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NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

7 GeV PROTON SYNCHROTRON PROJECT

Additional Earth Shielding for the Main Building

This paper requests financial approval to the extent of £25,000 to provide an extra 10 feet of earth shielding over the main building. It is considered that this additional earth shielding will ultimately be required to achieve the standards required for non-occupational workers. A saving of £8,600 will be made if approval is given to execute this work within the term of the present Civil Contract.

1. The design allows for a roof of 6 feet 2 inches of concrete (density not less than 145 lb/cubic foot) with earth cover of 7 feet (density not less than 80 lb/cubic foot). It will be recalled that the design of the Magnet Room was changed at a cost of approximately £100,000 so that the thickness of the earth cover could be increased by 10 feet should radiation monitoring prove this to be necessary.
 2. During consideration of the foundation design our Civil Engineering Consultants asked for a decision on earth shielding in order to set the initial floor levels to give the minimum inconvenience due to subsequent settling. Cost estimates were requested for an additional 10 feet of earth shielding, as it was recognised that it would be more economical to provide the earth cover now, whilst the Civil Engineering Plant and Equipment is available, than in several years, after the machine has been operating at maximum energy. It was recognised, however, that there should be good technical grounds for the additional expenditure. In this connection Dr. Lindenbaum from Brookhaven visited Harwell to discuss the radiation problem and he stated that he would regard the present shielding as just about adequate but certainly not excessive. He was of the opinion that the extra shielding would be required ultimately if the full potentiality of the machine were achieved, in an area where standards for the non-occupational worker are enforced.
 3. The additional earth would be required to rise up at the angle of repose, reaching the full extra thickness of 10 feet over the centre line of the Magnet Room columns, and extending over the outer area of the Magnet Room and down the embankment maintaining 10 feet thickness perpendicular to the angle of repose.
 4. The cost of providing the shielding and retaining walls is as follows:

If the work is done during the present Civil Contract	£25,000
If the work is done after completion of the machine	£33,600
- The approved estimate of £1,300,000 for the Building and Civil Engineering does not allow for this additional earth shielding and if work is to proceed, an increase of £25,000 in the estimate will be required.
5. General consideration has been given to the problem and it is now proposed that the shielding should be added during the present Civil Engineering Contract. Our reasons for arriving at this recommendation are:
 - 5.1 It is considered that an extra 10 feet of earth shielding will ultimately be required for protection against excessive external radiation.

- 5.2 A saving of £8,600 will be made by doing the work within the term of the present contract.
 - 5.3 It is preferable to take up the major settlement prior to the initial levelling of the Injector and Vacuum System.
 - 5.4 The additional loading of earth on the foundations would allow the simultaneous removal of all pre-loading magnet blocks, which would permit more rapid concrete dressing to take place in the experimental area prior to the building of the shielding wall. This would give more freedom to the Magnet Erection and Testing Teams in the Main Magnet Room.
6. It is therefore recommended by the Project Committee that:
- 6.1 The earth shielding be increased by 10 feet.
 - 6.2 Financial approval be given to the extent of £25,000.
 - 6.3 The work be completed within the term of the present Civil Engineering Contract.

D. W. Fry
Chairman, Project Committee

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