

Rutherford Laboratory Building CommitteeD.C. Power Supplies for VEC Ion Source Test Magnet in Heavy Lab. - Bldg. R.251. Introduction

This paper makes a proposal for a new generator house situated on the east side of the Heavy Lab., as shown in Fig.II, to house the motor-generator sets which are to supply D.C. to the magnet of the VEC Ion Source Model, and also the provision of the necessary A.C. power. The completion date required is 20th May, 1963, and to meet this date work must proceed immediately.

A detailed estimate of the costs is given in Appendix A, but the overall order of the proposal is:-

Moving 4 M-G sets	£ 500	
Building and A.C. power	£6600 to £7800	token estimate by SWO
Fees - say 15%	£ 975 £1170	
Total	£8075 to £9470	

2. A.C. Power Supply

The overall demand for 415V 3 ph. power in the Heavy Lab. exceeds the installed capacity. Further bulk demands, such as the 240 KW D.C. required for the VEC Ion Source, creates a need for a new and separate provision.

Two sources of extra power are readily available:-

Source (a) an 11 KV feed from Sub.12 to a splitter switch in the north west corner of the Lab. and which already powers. Model V.

Source (b) capacity is available from the 11 KV/3.3 KV transformer in Sub.13.

Power from either source will require a new transformer and feeder cable.

Source (a) is not recommended for the following reasons:-

1. Model V is scheduled for considerable use in the near future.
2. The power unit, which at present feeds Model V, is being modified to allow a 2500 amp. D.C. supply to be available for future work, particularly in the Magnet Group's area. Such work could necessitate fairly frequent shut down of the feeder.
3. It is considered inadvisable to add to this source a further large demand with different load characteristics and from a different Group, owing to the protection and control requirements.
4. The possibility of coincident use arising.

Although Source (b) will require a circuit breaker truck, the skeleton and chamber already being available in Sub.13, and also its power will be subject to the $\frac{1}{2}$ -1% voltage swing arising from Nimrod pulsing, it is recommended that this be adopted to avoid the difficulties mentioned above.

3. Recommendation

Two alternative methods for providing the power of 3000 amps. at 80V D.C., have been considered.

Scheme I a static rectifier set.

Scheme II a motor generator set or sets.

Scheme I is not recommended for the following reasons:-

1. A static rectifier set for this duty would cost not less than £5000.
2. It would require an extension of present designs and experience has shown that this has given rise to considerable development on each occasion.
3. Delivery is unlikely to be before mid August 63.
4. The pulsating nature of the A.C. supply available makes the stabilisation more difficult and costly.

Scheme II Use of Existing Generator Sets

It is therefore recommended to use four motor-generator sets at present available in the Preparation Area, Building R.2, with the following advantages.

1. These sets with their associated control and output busbar system have a combined output of 3000 amps. 80V D.C. and are at present redundant.
2. The 1% pulsing of the A.C. input will not affect them because of the flywheel effect of the rotating parts.
3. The Institute already has considerable experience of stabilising this type of M-G set and does not expect any difficulty.
4. The use of these machines avoids:-
 - (a) valuable equipment being unused.
 - (b) useful laboratory space in R.2 being sterilised or alternatively considerable storage space being necessary.

4. Generator House

A separate generator house is recommended for the following reasons:-

1. Valuable laboratory space in R.25 will not be absorbed.
2. Noise arising from the generators will be greatly attenuated and discomfort to users of the laboratory will be avoided.
3. The building will also house a 2000 cycles/sec. 10 KVA motor generator set which has a high noise level.

Based on the above SWO produced a scheme and an estimate of the costs. The building is shown in Fig.I and provides 525 square feet of floor area, access between itself and R.25, the transformer compound and oil drainage arrangements.

5. Completion

With care, some overlap of the completion of the building and the moving of the M-G sets, should be possible and a final completion date of 20th May, 1963. should be just attainable, but a more realistic date would probably be early June 63.

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Appendix A

Summary of costs and completion dates based on power Source (b)

A.C. Supply:-	Transformer compound, drains and oil sump.	}	£ 900	to	£1200	} These costs do not include SWO fees.
	Transformer, cable, breaker, isolator and dis. board.	}	£2500	to	£3000	
Total costs common to rectifier or M-G set			£3400	to	£4200	
<u>Scheme I</u>	Rectifier set in Heavy Lab.		£5000			
Total			£8400	to	£9200	

Completion of this scheme is entirely dependant upon delivery of the rectifier set, not before mid August 1963.

Scheme II 4 M-G sets and separate building

Estimated cost of building, including M & E services, access door to R.25	}	£3200	to	£3600	} These costs do not include SWO fees.
A.C. supply (as above)		£3400	to	£4200	
Estimated cost of moving MG sets		£ 500	to	£ 500	
Total		£7100	to	£8300	

Completion:- Building including transformer pit and A.C. supplies,
3 months from order.

Moving M-G sets, 1 month.

FIG.1

R25 HEAVY DUTY LABORATORY

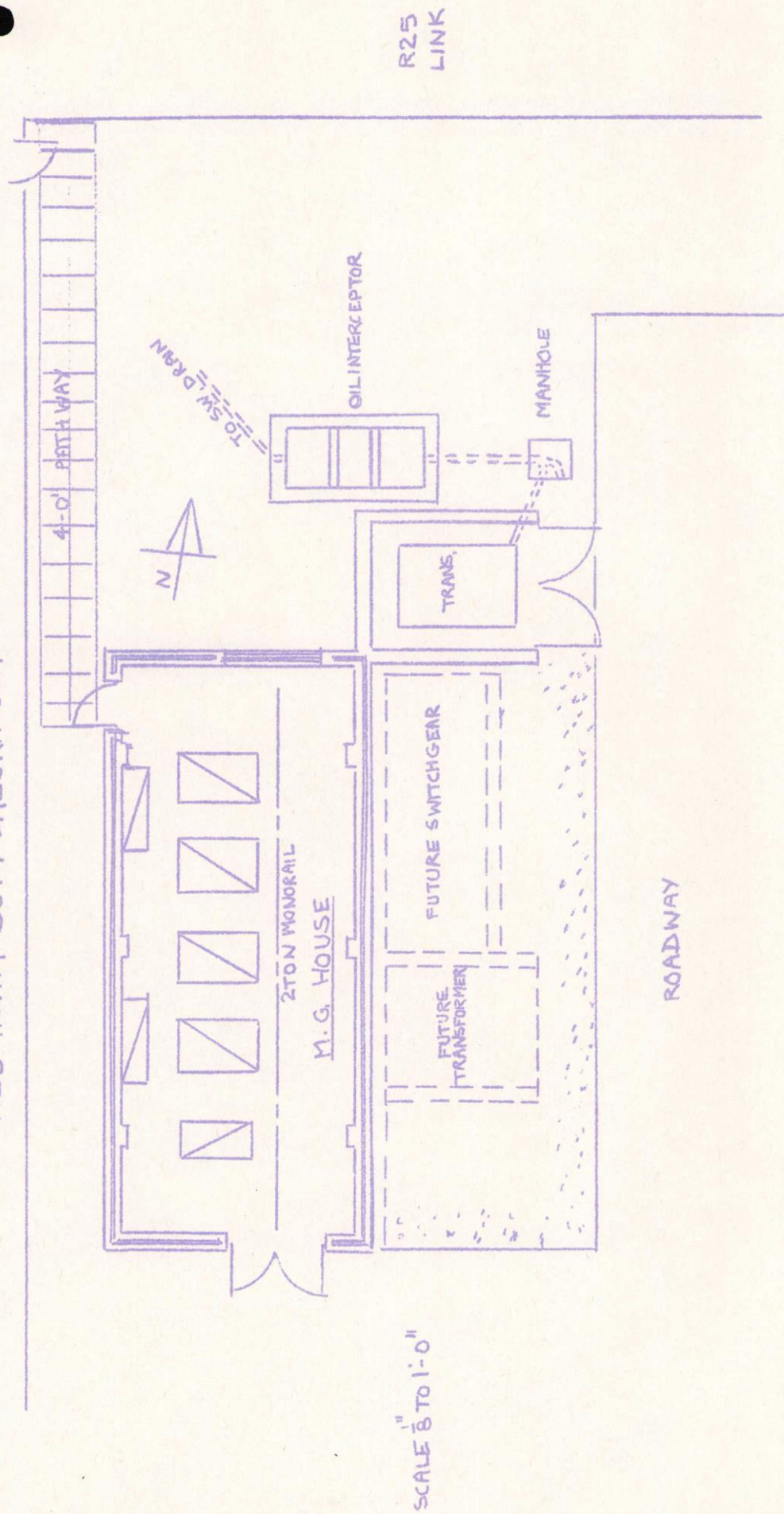
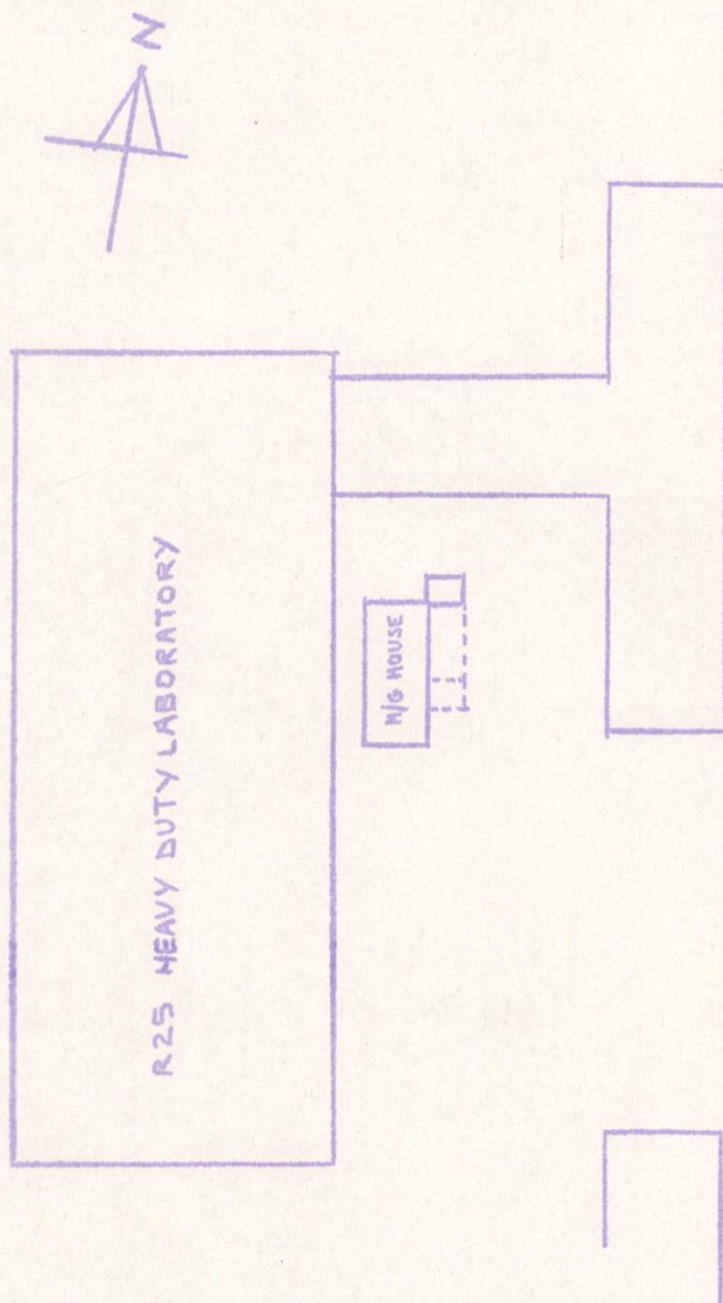


FIG. 2



KEY PLAN N.T.S.