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The Architecture of Telephone Exchange Buildings

Technological advances are rapidly rendering telephone exchange equipment obsolete, along with the buildings designed to accommodate it. Telephone exchange buildings are now leased or sold for change use or complete redevelopment at an increasing rate, with remarkably little attention paid to their architectural value. They are generally unobtrusive, everyday buildings easily overlooked or even forgotten. The standard types and modular construction may not have captured the general public's imagination, but these buildings have nonetheless played a significant part in shaping our modern way of life.

The Early Years

The first public telephone exchange in Europe was opened the 21 August 1879 by the Telephone Company (Bells Patents) Ltd at 36 Coleman Street, London. It initially served eight subscribers with a two-panel 'Williams' switchboard and cables radiating from a rooftop derrick, illustrated in figure 1. Within weeks, the rivalling Edison Telephone Company of London Ltd opened their first exchange a stone's throw away at 11 Queen Victoria Street. Rapid competitive expansion ensued and by April 1890, Bell's Telephone Company listed seven London exchanges and 16 regional exchanges, including Bristol, Manchester and Edinburgh, in their directory.

Figure 1: The Coleman Street Exchange, Illustration from "The Graphic" 1883. (Source: BT Group Archives)

Both companies suffered from technical shortcomings and soon merged to combine their expertise, forming the United Telephone Company of London Ltd, which would eventually evolve into the National Telephone Company (NTC). But before the amalgamation was complete, a legal case was brought against the Edison Telephone Company by the General Post Office (GPO), who regarded the telephone as an infringement and direct threat to their telegraph monopoly [2]. The landmark court action in December 1890 ruled that

telephones, and indeed any form of future electric communications, were covered by The Telegraph Act 1868. This Act required all telephone operators to be licensed by Her Majesty's Postmaster General, and the State consequently came to play a central role in development of Britain's telecommunications network.

The GPO was at this time under strict operational control by the Treasury [2] and not in a financial position to compete with independent telephone patentees in the development of new telecommunications technologies. In turn, the individual patentees were unable to fully exploit their technological advances due to the restrictions of their licenses. This stalemate between the GPO, the telephone patentees and the Treasury did not end until the last license expired in 1911 and the Telephone Transfer Act brought all telephone companies together under the control of the GPO.

Before nationalisation, the general practice of the NTC had been to lease existing premises and adapt them when required. In 1912, most local telephone exchanges were therefore housed in shops, offices, warehouses or other types of buildings. The range of building types created problems for the engineers responsible for the layout of equipment and the majority of these exchange buildings were eventually replaced. Purpose built telephone exchanges were at the time rare and exclusively located in larger towns and cities [6]. The Ministry of Works (MOW) had already designed some purpose-built telephone exchange buildings for the GPO, often combined with Post Offices, in the distinct Neo-Georgian style still recognisable today.

The outbreak of the First World War put a halt to the planned replacement of unsuitable NTC exchanges and the general expansion of the telephone network. When planning resumed in 1927, an ambitious building programme started in London [4]. The MOW was tasked with designing buildings externally in-keeping with their surroundings to satisfy the Planning Authorities, still capable of accommodating the functional and spatial requirements stipulated by the GPO. The majority of these exchanges were large enough to accommodate equipment for a multiple of 10,000 lines. One example of this type of building is the Marylebone Telephone Exchange, illustrated in figure 2. This Neo-Georgian building from the late 1920s was designed by the MOW. Following a reduction in space requirements, the upper levels, originally designed for office accommodation, were converted to residential apartments and a mansard roof extension was added in the early 2000s. BT still retains space on the ground, first and second floors.

Figure 2: The Neo-Georgian Marylebone Telephone Exchange. (Source: author's own)

As demand for telephone services spread across Britain, small standardised buildings were designed to serve smaller communities. They were initially known as Rural Automatic Exchanges, but soon renamed Unit Automatic Exchanges as the term 'rural' became inappropriate. The GPO took responsibility for the design of the equipment as well as the design and erection of the smallest buildings. Their Architect's Section co-operated with the Engineering Department in the development of Standard Types A, B and B1, which accommodated 100-line and 200-line exchanges. They could be constructed in three different ways; in brick, stone or a special construction suitable for sites prone to flooding. The Butterstone Telephone Exchange in Scotland, shown in figure 3, is a Standard Type A building constructed in brick and finished with white render.

The design responsibility for the larger 800-line exchange buildings was given to the MOW, who developed Standard Types D, E and F in conjunction with the GPO's Engineering Department. Two building types were designed for future extension from the outset; Type E could be extended vertically and Type F horizontally. As with Types A, B and B1, these standard types were designed for construction with a range of finishes to suit material availability or the local vernacular. The repetitive use of standard building types reduced both planning and construction times significantly. In the inter-war years, the number of telephone exchanges nearly doubled and by 1939 there were close to 6,000 telephone exchanges in the United Kingdom.

Figure 3: The Butterstone Telephone Exchange adjacent to a classic K6 telephone box featuring a Tudor Crown. (Source: author's own)

The Second World War presented further operational challenges, labour shortages and new security concerns. The subsequent economic controls, including restrictions on construction through a building licensing scheme operated by the post-war Government, had a significant impact on the development of the telecommunications network and on construction in general. However, while the war efforts slowed down the physical expansion of the network, they stimulated innovation and the exponential service expansion that followed incorporated many of the latest technological developments.

Post-War Developments

The post-war development of British telecommunications was a partly the result of wider application of war-time technological innovations, but more importantly driven by extensive collaboration between public ministries and private businesses. One such effort was the Joint Electronics Research Committee (JERC), which was formed in 1956. It brought together the five principal manufacturers of British telecommunications equipment (the GPO, Siemens Brothers, Automatic Telephone & Electric, Ericsson Telephones, General Electric and Standard Telephones & Cables), leading to technological developments including the experimental electronic exchange at the Tudor Manual Exchange in Highgate Wood, London, illustrated in figure 4. The public-private collaborations were also influenced by political and commercial decisions driven

by import and export policy, as expressed in a letter from the GPO to the MOW dated the 2 August 1957, a few days after the public announcement that a new type of electronic exchange would be working in March 1960:

'It is a matter of national prestige for us to be the first to introduce such an exchange. At present British firms supply quite a large proportion of the world's market with telephone exchange equipment so it will be of inestimable value to our export trade to be able to be first on the scene with this new development. Our engineers are still grappling with the problems presented by this new type of equipment so it has been difficult, until now, to give a clear picture of what will be needed in the way of structural work.'

In recognition of the political, economic and technological importance of the Highgate Wood project, all usual processes were expedited. The original Tudor building, which had already been extended by the MOW architect Eric Bedford in 1945, was altered internally and further extended to accommodate a new power plant, a stand-by engine and a fan room. The amendments were drawn by the MOW and, after negotiations between them, the GPO and the London Telecommunications Region, funded by their Maintenance Division. The Highgate Wood Electronic Exchange was formally opened by Reginald Bevins, the Postmaster General, for public use in December 1962 [1,5]. However, despite the exceptional collaborative efforts that brought the experimental exchange into being, it soon proved unsuccessful and was taken out of service in 1965. The digital revolution of telecommunications in Britain would have to wait until the development of System X in the 1980s.

Figure 4: The Highgate Wood Telephone Exchange, where Britain's first electronic telephone exchange opened in 1962. (Source: BT Group Archives)

The typical telephone exchange building gradually evolved from a civic edifice to a more discrete and efficient type of construction, driven by cost savings and standardisation. A collaborative working group with the express aim to reduce the cost of GPO buildings was founded in 1957. It was led by the GPO's Director of Mechanisation & Building Brigadier K. S. Holmes and the MOW's Superintending Architect Mr. J. O Stevens. The first task of this group, called the Joint Post Office and Ministry of Public Buildings and Works Research and Development Group (JRDG) was to design and construct 'optimised' building types for a head post office, a telephone exchange and a telecommunications engineering centre. Projects in Hitchin, Altrincham and Plymouth respectively were selected as 'quite typical' from the limited choice of pipeline projects available at the time.

Figure 5: The 1960 Altrincham Telephone Exchange, with the original NTC Telephone Exchange in the background. (Source: BT Group Archives)

The JRDG's aim for the Altrincham Telephone Exchange, illustrated in figure 5, was to 'design a scheme based on a simple form of construction capable of erection within the ordinary resources of the normal run of building contractors, and entailing the minimum of maintenance and running cost' [3]. The structural solutions were carefully evaluated with regard to both operational efficiency and the economy of layout and construction. The apparatus room was formed from a light streel frame, a simple timber joist roof and non-loadbearing cavity brick walls. The external walls to the ancillary accommodation were formed of loadbearing cavity brickwork, and the heating chamber and fuel store fitted with a concrete roof as a fire precaution. Continuous windows at high level on all sides of the apparatus room were designed to provide the best daylight conditions and the butterfly roof, designed to lead daylight into the centre of the apparatus room, formed a distinctive architectural feature.

Altrincham's optimised 10,000-line automatic telephone exchange benefitted from technical improvements to the design and layout of telephone exchange equipment, which made it possible to reduce the overall amount of floorspace required. Meticulous spatial planning reduced the circulation space to 1.2%, compared to 4.2% in a typical exchange, leaving 98.8% of the floor area as operational space [3]. Further cost savings were made through the omission of the basement cable chamber, which required expensive below ground works and waterproofing measures. Cables were instead designed to enter just above ground level and carried on bearers along the inside face of the external wall. New heating and ventilation systems were also trialled. When completed in 1960, the final cost of the Altrincham Telephone Exchange was approximately £23,000, down from an estimated £27,000 at sketch plan stage, and less than half the cost of a typical telephone exchange building meeting the same operational requirements.

The JRDG went on to design Standard Types H, K, L, M and P (with variations) between 1963-1972, when the Group was disbanded and the responsibility for standard designs transferred to the Property Services Agency's (PSA) Directorate of Post Office Services. These standard buildings implemented lessons learnt from Altrincham, adapted to new operational and servicing requirements and made use of the latest building technologies, materials and construction methods [8]. There was, however, still scope for external variation in the standard building types to suit site conditions, regional requirements or demands from Local Planning Authorities (LPAs), especially following the 1969 Post Office Act, as demonstrated by the stone clad Type K Blairgowrie Telephone Exchange illustrated in figure 6.

Figure 6: The Blairgowrie Telephone Exchange, clad in stone to suit the local vernacular. (Source: author's own)

The Post Office as a Public Corporation

The Post Office Act formally changed the status of the GPO from a department of state to a public corporation known as the Post Office (PO). This legal change had major ramifications on the design and delivery process of telephone exchange buildings and had a significant impact on the established relationships between the PO as a key 'client' to the MOW and its successor, the PSA. Until 1969, the GPO had been a Crown Corporation and did therefore not require planning permission for their buildings, although efforts had nonetheless been made to liaise with the LPAs as a matter of goodwill. LPAs were now empowered to approve or refuse planning permission for proposed telephone exchange buildings, and more attention was therefore required to the massing, layout and materials of the buildings.

Demands by LPAs did on occasion lead to escalated costs as higher quality finishes, reduced building heights or combined building uses with active ground floor uses, such as shops, were demanded. Particular challenges were encountered with proposals for two new telephone exchanges in Southampton and Cardiff, prompting a full review of planning issues faced by the PO across the country in the early 1970s. This situation brought to attention the growing sense of distrust between the PO and the PSA, manifested by ongoing experimental use of private architects to compare and assess the PSA's performance. However, the immediate response to the PO's review was to issue an informational brochure entitled 'Telecommunications Buildings and Environmental Planning' to the LPAs in 1973. This brochure explained basic site selection criteria, spatial requirements, planning time scales and other design constraints of telecommunications buildings including telephone exchanges.

Of all standard buildings, Types A, B and K are most numerous. However, the standard types only account for approximately two thirds of all telephone exchange buildings in the UK. Even before the 1969 Post Office Act, LPAs had insisted that buildings must harmonise with their surroundings and the PO had, where possible, paid due regard with bespoke building designs. Private architects were regularly appointed to deliver these buildings, with support from the MOW's architects and project managers, because of their expert local knowledge of what designs would be considered acceptable to the authorities in particularly challenging areas, or their capacity of delivering such high design quality that exceptions to usual planning policy could be made.

One such architectural firm was Hubbard Ford and Partners, who designed buildings ranging in scale from the iconic Mondial House in London (demolished in 2006) to a more modest extension to the Cheltenham Telephone Exchange. They also designed telephone exchanges in Birmingham, Burwash, Watford and Tunbridge Wells. Apart from Mondial House, the international switching centre illustrated in figure 7 which was unfavourably compared to a word processor by King Charles [7], their perhaps most controversial telephone exchange is the Chichester extension, which underwent a prolonged planning process and public inquiry with intensive local engagement. The existing telephone exchange was situated within a conservation

area, in close proximity to Chichester Cathedral. The architects worked hard to break down the mass and scale of the sizeable extension to suit these sensitive surroundings and added their distinctive design flair. The resulting building was equally praised and criticised on completion, with local conservationists lobbying for its demolition and describing it as a 'red brick corpse' over 20 years after its completion.

Figure 7: Artist's impression of Mondial House, built in 1978. (Source: BT Group Archives)

Following revised contractual agreements in 1969, private architects could also be appointed directly by the PO in order to assess and compare the value for money provided by the MOW or PSA. This 'Experimental Building Scheme' stipulated that a proportion of up to 10% of the provision of new buildings and extensions to existing buildings was to be undertaken by the use of private agencies. The London-based architectural practice Tripe & Wakeham, who had recently designed an extension to the Preston AMTE, was appointed to deliver multiple projects as part of this programme, including £150,000 extensions to Epsom and Sanderstead, and the new Tamworth Telephone Exchange at a value of £760,000, all designed and delivered between 1973-1977.

However, far from all non-standard buildings were designed by private architects. The individual architects employed by the MOW and PSA were rarely accredited for their accomplishments, but original drawings often reveal names of the Senior or Project Architect in charge. Occasionally the name or initials of the individual who drew the specific drawing are also available, which makes it possible to trace the developing careers of certain individuals. One such individual was Thomas Fred Winterburn, who worked as Eric Bedford's Assistant Architect on the Chiswick Telephone Exchange, one of the first buildings to be completed to post-war designs in 1949, illustrated in figure 8. Eric Bedford became Chief Architect of the MOW the following year and Winterburn went on to become Senior Architect at the Ministry, eventually supervising projects including the Grimsby Automatic Telephone Exchange (ATE) with A.G. Sheppard Fidler & Associates (who had been Birmingham's first City Architect) and Harrogate Spa ATE with Robert Cromie.

Figure 8: The 1949 Chiswick Telephone Exchange with a later extension at the rear. (Source: author's own)

Through the development of telephone exchange buildings, the aesthetics have largely depended on location. More money was generally spent on the exterior design and finishes if the exchange was situated on a city centre site or otherwise sensitive location. If the building was concealed from public view, the priority shifted instead towards providing maximum accommodation for minimum cost. The architectural solutions responded to a wide range of environmental and spatial requirements, but the proposed features occasionally conflicted with operational or technological requirements. For example, whilst large windows looked attractive and were often requested by the LPAs to suit the local context, and by the workers' unions to provide access to views and daylight, they caused thermal issues and let dust into the apparatus rooms. The slow nature of designing and constructing buildings compared to the rapid technological developments also meant that the changing demands of the telecommunications equipment often outpaced the buildings even though both standardised and innovative building methods were employed.

An Uncertain Future

Except for the BT Tower in London, no post-war telephone exchange buildings are currently listed by Historic England. A mid-century, subterranean GPO Telephone Exchange at MoD Corsham is listed as a scheduled monument. Grade II listing has been awarded to a small number of early 20th Century telephone exchange buildings, including the 1924 Neo-Georgian Sedding Telephone Exchange in Kensington and Chelsea, designed by John H. Markham for Her Majesty's Office of Works, and buildings in Manchester, Lewisham and Reading by architect Leonard Aloysius Stokes, who was married to the daughter of the General Manager of the NTC.

BT entered into a 30-year strategic property partnership with Telereal Trillium in 2001 to manage a gradual disposal of their estate in response to changing operational requirements. This disposal strategy is highly profit driven. Value enhancements achieved by obtaining planning permission for change of use or redevelopment are shared between the two companies, with no evident consideration of heritage agendas. For operational reasons, telephone exchanges are often located on prime city centre sites. They are dimensioned to accommodate large telecommunications equipment, and therefore not immediately compatible with alternative building uses, although there are several successful examples of building re-use. These factors will likely result in the demolition of many telephone exchange buildings, and we risk losing them without a thorough understanding of the historic and architectural values of this technologically driven building type.

Abbreviations

ATE	Automatic Telephone Exchange
GPO	General Post Office
JERC	Joint Electronics Research Committee
JRDG	Joint Post Office and Ministry of Public Buildings and Works Research and Development Group
LPA	Local Planning Authority
MOW	Ministry of Works
NTC	National Telephone Company
PO	Post Office
PSA	Property Services Agency

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