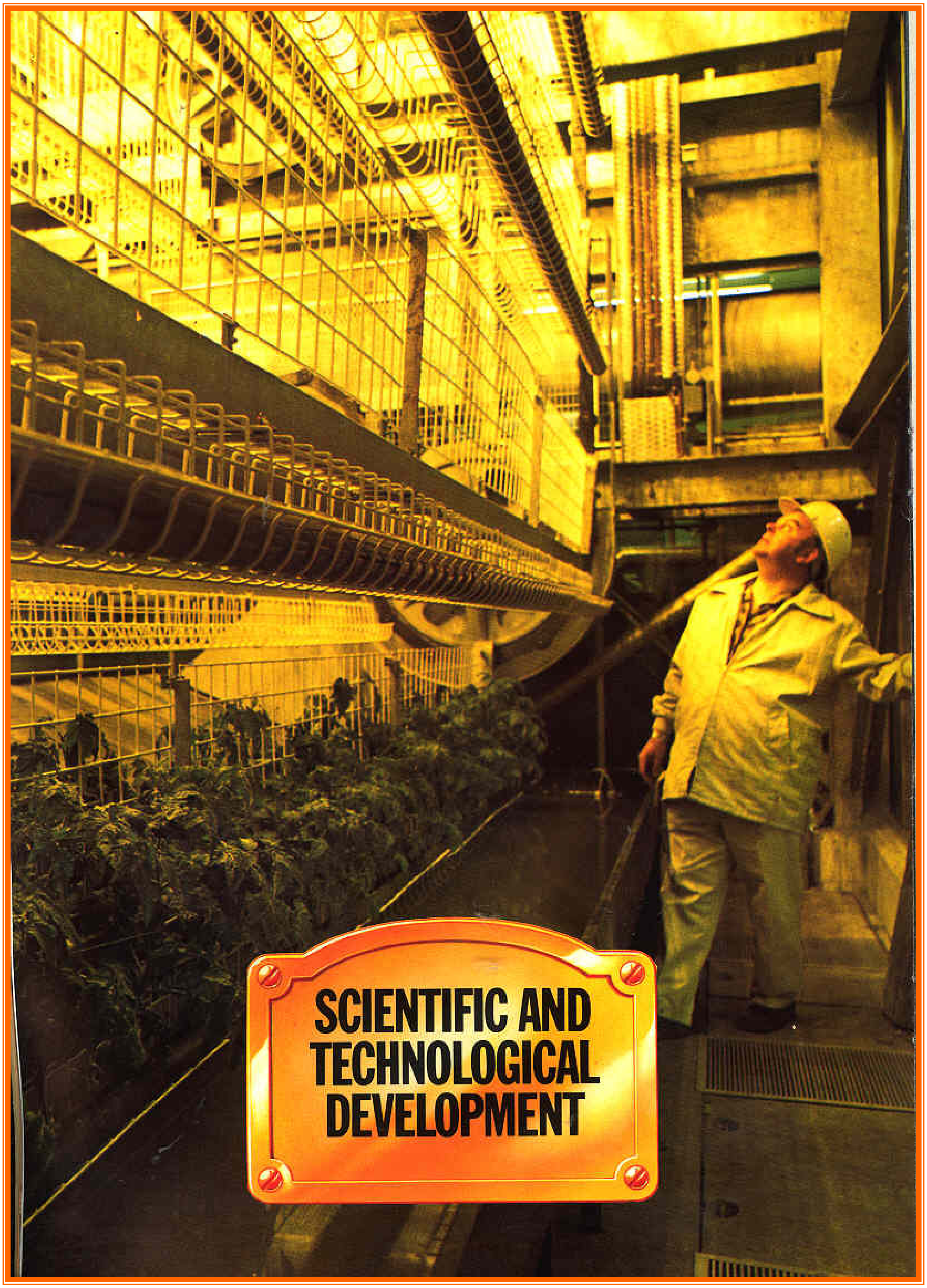


SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT

The relative simplicity of many engineering objectives is usually in sharp contrast with the complexities of the engineering itself. Few concepts are more basic than those of the generation, transfer and distribution of heat. It has been in the ways of realising these concepts, refining them and adding to them that the scientific and technological advancements have been made.

As we have seen, the early warm air systems were quickly followed by steam systems. James Watt installed one in 1784. Even when coal was a few shillings a ton it made economic sense to utilise the heat in the exhaust steam from machine-driving engines. Indeed, steam was to retain its popularity as a means of heating industrial buildings until the 1940s.

By the early 19th century all three main transfer media — air, steam and water — were well established. Nor was it long before a high-pressure system utilising a closed circuit (known as the Perkins system) offered higher operating temperatures than open-vented low pressure hot water. But both had to rely on gravity with its endemic idiosyncracies for circulation.

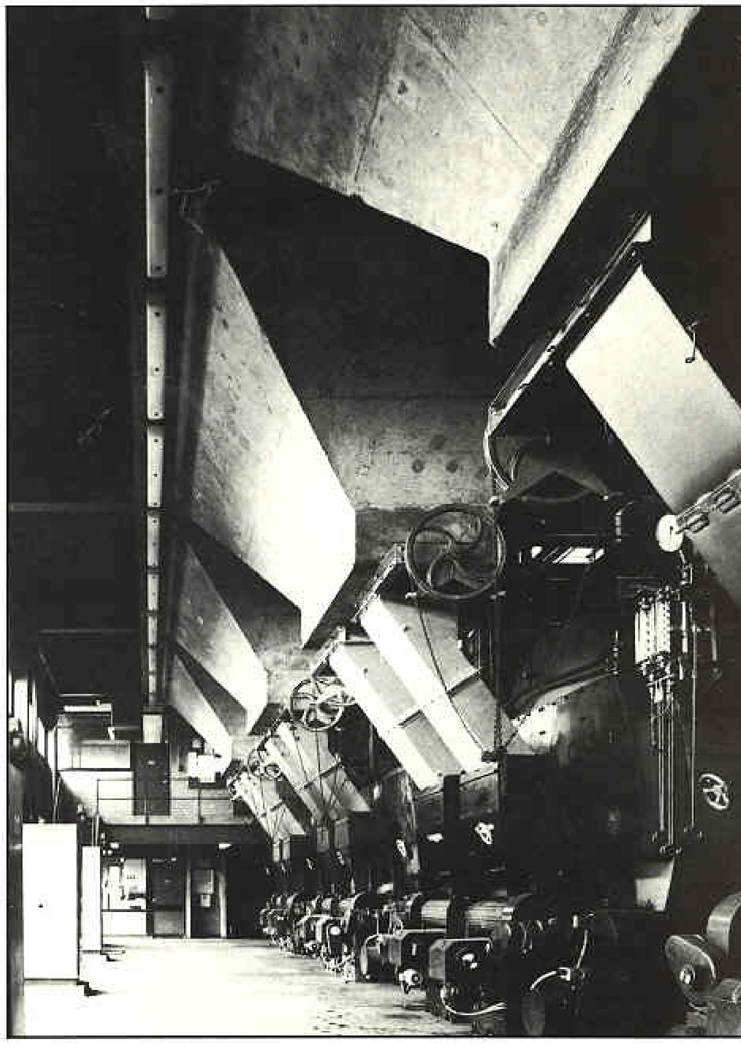
Circulation problems urgently applied the mind of the heating engineer. In steam systems practical experience dictated that the water line of the boiler should be at least four feet below the lowest heating surface in order to return the condensate water; later this was aided by the vacuum ingeniously induced into the steam pipe to reduce the operating temperature.

Equipment was both bulky and crude. Pipe stacks provided the heating surface for hot water systems. The joints in the cast iron mains were sometimes a fruitful source of leakage while the wrought-iron welded boilers were relatively inefficient.

Heating practice was empirical rather than scientific. Heat requirements were calculated by the engineer applying his discretion and experience to schedules listing the average footage of 4 inch pipe required for each thousand cubic feet of air space in different buildings.

The Perkins system was designed to use a loop of small diameter pipe tested to 3000 lbs per sq.in. and coiled to form the heating surfaces and the boiler element. In the more commonly used low pressure hot water system, pipe sizing took little account of the distance from the heat source and prudence often led to over-sizing of the already large diameter pipes to ensure circulation. Today system design and calculation is a highly sophisticated operation in which computer programmes are often used.

A major landmark in the development of the scientific approach was the formation in 1897 of the



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Opposite page Pilot scheme to use waste heat for horticulture. As the plants rotate on a vertical, motor-driven conveyor, hydroponic equipment feeds them, and sprinklers douch them in a controlled environment.

1 These coal-fired boilers, mechanically stoked, heat a large hospital.

2 Between the wars some night tariffs for electricity were sufficiently low to encourage its use for large-scale heating. The storage medium was water heated by electrode boilers.

Institution of Heating and Ventilating Engineers (now the Chartered Institution of Building Services). Engineers from all sides of the industry have participated in the Institution's work and its Guide is the industry's standard work of reference.

Advances proceeded apace in the present century. The general availability of electric power provided the means of 'forcing' the circulation of air or water by fan or pump. It also stimulated development in automatic controls. These not only regulate internal temperatures by the time of the day but by sensing external temperatures can anticipate internal environmental requirements and transfer unwanted heat from the sunny side of a building to the cooler shady side.

Innovation by contractors has continued from the earliest times. A significant development adopted throughout the world was the use of low temperature radiation from heating elements embedded in the ceilings, floors or walls. This system necessitated welded pipework and from it grew many forms of medium and high temperature radiant heating.

A variety of factors have influenced the choice and development of new systems and techniques. For example, the heavily constructed buildings that dominated the architectural scene for the first half of the 20th century have slow thermal response and lent themselves to continuous hot water heating, often by radiant floor or ceiling panels.

Lighter, high rise buildings preclude natural ventilation and their quick thermal response is best served by air-conditioning designed where necessary for intermittent operation.

The high premium on building space

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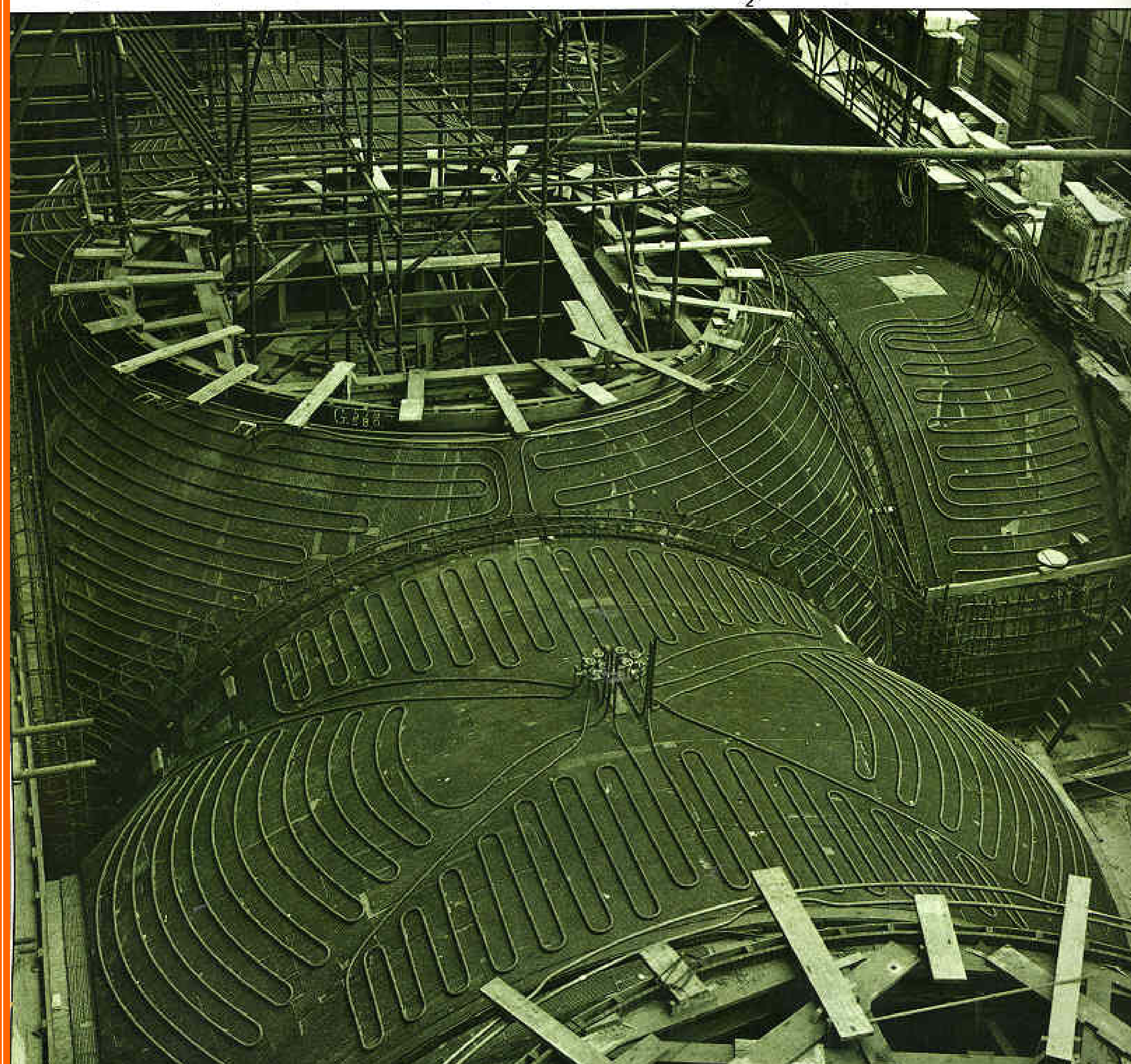


fostered the development of forced circulation through smallish pipes and finned tube convectors to provide a concentrated source of heat which can be accelerated by fan assistance.

Pipe joints are often welded rather than screwed and prefabrication under factory controlled conditions is practised on an ever-widening scale. Ductwork, once a heavyish 'railway arch' operation is now manufactured from light gauge material largely on a production line basis.

Hand in hand with improvements in design and erection techniques has come an ever widening range of equipment from the manufacturing side of the industry. A relatively modest heating system can require the assembly of 1000 separate components and as many as 50 000 in a complex multi-purpose installation.

Needless to say, changes in the relative price and availability of fuels have had significant impact upon the industry. In the 1930s oil began to supplant coal and coal manufactured gas as the preferred fuel. Today, natural gas is the market leader, following the fivefold increase in the price of oil and concern about its longer term availability, notwithstanding the discoveries in the North Sea. But all three major fuels hold rightful, if changing, places in the task of heating the nation's buildings. Electricity is confined mainly to home heating where its convenience can outweigh its cost.

The dominant need for energy conservation makes organised research even more vital for future progress. With foresight the industry in 1955 established its own research body — now the Building Services Research and Information Association.

1 Plant formally accommodated in the basement can now be located on the roof thanks to new technology and piped fuels

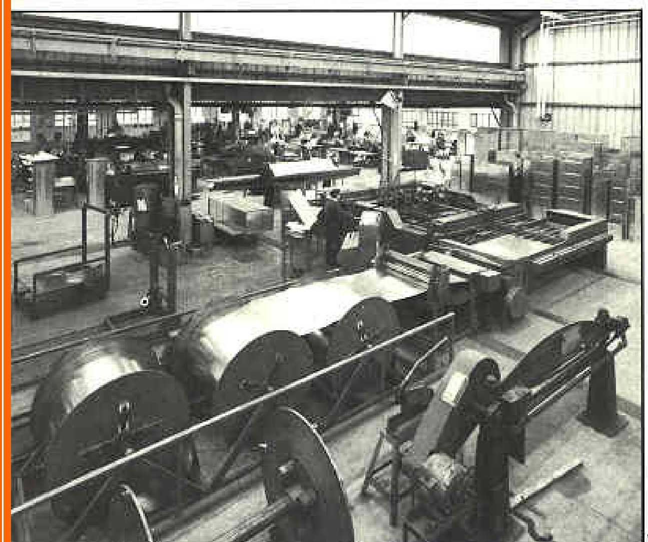
2 One form of ceiling heating — low temperature water circulates through these copper heating pipes embedded in the dome of Bank of England

3 A modern coil-line duct forming unit

4 Centrifugal chiller units. They can extract the heat equivalent of 2,200 kilowatts

5 Testing air leakage from seams and cross-joints in low velocity ductwork at the Building Service Research and Information Association

6 Low temperature ceiling heating developed by British contractors between the wars. The welded pipes were pre-tested against leakage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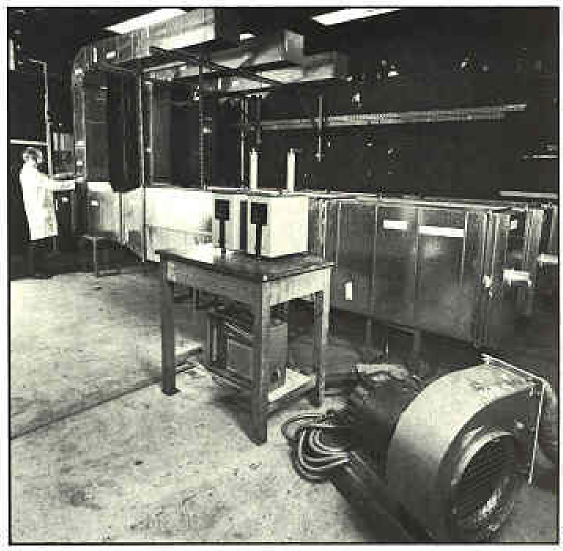
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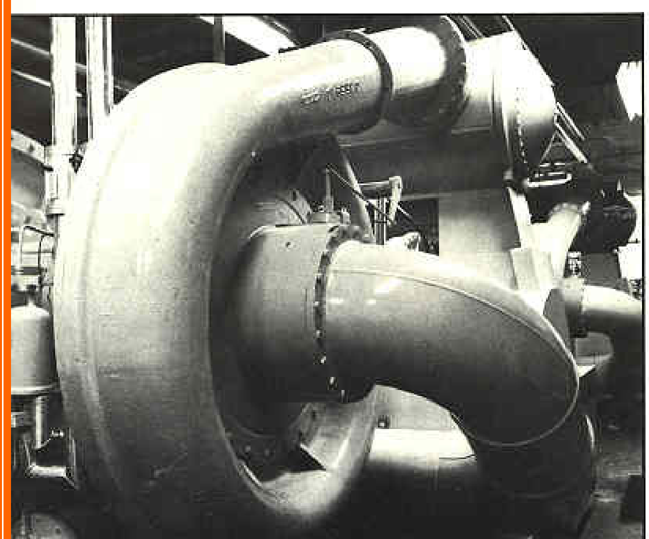
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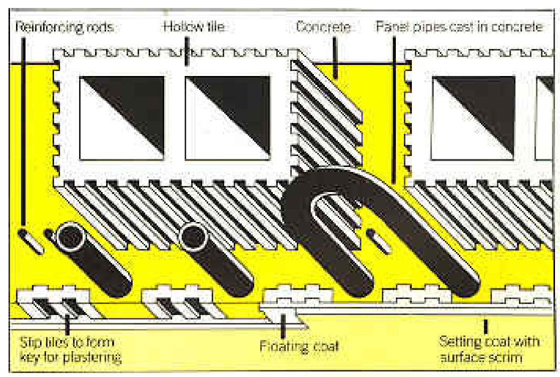

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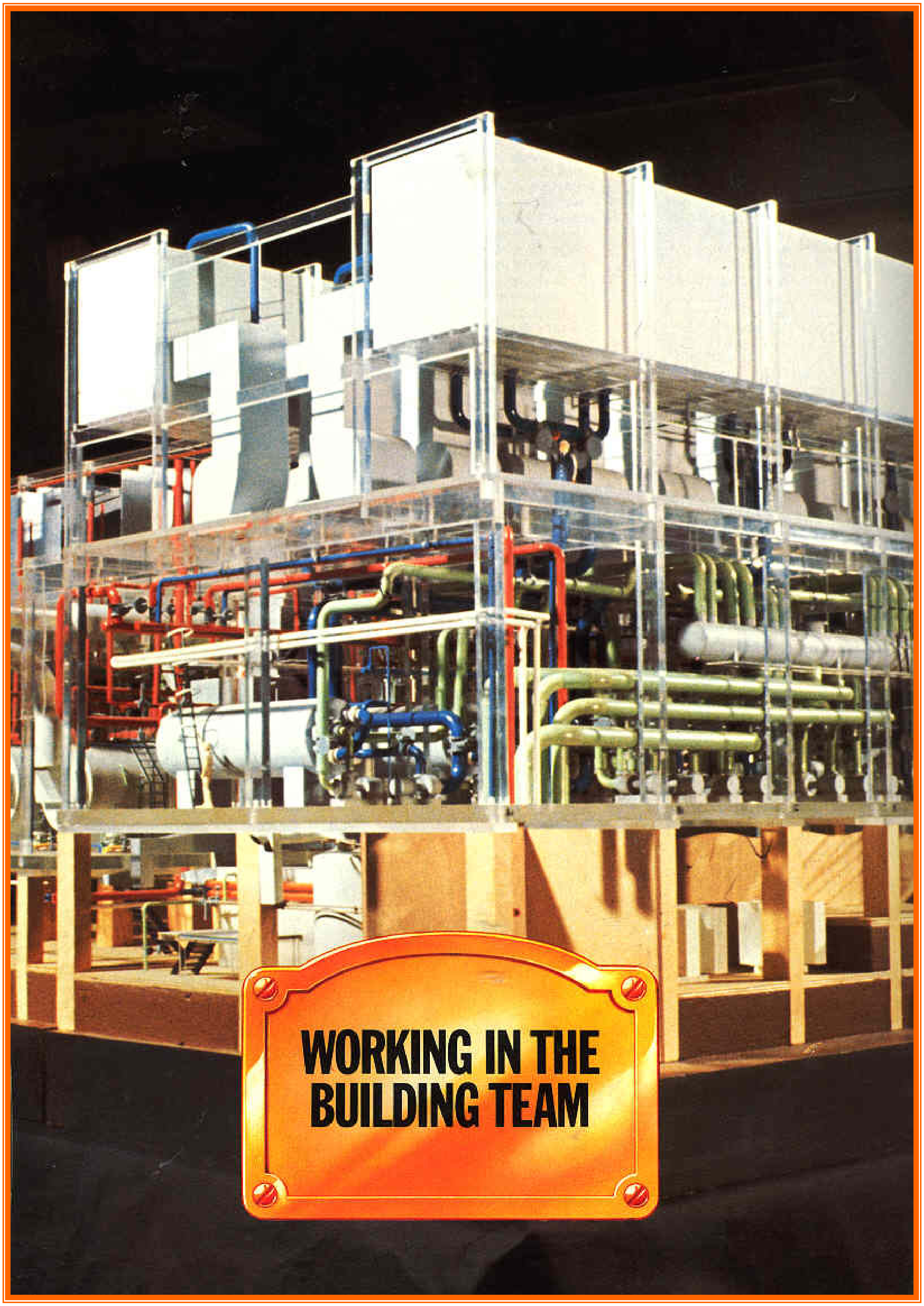
WORKING IN THE BUILDING TEAM

The work of the early heating engineers had two distinguishing features. It was concerned with existing buildings and the systems were contractor-designed.

Much of the industry's work has these same features today. Indeed, escalating fuel prices and the compelling need for economy has given a new impetus to the rehabilitation and retro-fitting of systems in both commercial and industrial premises. Routine repairs and maintenance — sadly neglected by some building owners — represents another self-contained market.

For the rest — some 60 per cent of turnover — the industry works as part of the building team. Its role has become not only immensely complicated but also highly sensitive to the critical path along which building operations should proceed but from which they sometimes stray.

There were but four main parties to building operations right up to the 1920s. First the client. Second the architect who was both the designer and the co-ordinator and often ruled the site with a rod of iron. Third the main contractor who deployed most of the craft skills. Fourth, a few selected specialists like the heating engineer.

The heating engineer usually had a contract direct with the client who both appointed him and paid him. Site co-ordination was not a problem and it was largely for reasons of convenience that clients began, on the basis of guaranteed payment, to nominate the heating engineer (chosen after competition) to the main contractor as a nominated sub-contractor.

Things have changed fundamentally in the last sixty years. The public sector is a major client, often a multi-headed client. Public accountability usually requires independence in all aspects of building design. So the architect has been joined in the professional team not only by the structural engineer and the quantity surveyor but also by the services engineer. Main contractors cannot deploy the vast range of skills and expertise now required by building operations so sub-contracting has become the rule rather than the exception.

The nomination system, a unique British development, gives the specialist sub-contractor confidence to tender in the knowledge that the competition will be fair — no multiple tendering or dutch auctioning — and that the contract conditions will be equitable. The system provides a practical means of harnessing the design capabilities of the specialist. It also recognises the complexities of 20th century building by reserving to the client the competitive selection of the specialists while leaving the site co-ordination role in the hands of the main contractor.

Considerable problems are involved in co-ordinating and controlling the many specialists engaged in the construction of a sizeable building. Careful and detailed programming is required to ensure an orderly sequence of operations and to prevent disturbance getting beyond the point when costs begin to escalate.

Engineering services are a critical part of the programme. They have to be threaded through the structure and their installation has to be dovetailed with the work of other trades. Most of the spatial conflicts on building operations arise because one service is in conflict with another or with the basic structure. When engineering services are subject to variations (the American expression 'change orders' is more explanatory) it often means back to the drawing board because of design considerations.

Despite the inherent problems, many large and complex building projects proceed without undue let or hindrance. Others, however, suffer inordinate disturbance and interruption.

All too frequently the nomination system gets paraded as the root cause of delays. It is true that nominated sub-contractors sometimes cause delay as do all members of the building team. But the nomination system, as such, is not the culprit provided it is managed properly. To prove this it is only necessary to point to the many jobs both large and small that go through smoothly utilising the nomination system.

The root causes of delays are incomplete design and lack of preplanning at the tender stage, indecision or changes of mind by the client and poor programming, co-ordination and control during construction.

The real need is to create a building team which works with mutual trust and co-operation with the object of integrating all aspects of design and achieving the vital pre-planning and programming on which good site co-ordination and control can proceed. In such a wind of change the specialist heating industry will be a willing partner.

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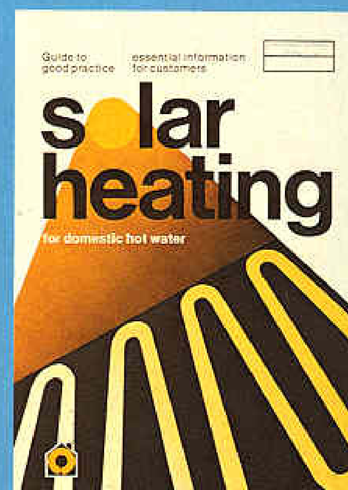
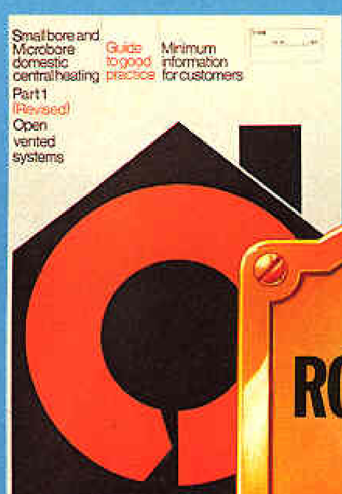
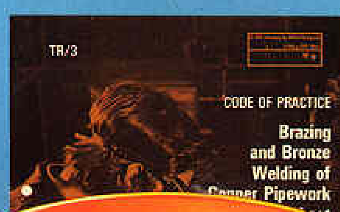
Opposite Page Model of a total energy centre for a hospital. Models can greatly assist such design considerations as space utilisation and erection sequences.

1 & 2 The finished ceiling conceals a labyrinth of services

Reception area at ESCA House, the Headquarters of the HVCA







ROLE OF THE HVCA

Most national employers' organisations were established around the turn of the century and usually they were built upon the already established local associations.

As regards timing, the Heating and Ventilating Contractors' Association was no exception because it was founded 75 years ago in 1904. But as regards structure, it was different because it started with just 14 founder members on a national basis and then set about establishing a regional structure, largely by embracing the local associations.

Mergers with the associations in Scotland in 1940 and in Northern Ireland in 1974 set the seal on the present Association with over 1,100 members spread among ten branches, three specialist groups and a National Contractors' Group.

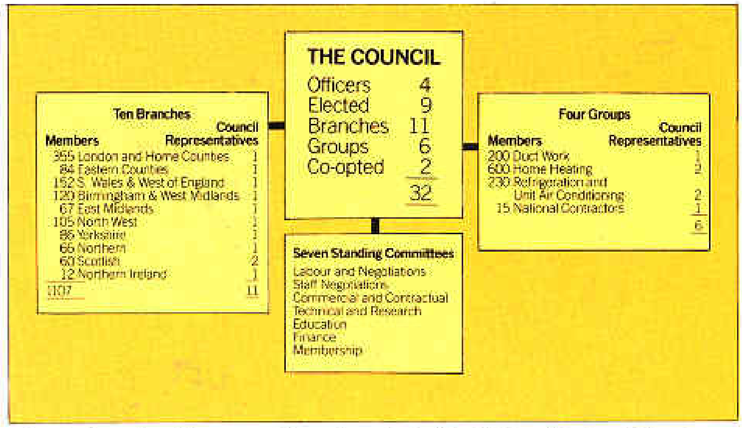
Ancillary to the Association is an organisation in Penrith, Cumbria, which administers the industry's scheme covering payment for annual holidays and welfare benefits. Every operative in the industry has a card to which the employer affixes a weekly stamp the cost of which provides a credit for annual holidays and a premium for welfare benefits. About one million stamps are sold each year.

In the construction industry the major motives for the formation of national associations were two-fold

1 to secure a national agreement on wages
2 to secure equitable conditions of contract

In the case of the HVCA, there was a further reason —
demarcation problems with plumbers

Happily demarcation problems hardly arise today. But the scope of the rest of the Association's work has extended greatly with the growth and diversification of the industry, the intrusions of Government, the complexities of legislation and the new horizons presented by the Common Market and the potential for exports on a world-wide basis.



The Association's headquarters are located in Bayswater, London, in a building shared jointly with a sister association, namely the Electrical Contractors' Association. Scotland has its own full-time Regional Officer but the other Branches are served by part-time secretaries. Thus staff resources are concentrated at headquarters and are deployed as follows:

Executive Staff
4 General service to members
3 Specialist Groups
4 Industrial Relations — Operatives and Staff
5 Commercial and Legal
3 Education and Training; Safety
1 Technical and Productivity

Much of the industry's enviable record in the field of industrial relations is due to the mutual respect and trust that has been built up between the Union and the Association — the Union being the National Union of Sheet Metal Workers, Coppersmiths, Heating and Domestic Engineers.

In 1972 the Association became a signatory to an agreement for environmental engineering staff in the heating, plumbing and electrical contracting industries negotiated with the staff section of the Electrical, Electronic, Telecommunications and Plumbing Union (EETPU). This agreement prescribes minimum salaries for various grades of staff and staff members are graded under a jointly agreed job evaluation scheme.

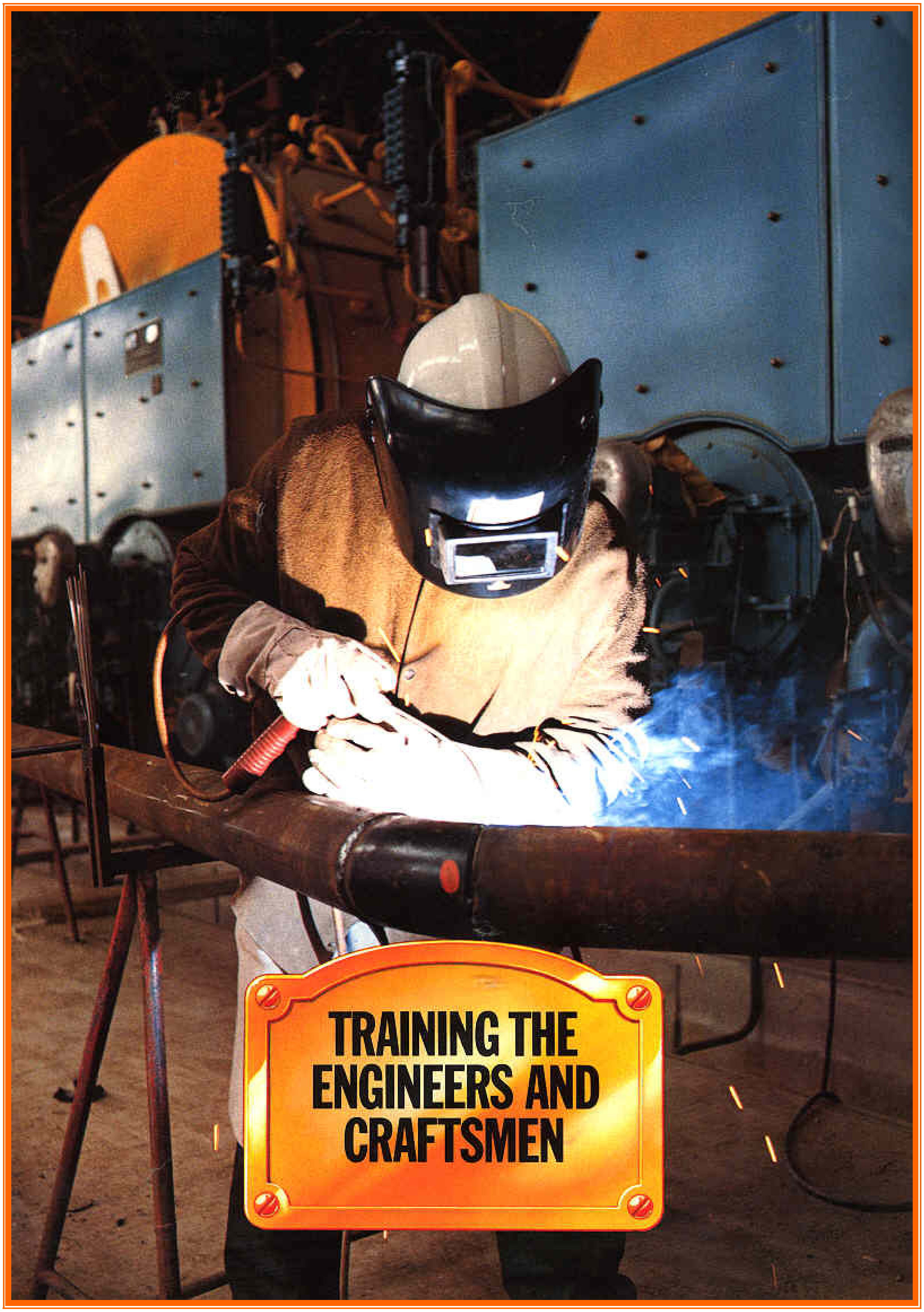
The Association's commercial and legal work has the object of creating a framework within which the industry can operate efficiently, responsibly and profitably. It often involves long and patient negotiations over such matters as tendering procedures, contract conditions or conditions for the supply of materials.

Fundamental to the structure of the Association are the three specialist groups. They allow members operating in specific fields to meet, discuss and act together. The Duct Work Group was founded in 1945 and its specifications for the manufacture and erection of ductwork have been adopted by the Government and by some countries overseas.

The main work of the Home Heating Group, founded in 1964, has been to raise standards by establishing good practice for home heating work. Sales of the Group's specifications exceed 80,000 and its double guarantee scheme (approved by the Office of Fair Trading) gives the householder equitable conditions of trading and the double guarantee that should a member default, the Association will step in and put the matter right.

Refrigeration and unit air conditioning are fast developing specialisms. The Group founded in 1971 has produced the only UAC specification in Britain and is conducting a vigorous education drive to ensure that sufficient mechanics are available for future expansion.

The Association was a founder member in 1961 of an 'umbrella' organisation called the Committee of Associations of Specialist Engineering Contractors. CASEC deals with matters of common interest on behalf of associations representing specialist contractors in heating, plumbing, electrical, lifts, structural steelwork and metal windows. It has a seat at the top tables of the construction industry.



TRAINING THE ENGINEERS AND CRAFTSMEN

The industry is people intensive rather than capital intensive. There is relatively little plant and machinery. In the last analysis what it 'sells' is a trained and organised work force.

Training is the touchstone of the industry. With a smallish but national workforce there were many problems to overcome before the present sophisticated pattern of training was developed.

The very first organised courses of technical training date back to the beginning of the century. They were conducted by the late Professor A. H. Barker at London University, and required a student to attend three days a week for three years to qualify for the University College diploma in heating and ventilating. Only a handful of students took the course each year.

The second seat of learning was destined to become the industry's main centre of technical training. It was the old Borough Polytechnic which began a pilot series of lectures in 1921. Later in 1948 the industry established its own National College in a purpose-designed building adjacent to the Borough Poly and the whole complex is now absorbed into the Polytechnic of the South Bank.

Meanwhile, in 1919 the industry set up its joint body responsible for the promotion and regulation of craft apprenticeship training, namely the Heating, Ventilating and Domestic Engineers National Joint Industrial Council. Craft courses were slowly established in the major conurbations. A Technical Education Committee was formed in 1923 leading to the organisation of draughtsmen courses and day release was instituted for both craft and student apprentices.

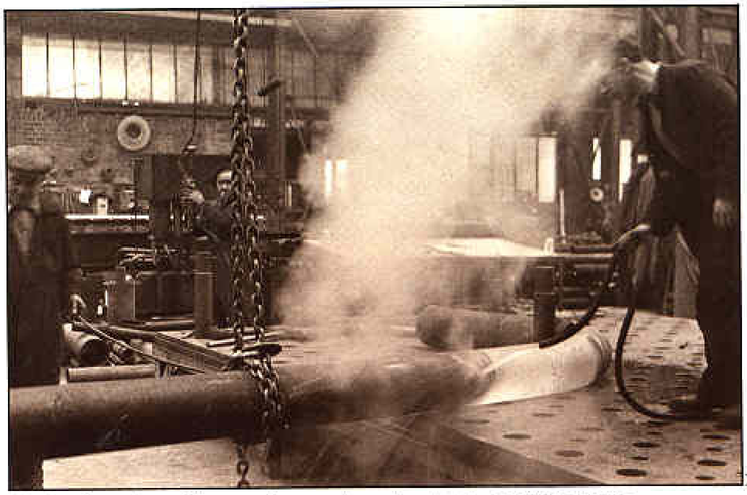
Today the usual training pattern is block release for craft apprentices and sandwich courses for technical training. Degree courses in environmental engineering are offered at eight universities and polytechnics.

Few industries have such an outstanding record of care and attention to education and training. The NJIC has established a network of 28 regional committees which liaise with their local technical colleges and oversee the training of craft apprentices in their area.

A separate body now deals with technical training; yet a third body organises and provides mid-career training.

Although contract values often run into six or seven figures, system design and erection is still done by small teams. The work provides considerable job satisfaction to those concerned who enjoy working in a friendly industry with good communications between employer and employed. By national standards, local firms in the industry are small with less than 20 employees. The typical provincial contractor employs perhaps 20-50 people. The largest firms may employ 1 000 or more spread among several regional ofices.

Training courses are available at all levels of ability and in all the specialisations of what is a diverse and demanding industry. They lead to careers which offer absorbing interest and a real challenge to anyone who enjoys working in an engineering industry whose workshop is a building site or an existing building and whose unfailing characteristic is to present new problems and new interests every day. The three main patterns of training are shown in the next two pages. There are other schemes covering, for example, the training of refrigeration and unit air conditioning mechanics, ductwork erectors and domestic heating fitters.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Opposite Page Welding on a bend on-site

1 Before the introduction of welding, bends in large pipes could only be formed in the workshop

2 Concentration at the drawing board

3 Drawing office old style

4 The contract manager checks progress

Craft Apprenticeships

Craft apprentices are usually 16-17 year old school leavers although you can be up to 20.

You must be physically fit, have good eyesight and an aptitude for working with your hands.

Your workplace is going to be a building site or an existing building so you must be prepared to work in outdoor conditions which are sometimes rough and ready, wet and muddy.

Personal qualities and aptitudes count most but it is a great advantage to have CSEs in maths and English language.

Training

Your four year paid apprenticeship will make you an excellent heating fitter or fitter-welder.

College training continues throughout but is concentrated in the early years. You spend about 50 per cent of your time at college in the first year; 25 per cent in the second year and 20 per cent in the third and fourth years.

Back with your employer, you put into practice what you learn.

Your training covers:

- basic pipework — measuring, setting out, bending, jointing and welding
- assembly, erection and connection of boilers, radiators, fans and other plant
- commissioning, testing, operation and maintenance of systems; fault-finding
- reading and interpreting drawings
- basic theory of heating, ventilating and air conditioning systems

Qualifications on passing your examinations

You are awarded a certificate from the City and Guilds of London Institute; your indentures are endorsed; and after six months site welding experience you receive your certificate(s) of competency in welding.

Career Opportunities

You acquire skills which will always be in demand.

The industry's on-site professionals have a fascinating and rewarding job.

There is every opportunity for promotion to chargehand and foreman and if you have the will and ability you can progress to top positions in the industry.

Student Apprenticeships

There are excellent student apprenticeships for 16-18 year old school leavers.

You must be a practical person who is able to think and work scientifically. The ability to get on with people and overcome difficulties in a tactful way is important.

There are two levels of student apprenticeship. If you show the necessary aptitude and ability you can always move from Student Technician to Student Technician Engineer.

To be indentured as a Technician you must, as a minimum, have maths, English language and a science subject (preferably physics) at Grade 3 CSE or in Scotland at SCE O grade.

To be indentured as a Technician Engineer you must have grades A B or C in maths, English language, physics and a drawing subject at GCE O level, or in Scotland the equivalent SCE O and H grades.

Training

Your four to five year paid apprenticeship will teach you all the basic technicalities of a fascinating branch of engineering. You spend 10-15 weeks each year at college which coupled with on-the-job training, covers:

- technical drawing and draughtsmanship
- heating and hot water services
- refrigeration and air conditioning

There are a number of optional studies including fire protection, contract management, services surveying and multi-service contracting.

Qualifications on passing your examinations

You not only qualify under TEC* or SCOTEC* but are also eligible for an appropriate grade of membership of the Chartered Institution of Building Services (CIBS).

*Technician Education Council and Scottish Technical Education Council which are the national bodies for technical education in the UK.

The Industry is one where responsibility comes early and there are many opportunities for promotion to the top. At the start there are three main choices:

- contract management — for the practical person with a flair for organisation and management of people
- work on the drawing board — for the person who likes applying his engineering knowledge to conceptual and detailed design
- services surveying — for the person with a commercial outlook who likes wrestling with the more contractual, legal and financial aspects of design and installation

Degree Courses

There are well established routes to get a degree in building services engineering.

One way is to do a general degree in mechanical or electrical engineering or in physics or chemistry and then take a specialised post-graduate course.

The more usual way is to take a specialised degree course. For this the usual age of entry is 18-19 years and as a minimum you must have maths and physics at GCE A level with at least three other subjects at GCE O level or the equivalent SCE grades in Scotland.

Some courses are full-time while others are on a sandwich basis with planned industry experience for which a special technologist training register has been set up.

Training

You will get sound training in engineering and its applications to the various branches of engineering services. It is important for example to gain an understanding of the need to integrate building design and services design and to co-ordinate the work of construction.

During a sandwich course or end-on to a full-time course, you will have opportunities for both site and office experience. There you will learn drawing office practice, estimating, tendering and contract procedures; contract management and organisation including the commissioning and testing of systems and their planned maintenance.

Qualifications on passing your examinations

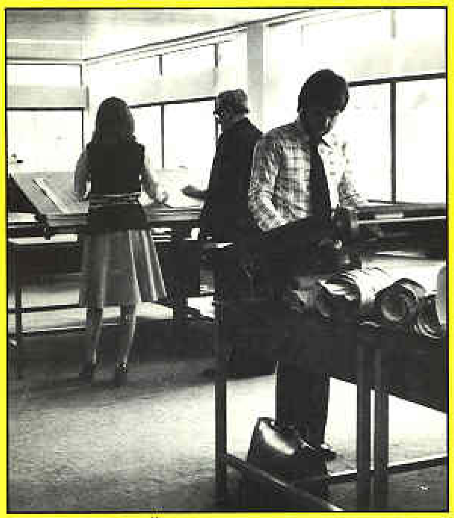
As well as getting your degree, you will become eligible for corporate membership of the Chartered Institution of Building Services (CIBS).

Career Opportunities

Opportunities abound for the graduate building services engineer. His is a career in touch with the frontiers of tomorrow's technology and he has a key role to play in energy conservation.

'Dentistry' in a fan housing

An apprentice practices brazing



A pleasant drawing office

Students cross-check the fan efficiency reading on a demonstration unit (right) against that on a site-measuring instrument (left)

Undergraduates carry out an acoustics and vibration experiment

An example of career progression

1961 graduated in mechanical engineering

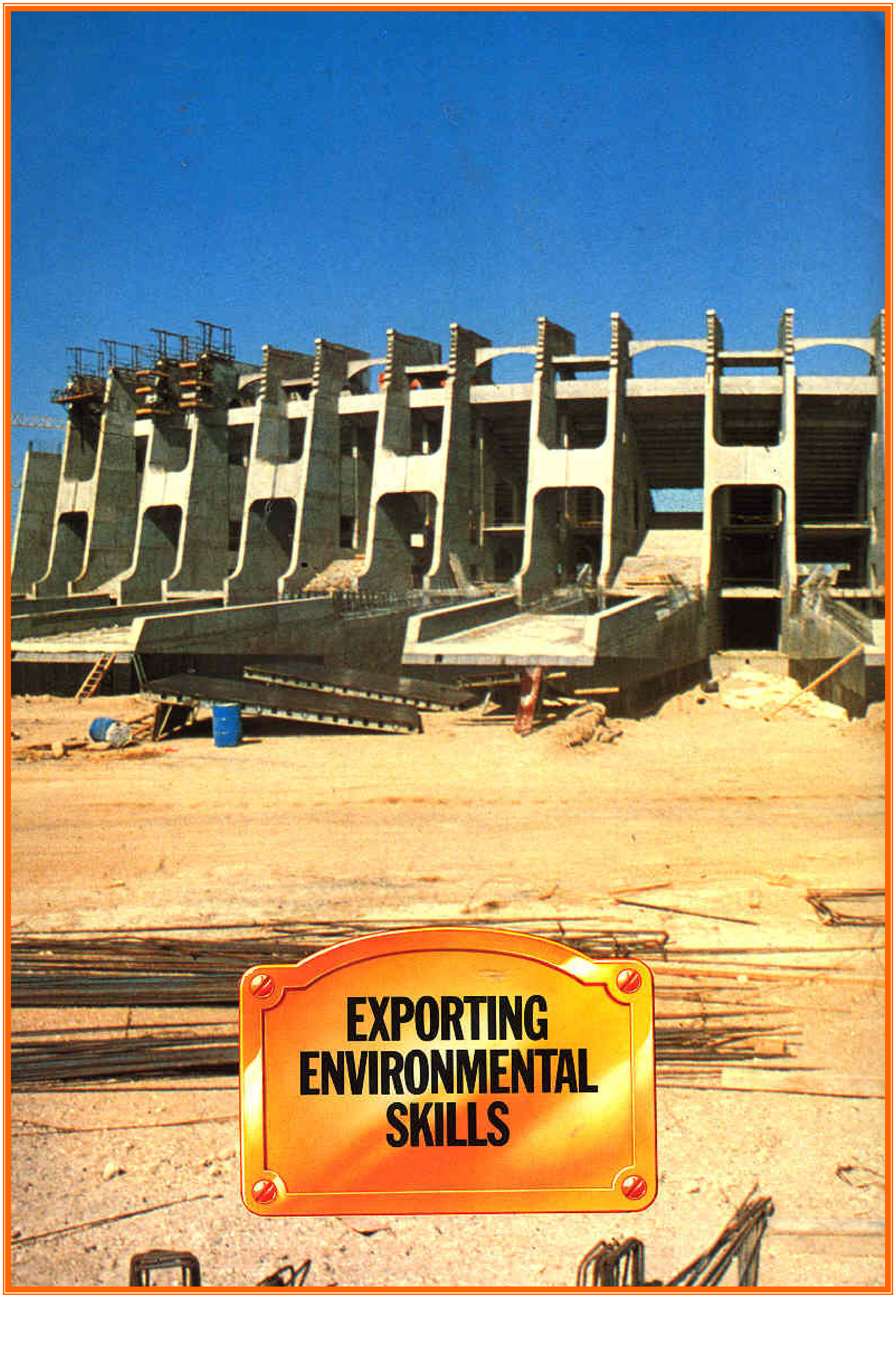
1962 success in post-graduate course

1963 completion of office and site experience; appointed team leader on design and contract work

1968 appointed drawing office manager of a subsidiary company

1970 appointed manager of Leeds Branch

1977 appointed managing director of Australian subsidiary


EXPORTING
ENVIRONMENTAL
SKILLS

The industry in common with the British construction industry, has a long tradition of working abroad. It certainly dates back to the 19th century for in 1894 an order was obtained for heating and other engineering services in the administration building of the Dette Publique Ottomane in Constantinople. Indeed, both the Middle and Far East were to prove useful markets for the industry's services up to 1939.

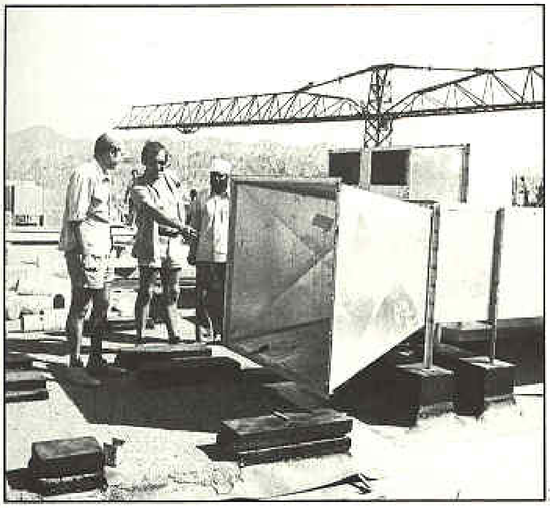
Today perhaps a score of engineering services contractors operate in as many countries all over the world. It is their talent for engineering design as much as their skill in installation that enables them to compete for international contracts.

In recent years it has been the oil-rich states of the Middle East that have provided the major market for multi-million jumbo contracts. British engineered systems will be found not only there and in South Africa and South America but also in such less likely places as Poland, Spain, Liberia and Mauritius.

To encourage exports, the Association published a booklet entitled 'Thinking of Working Abroad?' and members can obtain intelligence and advice on overseas markets through the affiliation arrangement established with the Export Group for the Constructional Industries.

Pitfalls abound. Different rules apply. An overseas contract may be held in the balance because of the country's political uncertainty, financial instability or seemingly insurmountable transport problems.

Yet the engineers, supervisors and craftsmen sent on overseas projects seem to thrive on adversity. The pay is good and the experience unrivalled.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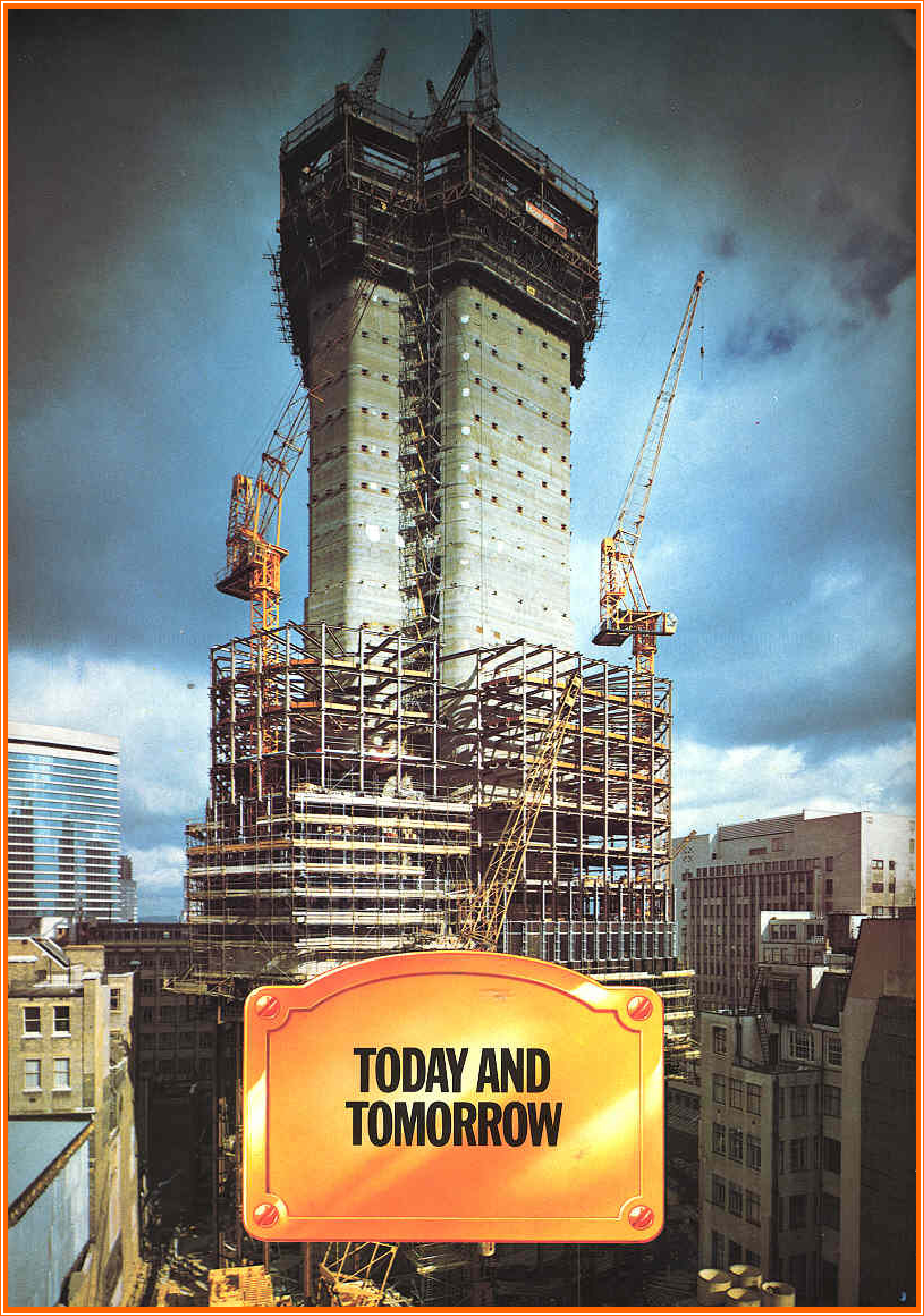
Opposite Page Construction of a new sports stadium outside Abu Dhabi. The engineering services contract covers air conditioning, plumbing, boiler plant, electrical services, communication and alarm systems, controls and even a sophisticated electronic score board

1 The world is your oyster as a trained heating engineer

2 Ventilation system for a large textile mill in Khartoum

3 & 4 The unique shape of the Sydney Opera House posed problems for installing the engineering services


TODAY AND TOMORROW

We have sketched the establishment of an elementary heating industry by the original 'Heating Apparatus Manufacturers' and its subsequent diversification into all aspects of environmental and process engineering. The industry's fortunes will always, to some extent, be bound up with those of the construction industry.

But it has a resilience and destiny of its own, the more so since energy conservation has become of such compelling importance. One of the clearest trends over the past century is for engineering services to account for a steadily increasing proportion of building content and cost. Another trend, except in times of war or economic crisis, is for construction output to equal or outpace the growth in national output.

So the market for engineering services usually enjoys the double stimulus of a rising content within a rising building programme. However, the economic crisis of 1973/74 led to savage (and many would say disproportionate) cuts in capital expenditure and plunged the construction industry into serious recession. Output fell by 25 per cent and as much as 40 per cent in certain trades. In the special case of the engineering services trades, the impact was much less severe and output declined only by some 10-15 per cent.

Today the industry is once again on the upturn. It faces an exciting future which is likely to involve:—

an increasing demand for its services

ever widening diversity and new applications of its skills

higher standards of engineering for maximum energy conservation

closer integration of building design and engineering services design

application of the micro-chip to design, co-ordination and contract control

advances in automatic controls also using the micro-chip

re-vamping and retro-fitting of systems in existing buildings to save energy and costs

alternative sources of energy

The industry itself is changing and responding to these new demands. Contractors are increasingly developing a multi-service capability under which they assume responsibility for the integrated design, provision and maintenance of all the vital services that make a modern building tick ranging from heating, electrics, lighting and plumbing to fire protection, telephones and piped services.

To meet tomorrow's challenges the industry must recruit top quality people today. Indeed, the only serious cloud upon its future is the shortage of skilled manpower of all kinds. A variety of absorbing and satisfying careers awaits men and women of energy and enterprise at all levels of ability.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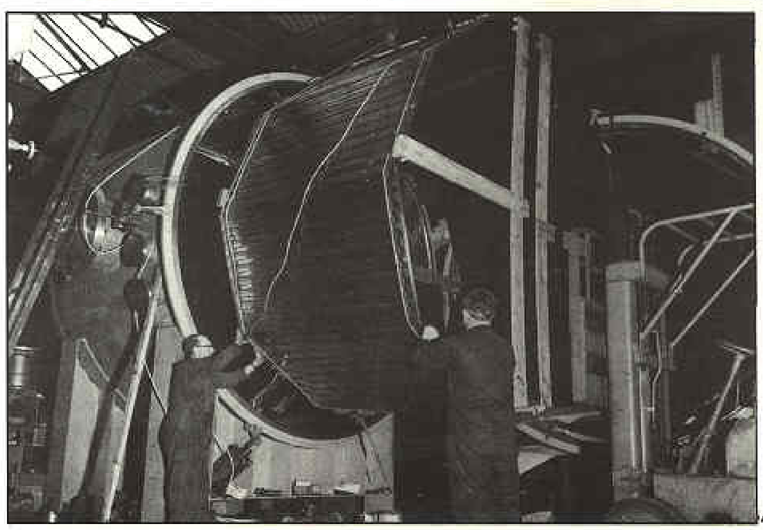
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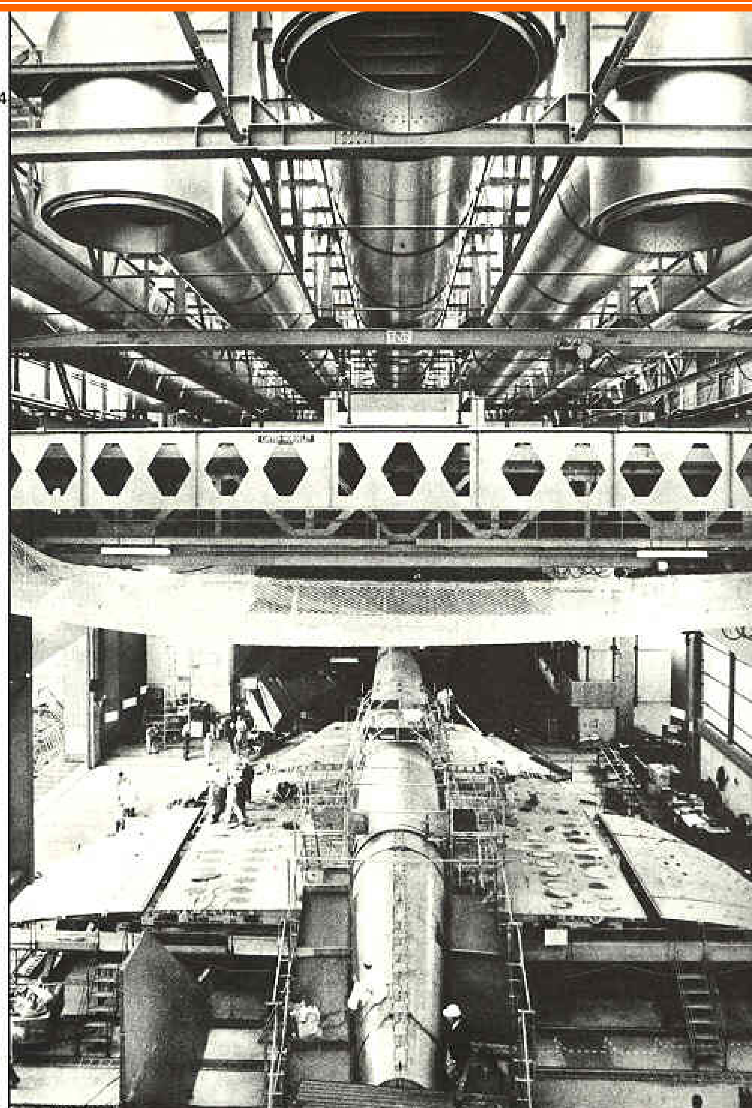
Opposite Page London's tallest building under construction. The engineering services were contractor-designed and installed. Over 7 miles of ductwork have been threaded through the building

1 Television studios become unbearably hot if they are not air conditioned

2 Even in Britain's temperate climate solar heating has a place. Swimming pools are one example. Fish farming and horticulture are others

3 Automatic paint spraying booths represent an interesting example of the industry's diversification

4 Chamber for testing space satellites



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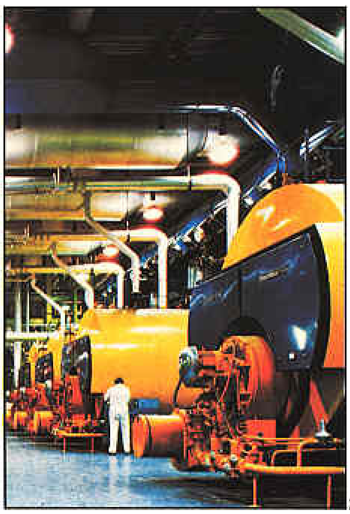

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1 Complex pipework for a gas installation

2 Part of a total energy complex for a hospital

3 This building has an advanced heat recovery system which optimises the use of the heat produced by computers, lights, generators and people

4&5 Seven feet diameter ducts applied air at temperatures ranging from plus 180°C to minus 20°C to the skin of Concorde to test for metal fatigue

Opposite Page An oil rig is a vast engineering workshop combined with accommodation and recreational facilities comparable with a first class hotel. The mechanical services work includes pressurisation of certain areas to prevent the ingress of combustible gases which could cause an explosion

Mechanical Services in Buildings

heating – air, water, steam
air conditioning
refrigeration, cooling, humidification
mechanical ventilation
dust and fume removal

hot and cold water
filtration
water treatment and sterilisation
fire protection, sprinklers, alarms

piped fluids and gases
process plant
cooking and laundry facilities

Related Engineering Services

plumbing
sanitation
electrical lighting and power
lifts, escalators
conveyor systems
communication systems
lightning protection systems

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DW/141

Specification for sheet metal ductwork

Low and high velocity/pressure air systems

HEATING AND VENTILATING CONTRACTORS' ASSOCIATION 1977

1977

DW/142

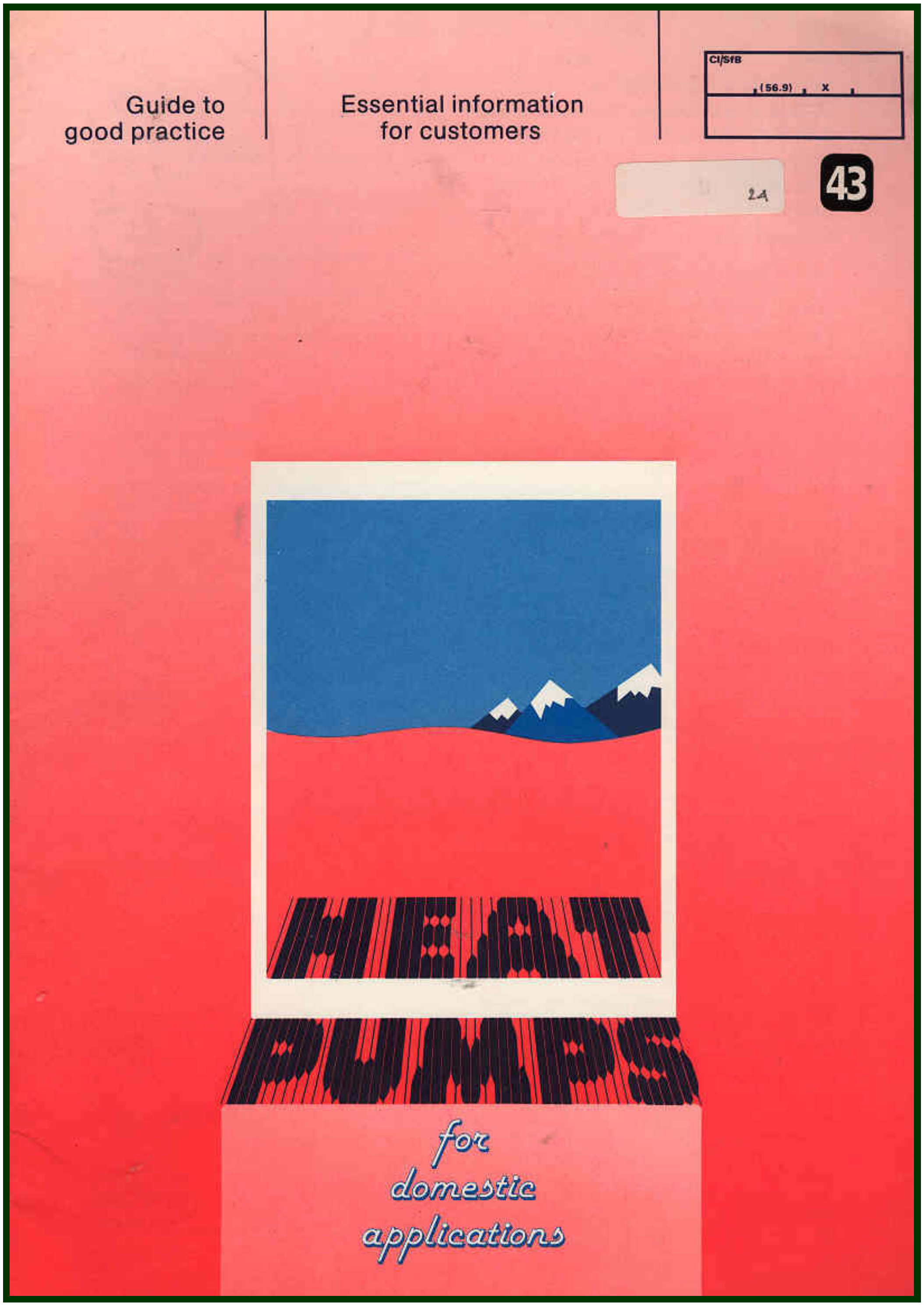
Specification for sheet metal ductwork

Low, medium and high pressure / velocity air systems

HEATING AND VENTILATING CONTRACTORS' ASSOCIATION

1982

1982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for domestic applications

1983

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A practical guide to

DUCTWORK LEAKAGE TESTING

Based on the requirements of DW/142 specification for sheet metal ductwork

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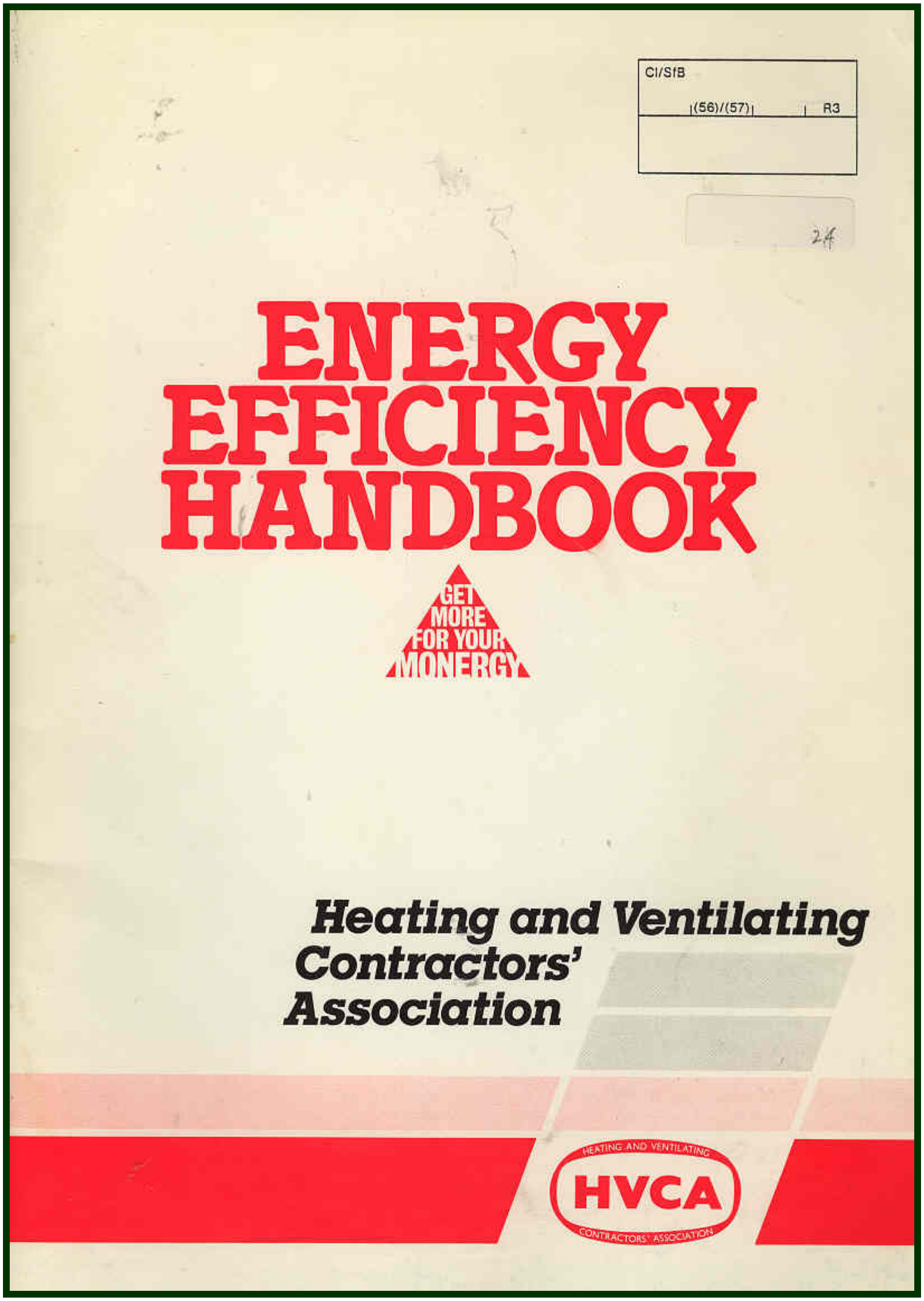
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GET MORE FOR YOUR MONERGY

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Standard for installation work

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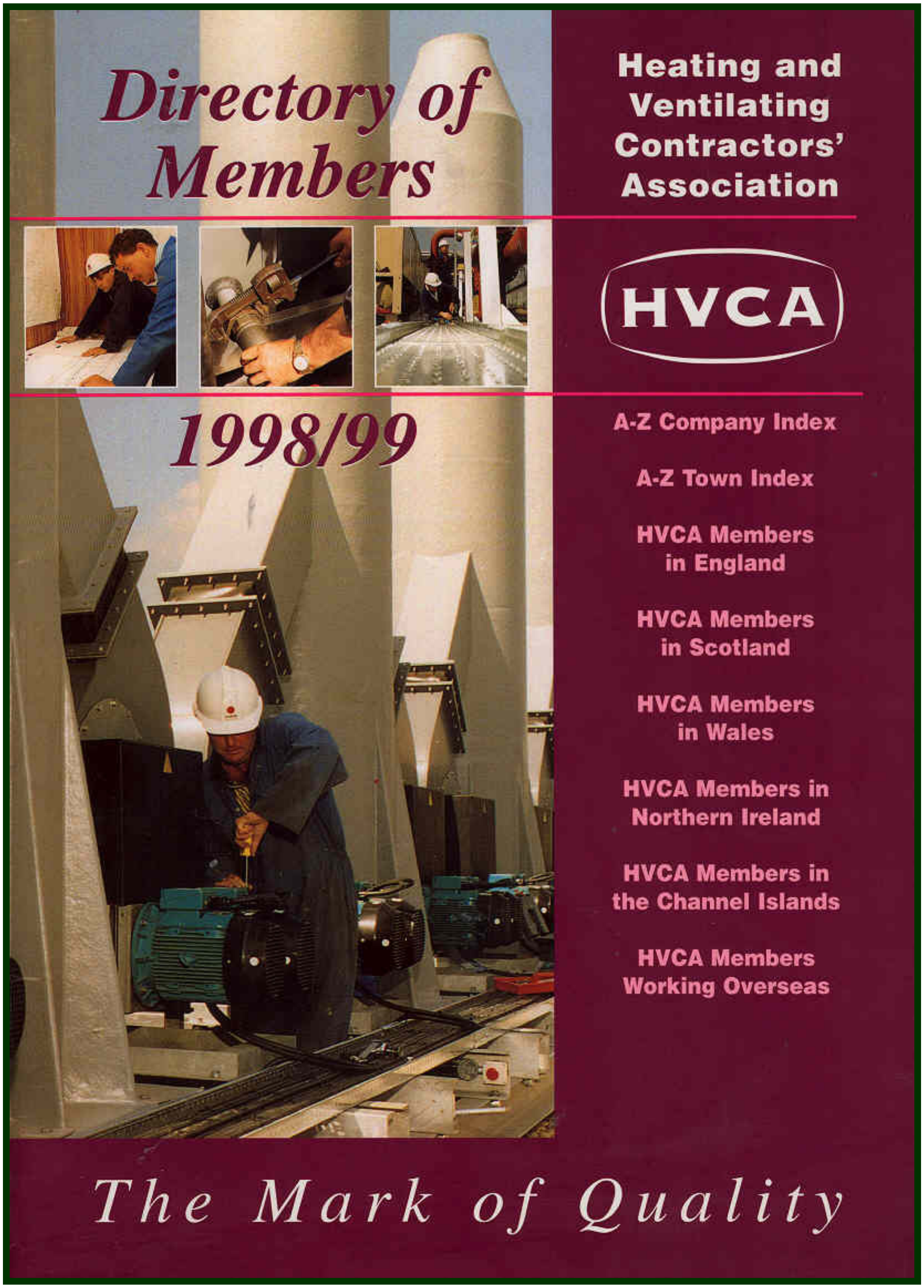
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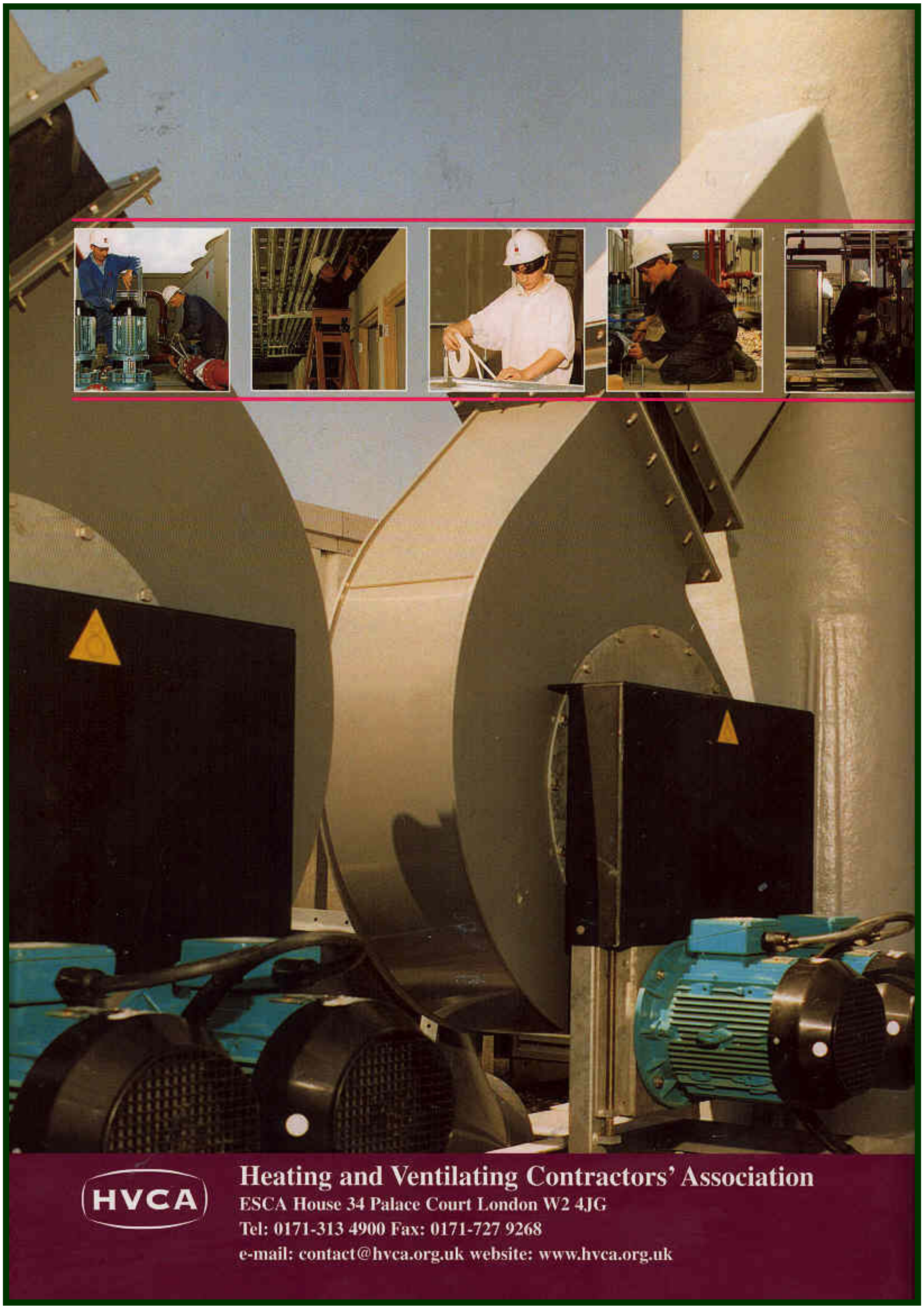

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