



**MARCONI'S
BEAM WIRELESS
STATION
AT
DORCHESTER**

by Paul Hawkins



View of Dorchester Radio Station in 1928 looking North, showing the masts of the New York Beam antenna behind the station

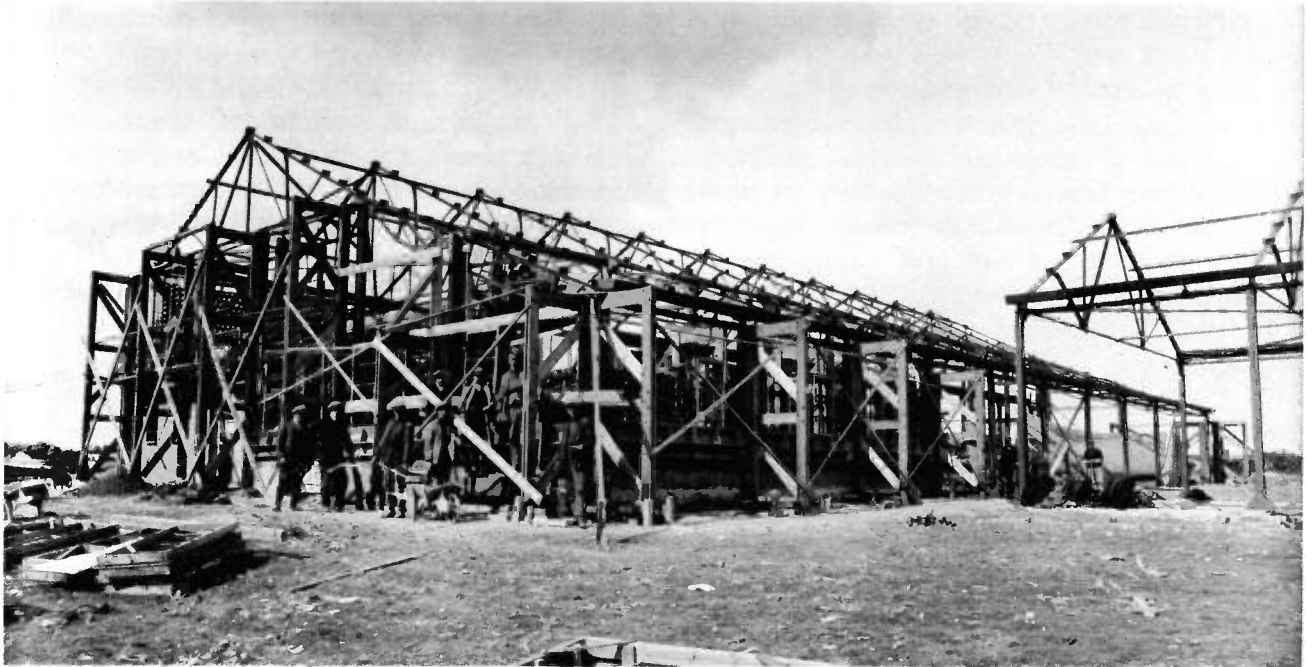
Twenty years after his historic first transmission of a radio signal across the Atlantic in 1901 Marconi was still making important new discoveries in the field of radio communications. In the early 1920's, beating his rivals, Marconi and his associates discovered the properties of short wave radio, how signals transmitted at one point on the globe could be received thousands of miles away, reflected by an invisible layer in the upper atmosphere.

To exploit this newly discovered phenomena Marconi planned to build a network of radio stations to provide telegraphic communications between Britain and its Empire, Europe and the Americas. The government ruled that Empire communications should be the responsibility of the state hence Marconi built stations for the GPO to operate. However, the Marconi Company was permitted to build stations and operate commercial radio telegram services between Britain and countries outside the Empire. For this purpose a new transmitting station was built near Dorchester.

Known as the Beam Wireless Station, it sits proudly on Fordington Down just to the west of Dorchester, in the rural county of Dorset. Although the last Morse code dots and dashes were beamed from its ageing transmitters back in 1979, with a tall cellular telephone mast nearby, one could be forgiven for thinking that it still is a radio station.

Construction of the Station

Construction of Dorchester Radio Station commenced in 1925 and at a dinner in July of that year senior officials from the Marconi Company addressed members of the Rotary Club in Dorchester. It was explained that advances in science and technology and the discovery of 'short waves', something Marconi laid a significant claim to, enabled the Marconi Company to offer the public a high speed telegram service to New York and South America via a new wireless transmitting station being built on the Bridport Road two miles to the west of the town. Signals were to be beamed to their destination by an antenna system of wires supported by an impressive array of 'T' shaped masts designed by Charles Franklin, one of Marconi's closest colleagues.



Construction of the Power House and the frame of the original transmitter hall on the right.

Initially the station consisted of two main buildings, one relatively small building for the transmitters and a much larger one for the power generation equipment. Charles Franklin was the chief designer of the Beam System and R.N. Vyvyan, another of Marconi's inner circle, was in charge of station construction and equipment installation. Construction of a second, larger, transmitter building was also commenced, being completed in 1930.

In fact, at the time the Beam Stations were erected short wave wireless technology had been barely proven by Marconi. But such was the race against other wireless companies, in Germany and the USA, to establish a global wireless telegraphy system the risks were considered worthwhile. The first contract Marconi received was from the Post Office to build Beam Stations to communicate with the British Dominions. To enter into fixed contracts for the system put the Marconi Company at significant risk pursuing the venture. Dorchester and its sister receiving station at Somerton in Somerset were built to expand the Marconi telegram services to countries outside the empire, such as the USA, and open new services to destinations in South America, the Middle East and beyond. Until that time the New York telegram service had been carried by undersea cable and also by high power long wave transmitters at a Marconi station near Caernarfon in North Wales. From the business point of view Marconi had his eye on the telegram traffic carried by the cable companies with their almost monopolistic worldwide network.

Charles Franklin had three challenging tasks to complete in order to make Marconi's Short Wave Beam System operate successfully. These tasks were the design of the antenna system, the transmitter and the means of connecting the transmitter to the antenna.

Beam Antennas

Franklin was an accomplished engineer and at that time had as much experience of short wave antenna design as anyone. The Beam Antenna used a huge array of vertical wires supported between the characteristic 'T' shaped masts. The first service from Dorchester would be to New York and to provide an antenna for the various wavelengths used, the array was suspended between five masts, each 287 feet high, and spaced 650 feet apart. Due to the sharp beam produced by the antenna it required precise alignment during construction to ensure the transmitted signal was directed along the exact bearing of the distant receiving station at Riverhead on Long Island near New York City.

The radio frequency design was not the only difficulty. The civil engineering aspects of this project were a major task. Each mast weighed around 45 tons with around 128 cubic yards of concrete in the base to support it. The same antenna design was used throughout the world so it had to be strong enough to survive for many years in a large variety of climates.

Since Cairo is almost in the opposite direction to New York an economy in the number of masts was made as the Cairo Beam was mounted on the other side of the N.Y. Beam. The same applied to the Japan and S. American Beams.

Transmitter Description

Franklin designed a transmitter that consisted of three or four units, called 'Panels'. The radio valves and component parts of each panel were supported on plate glass insulators mounted on an open brass framework. Each panel had a number of meters and tuning controls and the operator was protected from access to the high voltages inside by mesh doors.



The first Short Wave Beam Transmitters

Panel 'A' housed the 'No.1 Magnifier' or the final power amplifier producing a transmitted signal of 10 kilo Watts. Panels 'B' and 'C' housed the No.2 and No.3 Magnifiers that amplified the radio signal produced by the master oscillator. Panel 'D' housed the keying unit that controlled the Morse code being transmitted. Each 'Magnifier' was in fact a radio frequency valve amplifier tuned to the operating wavelength.

In addition to the Magnifier Panels, pumps were required to circulate coolant around the transmitter valves to regulate their operating temperature and various other controls were required to regulate the power supplies to the transmitter. The transmitter was aptly named the 'Short Wave Beam 1', abbreviated to SWB1 and soon became well known as a 'Swab One'.

Coaxial Cable

To connect the transmitters to the aerials Franklin devised a feeder using concentric copper tubes, called 'Coaxial Feeder' now popularly known as 'coax'. The overall diameter of the coaxial feeder was 3.5 inches, with an inner conductor of 7/8 inch diameter supported by porcelain insulators. In the field near the antenna a number of junction boxes were used to divide and feed the transmitter energy equally between the many wires of the Beam Array.



The Power House 1925

Power Generation

At the time the station was constructed there was no electricity supply locally hence power had to be generated at the station, by five Ruston and Hornsby engines producing D.C. at 440 volts. This voltage was converted by motor-generators to produce the various supplies required by the transmitter valves. The generating plant was mounted on concrete bases with cork shock absorbers and great care was taken to keep the generator building separate from the transmitter building to avoid noise and vibration interfering with the transmitters and affecting their stability.

Open for Business

The station opened in August 1927 and when the first Morse characters were beamed at up to 200 words per minute, or maybe more, towards the receiving station in the USA it was as 'state of the art' as any modern technology such digital satellite TV or the latest Pentium. This was twice as fast as the submarine cable systems could operate at and with competitive prices for telegrams the cable companies soon came under intense pressure.



Station Manager P.J. Woodward, left, and deputy C.C. Redshaw pictured circa 1930

Experiments with radio telephony were also undertaken at Dorchester. Using the Cairo transmitter voice communication was established with Marconi on his steam yacht 'Elettra' in the Mediterranean. Marconi was soon able to offer international radio telephone services but the GPO ruled that they retained a statutory monopoly of telephones and Marconi must stick to telegraphy. However, Marconi was permitted to provide voice services for overseas broadcast relay.

Before the close of 1929 the Marconi Beam Services, combined with the Beam Stations operated by the Post Office to the Dominions, were threatening to put the cable companies out of business. A combination of new technology, lower operating costs and hence cheaper rates for telegrams threatened the somewhat conservative cable companies with bankruptcy. As a result the UK and Empire governments were forced to realise the strategic value of the cable companies, as it was acknowledged that an enemy could jam or eavesdrop on wireless signals, and resolved to create a compulsory merger of wireless and cable communications.

Hence, before Marconi had time to fully savour the results of his labours the ownership of Dorchester and other Beam Stations changed hands and instead of competing with the cable companies became part of a joint cable and wireless system under the company name of "Imperial and International Communications". In 1934 the company name changed to the more catchy "Cable and Wireless Ltd".

This did not stop the march of technology or the association with the Marconi company. In fact during 1930 Marconi personally led a VIP delegation to inspect the radio station. Guests included a number of MP's plus the Prime Minister of Australia, The Rt. Hon J.H. Scullin M.P.

Under Cable & Wireless Ltd the short wave wireless telegraphy network was integrated with the cable network and hence telegrams could be sent via the ionosphere or the ocean bed.

With the completion of the second transmitter building in 1930 further transmitters were installed and services were opened via Dorchester to Rio de Janeiro, Buenos Aires and Bogota in South America, then Cairo and Japan.

Throughout the 1930's services at Dorchester expanded to include Santiago, Maracay, and Shanghai. Telegram traffic for Capetown, Montreal, Berne, Beirut, Teheran, Bangkok, Salisbury (now Harare) and Nairobi could also be transmitted when the transmitters at the Ongar (Essex) or Bodmin (Cornwall) radio stations were out of service, or when extra capacity was required. In 1934 the transmission of Radio Pictures, or facsimile, also commenced.



The End of an Era

Sadly on the 21st July 1937 the pioneering era of wireless telegraphy ended with the death Guglielmo Marconi from a heart attack. At Dorchester and many other stations flags flew at half mast. It is interesting to note that in spite of being owned by Cable & Wireless since 1930, the name 'Marconi' had remained above the entrance porch and was not removed until a respectable time after his death.

July 21st 1937 - Honouring Guglielmo Marconi

Employment

With its roots in the Marconi era, a number of staff had relocated to Dorchester from other Marconi stations in the UK and Ireland. The Marconi Company had been quite a 'close knit' organisation and even after the C&W takeover officials from the company paying the occasional visit would usually seek out former colleagues or workers for a chat about old times. Many employees were however recruited locally and C&W at Dorchester employed a large variety of skills.

Inside the building there were the technical staff that operated the transmitters, electricians who were responsible for a variety of electrical machines and equipment, mechanics who maintained the generators as well as the management and administration staff. In the workshop the fitters could fabricate anything required and their skills included turning, welding and even casting. Outside was the domain of the riggers who maintained the masts and antenna arrays, often having to climb the 287 feet from the ground up the iron ladder of a Beam mast. Copper smiths were responsible for the miles of coaxial feeder and other members of staff were employed for general labouring duties and the gardens. Of course at this time the workforce was almost exclusively male.



A group of manual workers, circa 1930

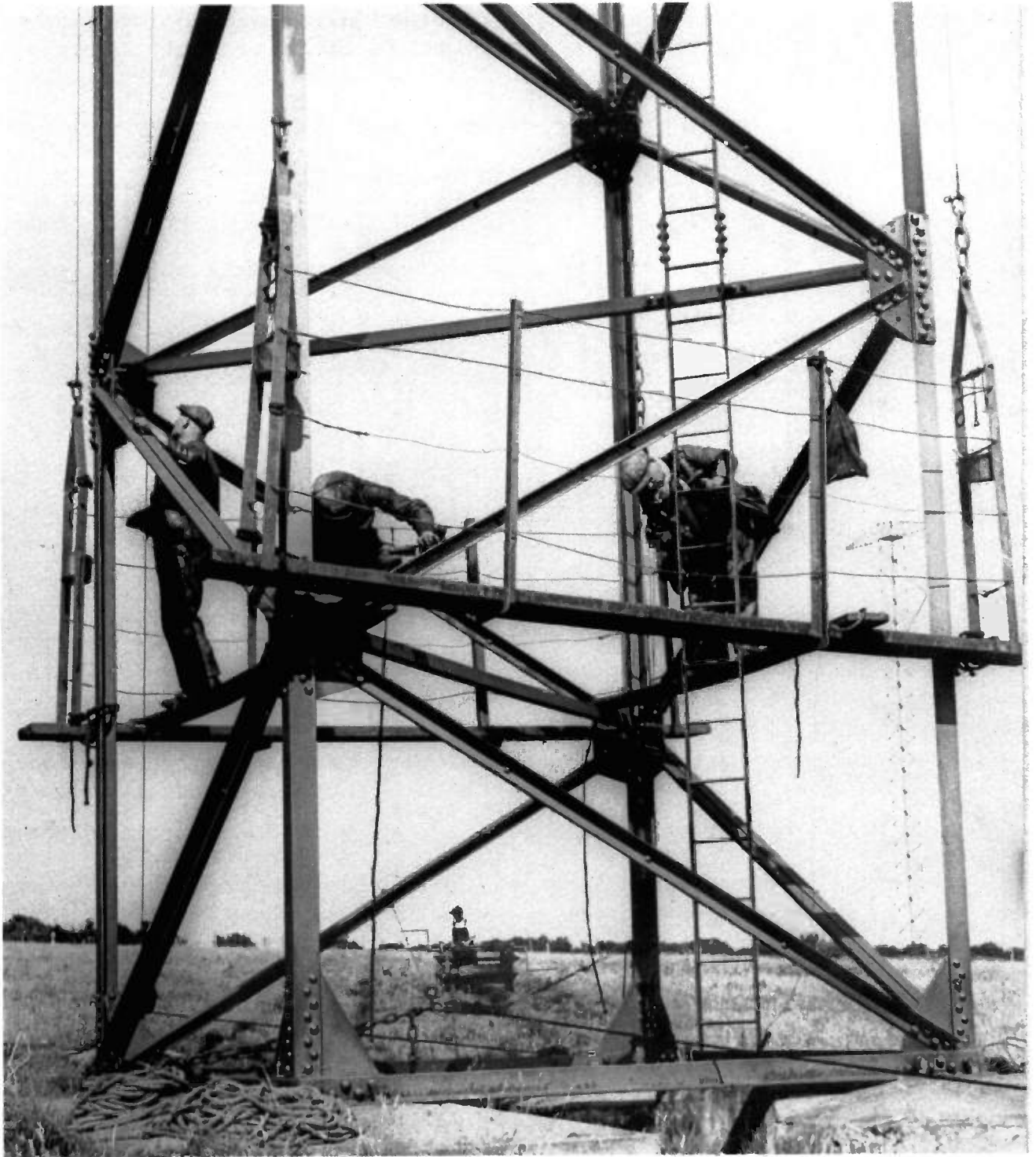
It is interesting to reflect upon the wages and working conditions at a radio station in the 1930's. With the depression people were glad to have a job and the telecommunications industry was a relatively good employer. In 1938 technical staff earned an annual salary of £300-400 depending upon seniority, manual workers earned a weekly wage of between £2-10s (£2.50p) and £4-10s (£4.50p) and the station manager earned a salary of around £900.



Rebuilding the power generators

Tightening the main bearings (above) and casting white metal for the small end bearings (right)

However, there was little in the way of a 'health and safety executive' so hard hats, 'toetectors', ear defenders and other protective clothing was not provided. Men working outside, climbing masts or digging post holes, wore hob nail boots, overalls, a cloth cap and maybe a 'sou-wester' if it was raining. In the transmitter halls protection from the high voltage supplies to each transmitter was minimal and staff had to be able to read and understand signs with 'DANGER' written on them! The cleaners had to check that a transmitter was switched off before they tried sweeping away cobwebs from the power wires suspended from insulators in the roof space. Accidents did happen but people were generally aware of the risks.



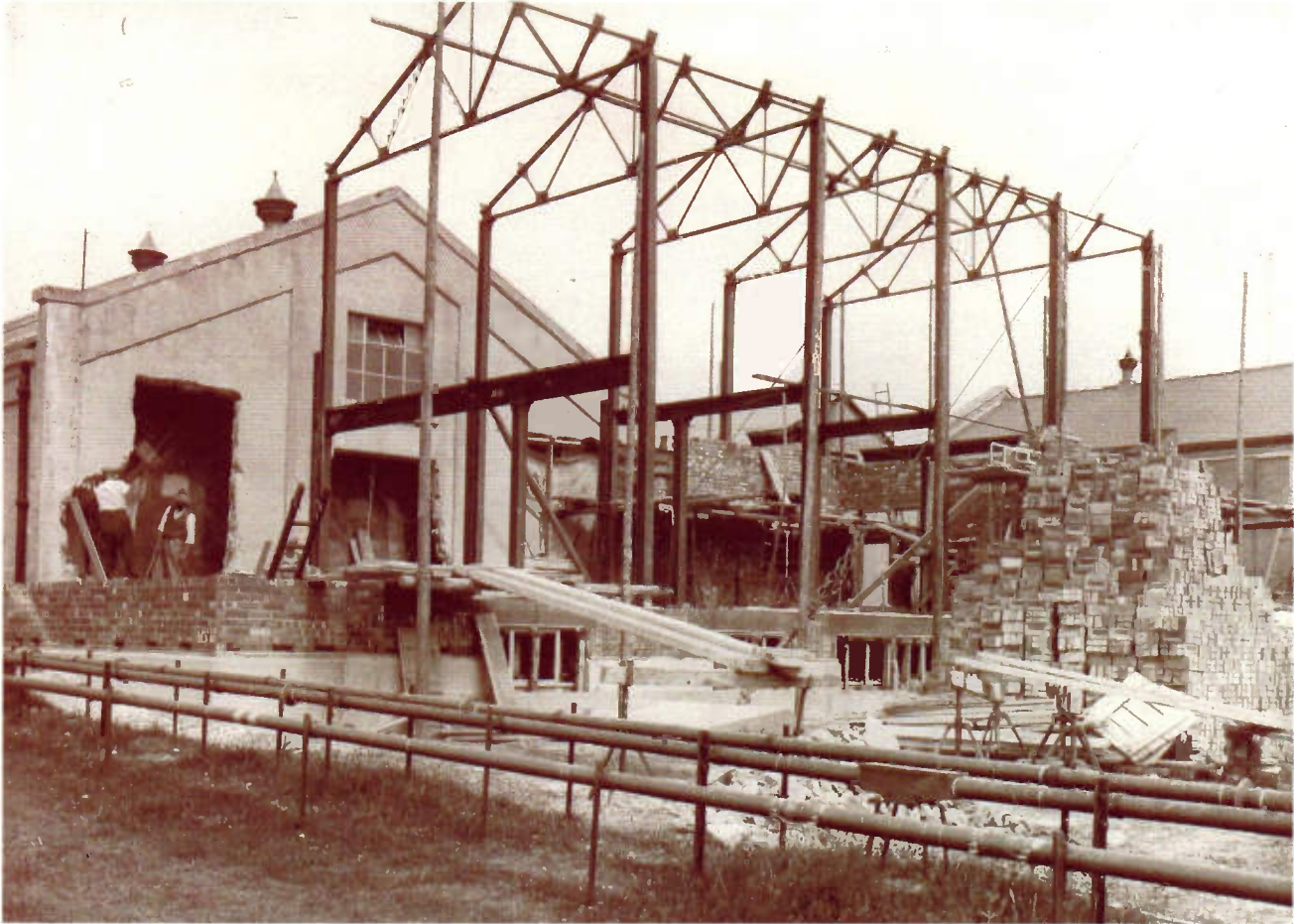
Painting a Beam Mast in 1938

Expansion

In 1938 a new transmitter hall was added to the existing 'lower hall'. This was part of a rationalisation that would result in the closure of Bodmin Radio Station and the permanent transfer of the Capetown and Montreal services to Dorchester. The new building had two floors and a basement. The upper floor was divided such that on one side of the building it formed a balcony over the ground floor and on the other side there were offices. The balcony was used for ancillary equipment, such as the modulator for the facsimile transmitter and the basement accommodated water tanks and electric pumps used for the cooling systems of the transmitters.

New Marconi transmitters were installed, these being the latest SWB8 and SWB8-10 types. In fact, the SWB8-10 was really a SWB8 used as a driver and the SWB10 part being a high power amplifier.

New antennas were also erected for the new services. The Beam antenna design was revised and a new horizontal diamond shaped antenna, supported from four masts, called the 'Rhombic' also first appeared at Dorchester.



Construction of the extension to the 'lower hall' in June 1938

The Second World War

Following the outbreak of the Second World War it was considered important to minimise the possibility of the station becoming a target for enemy bombs. At first some of the radio station buildings had their roofs painted in camouflage colours. This was not very effective so a more elaborate method was undertaken with a huge camouflage net supported by scaffolding enveloping the buildings. Where necessary the windows were also blacked out. During one winter however a heavy fall of snow wrecked much of the camouflage fabric.

Luckily no bombs ever fell on the station although there was one near miss. A lone German bomber believed to be returning to France from a raid on Bristol must have considered it worth while to take a pot shot at the station to lighten its remaining load, but the bomb landed in a nearby field. The blast broke a few windows and reputedly killed a rabbit.



The station with partially completed camouflage.

Although some staff joined the services during the war, many remained as telecommunication workers were a 'reserved' occupation. However, in keeping with staff at other radio stations and to 'do their bit' the staff at Dorchester formed a Home Guard Unit serving in this when not on duty at the station.

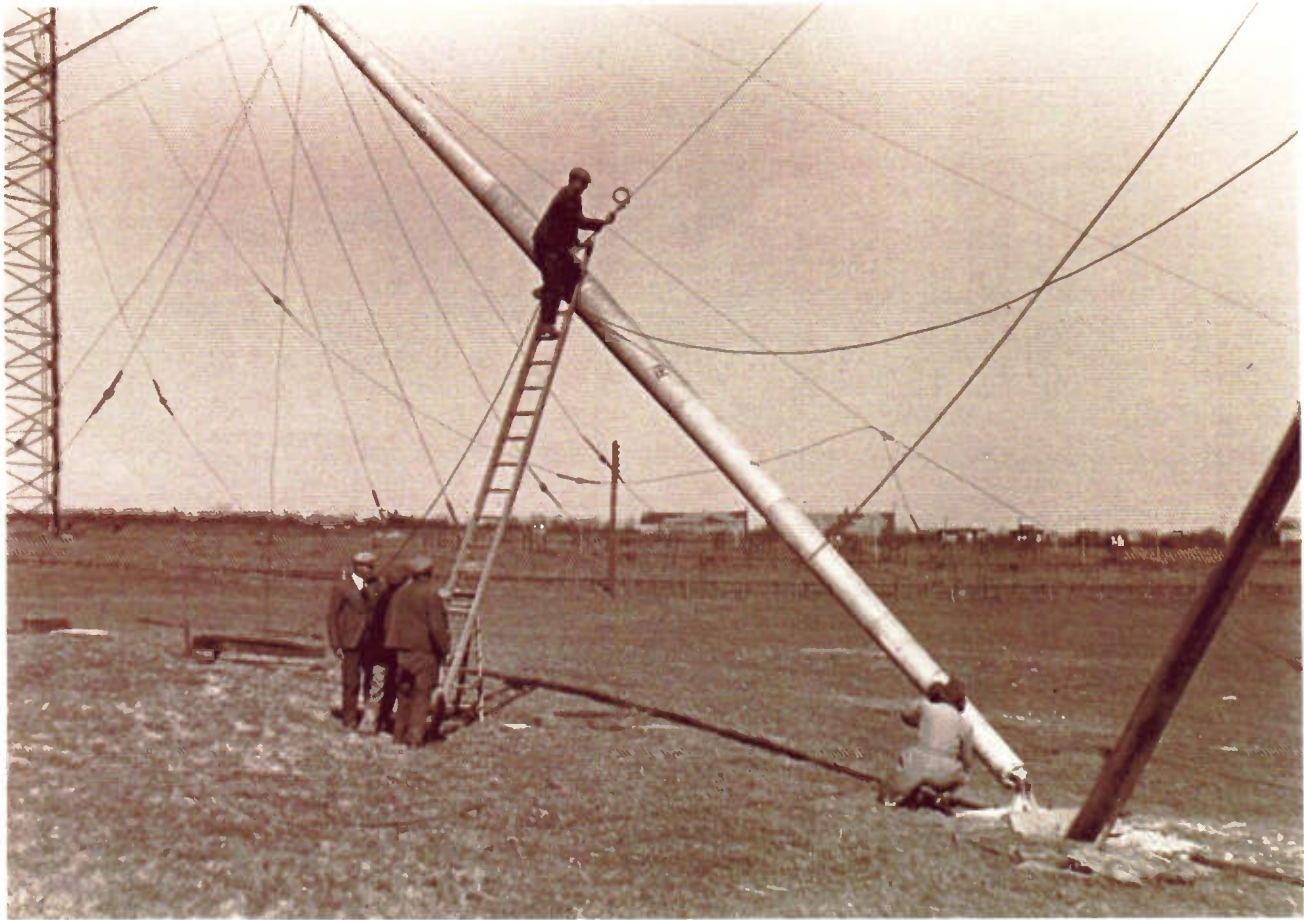


Dorchester Radio Station Home Guard Unit

The increased demand for telegrams by the press and government departments during the war lead to the further expansion of the main building and the erection of a new transmitter building half a mile south east of the main station, on the south side of the A35 road. Five new SWB8-10 transmitters were installed in what became known as 'B' Station and a novel feature of this new building was the remote control of the transmitters from the main building. With the new remote station being known as 'B' station it was logical that the main station became known as 'A' station.

In later years the control of transmitters from a remote location became quite common at many radio stations, but in 1941, this was another demonstration of novel technology at Dorchester. The development of this new remote control technology was part of a drive to reduce the man power requirements at radio stations, particularly at a time when a large portion of the available workforce was in uniform and otherwise engaged.

New services were required to Australia, Singapore, Barbados, Ceylon (Sri Lanka), and South Africa. These required new antenna arrays and hence the site expanded to cover 465 acres.



Erection of a new mast in the 1940's (above)

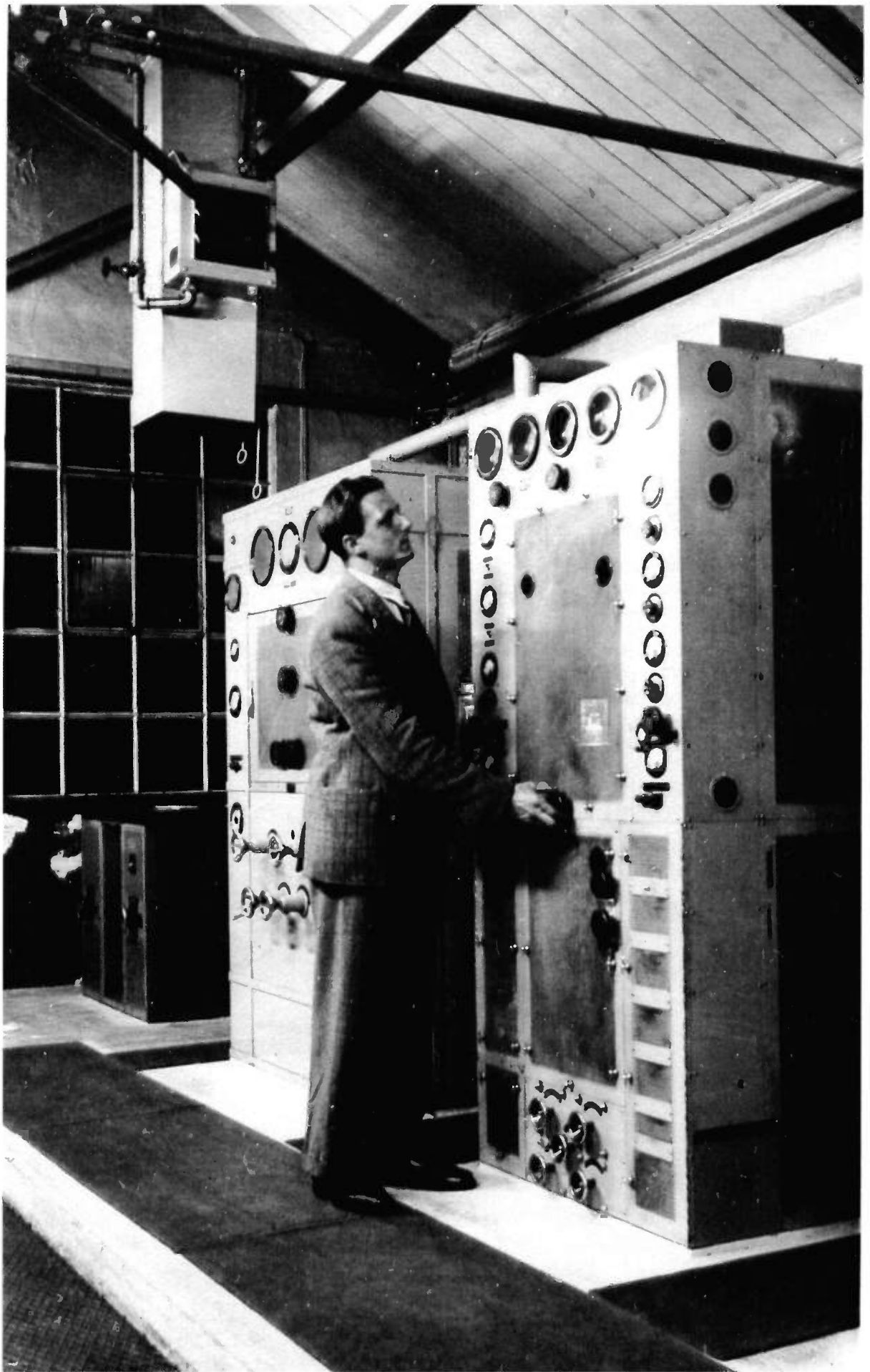
This is what happens to antenna wires in a 'real' winter! (below)

The Post War Years

The station may have escaped the wrath of the Third Reich during the war, but it did not escape the clutches of Mother Nature in the winter of 1947. Serious damage was done when a build up of ice on a large number of antenna wires caused the failure of several antenna systems. The 'outside gang' and Riggers had to work in freezing conditions to make repairs and minimise the disruption to the radio services. That winter also afflicted much of the country and many of the other C&W and GPO radio stations were similarly affected.

After the war, politically speaking, Britain took another direction with the nationalisation of many utility services. The international communications services became a target for state ownership and with the passing of the 1949 Telecommunications Act the C&W stations in the UK were transferred to Post Office ownership. The actual date of transfer to the GPO was April 1st 1950. After a short period of management by the 'Engineer in Chief's Department' the Post Office created the 'External Telecommunications Executive' a new management body to operate the international and maritime radio services. The terms of employment under the GPO meant that members of staff at the radio station were now civil servants.





Phil Savage Tuning 'No.11', a Marconi SWB8-10 transmitter



Radio Station Staff in 1955

The Post Office engaged in a huge programme of investment in international telecommunications. For Dorchester radio station this came in the form of an extension to 'B' station with four new 30 kilo watt transmitters, supplied by S.T.C. Ltd and the master oscillators in the Marconi transmitters were fitted with more modern replacements. The original Ruston Hornsby power generators were also replaced with two new English Electric 550kVA generators, being used only when the mains power failed.



The Power House with the New English Electric Generators



The station sign in the 1960's

New technology also meant that the high speed Morse telegraph systems were converted to teleprinter and growth in demand meant that single channel transmissions were upgraded to multi-channel frequency division multiplex systems. New services included Asmara, Accra, Lagos, Tangiers and Ascension Island.

The building was also extended with a new workshop for the riggers and a new canteen for the staff. The canteen was large enough to host social gatherings at Christmas and was regularly used when the Radio Station table tennis teams played matches in the local league.



S.T.C. 30kW Transmitters in 'B' Station

The Beginning of the End

With the development of long distance undersea telephone cables in the mid 1950's and the advent of Telstar and satellite communications in 1962 an end to short wave radio telecommunications came in sight. Now it was the turn of the radio stations to be overtaken by new technology.

Dorchester had been perhaps one of the least upgraded of all the Post Office radio stations. In 1963 the New York telegraph circuits were transferred to trans Atlantic cable and after 35 years of service the distinctive Franklin Beam antennas came to the end of their life. Dorchester lost a familiar landmark when the five original 'T' shaped masts came crashing to the ground in spectacular fashion. This was followed by the felling of the three Beam masts for the Australian service as that service was transferred to the new Commonwealth-Pacific, 'COMPAC', cable.

In 1966, in a reversal of the trend, the station took on three new services, these being teleprinter broadcast services for the Associated Press News Agency. Three new antenna arrays known as 'log periodics' were erected in the south east corner of the site near the junction of the A35 with the road to Martinstown. Three pairs of masts, the tallest pair being 300 feet high, supported each Log Periodic Antenna and these provided an arc of coverage from the Middle East to southern Africa.

The last two Franklin Beam masts, stripped of their antenna array, were felled in October 1967. Although this did not completely sever the link with the Marconi era as a number of the original 'Swab One' transmitters were still in operation.

The Final Decade

However, in 1970 the end really did come for the international short wave radio services. The Post Office re-organised their radio services such that all point to point international circuits were transferred to the more modern radio stations at Rugby and Ongar and the remaining stations, Leafield and Dorchester, were converted to handle the growing traffic in the long distance ship to shore service operated from the world renown Portishead radio station.

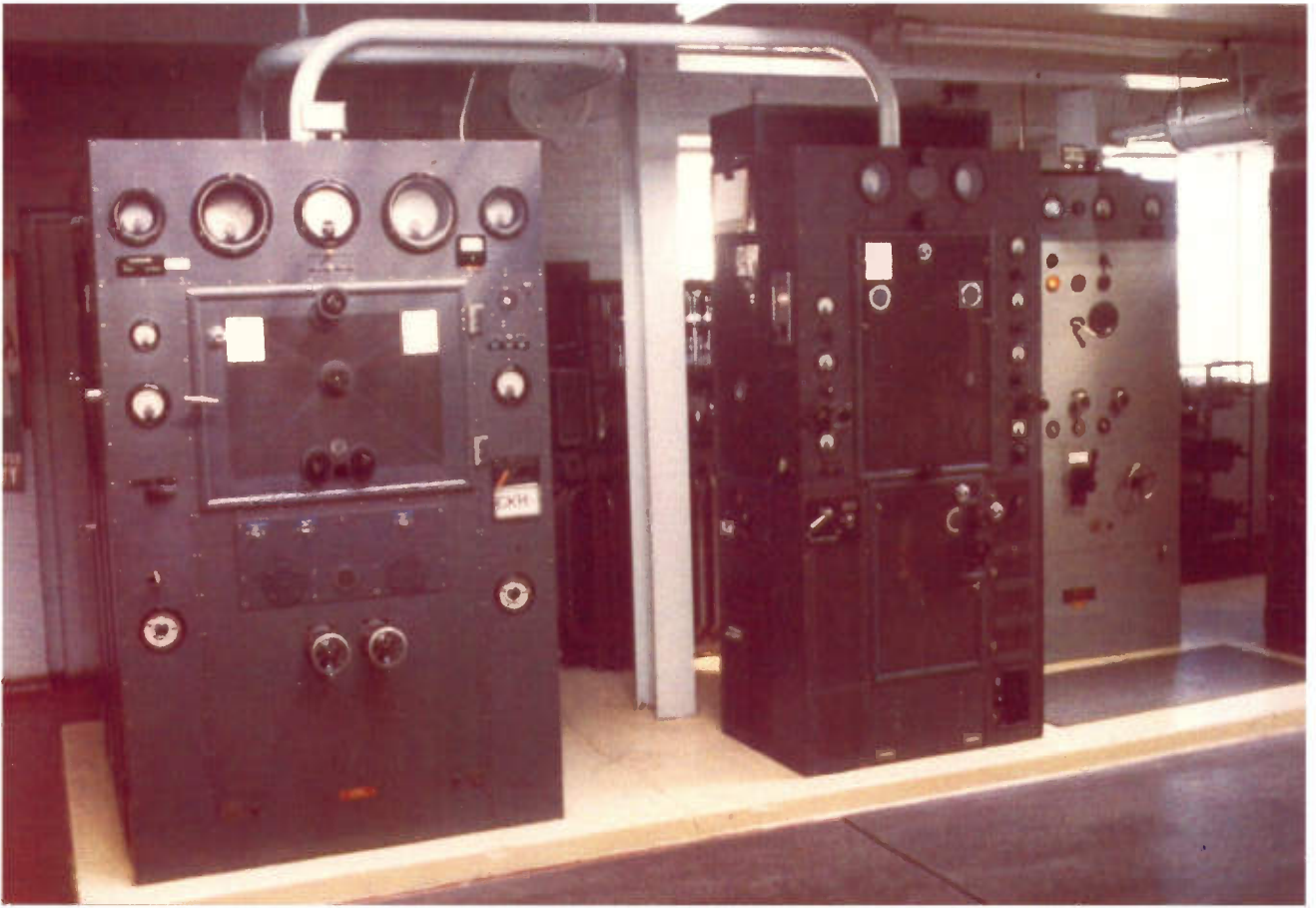
This meant a big change to Dorchester. The directional rhombic antennas were removed and replaced with new arrays of dipoles, a rotating log periodic and various conical shaped antenna systems, designed to provide a wider area of coverage more suited to long distance maritime communications.

In what may be seen as a retrograde step, a number of the transmitters were converted back to Morse code operation. The SWB8-10 transmitters originally installed in 'B' station in 1941 were either scrapped or used to replace older ones at 'A' station.

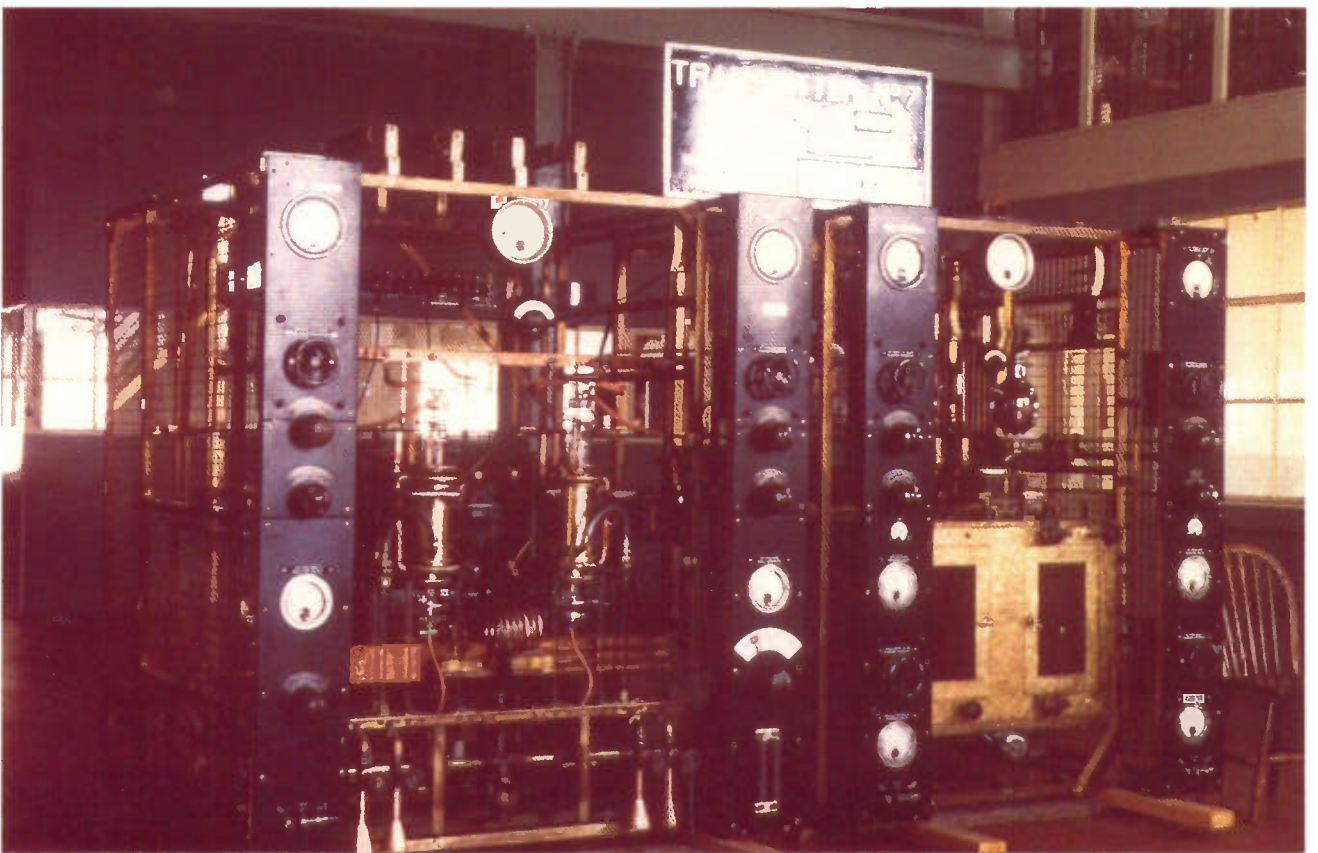
The remaining original SWB1 transmitters had been obsolete for years and were finally scrapped, with the exception of No.7. That transmitter was restored to resemble its original 1927 form for exhibition in the Kensington Science Museum, where part of it stands today. It is to the credit of Franklin and Marconi that these transmitters, from the dawn of short wave operation, remained in service for so long.

Once the station was up and running as part of the Portishead service it was quite successful and it continued operation until July 1979, at a time when satellites had started to have an impact on maritime communications. Even the better and newer equipped stations of Ongar and Leafield continued only for a few more years.

In 1977 the radio station enjoyed a 'Golden Anniversary', opening its doors to the public and local dignitaries to provide a glimpse of its workings and an exhibition of radio communications.



Marconi SWB 8-10 Transmitter (No.17) operating call sign 'GKH' for the maritime service



Transmitter No7 restored to 1927 condition prior to shipment to the Science Museum

Dorchester radio station lived for 52 years and if you have ever been to a transmitting station you will understand the word 'alive'. The constant hum of transmitter cooling systems, water pumps and fans, the glow from the PA valves and the musty warmth that emanates from a couple of dozen high power transmitters gave the place a 'feel'. Certainly, after the station was shut down the building felt cold and empty. The closure of Dorchester and other similar stations was a result of technological progress and was the end of an era.

The Old Beam Station in 2004

Twenty five years have passed since the last transmitter was finally switched off and the station fell silent. In 1979 the remaining masts were removed and once again agriculture became the primary use of the surrounding land. Inside the station the transmitters were scrapped and the building lay empty and neglected for a few years.

However since 1984 the station has been back in the communication business, this time in the form of the printed word. The current owners are the Friary Press and are responsible for the production of a wide range of printed material including high quality magazines, brochures and other promotional material. To accommodate the growth in its business the Friary Press have expanded the building, although it is pleasing to see that this has been done in sympathy with the original Marconi architecture. Where the building once hummed to the rhythms of radio transmitters it is now alive with the rhythm of printing machines.



Printing machines now occupy the old radio station power house

There is one final story to tell. During a recent visit by the author to the old station it was reported that staff at the Friary Press regard the lower hall basement as a rather spooky place, used only for storage and somewhere they try to avoid due to its 'strange presence'. Unknown to most people, just over fifty years ago a member of the radio staff sadly took his own life in this rather dark place. Any conclusion is left to the imagination of the reader!



1935 View From Maiden Castle

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The Station in 2004