



Historic England

Infrastructure: Utilities and Communication

Listing Selection Guide



Summary

Historic England's twenty listing selection guides help to define which historic buildings are likely to meet the relevant tests for national designation and be included on the National Heritage List for England. Listing has been in place since 1947 and operates under the Planning (Listed Buildings and Conservation Areas) Act 1990. If a building is felt to meet the necessary standards, it is added to the List. This decision is taken by the Government's Department for Digital, Culture, Media and Sport (DCMS). These selection guides were originally produced by English Heritage in 2011: slightly revised versions are now being published by its successor body, Historic England.

The DCMS' *Principles of Selection for Listing Buildings* set out the over-arching criteria of special architectural or historic interest required for listing and the guides provide more detail of relevant considerations for determining such interest for particular building types. See <https://www.gov.uk/government/publications/principles-of-selection-for-listing-buildings>.

Each guide falls into two halves. The first defines the types of structures included in it, before going on to give a brisk overview of their characteristics and how these developed through time, with notice of the main architects and representative examples of buildings. The second half of the guide sets out the particular tests in terms of its architectural or historic interest a building has to meet if it is to be listed. A select bibliography gives suggestions for further reading.

The provision of public water, gas and electricity supplies and the removal of waste and sewage are known collectively as the 'public utilities'. By the mid nineteenth century these were coming to be seen as the responsibility of central and local government, 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. Buildings housing technical services to send and receive messages (postal and telephone networks), comprises a small but significant category of historic structures. They are dealt with here alongside utilities structures as both are functional in purpose and they developed alongside each other.

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Front cover

Abbey Mills Pumping Station, London Borough of Newham, 1868. Listed Grade II*.

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Introduction

This selection guide treats buildings associated with communications and several core utilities. The former, housing technical services to send and receive messages (postal and telephone networks), comprises a small but significant category of historic buildings. They are here dealt with alongside utilities structures as both are functional in purpose and they 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'. By the mid nineteenth century these 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, items such as post boxes, telephone kiosks, drinking fountains, water troughs, items of traffic control, and electrical distribution kiosks are assessed primarily as items of street furniture, and are accordingly dealt with in the [Street Furniture](#) listing selection guide. Well-heads, well-houses and conduits are

treated here as utilities. Buildings such as the showrooms and offices of gas and electricity boards are dealt with in the selection guide on [Commerce and Exchange Buildings](#). It is also advisable to consult the [Industrial Buildings](#) selection guide as there is necessarily some overlap with Utilities and Communications Buildings in areas such as power generation.

1 Historical Summary

1.1 Water supply

The provision of clean water has, intermittently, 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 (as at Gloucester and Canterbury), and similar conduit systems were built for some medieval

towns: some are listed, while others may be designated as Scheduled Monuments (as set out in the [Utilities](#) scheduling selection guide).

Most medieval towns were supplied via wells or springs, as were fortified sites and manors. Spring water was generally delivered by gravitation to a conduit head, and these often have considerable architectural elaboration (Fig 1). Some conduits, as at Exeter (fourteenth and fifteenth centuries), were laid underground; others (as at Helston, Cornwall) ran in the street (Fig 2). One especially



Figure 1
A conduit built in 1540, adjacent to St. Mary Le Wigford, Lincoln, and composed of surviving fragments of Whitefriars Priory which stood on the site of the nearby railway station. This Grade II*-listed structure is also a Scheduled Monument.



Figure 2
Open water conduits, Coinagehall Street, Helston, Cornwall. Known locally as kennels these open conduits, set into new granite paving in the early nineteenth century, represent some of the most basic, and yet pervasive, methods of street cleaning and are still in use today. Listed Grade II.

significant development was the construction in the early seventeenth century of the New River from Hertfordshire to London (Clerkenwell), 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, although 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).

Wells

Varying depths of well were commonplace in the past, and their architectural treatment at the surface, the well-head or well-house, varied from the rudimentary to the elaborate depending on their context. By the eighteenth century water was typically pumped up, rather than drawn via a bucket, and well-heads gave way to communal water-pumps in the wake of urban expansion. While in urban areas piped water was increasingly available from the mid-nineteenth century (below), many villages depended on pump water until well into the twentieth century.

Waterworks

This 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 (London Borough of Islington) 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 monumental waterworks such as the Goldthorn Hill pumping station of 1851 at Wolverhampton, in the west midlands, and the Whitacre pumping station (cover) of about 1872 and 1880 at Shustoke, Warwickshire (both listed Grade II), to the isolated hydrant.

But the idea of universal access to water is primarily a phenomenon of the mid to late nineteenth century. 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 (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.

Reservoirs

From the mid-nineteenth century a number of Acts authorised water authorities to extract water from rivers or construct reservoirs. Others were built as a result of private agreements, as at Hythe, Kent, in 1888. Covered reservoirs, as seen at Hythe, survive from the early Victorian period onwards, and required elaborate brick sub-structures to create large storage chambers. 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, for instance Liverpool (1892, drawn 52 miles from Lake Vyrnwy) and Birmingham (1890, drawn 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. Reservoirs often necessitated the provision of ancillary structures such as pump, valve, gauge, and meter houses, often made in the image of gate lodges or modest castles to complement the carefully designed landscape. Those designed landscapes are further considered in the selection guide on [Institutional Landscapes](#).

1.2 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 through exterior walls 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 (Figs 3-4). The basic treatment processes had been largely developed by the beginning of the First World War. At the domestic level the construction of outside privies went hand-in-hand with the construction of subterranean cess-pits (when they could not be sited over flowing water). The waste was usually removed from the cess-pits by so-called night soil men for whom alleyways were often created to the rear of terraced and villa housing in Victorian Britain. The waste was usually sold on to farmers as fertiliser. The water-closet was first patented by Alexander Cummings, a watchmaker of Bond Street, London, in 1775, and became more common by the 1830s. Public lavatories are discussed below.



Figure 3
The Western Pumping Station, 124, Grosvenor Road, London Borough of Westminster. A sewage pumping station and tower of 1875, built to resemble a large detached house. Inside, such buildings often contained virtuoso displays of ornate cast-iron work and were a source of civic pride. Listed Grade II.



Figure 4
Abbey Mills Pumping Station, Abbey Lane, Stratford, London Borough of Newham. Municipal magnificence at its finest. This sewage pumping station was designed by Sir Joseph Bazalgette and Edmund Cooper in 1868 in an Italian Gothic style. It contains a flamboyant interior lit by a central octagonal lantern. Listed Grade II*.

1.3 Gas supply

Gas lighting derived from coal was invented by William Murdoch in the 1790s and pioneered at Boulton and Watt's Soho manufactory in Birmingham. A rival system was promoted by the German 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 (Hampshire). 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 (Fig 5): gas, produced in retorts, was transferred to gasholders before being distributed to customers. The earliest known surviving horizontal retort house at Birmingham (listed Grade II*; Fig 6) 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 (Fig 7). 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



Figure 5
Former gas retort house at St. Martin's, Richmondshire, North Yorkshire. Designed by G T Andrews and completed in 1846 for the Great North of England Railway, this served just the station complex and is typical of small-scale early gas retorts. Listed Grade II.



Figure 6
Former gas retort house, 39 Gas Street, Birmingham. One of the earliest provincial gas works (begun 1818), the retort house of 1822 is the only surviving element and is listed Grade II*. The innovative metal roof, stiffened by a combination of wrought and cast-iron elements, was designed specifically to counter the very high temperatures generated during gas production. The consultant engineer to the Birmingham Gas Light and Coke Company was Samuel Clegg (1781-1861), the first specialist gas engineer.



Figure 7

Designed by the eminent engineer, Sir Corbet Woodall, Kennington Gasholder No.1, was the world's largest when built in 1847. It was later rebuilt in 1879 ahead of

the first test match at The Oval in 1880. It was listed at Grade II in 2016.

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. What is thought to be the oldest surviving gasholder in the world is Fulham No. 2 (in the London Borough of Hammersmith and Fulham), completed 1830, which is listed at Grade II. Other prominent components to gasworks might include the manager's house, the company office and gateway which often have careful attention paid to 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 and scheduled. It took some time to develop the technology to use gas for heating (about 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.

1.4 Electricity supply

The introduction of electricity is seen by many as the start of a second, or new, phase of the Industrial Revolution. Early generators were often located in large mill complexes to replace steam power. The remote supply of electricity to smaller businesses and domestic households in the early years of the twentieth century necessitated both smaller

generating stations and facilities for storage. As a natural phenomenon electricity had been studied by the ancient Greeks. Then, from the seventeenth century through to the nineteenth, key figures such as Robert Boyle, Sir Isaac Newton, Benjamin Franklin, Luigi Galvani, Alessandro 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 (listed Grade II), 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 is included in the Grade II listing), 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 1887-9 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. A recent listing at Grade II of the Moore Street Electricity

Substation in Sheffield (South Yorkshire) was principally for its architectural, rather than technical, interest.

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.

1.5 Communications

Postal system

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.

Telegraphy

Prior to the 1830s, telegraphic messages were conveyed by visual means. A series of hilltop telegraph stations, built by the Admiralty from the 1790s to connect Portsmouth naval dockyards with Whitehall, passed information quickly along a line of observation towers as seen in Semaphore House, Esher, Surrey of 1822 (Listed Grade II), one of a number of surviving structures. 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.

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 up to the 1950s; more recently with the advent of digital telecommunications such exchanges have been largely eclipsed.

Radio

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 as commemorated by the Marconi Monument of 1937 (listed Grade II) and a museum. 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 (Warwickshire) 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. Public broadcasting by wireless in England began in 1922. Television was first demonstrated by John Logie Baird in 1926 whose house in Frith Street, City of Westminster, is listed because of this very significance. 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 (listed Grade II) in north London in 1936.

From 1956 onwards, enlarged transatlantic submarine cables, first laid successfully by the *SS Great Eastern* in 1866, 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 from Cape Canaveral 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 (listed Grade I) of 1952-7 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 (formerly GPO) Tower, London, of 1964 (listed Grade II), 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.

2 Specific Considerations

As with all building types, those relating to communications and the utilities have to be assessed in terms of any special architectural or historic interest; here these things may relate variously to their 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. Where the quality of the landscape is significant consideration of inclusion in the *Register of Parks and Gardens* should also be considered.

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 as will degree of survival.

Individual buildings must be assessed on their own merits. However, it is important to consider the wider context and where a building forms part of a functional group with one or more listed (or listable) structures this is likely to add to its own interest. Key considerations are the relative dates of the structures, and the degree to which they were functionally inter-dependent when in their original uses.

2.1 Water supply

Wells

Once a common feature of everyday life, these have largely fallen out of use and been capped, boarded over or turned into wishing wells in tourist locations. These are usually modest walled enclosures with a windlass for the bucket and are rarely listable on aesthetic or technological grounds with the exception of rare late-medieval survivals such as Our Lady's Well, Hempstead, Gloucestershire (listed Grade I). This is one of a number of such structures in and around Gloucester associated with its religious houses. Religious or pagan associations (often claiming therapeutic powers) can add to the interest of such sites, although care needs to be taken when assessing

folkloric claims. Less substantial examples, such as the seventeenth-century thatched well-house in Clanfield, Hampshire (listed Grade II), also retain much special interest. Later wells tend to be valued for the architectural interest of the surface-building known as the well-head or well-house. Significance is afforded to the more architecturally accomplished well-heads which incorporate well-detailed timber shelters such as that of 1865 designed by William Burges for Forthampton, Gloucestershire (listed Grade II) or the famous example of 1859 designed by Philip Webb for the Red House, Bexleyheath, Kent (listed Grade I). Such structures usually post-date the sinking of the well and were often built as, or became, memorials such as that of 1881 at Astwick, Bedfordshire (listed Grade II). Their claims need to be carefully assessed on grounds of architectural and historic interest, but with due allowance for the special communal values which attach to war memorials.

Free-standing hand-powered water pumps, commonly once found in back yards, on village greens, and supplying urban tenements, are almost without exception utilitarian objects of a standardised mass-produced design; many are already listed. Designation is likely to be reserved for examples displaying visual interest and which have not undergone too much alteration.

Waterworks

England's oldest extant water-pumping beam engines (of 1820 onwards) are those at Kew (listed Grade I). 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 more than 20 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. Waterworks often occupied large areas and these were often 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 Parks and Gardens*: guidance is given in the selection guide on [Institutional Landscapes](#). Papplewick Pumping Station (Nottinghamshire) is an example, and here the Grade II* pumping house stands within a Grade II registered landscape. 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. 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 and no modern water supply buildings have been listed to date, the most recent being the Brede Valley Waterworks of 1900 in Brede, East Sussex.

Water towers

Conspicuous by their elevated situation, water towers 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 (Fig 8). Most twentieth-century water towers are built entirely (that is, both tower and tank) of reinforced concrete – the first erected



Figure 8
Municipal Water Tower, Balkerne Passage, Colchester, Essex. Opened in 1883, alongside is an early nineteenth-century reservoir, this enormous campanile, nicknamed ‘Jumbo’, was designed by the Borough Surveyor and Engineer Charles Clegg. Listed Grade II*.



Figure 9
A probably late nineteenth-century cast iron urinal in Star Yard, off Chancery Lane in London’s legal district, manufactured by McDowall Steven & Co of the Milton Iron Works, Glasgow. Listed Grade II.

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 (as with The House in the Clouds, Thorpeness (Suffolk) of 1923: listed Grade II), or where group value is a key consideration.

Filter beds

These 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, such as the group of six at Swithland Reservoir, Leicestershire (listed Grade II) complete with an air vent disguised as a gazebo, may merit listing.

2.2 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 as magnificently embodied by Bazalgette’s major pumping stations at Crossness (listed Grade I) and Abbey Mills (listed Grade II*) (London Boroughs of Bexley and Newham): these will be assessed in the same way as waterworks.

Early public conveniences may on occasion warrant protection where there is high-quality design,

distinctive group value, or technical innovation as in the Gothic Revival design constructed in concrete at Norwich (listed Grade II). Several prefabricated cast-iron examples are listed (for example Fig 9), such as that of about 1880 on Whiteladies Road, Bristol (Grade II), while some of the most decorative late nineteenth-century municipal lavatory facilities are in Birmingham. Elements of prefabricated lavatories can even be found incorporated into medieval fabric as at Ormskirk (Lancashire) parish church (listed Grade II). 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 except in the case of rarities such as the ornate pre-cast concrete urinal of 1919 (listed Grade II) designed for St. Crispin's Street, Norwich, by its City Engineer.

2.3 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.

2.4 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 (Wiltshire), both listed at Grade II, are rare. Other buildings may have intrinsic architectural interest and group value needs to be

carefully considered. 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 (most notably major innovation) and the structural interest of the structures will be key determinants, as will earliness of date, aesthetic architectural treatment and group value with other gas-related buildings. Designation is concentrated on above-ground structures; the archaeological evidence of other aspects of a works may sometimes be worth recording.

2.5 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 (Fig 10). Experiments include a combined refuse incinerator and generating station at Plumstead, south-east London (1903; listed Grade II). The architecture of urban power stations often reflected municipal or company status or pride and confidence in new technology.



Figure 10
The former City of Worcester electricity works, Powick Mills, Old Road, Worcester, completed in 1894. An entire electricity works: offices, power halls for turbines (over the river), back-up boiler rooms and chimney stack. Worcester was the first municipality to build its own hydro-electric power station. Listed Grade II*.



Figure 11
Crompton's Arc works, Anchor Street, Chelmsford, Essex. A simple utilitarian building designed, in imitation of an orangery, to house electrical generating plant and offices for R E B Crompton in 1878. Chelmsford had the first electric street lighting in the country, supplied by the Arc Works, in 1901. Listed Grade II.



Figure 12
Battersea Power Station, Cringle Street, London Borough of Wandsworth. Designed by Sir Giles Gilbert Scott and begun in 1932, in its Egyptian massing and decorative motifs Battersea is one of the few power stations to exhibit architectural pretensions. Listed Grade II*.

Historical revival styles tended to be favoured for local-authority undertakings as at Heaton Moor, Cheshire (listed Grade II). 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. Early power halls for country houses were often designed to be in keeping with the architecture of the house or estate as at Lyme Park, Cheshire, where Charles Reilly designed a complex of cottages and estate workshops which included a small electricity generating station in 1904 in the Arts and Crafts manner (listed Grade II). 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 (Fig 11), 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 Bournemouth 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; listed Grade II*; Fig 12) represents the apogee of the genre and is of very considerable architectural note for his treatment of the massive brick envelope and its distinctive chimneys; the moderne control room is also of special interest, as are the riverside cranes, exemplifying the role of coal in fuelling the complex.

The 1950s and 1960s saw the transformation of power-station design, with a change from the 'brick-cathedral' model of the 1930s and '40s such as Battersea and London's Bankside (of 1947, also designed by Sir Giles Gilbert Scott and now Tate Modern), to a Modernist and anti-monumental type using lightweight cladding on steel frames, conceived simply as an enclosure



Figure 13

At first sight little more than a shelter, this structure in the Dorset village of Iwerne Minster, known as 'The War Office', is a rare purpose-built survivor of structures built to display the latest newspapers and telegraph bulletins. Established during the First World War to keep villagers informed about the war, this fine example was rebuilt to a design by Giles Gilbert Scott about 1920 with a relief carving of Mercury sending out the news. Listed Grade II.

of the generating plant, as found at Marchwood (Hampshire) (1951-59 by Farmer and 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 (Shropshire) and Didcot (Oxfordshire) have enormous presence in the landscape, but opinion remains divided as to whether their contribution is an altogether positive one. At Buildwas, the first power station of 1929-32

(also known as Ironbridge A) gave way to a second power station (1963-67) where project architect Alan Clark and landscape architect Kenneth Booth introduced a red pigment into the concrete of the cooling towers to help them blend into the surrounding topography. 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. Their high technological interest, however, is undeniable; preservation through record is an option.

2.6 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 (Fig 14). Between the wars, design favoured traditionalist styles (Fig 15), which contrasts with the exuberance of Victorian and Edwardian examples. Post-Second World War post offices tend to be fairly reticent in architectural terms and seldom possess special interest.

Telephone exchanges

Some of the earliest examples are still in use, albeit with modern equipment, and are often of considerable architectural quality, particularly those by designed by the noted architect Leonard Stokes (1858-1925). These may be listable on grounds of external architectural quality alone



Figure 14
General Post Office, Victoria Street, Derby, Derbyshire. An early (1868) purpose-built head Post Office based on Renaissance precedents and resembling a London gentleman's club more than a new nineteenth-century building type. Listed Grade II.



Figure 15
Radway Post Office, Sidmouth, Devon. A good example of the Office of Works' increasing tendency to employ the neo-Georgian style for Post-Offices during the inter- and post-war periods. Here the quality of the design, by H E Seccombe, lifts this example of 1938 (listed Grade II) above the average.

although many, whilst exhibiting good use of materials, have a stolid and repetitive design: exchange buildings that have retained their original switchboard gear are particularly rare. Interwar neo-Georgian exchanges are sometimes of high architectural quality too. Post-Second World War a significant number of new and very large telephone exchanges were built by the Ministry of Works, some of which are of a high quality. In many cases sizeable extensions were added to earlier exchange buildings as at the Trinity Street exchange, Hanley, Staffordshire (Grade II). Where they do not compromise the original building, and have architectural interest, such additions may add to the special interest by demonstrating continuity of function and development of an in-house style to accommodate technological change.

Radio and television

Broadcasting House (1931) 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. So too are

some less well-known examples such as the British Broadcasting Station's 1933 Washford transmitting station in Willington, Somerset (listed Grade II). The television network of the BBC 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. In most cases assessment should mainly take account of architectural and historic interest as exemplified by the listing in Grade II of the BBC Television Centre (1951-60), designed by Graham Dawbarn. That was designated because of its architectural interest, including its distinctive plan-form, and early date (it is believed to be the world's first national television broadcasting complex). In general, in such buildings survival rates of original technology will

be very low and thus listing is likely to concern itself primarily with the architectural setting of these facilities. Secondly, there are the structures erected to radiate broadcasts (transmission masts), which may occasionally have specialist engineering interest.

Recording studios

Of equal interest is the growth of the music recording industry and its creation of recording studios. Such buildings are rarely of architectural note, require careful selection, and usually require retention of their original machinery and interiors to justify listing. Only rarely, as in the case of the famous Abbey Road recording studios, London Borough of Camden, created within a converted Georgian house in 1931 for the Gramophone Company, may listing be justified.

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.

2.7 Extent of listing

Amendment to the Planning (Listed Buildings and Conservation Areas) Act 1990 provides two potential ways to be more precise about what is listed.

The empowerments, found in section 1 (5A) (a) and (b) of the 1990 Act, allow the List entry to say definitively whether attached or curtilage structures are protected; and/or to exclude from the listing specified objects fixed to the building, features or parts of the structure. These changes do not apply retrospectively, but New listings and substantial amendments from 2013 will provide this clarification when appropriate.

Clarification on the extent of listing for older lists may be obtained through the Local Planning Authority or through the Historic England's Enhanced Advisory Service, see www.HistoricEngland.org.uk/EAS.

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