Operating & Maintenance Instructions

Where the instructions, often hand-written, for the engineering services of a particular building can be found, these are extremely important to the understanding of the system being examined. Typically, they will detail the plant as installed and provide information on the types and capacities of the main items of equipment. Victorian examples often also give advice on hours of operation, opening and closing of windows, and operation of the gas lighting.
Opposite page
Left. Instructions for Management, written by Wilson Physon, dated 12 March 1890, for the operation and maintenance of the ventilation at the Empire Theatre, Leicester Square, London. They show the plant had fans, driven by gas engines, and that the theatre had both electric and gas lighting [PC/45]

The Empire Theatre, 1915 [Eric de Mare]

Right Instructions as to Management of Apparatus (steam radiators, stoves and cross-ventilation by opening windows), written by Physon, undated (late 1880s) for a new unnamed French Hospital [PC/45]

This page
Extract of the Instructions for the same unnamed French Hospital with a schedule of valves, listing valve number and function [PC/45]

10. Cold water fed to Hot-water Boiler.
11. 1st Hot water main to Lavatories on South East Side.
12. 2nd Hot water main to Lavatories and Baths, North West Side.
13. 1st Hot water main to Scullery and Kitchen, and Lavatories on South Side.
14. 2nd Hot water main to Lavatories on North Side.
15. 2nd Hot water main to Lavatories on North Side.
16. 1st Hot water main to Lavatories on North Side.
17. 1st Hot water main to Scullery and Kitchen, and Lavatories on South Side.
18. 2nd Hot water main to Lavatories and Baths, North West Side.

Note: The schedule for the return of the steam return is stated under the shop at entrance to Boiler Room, and the valves fixed on same numbered 19, 20, 21 and 22, corresponding with the steam supply pipes. 19, 20, 21 and 22 are connected with the junction with the steam supply valves for regulating the heating of the building.
Drawings
Architectural plans and sections and views of buildings are a useful source of background information when investigating historic building engineering services. However, there is no substitute for finding either the original services scheme drawings or good, clear copies of them. Unfortunately, engineering drawings, either in original or copy form, are extremely rare.
The Criterion Theatre & Restaurant London, 1870-4. Wilson Fife son provided warm air ventilation for the basement theatre, the system being upgraded in 1884.

Opposite
Top: Chamberlain Square, Birmingham, c.1900, showing the Council House (centre) and the Town Hall (right), both Fife son projects [Birmingham Public Libraries]
Bottom: Detail from the Fife son drawing (front cover of this book) showing the heating & ventilating scheme for the Birmingham Council House, 1873 [BJRC 45/2].
Record Photographs

Contemporary photographs of building interiors may reveal, on close inspection, details of buildings services, such as radiators, heating pipework and lighting arrangements. Modern photographs may help understand the building and show features such as windows and courtyards which influenced lighting and ventilation systems design.

Opposite page
Top Left: Royal Holloway College, Egham, 1879-87 [PHO 90/1007]
Top Right: Natural History Museum, S Kensington, 1876-80 [PHO 90/1007]
Bottom Left: Prudential Assurance, Holborn Bars, London, 1905 [RCH14]
Bottom Right: Clerks Office, Grosvenor Street Block

Wilson Physon was the engineer for the projects on both pages.
Opposite page
Engineers supervising the installation of boilers for the International Exhibition, London, 1852 [V&A Museum]

Left
Boiler house of the City of London Electric Lighting Company, Berkside, London, c.1890s [Guildhall Library]

Electricity generating plant at Paddocksburn, Sussex, c.1897 [Country Life]
Company Histories

The published history of a company can be a rich source of information on its products, people, its clients, projects and all sorts of activities.

UK companies engaged in building services with their history in print include Fred G Alden, Ashwell & Nesbit, Cochran, Colt Group, Drake & Gorham, Drake & Scull, Garton & King, Gas Light & Coke Company, Haden, How Group, Resser & Russell, John Thompson, and J Roger Preston & Partners. Information on other organisations is available in books which are semi-biographical, relating the story of the founder and the company itself: *Henry Lea* (Horace Lea & Partners), *Oscar Faber*, and *Mr Copperad* (Basil Tanner).

Similarly, there are American books covering companies working in the UK market. Examples include Honeywell, Johnston and Lennox, all of which have issued centenary publications. Biographies include those on Willis Carrier, John Gorrie, Joseph Nason and Warren Webster.
Haden celebrate this year the foundation of their Company 175 years ago, when in 1816 George and James Haden first started work on their own in the town of Trowbridge, Wiltshire. The Industrial Revolution had gathered momentum during the latter half of the 18th century and by 1816 it was well advanced, so that men were able to exploit the inventions of earlier generations by applying them to quite new uses, a formula for success that the Company follows to this day.

The two brothers were very different in personality. From his letters to his father George appears as somewhat pious but he was the more dynamic of the two brothers, and probably the better business manager.

James, a bachelor, was possibly of a less dedicated temperament, although like George he worked extremely hard.

Part of the introductory page of “Haden: A Short History of The Company, 1816-1991.” However, the picture is not of the Haden Trowbridge Works, but is of the Boulton & Watt Soho Manufactory, Birmingham, the mistake probably due to the fact that G & J Haden was originally established as the West Country agent for Boulton & Watt steam engines.
The Life of an Engineer

Additional information on a particular building, its services or the system itself can sometimes be established by investigating the life history of the building services engineer.

Documents which may assist include birth, marriage and death certificates, census records, and membership applications to professional institutions. Knowing key dates can lead to published papers, newspaper cuttings, obituaries, last Will & Testament and memorial booklets. These may provide information on projects, contacts, family and personal life, staff and business associates.

In the case of Phipson, his Application for Associate Membership of the Institution of Civil Engineers in 1868 was supported by J W Bazalgette (who designed London’s intercepting sewer system) and by the architects Thos Henry Wyatt and M Digby Wyatt. His application for transfer to Member (opposite) lists his heating & ventilating projects, including Royal Albert Hall, Glasgow University, Alexandra Palace and the Criterion Theatre. His obituary [Proc.ICE, 108, 1891-2, pp.406-7] expands on this. His memorial booklet is particularly informative. His Will empowers his assistant William Pelly to be paid £4 per week to complete his contracts. But it is known that the business was taken over in early 1892 by the firm of Ashwell & Nesbit, heating contractors of Leicester and London.
The Institution of Civil Engineers,

12, GREAT GEORGE STREET, WESTMINSTER, S.W.

15 Jan. 1877

We, whose names are hereunto subscribed, submit to the Council of The Institution of Civil Engineers, the property of considering...
Business Associations

One method of researching building services systems of historic interest and locating additional information is to find out as much as possible about the business relationship between the parties involved.

For example, the client may have required a particular type of building to operate his business, say, banking. He may have regularly employed a certain architect, who then became accustomed to his client's requirements. In turn the architect may have engaged a particular services designer. The designer may have favoured a particular form of heating, say, hot water and preferred certain boiler or radiator manufacturers, or one installer in preference to others. There may be a link to a builder, and so on.

Where information is lacking on the system under review then following business association links may at least open up some avenues of research and probable results.

By way of example, Phipson worked for the architects John Gibson, T Marsh Nelson and Alfred Waterhouse. When starting out Phipson worked with Nelson (a friend of his Father) on Rothschild's Piccadilly mansion (1862), Rothschild's Bank in St Swithin's Lane (also 1862) and then the Junior United Services Club in Regent Street (1868). Gibson was Architect to the National Provincial Bank of England and Phipson designed services for their banks at Bishopsgate in London (1863-5), Newcastle-upon-Tyne (1872) and Piccadilly, London (1877). He also worked with Waterhouse in London on the Natural History Museum (1877-89), The National Liberal Club (1885-7) and the Prudential in High Holborn (1878-91); also on the Liverpool Royal Infirmary (1866).

We also know that Phipson tended to use certain suppliers: Fraser & Fraser for boilers, Benham for kitchen equipment and Longden for radiators.

Other associations may be geographical or religious. G & J Haden began in Trowbridge in 1816 and went from installing steam engines to making heating stoves and then installing heating systems. Many early installations by Haden were for West Country churches, and several others were by the Bristol-based contractor Vincent Skinner (1880). John Metcalf, established as a heating engineer in Preston (1873) heated numerous Catholic churches, convents and schools throughout the country. It is possible to compile a database of such links.
NOTICE OF REMOVAL.

SKINNER & BOARD,
Horticultural Builders, Ironfounders,
and Hot-Water Apparatus Manufacturers,
STOKES CROFT, BRISTOL.

(Patentees "Venetian" Orchard Houses).

January, 1891.

Dear Sir or Madam:

We beg most respectfully to inform you that in consequence of the death of our senior partner, Mr. Vincent Skinner, we have removed our business from above address to more extensive and central premises situated in RUPERT STREET, BRISTOL.

We shall be most happy to receive the continued favour of your esteemed orders, which shall have our usual prompt and careful attention.

We beg to enclose herewith our circular of Hot-Water Heating and Horticultural Building, and to submit to your notice our Non- Patent "Venetian" Orchard Houses, which we are now erecting, and for which we are receiving the highest commendation, both for its simplicity and adaptability for all kinds of fruit culture.

We shall be most happy to quote you for the same, or for any other kind of Horticultural Building, or Hot-Water Heating you may require.

Yours faithfully,
SKINNER, BOARD & Co.
Textbooks, Catalogues & Advertisements

Contemporary books dealing with building services, written by experts in their field, together with manufacturers' catalogues and trade advertisements are an important tool in identifying systems and equipment.
Catalogue of Mackenzie & Moncur, Heating & Ventilating Engineers, 1900

Mackenzie & Moncur catalogue page showing engines, fan, boiler and kitchen equipment
Institutions and Societies

The archives and libraries of various professional institutions, learned societies and trade organisations can be a useful source of information and illustrations relating to building engineering services. Organisations specialising in this branch of engineering date only from the close of the 19th century. Before this building services records may feature as a very small part of more broadly based institutions. The very earliest organisations include the Worshipful Company of Plumbers (1365) and the Worshipful Company of Tallow Chandlers (from c.1300, Grant of Arms 1456). Next came the Royal Society (1660). There is then a gap until the Royal Institution (1799), the Royal Institute of British Architects (1837), the Institution of Mechanical Engineers (1847), the Institution of Gas Engineers (1862) and the Institution of Electrical Engineers (1880). An important institution as regards building services is the Institution of Civil Engineers (1818) as a number of important heating and ventilating engineers were members.

Specialised building engineering organisations include the Sanitary Institute (1876), the Institution of Heating and Ventilating Engineers (1897), the Institute of Refrigeration (1899, originally the Cold Storage and Ice Association), the Institute of Plumbing (1906) and the Illuminating Engineering Society (1909). The IHVE and the IES are now amalgamated as the Chartered Institution of Building Services. The CIBSE includes the Society for Light and Lighting, the Society of Public Health Engineers, and the CIBSE Heritage Group (1973). Early UK trade organisations are the Plumbers Company (1886), the Electrical Contractors Association (1901) and the Heating and Ventilating Contractors Association (1904). Information relating to UK systems, equipment and buildings is also available from the American Society of Heating and Ventilating Engineers (1894) and the American Society of Refrigerating Engineers (1904), now combined as the American Society of Heating, Refrigerating and Air Conditioning Engineers.
Transactions, Proceedings, Journals & Magazines

Some building engineering information is available in early scientific, engineering and building publications: Philosophical Transactions (1660), ICE Proceedings (1818), The Illustrated London News (1842), The Builder (1843) and The Engineer (1856). Early news about the IHVE appeared in The Ironmonger and Domestic Engineering and Estate Engineer (subtitled A monthly journal published in the interest of the Heating, Ventilating, Lighting and Cleaning Industries). This was supplanted by the IHVE Proceedings (1901-33), which then continued as the IHVE Journal. The Illuminating Engineer (1908) was accepted as the journal of the IES, later (1936) becoming two publications, Light & Lighting and the IES Transactions. Early trade magazines include Heating & Ventilating Engineer (1927), The Steam Engineer (1931) and Electrical Times and Electrical Review (both over a hundred years old). Later titles include Heating & Air Treatment, Plumbing and Electrical Design.

Numerous articles in the American press relate to UK building services. Publications include Scientific American (1845, originally titled The Advocate of Industry and Enterprise, and Journal of Mechanical and Other Improvements), The Journal of the Franklin Institute and Harper’s Weekly. At the close of the 19th century there was Domestic Engineering, The Metal Worker, Engineering Review, Manufacturer and Builder, Ice & Refrigeration, Cold Storage & Ice Trade Journal, ASHVE Transactions, The Heating & Ventilating Magazine and American Electrician. Later came Heating, Piping and Air Conditioning (1929), which originally incorporated the ASHVE Journal. Other magazines include Air Conditioning, Heating & Ventilation and Actual Specifying Engineer.

Many of the titles mentioned are no longer published.
First issue of the HVE Proceedings, 1901. An index of Proc-HVE and the HVE Journal can be found in the 1971 HVE Guide (Blue) Book.

Right
An 1897 issue of the US magazine Domestic Engineering, the year of the founding of the HVE. Now the recycling hole (top left corner) with the instruction “Well, I'll be hanged.”
Patents
A useful source of drawings and details of construction of building engineering services equipment and systems is the UK Patent Office (which holds details of early British Patents). Similarly, records of the United States Patent Office may be consulted.
N° 5182

A.D. 1894

Date of Application, 13th Mar., 1894—Accepted, 30th June, 1894

COMPLETE SPECIFICATION.

An Improvement in Boilers for Heating Greenhouses and other Structures.

I, THOMAS POTTERTON, of "Nerman Hurst," 122 Cavendish Road, Balham in the County of Surrey, Hot Water Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement—

5 Usually the flue from an independent hot water boiler passes away at the top, there being a clear way to same directly over the fire, by which much of the heat is conducted away and wasted. My invention relates to a boiler by which I avoid this waste of heat, as I shall describe in accompanying drawings.

Fig. 1 is a vertical section, and Fig. 2 is a sectional plan of a boiler according to my invention.

I make the boiler in two sections, right and left hand, which are bolted together K K, each part having zig-zag projections A. B. C. over fire. The top part of each section is made parallel to the part over the fire, thus forming a zig-zag flue D. E. F.

15 A feed hole H, and clinker door J are provided in front. A flow pipe G from top of each section, and return pipe R from side of each section, provide for water circulation. These two parts are made so that these pipes may have the same or independent circulation.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:

A boiler having zig-zag projections over fire, and constructed to a form a zig-zag flue, to act substantially and for the purpose set forth.

Dated this 13th day of March 1894.

THOMAS POTTERTON.
Further Reading
Some modern information sources


Donaldson, B & Nagengast, B 1994 Heat & Cold: Mastering the Great Indoors, American Society of Heating, Refrigerating and Air Conditioning Engineers, Atlanta, GA, USA (an illustrated history of heating, ventilating, refrigeration and air conditioning, published for their centenary)

Richardson, R & Thorne, R 1994 The Builder Illustrations Index 1843-83, Hutton & Rostron, Guildford (45 years of cross-references to articles in The Builder)

Roberts, B M 1997 The Quest for Comfort, privately published for the CIBSE Centenary (a selective pictorial history of all building engineering services)

Roberts, B M 2000 The Comfort Makers, American Society of Heating, Refrigerating and Air Conditioning Engineers, Atlanta, GA, USA (270 mini-biographies of pioneers of heating, ventilating, refrigeration and air conditioning)


Additional information is available on the website of the CIBSE Heritage Group at www.hevac-heritage.org
3. In the summer months the Fans to be worked from 3.0 clock in the afternoon till the house closes. This will apply from June 1 to September 30th. For the remaining months, judgment is necessary, as the time of starting will much depend upon the external temperature.

But as a rule, the Fans should be in full operation 1/2 an hour or an hour before the admission of the public.