N.I. (G.P.) (59) 18

PC.PS/P.41

THE ELECTRICAL DISTRIBUTION SWITCHGEAR

FOR

THE RUTHERFORD LABORATORIES

1. The original estimate included a sum of £400,000 for Mechanical and Electrical services, of which £20,000 was for the provision of the distribution switchgear for the main motor alternator set and laboratory services. The estimate was based on general information as at that time, the specification for the main alternator set had not been written nor had the services been considered in detail.

2. The information on which the estimate was based in November, 1957, is as given in Appendix 1 and, since that date, there has been no revision of estimates under this sub-head.

3. The appendix brings out the following points :

3.1 The pulsating nature of the load has necessitated a separate feed from the Grid so as not to induce too great a voltage variation on those A.E.R.E. and Rutherford laboratories which are sensitive to voltage fluctuations.

3.2 Two separate drive motors, each of approximately 5000 H.P. replace the one single unit initially proposed

3.3 For greater mechanical reliability, the self-driven cooling fans on the alternator shafts have been replaced by motorised units. There are eight such fans each of 55 H.P.

3.4 There have been increases in the proposed rating of Experimental apparatus, notably the 4 megawatts of D.C. power required by the Bubble Chamber.

3.5 The continual increase in number of circuits on the medium voltage (415 V) Board and the space limitation in the Alternator House has lead to a redesigned distribution system. This scheme utilises an Oil Circuit Breaker switchboard with fusegear panels which would permit further extension to the limit of the transformer capacity, which can be accommodated. Further fusegear distribution panels are used at the load centres.

The provision of the new 11 KV switchboard to cover 3.1 to 3.4 is estimated at £13,000 and the modification to the 415 V switchboard under 3.5 at £5,000.

4. An examination has been made of other estimates and these increases cannot be offset by savings anticipated elsewhere.

5. As proposals for the beam transport system develop, a further 3.3 KV distribution board will be necessary in the Experimental Area. The cost of this cannot, at present, be

properly estimated and this will be the subject of a further submission.

6. It is suggested, therefore, that consideration be given to these proposals and that the Civil Estimates Mechanical and Electrical section be increased by a sum of £18,000 to cover this increased requirement.

P. BOWLES

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Engineering Division,
10th JUNE, 1959

7 GeV PROTON SYNCHROTRON

ELECTRICAL SWITCHGEAR.

1. H.T. SWITCHGEAR

Figure 1 is a single line diagram shewing the layout of 11 KV and 3.3 KV switchgear (a) as envisaged in November 1957 and (b) as proposed now.

(a) Assessment in November 1957 of the P.S. power demand

i) A motor alternator set of up to 10,000 HP fed at 11 KV from a single driving motor

ii) A 3.3 KV switchboard supplying motor generator sets, the 3.3 KV supply being obtained from an 11/3.3 KV transformer of about 5 MVA capacity

iii) Approximately 2 MVA of medium voltage load fed by 2 x 1 MVA 11/0.415 KV transformers.

iv) A temporary demand of 1 MVA at 11 KV for magnet sector testing. The 11 KV supplies for this scheme were to be taken from Substation 10, reinforced with the necessary 11 KV cabling from Substation 1.

Spare switchgear panels already installed in Substation 10, along with one new unit, provided the required 11 KV switchgear for the project.

(b) Present proposals

i) Due to the large pulsating load involved and to keep the system voltage variations within tolerable limits, it is now proposed to supply the main power requirements of the P.S. from its own 132/11 KV 20 MVA Grid transformer. This necessitates the provision of a new 11 KV switchboard.

ii) Two main drive motors are being installed, each supplied with its own 11 KV feed.

iii) Two rectifying equipments provide a D.C. supply for the excitation of the alternators. Each rectifying equipment has its own 11 KV supply.

iv) The alternator ventilation fans are fed from a separate 11/0.415 KV transformer.

v) Two 11 KV supplies from substation 10 have been installed for magnet testing.

Apart from the provision of a separate 11 KV switchboard, there is an increase of 6 11 KV switch units, one of which will be supplied by the G.E.G.B., The extra cost is estimated at £13,000.

2. M.V. SWITCHGEAR

It is wished to make provision for the future installation of a third 1 MVA transformer to feed the 415 volt P.S. board. As originally planned, the 415 volt board was a combination of OCBs and switchfuse units. Space considerations limit its further expansion and it is therefore proposed to instal, instead, a MV switchboard consisting entirely of OCBs. This will provide the current rating capable of exporting the output of 3 x 1 MVA transformers at 415 volts.

The extra cost is estimated at £5,000.

7. GeV PROTON SYNCHROTRON FIGURE 1.

FIGURE 1(a) 11 KV AND 3·3 KV LINE DIAGRAM AS SEEN IN NOVEMBER 1957.

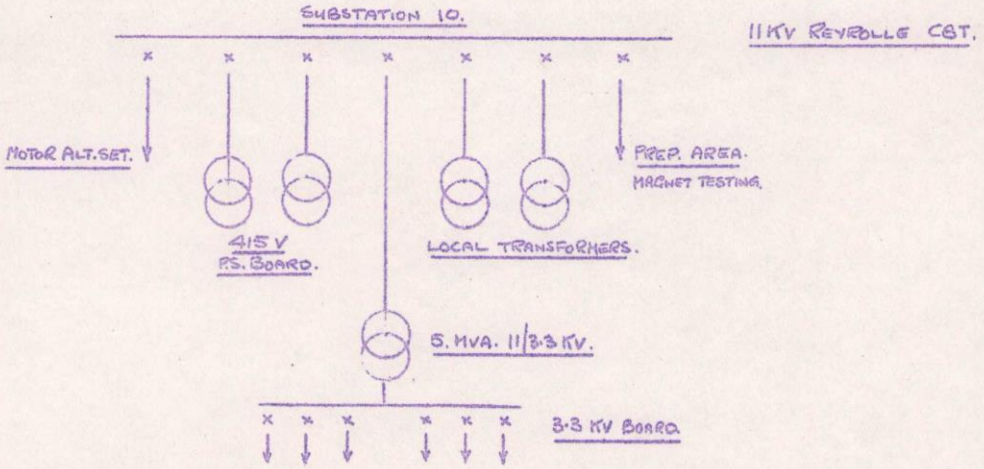

FIGURE 1(b) 11 KV AND 3·3 KV LINE DIAGRAM SHOWING PRESENT SCHEME.