



THE ORIGIN OF THE BS 1363 PLUG AND SOCKET OUTLET SYSTEM

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THE BRITISH ring final circuit system and BS 1363: 13 A plugs, socket-outlets, connection units and adaptors plug and socket-outlet system were introduced into the UK in 1947 following many years of debate which began in June 1942 with the first meeting of 'The Electrical Installations Committee' of the IEE. This committee was formed by the Minister of Works and Planning, Lord Reith: "...with the object of securing a comprehensive and co-ordinated review of building techniques for the guidance of those who would be responsible for the direction and organisation of building after the war."

Part of the Terms of Reference were "to review existing information and practice concerning installations in buildings".

The committee held 22 meetings between 1942 and 1944 which resulted in the publication of 'Post War Building Study No. 11 – Electrical Installations' in January 1944 and the 'Supplementary Report' in July 1944.

This study is by far the most significant process which led to the UK ring final circuit and which resulted in the development of the BS 1363 13 ampere fused, flat-pin plug and socket-outlet system by BEAMA. The Study is very detailed and covers the whole area of electrical installation, not just plugs and sockets. It makes very clear the reasoning process at the time which led to our present system of plugs and sockets.

The study is remarkable in terms of its foresight – it refers to such topics as energy efficiency and environmental protection, and makes proposals for single pole fusing, a novel compact design of consumer control unit, the cooker control unit which we are familiar with today etc., and even proposed that: "The haphazard arrangement of different pieces of equipment of odd types and sizes attached to walls in positions regardless of convenience or appearance should no longer be tolerated" – which we are still waiting for in many premises today.

Revolutionary outlook

In its day, it must have been almost revolutionary in its outlook with many radical proposals aimed at providing improved amenities in post-war housing.

The reasons for proposing a radical change in wiring practices were made clear:-

Experience had shown that the existing 2, 5 and 15A BS 546 socket-outlets were: "...wholly unsatisfactory from the standpoint of the convenience of the consumer. The absence of an intermediate size between 5 and 15 amperes and the cost and dimensions of the 15 ampere [plug], have contributed

to the use of non-standard socket-outlets and plugs to fill a gap in which there is substantial demand.”

BS 546 is entitled: *Specification. Two-pole and earthing pin plugs, socket-outlets and socket-outlet adaptors.*

Improved safety was of course a major objective of this whole exercise. Particular reference was made to children and the need for shutters and to the reduction of the likelihood of damage by flush-mounting and by mounting well above floor-level.

Recognition of the rapid moves towards the use of more and more electrical appliances in the home with the resulting need for a multitude of socket-outlets in post-war housing which the ‘new’ ring-circuit could provide was a major factor. Even in 1944, there was concern over “...the rapidly increasing number of these small consumption appliances...”.

The emphasis throughout this study has been the economical provision of many sockets-outlets as well as the supply of heating loads. The Study states: “the installation should allow the occupier to use electricity, if he so desires, for providing ‘topping up’ heat. Bearing in mind the limited cubic capacity and the load diversity of the small dwelling under review, it is considered that they could be adequately heated electrically using portable or inset electrical fires or convector up to 2 kW rating from the ring circuit.

“This [substantial demand] applies to the smaller classes of dwellings in which 2 kW radiant electric fires are commonly used, and in which fires or other appliances exceeding this rating are seldom required due to the limitations imposed by the size of the room.”

The ring final circuit

It was decided during this study that the alternative of providing a separate circuit fused at 15 amperes for each principal room which would feed all socket-outlets in that room: “is attractive as compared with pre-war practices but is less flexible in installation than the ring-circuit, provides less flexibility in loading and, except possibly in the smaller type of house, is not so economical.”

It was realised that a post-war Britain would continue to suffer from a massive shortage of raw materials and it was estimated that the proposed changes to the ring-circuit and single-pole fusing would show a saving of approximately 25% compared with pre-war regulations. The opportunity to improve both consumer safety and convenience due to the interruption in new building during the war and the massive programme of building which would be required after the war was recognised at an early stage. Initially, a majority favoured a new British

Standard for a 10 A, fused, shuttered socket-outlet and a plug with round pins conforming to BS 546. The final unanimous decision was for a 3 kW (230V; 13 A) socket-outlet with fused plugs.

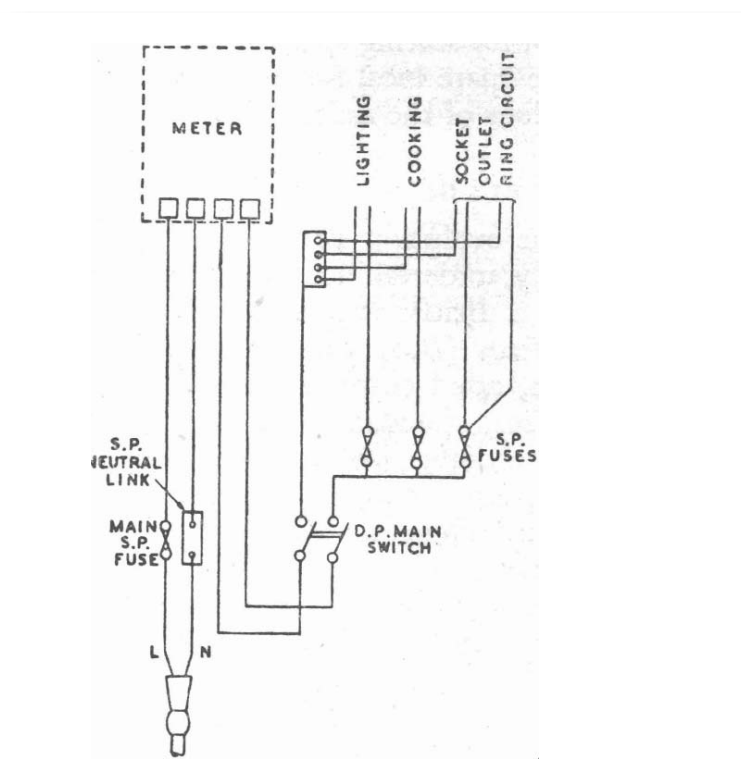
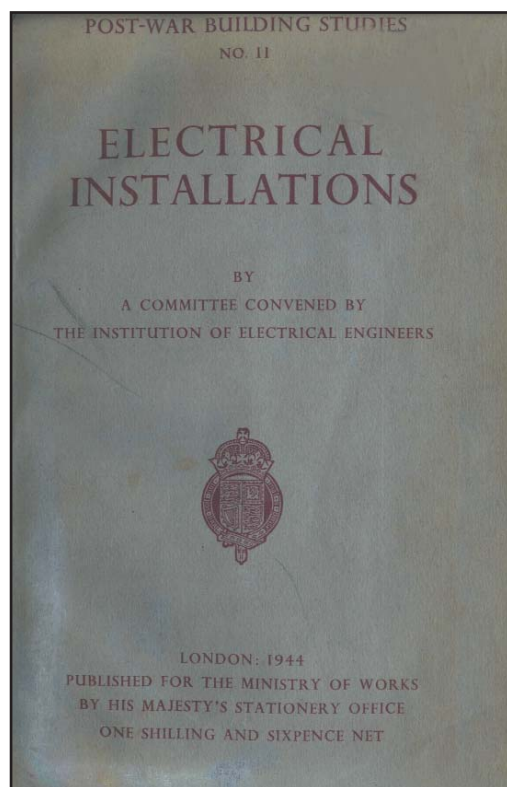
BEAMA were invited to propose suitable designs or standards which they accepted.

The following observation was made in the report: “The general benefit to be obtained from the widest use of a single standard is so great as to call for the subordination of individual preference, or even of comparatively minor technical consideration, to the choice of the alternative most likely to meet with general acceptance.” This is just as valid today as long as safety is assured.

Much has been written about ring final circuits and BS 1363 accessories since the second world-war. Of particular interest is ‘*Ministry of Works Technical Note No. 4*’ published in 1957. This pamphlet begins in its opening paragraph: “Socket-outlets should provide a safe and convenient means of plugging in portable appliances to the electric supply, but unfortunately they have long been regarded as an expensive luxury and it is sometimes wrongly thought that economy can be achieved only by reducing their number. Nowadays, however, because of the increasing use of domestic electrical equipment, more socket-outlets than ever before are needed.”

Later in the pamphlet the danger of too few socket-outlets is again highlighted where householders are tempted to use trailing sockets which become regarded as permanent wiring, but are susceptible to damage and present a serious fire and shock risk. As regards to the ring-circuit and BS 1363 accessories, the pamphlet continues: “The ring circuit system of wiring takes full advantage of domestic load diversity because one circuit serves an unlimited number of standard socket-outlets (BS 1363 type of 13 Amp rating) which may be used at any time and added to after if required. A large fuse at the meter end of the installation that has to be capable of carrying the full load of current drawn from several socket-outlets at once may not protect a flexible cord leading from an individual socket. The way to ensure adequate and selective protection is to connect each flexible cord to a separately fused plug.”

The pamphlet highlights cost-savings between the pre-war system where a typical 3 bedroom urban home would require at least nine 15 amp fuses whereas a ring-circuit system required one 30 amp fuse for the required number (15 in this case) of socket-outlets. Although modern radial or tree circuits can supply more than one socket-outlet, they



would still require more overcurrent protective devices, a larger consumer unit, more cable and are usually more expensive to install.

The pamphlet emphasises that the ring circuit system required 30% less cable and can save about 25% in the cost of the wiring of a house and concludes: "There is no doubt that in modern domestic premises that are to be adequately provided with electric points, the cheapest and safest system is to use a ring final circuit."

Modern wiring needs are obviously different to what was envisaged in 1944 but (apart from the even greater increase in small portable appliances originally seen as a justification for ring final circuits) the main change has been the increase in size (i.e. area) of installations which utilise ring final circuits. The reasoning in 1944 centred on the tendency before the war for an increase in small domestic dwellings with an expectation that this would increase after the war. The emphasis was on a new system for housing that would allow a multitude of socket-outlets without a corresponding need for many final circuits. Remember that pre-war usual practice was to supply a single socket from one fuse and to use different size plugs and sockets (usually to BS 546) to ensure that the maximum allowable current loading of

Above left:
Study no 11

Above right:
Circuit diagram for a 1944 house, including a ring final circuit, from Study no 11

the flexible cable and appliance was not exceeded so as to provide overload protection. Not until the 12th Edition of the Wiring Regulations did the UK accept the Continental practice of increased risks of damage in radial circuits due to overload and small over-currents due to the rating of the overcurrent protective device being greater than the rating of the flex and appliances.

The Post-War Study could not have foreseen the massive increases in commercial wiring needs in offices due to information technology. The sophisticated wiring systems now available (e.g. perimeter trunking, underfloor powertrack systems) mean that large numbers of socket-outlets are required. Ring final circuits are often used in such installations and a BSRIA report commissioned by the DTI in 1994 shows clearly that ring final circuits cost less to install than the equivalent radial circuits.

The British plug and socket and ring final circuit system has proven itself over many years. Its development was due to the recognition of an opportunity seen by leaders during a time of war and mass destruction. A truly unique, innovative, world class system was developed by people of vision. A system that cannot be equalled in terms of safety, performance and convenience. ■