



ENGLISH HERITAGE

Utilities and Communications Buildings Selection Guide

Heritage Protection Department

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Selection Guide

Utilities and Communications Buildings

I INTRODUCTION AND DEFINITIONS

Public utilities and communications each contribute vastly to modern life. Functional as they are, their history remains important. They combined entrepreneurial discovery with municipal or state undertakings; science and engineering were housed in monumental premises with strong architectural character; and modern improvements have taken place alongside the retention of large elements of historic infrastructure. Heritage considerations can be important.

Communications constitutes a small but significant category of historic buildings. The provision of technical services to send and receive messages (postal and telephone networks) is dealt with here alongside the utilities as both are functional in purpose and both developed alongside each other. The provision of public water, gas and electricity supplies and the removal of waste and sewage are known collectively as the 'public utilities' and by the mid nineteenth century were coming to be seen as the responsibility of central and local government, although ventures were often set up with joint private/public capital. They helped create a safer and healthier environment and some municipalities and corporations saw such improvements as being one of the principal justifications for their existence. Consequently many of the buildings were monumental in scale, and set in carefully designed landscapes.

For the purposes of designation, post boxes and telephone kiosks are assessed primarily as items of street furniture, and are accordingly dealt with in the **Street Furniture** selection guide.

2 SPECIAL CONSIDERATIONS WHEN SELECTING UTILITIES AND COMMUNICATIONS BUILDINGS FOR DESIGNATION

As with all building types, communications and the utilities have first to be assessed in terms of their intrinsic value – this may lie in their special architectural, planning, engineering and technological interest. As with industrial buildings more generally, completeness can be of overriding importance especially where important processes can be illustrated on a single site. (The 'special considerations' outlined more fully in the selection guide **Industrial Buildings** are relevant to the Utilities which in many ways are a sub-set of the industrial category.) Relative date may be significant, as will rarity. Alteration and upgrading is likely to have taken place, and assessment of the authenticity of the structures from a historical point of view will sometimes be necessary. The designation of buildings and structures concentrates on the above-ground evidence of the systems. Below-ground remains and infrastructure, important to the overall understanding as they are, will generally not be designated; exceptionally, there may be grounds for scheduling, however.

3 HISTORY

Water Supply

The provision of clean water has been seen as a public responsibility since early times. The earliest engineered water-supply systems in Britain were built during the Roman period. Aqueducts supplied civil and military centres from wells, springs and impounded sources. Medieval water systems were constructed for monasteries as early as the twelfth century, and similar conduit systems were built for some medieval towns: some are listed, while others may be scheduled as Ancient Monuments.

Early supplies depended on gravitational flow from a spring to a conduit head, structures that often have considerable architectural elaboration. Most medieval towns were supplied by at least one well or spring. Some conduits, as at Exeter (fourteenth and fifteenth centuries), were laid underground; some (as at Wells) ran in the street. One especially significant development was the construction in the early seventeenth century of the New River from Hertfordshire to London, a 40-mile long canal built between 1609 and 1613 to bring spring water to the rapidly growing metropolis. It is an exceptional example of a larger-scale long-distance water-supply system, and its importance is reflected in the listing of many of its component features. Despite its technical and financial success, nothing of comparable scale was built until the impounding schemes of the late Georgian period. By and large, such early structures gradually fell into disuse during the nineteenth century, though the tradition of providing public drinking fountains and drinking troughs for animals underwent a dramatic revival in the Victorian period (see the **Street Furniture** Selection Guide).

Waterworks is the generic term to describe buildings associated with the process of filtering abstracted water (a legal requirement after the mid 1850s) and pumping it to the consumer: these activities did not necessarily take place on a single site. The term pumping station describes the pumping house and its ancillary structures. The anticipated volume of water it was necessary to pump and the number of engines required determined the size and plan of the pumping house. None of the first generation of pumping engines has survived, although the engine house at New River Head in Clerkenwell that John Smeaton designed in 1766 for an improved Newcomen engine does still stand, embedded in later additions. The result was the creation of modern water supply systems, which include reservoirs, pumping stations and filtration plants. Structures range from the monumental waterworks to the isolated hydrant.

But the idea of universal access to water is primarily a phenomenon of the mid to late nineteenth century. This was based on health grounds. The Westminster doctor John Snow (d.1858) established the link between cholera and foul water in 1850 and the scale of the problem was underpinned by statistical evidence such as that collected by Edwin Chadwick (kt. 1899, d.1890). This influenced the creation of a regulatory framework that has been in place since the 1840s with various Acts for public health and water provision.

From the mid nineteenth century a number of Acts authorised water authorities to extract water from rivers or construct reservoirs. (Some were built as a result of private agreements, e.g., Hythe (Kent), 1888.) Covered reservoirs survive from the early

Victorian period onwards, and required elaborate brick sub-structures to create large The construction of clay-core earth dams was an important British contribution to the history of dam building, and the early English examples were built for reservoirs to supply northern towns around the Pennines. Some corporations drew their supplies from far afield, e.g., Liverpool (1892, 52 miles from Lake Vyrnwy) and Birmingham (1890, 68 miles from the Elan Valley). Mass-concrete arch dams were built from 1905; and the Lake District's Haweswater Dam (1941) was the first buttress dam in Britain.

Sewage Disposal

The first medieval sewage systems were those built for monasteries, such as that of the twelfth century at Canterbury Cathedral. Great households variously used garderobes voiding by chutes and manually-emptied earth closets. There was a public lavatory in London in the fifteenth century; early sewers removed rain and waste water and simply discharged into rivers. Notable advances were made in sanitary science and engineering during the mid nineteenth century. The main changes were from dumping (where waste was allowed to drain on 'sewage farms' before being used as fertiliser) to treatment by filtration, and the increasingly powerful methods of pumping effluent away from centres of population. The first steam pumping disposal station was built in 1852 at Southampton and the first sewage treatment works was established at Leicester in 1853. England's two outstanding historic sewer systems are the main drainage schemes of Brighton and Hove, and London, where Joseph Bazalgette (kt. 1874; d.1891) master-minded a major engineering feat in the 1860s that included the construction of the Thames Embankment with a tunnel for the Underground, an extensive system of cross-metropolitan drains and a series of pumping stations, designed to remarkably high architectural and technical standards. As with water supply, the installation of proper sewage systems frequently involved pumping equipment to keep the foul water moving. The basic treatment processes had been largely developed by the beginning of the First World War.

Gas Supply

Gas lighting derived from coal was invented by William Murdoch in the 1790s and pioneered at Boulton & Watt's Soho manufactory in Birmingham. A rival system was promoted by F.A Winsor soon after, resulting in the formation of the Gas-Light and Coke Company in 1810 and the lighting of Westminster Bridge in 1813; from 1816 gas lighting in the capital took off, and spread nationally. The earliest gasworks formed components of factories but gas came increasingly to be used primarily for street lighting; from the 1820s in private houses, factories, offices, clubs and churches. Gas lights were sometimes carefully designed, creating new forms of street embellishments as at Lymington (Hants.). Railways facilitated the transport of coal, which provided a further stimulus. Gasworks comprised coal stores, retort houses for the extraction of gas, filtration units, gas holders, and administrative buildings. Although the individual components of gasworks underwent modification during the nineteenth century the basic layout remained relatively unchanged: produced in retorts, gas was transferred to gasholders before being distributed to customers. The earliest known surviving horizontal retort house at Birmingham dates from 1822 and although the building type went through a number of changes (charging a retort and removing waste from a different rather than the same end, thereby speeding input, appears in 1831; automatic stoking in 1868) major efficiencies were only secured with the vertical retort in 1903,

which made it easier to control carbonisation: this transformed the physical appearance of the building. As a safety precaution gas was first stored underground, then stored in iron tanks immersed in water. Later gasholders were enclosed within gasholder houses, which were an obvious opportunity for architectural embellishment. As the danger of explosion came to be seen as minimal, so the casing was abandoned and the traditional gasholder emerged in the form of a large bell of wrought iron, still sealed in a tank of water. The telescopic gasholder with guide-towers (that varied capacity on a fixed site) was invented in 1824 and had reached great scale and sophistication by the 1890s. Other prominent components to gasworks might include the manager's house, the company office and gateway and often have architectural detailing. Larger companies could afford grand architectural statements in their premises, but even smaller gasworks were designed with some aesthetic sensitivity as a way of offsetting the environmental impact of these complexes. The best survival of a small town gas works is to be found at Fakenham (Norfolk), which dates from 1846 and is now a museum. It took some time to develop the technology to use gas for heating (c.1840) and it did not take on until later still: the gas ring, invented 1867, made domestic gas cooking feasible. The challenge of electricity in the early 1880s was fought off in 1885 with the invention of the incandescent gas mantle but, by the 1900s, the traditional stronghold of gas – lighting in streets and buildings – was under irreversible pressure. Gas lighting of streets and railway stations nonetheless survived intermittently into the mid twentieth century.

Electricity Supply

Electricity as a natural phenomenon had been studied by the Greeks; Robert Boyle, Sir Isaac Newton, Benjamin Franklin, Galvani, Volta, Sir Humphrey Davy, and particularly Michael Faraday all contributed to its identification and growing understanding. The practical harnessing of its potential was a later nineteenth century development. The invention of the electric arc light and the incandescent electric filament lamp attained commercial success between 1879 and 1884. The pioneer, R. E. B. Crompton's Arc Works in Chelmsford (Essex), established in 1878, still stands in part, and an early electricity station of 1888 built in London by his company to supply a state-of-the-art housing development, Kensington Court, survives, and embodies the arrival of centrally supplied domestic energy. Although generators were used to illuminate large buildings from the 1870s, most power houses were small and isolated, providing limited supply to country-house estates, industrial sites, lighthouses or hospitals. While these small-scale and narrow-purpose generating stations continued to operate up until the nationalisation of electricity generation in 1948, their relative importance diminished from the 1890s as large central stations were built to generate power for transmission over wide areas, for a range of customers and uses. Sebastian de Ferranti's partly-surviving Deptford Power Station in south-east London of 1887-89 was the first high tension power station to convey electricity over a substantial distance. In the early decades of the electricity industry multiple undertakings overlapped and competed in a haphazard scramble for territory, resulting in legislation commencing with the 1919 Electricity (Supply) Act. The scale of generating stations was influenced by the type of operator (private, municipal or government) and the use for which the electricity was supplied, such as lighting, traction for transport, or motive power for industry.

Key dates for the industry include the large-scale commercial use of electricity for telegraphs from 1837; for lighthouses from 1857; arc lighting for streets and large buildings from the 1870s; and tramways from 1883. The National Grid, the network of

cable-borne power supply connected to the network of major power stations, was established by the 1926 Electricity Supply Act, which brought the Central Electricity Board into being, and it was complete by 1935. The industry was nationalised in 1947, and the Central Electricity Generating Board was set up in 1958. The world's first full-scale nuclear power station was opened at Calder Hall (Cumbria) in 1956, five years after the opening of the plutonium processing plant at Seascale nearby. The 1989 Electricity Act privatised the network.

Communications

(for post boxes and telephone kiosks, see the **Street Furniture** selection guide.)

A state-run *postal system* was re-organised in England in 1635, and cross-country mail services underwent important improvements during the eighteenth century, first through Ralph Allen and later by John Palmer. Sir Rowland Hill's reforms of 1837 created the modern postal system, with the penny post being introduced in 1840. Other services included telegraphs, savings banks and money orders. Post offices increased in number as distinct buildings; less conspicuous were sorting offices.

Prior to the 1830s, *telegraphic messages* were conveyed by visual means. A series of hilltop telegraph stations, built by the Admiralty in the 1790s to connect naval dockyards with Whitehall, passed information quickly along a line of observation towers. Each was equipped initially with a set of vertical shutters, which could be opened and shut in various combinations to transmit messages, later replaced with semaphore arms. It was with the coming of the railways that quadrant semaphore signalling came into its own, and coupled with the traditional red and green lights, became the worldwide system for controlling the movement of trains. Traffic lights and Belisha Beacons arrived a century later and also became universally adopted systems for controlling road traffic.

The *electric telegraph* was introduced in the 1830s and was also adapted for railway signalling purposes. Samuel Morse's dot-dash code evolved from 1835, and the technology of long-distance telegraph communication developed rapidly thereafter, with underground and submarine cables being developed from the 1850s. Following the invention of the electric telephone by Alexander Graham Bell in 1876, the first telephone exchange was established by a private company in London in 1879 and others quickly followed, developing a countrywide network. The creation of a state-operated telephone network led to the oversight of buildings by HM Office of Works, and a standardised approach being taken to design; municipal exchanges were built from 1901 and in 1912 (the year in which the Post Office took over the network created by the National Telephone Company) the first automatic exchange was opened at Epsom (Surrey). The Neo-Georgian manner became the standard style for telephone exchanges.

Communication by radio waves is one of the most significant advances of the twentieth century. Guglielmo Marconi developed ship to shore communications and opened the world's first permanent wireless station in an Isle of Wight hotel in 1897; the wireless station at Poldhu, Cornwall, of 1900 was the first purpose-built radio building and is now a museum. Public broadcasting by wireless in England began in 1922. Television was first demonstrated by John Logie Baird in 1926, and in 1929 the young British Broadcasting Company extended its remit to include this new medium, alongside wireless services. The world's first television transmitter was erected at

Alexandra Palace in North London in 1936. International communication improved markedly after the First World War. Aeroplanes made air mail possible, which extended the utility of the post, and radio technology developed rapidly: the Post Office radio station at Hilmorton (War.) opened in 1926, equipped with the world's most powerful transmitter: in that year the first two-way conversation by radio telephone took place between Hilmorton and the United States.

From 1956 onwards, enlarged transatlantic submarine cables were laid to the United States, but artificial earth satellites were soon recognised as the long-term solution for the rapidly expanding worldwide telecommunications network. The first active telecommunications satellite (Telstar) was launched in 1962, and one of its three international reception and transmission dishes was at Goonhilly in Cornwall. The technology here is similar to radio astronomy; the structure is wholly flexible and has both scientific and historic importance, as well as dramatic visual quality. Jodrell Bank in Cheshire of 1952-57 has become the most celebrated example of a dish, based on wartime radar models, used to receive radio waves from the galaxy.

The introduction of a countrywide network of radio communication towers from the 1950s has provided new landmarks of the second half of the twentieth century. Such structures often combine perfect technical performance with architectural elegance and structural audacity. The Government Post Office also experimented with radio waves in a series of land-based transmitters centred on the British Telecom (or Post Office) Tower, London, of 1964, which has also become a landmark feature. It was built as a centre of national and international telephone communication by ultra high frequency (UHF) microwave transmission, and was the first tall tower in Europe to be built for high frequency waves; it also fulfilled a national security role. The telephone network has undergone major change in recent years. The rapid rate of development of telephony, particularly since the introduction of subscriber trunk dialling in the 1950s, has resulted in most early exchange and transmission equipment disappearing. Microwave transmitting, relay towers and multi-core cables have almost eliminated the poles and wires in many parts of the country.

4 SPECIAL INTEREST

Early utilities will almost always be eligible for designation, as will key communications buildings. They will need to be assessed within their historical context, and due consideration given to specialist claims to significance. Architectural quality will almost invariably be a key consideration.

Water Supply

England's oldest extant water-pumping beam engines (of 1820 onwards) are those at Kew. Because of their rarity almost all surviving pumping houses (or stations) from before 1860 are listed: there are some half dozen from before 1850, and twenty plus from the 1850s. The decades between 1860 and 1930 were the most active years of waterworks' architecture. They saw the widespread use of steam engine pumping and most undertakings, both private and municipal, built impressive pumping stations. These buildings were public symbols of the investment of both local authorities and private companies and reflected the high value placed on the activity, and its association with

health and town improvement. Pumping stations achieved an individual 'waterworks' style, an architectural response to requirements for light and ventilation, an identity that was maintained for over a hundred years notwithstanding changes in pumping technology, including the introduction of electricity. Stations built after 1860 must be selectively listed, choices being based on the survival of plant and on architectural interest, tempered by the degree of alteration and condition. As these are buildings erected to house mechanical plant, the survival of the original engine is of major significance for a waterworks: where they survive in near complete condition they are generally highly graded. Buildings from the period up to the Second World War are much smaller than those built for steam engines, and their external appearance is less distinctive. Few are listable.

Filter beds are increasingly rarely found as more compact filtration systems have replaced them. The rate at which water could be filtered was accelerated by the introduction in the 1920s of rapid filters, housed in primary filter houses. Mid nineteenth-century filter houses are technologically important and significant examples may merit listing.

Waterworks often once occupied large areas and these were carefully landscaped with aesthetic and amenity considerations in mind. The most important, especially when associated with complete sets of buildings, may be eligible for inclusion on the *Register of Historic Parks and Gardens (available on the English Heritage website)*. Papplewick Pumping Station (Notts.) is an example.

Water towers, conspicuous by their elevated situation, were designed to act as a buffer between the pumping station and the consumer, and to pressurise the mains. They were emblematic as well as utilitarian. Cast iron water tanks first appear in England in the 1820s (the earliest of all are cylindrical, later examples rectangular). The majority of mid nineteenth-century towers are of brick or stone, and are embellished in a wide range of architectural styles. Substantially complete examples of pre-1850 towers are good candidates for listing. For the period up to the early twentieth century greater selectivity has to be applied: the principal factors being architectural quality, engineering virtuosity and group value with other water-related structures. Most twentieth-century water towers are built entirely of reinforced concrete (i.e. tower and tank) – the first erected near Liverpool in 1904. Plain functional designs in concrete are not usually considered to fulfil the criteria, in contrast to those where aesthetic possibilities have been more successfully explored (The House in the Clouds, Thorpeness (Suffolk) 1923), or where group value is a key consideration.

Sewage Disposal

From the 1850s waterworks were required by law to provide filter beds for cleansing abstracted water but very few disposal facilities survive, having been constantly modernised and replaced, or destroyed as part of recent re-organisations of the industry. Despite the importance of the processes for public health, therefore, very little will be listable other than the great pumping houses and their ancillary buildings: these will be assessed in the same way as waterworks. Early public conveniences may on occasion warrant protection where there is high-quality design or distinctive group value. Some of the most decorative late nineteenth-century municipal lavatory facilities are in Birmingham, their ornate cast-iron fittings contributing to the street scene. Early

tiled interiors and ranks of urinals, such as those of 1897 at South End Green, Hampstead, are also of interest. Twentieth-century conveniences will rarely fulfil designation criteria.

Hydraulic power

The provision of power through water, or hydraulics, has left a scattering of monuments from the late nineteenth century and early twentieth century, some of which are listed. The London Hydraulic Company's station of 1890 at Wapping is protected at Grade II* as the last fully-fitted building of its type in Britain. Remote storage of hydraulic power in accumulator towers is often associated with docks or other industrial establishments, as at Hudson Dock, Sunderland, or the Royal Gunpowder Factory, Waltham Abbey (Essex), where accumulators are protected.

Gas supply

The conversion to supplies of natural gas during the late twentieth century has led to the closure of many traditional gasworks and many sites are redundant and ripe for redevelopment. Early and innovative gasworks buildings will be listable on grounds of technical and historical interest. Humble gas-works buildings from the 1830s such as those in Saffron Walden (Essex) and in Bradford-on-Avon (Wilts.) are rare. Other buildings will have intrinsic architectural interest. In some cases exceptionally well preserved integrated sites may be eligible but it is not normal practice to list multiple gas holders of late date and standardised design: technical claims and the structural interest of the structures will be key determinants. Designation is concentrated on above-ground structures; the archaeological evidence of other aspects of a works may sometimes be worth recording.

Electricity Supply

Form follows function: the two main structural components of an electric power station are the boiler house and the engine room or turbine hall, generally attached side-by-side with one or more chimneys. Experiments include a combined refuse incinerator and generating station at Plumstead, south-east London (1903). The architecture of urban power stations often reflected municipal or company status or pride and confidence in new technology. Historical revival styles tended to be favoured for local-authority undertakings. Power and tramway companies often employed a more utilitarian style of building, though there are exceptions (particularly for frontage buildings). Company house style pervades the distinctive design of local sub stations and distribution kiosks and pillars (for transformer stations and street lights see the Street Furniture selection guide). Early power halls for country houses were often designed to be in keeping with the architecture of the house or estate. Isolated rural supply stations by contrast were rarely architecturally distinguished, and tend towards the vernacular, often being housed in converted water mills or simple shed-like outbuildings.

Only the most important *power stations* are listable. This may include the earliest survivors or key examples of a major development. Generally, however, designation will normally depend on the architectural elaboration of the exterior, the quality of the interiors and the survival of any machinery or switchgear (which is quite rare). Among the most complete survivals is a power station in Christchurch (Dorset), built in 1903

for the Boumemouth and Poole Electricity Company, and now a museum. Very few inter-war electricity-generating buildings are listed: Sir Giles Gilbert Scott's Battersea Power Station (1929-55) represents the apogee of the genre.

The 1950s and '60s saw the transformation of power-station design, with a change from the 'brick-cathedral' model of the 1930s and '40s such as London's Bankside (of 1947, also designed by Sir Giles Gilbert Scott and now Tate Modern) and Battersea, to a Modernist and anti-monumental type using lightweight cladding on steel frames, conceived simply as an enclosure of the generating plant, as found at Marchwood (Hants.) (1951-59 by Farmer & Dark). Architectural character came to depend on the massing of low blocks in relation to chimneys, sometimes with enormous concrete cooling towers, which introduced continental forms of concrete construction from the 1920s. Some groups of cooling towers such as Buildwas (Shrops.) and Didcot (Oxon.) have enormous presence in the landscape, but opinion remains divided as to whether their contribution is an altogether positive one. Similarly, electricity pylons are dominant landscape features: even though their design was modified in the 1930s in order to make a more positive impact on their rural settings, their claims to special interest can be debated. However, they would not be considered listable except in exceptional circumstances. Nuclear power stations possess claims to special historic interest in their technical aspects, but their architectural elements are unremarkable at best. Given the exceptional sensitivity surrounding the issue of contamination, any designation would require very careful consideration indeed.

Communications

Post offices are often of considerable architectural quality externally and, although generally modest inside, the principal ones may contain a large, elaborate public room similar to a banking hall. Survival of early fixtures is exceptional, however. Other rooms and offices are usually utilitarian, as are associated sorting offices. Main post offices are inevitably on a grander scale than rural or suburban branches, and assessment should bear this in mind. Between the wars, design favoured traditionalist styles, which contrasts with the exuberance of Victorian and Edwardian examples. Post-World War II post offices tend to be fairly reticent in architectural terms and seldom possess special interest.

Some of the earliest **telephone exchanges** are still in use, albeit with modern equipment and are often of considerable architectural quality particularly those by designed by Leonard Stokes (1858-1925). These may be listable on grounds of external architectural quality alone: exchange buildings that have retained their original switchboard gear are particularly rare. Interwar Neo-Georgian exchanges are sometimes of high architectural quality too. Post-World War II a significant number of new telephone exchanges were built by the Ministry of Works, some of which are of a high quality.

In terms of **radio and television**, Broadcasting House and Alexandra Palace (London Borough of Haringey), the earliest buildings of state broadcasting, are both listed for their architectural interest as well as their historical significance. The television network of the British Broadcasting Corporation was expanded throughout the country in the late 1940s and early 1950s, and commercial television rapidly followed. There are broadly two types of structures associated with broadcasting. Firstly, there is the largely

urban group of studios, production and management departments which are generally contained in buildings which could be mistaken for office blocks, save for the provision of television studios. Adaptation and replacement has often compromised these buildings, but they can display ingenuity of planning. Secondly, there are the structures erected to radiate broadcasts (transmission masts), which may occasionally have specialist engineering interest.

Architectural quality of many of the post-War communications structures is often expressed in composition, spatial treatment and scale, and in planning and detailing. These are critical factors in assessing them for listing. Most structures will exhibit some or all of these features, and the most successful are generally those that achieve a consistency of form and function. New construction techniques also make an important contribution to the design of a building, but are generally of interest when combined with architectural effect. Thus careful selection is required when considering buildings using innovative techniques for listing.

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