

5th July, 1961

- Two issues*
- (1) Value of work.
 - (2) The content of expenditure on the contract.
- 3 Approval.

NI/GP/61/38

At one time I feared that the value of work may of been a success of money approved. This has been evaluated & work done to be done is within estimate. It will however be necessary to raise the limit of the contract to that indicated in estimates.

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

GENERAL PURPOSES COMMITTEE

Nimrod M & E Building Services

" In case of the Berry contract the investigation is complete, & all details are in agreement. (1) In case of Bailey & Co. little more investigation required.

1. Contract with N.G. Bailey & Co. for Electrical Installation

In November 1960, paper NI/GP/60/45 sought approval for an increase in the limit of expenditure on the Contract with N.G. Bailey & Co. The increase was approved but the Committee requested further details to be submitted by the Southern Works Organisation when the investigation then in progress was completed.

The attached paper by S.W.O. gives details of the commitments under this contract and takes into account all requirements of the client known to S.W.O. Many of the requirements were not known at the time the contract was placed in August, 1958, neither was it evident at that time that the whole of the electrical installation work would be undertaken by this contractor.

The anticipated final cost of £126,000, approximately, is within the sum of £130,000 included for electrical installation in the Treasury Approved Estimate.

2. Contract with Z.D. Berry for Pipe Work Services

In November 1960, paper NI/GP/60/45 sought approval for an increase in the limit of expenditure on the contract with Z.D. Berry. This increase was approved but the Committee requested further details to be submitted by the Southern Works Organisation when the investigation then in progress was completed.

The attached paper by S.W.O. gives details of commitments under this contract and takes into account all requirements of the client known to S.W.O. Many of the requirements were not known at the time the contract was placed in September 1958, neither was it evident that the whole of the pipe work services would be undertaken by this contractor.

The anticipated final cost of £132,000, approximately, is the sum included for pipe work services in the Treasury Approved Estimate.

P. BOWLES

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Harwell.

Circulation - to Members of the G.P.C.
Members of the Governing Board for information

7 GeV Proton Synchrotron

Contract with N.G. Bailey & Co. for Electrical Installation
CON/SWO/2111

1. The present paper reviews the contract as a whole from the date of letting and seeks to show the full extent of the present commitments, and the reasons for the increase that has occurred.
2. Following keen competitive tendering, the contract was placed on the 25th August 1958 in the sum of £40,444 against an estimate of £55,000. It was based on eight drawings and two schedules covering two main blocks of work, the office and laboratory building and the Magnet Room and associated buildings. It included two P.C. sums to cover the extension to the experimental area for the Hydrogen Bubble Chamber and the Motor Alternator Building.
3. The comparison between the contract as let, and the anticipated final cost, inclusive of dayworks and overtime working but excluding C.V.C. and possible claims, is as follows:-

<u>Job No.</u>	<u>Item</u>	<u>Original Contract Sum</u>	<u>A.F.C.</u>	<u>Difference</u>
6900	Magnet & Injector Rooms	19,651	55,916	36,265
6901	Experimental Area & Hydrogen Bubble Chamber	4,022) 2,000)	21,819	15,797
6902	Tunnels	-	1,981	1,981
6903	Preparation Area Extension & Control Room	-	1,233	1,233
6904	Offices & Laboratories	10,771	24,220	13,449
6905	Motor Alternator House	4,000	6,446	2,446
6906	Converter House Complex	-	6,380	6,380
6907	Mechanical Draught Cooling Towers and associated pump house	-	914	914
6909	Air Conditioning Plant	-	1,896	1,896
6921	Drainage	-	199	199
6938	Non-productive time	-	660	660
6950	Temporary Works	-	2,139	2,139
6800	Extension to Assembly & Test Building R.9	-	398	398
6653	Surplus Material	-	1,731	1,731
		<u>£40,444</u>	<u>£125,932</u>	<u>£85,488</u>

It will be seen that not only have known works cost considerably more than was originally envisaged, but a number of new items have been introduced as the design of the project developed.

4. At the time the contract was placed, completion of the injector room roof was a month away and work was continuing on the magnet room monolith. The erection of steelwork for the Office and Laboratory Block was just starting. In view of the relatively early stage at which the tender drawings had been prepared, and which was essential in order to let a contract soon enough to get a contractor

onto the site to install such conduits as were required to be cast into the concrete fabric, it was inevitable that much detailed design still remained to be done. Evolution of the machine design naturally had consequential effects during this period.

5. As might be expected, the largest item and where the largest increase has occurred, is in the Magnet and Injector rooms. About £18,000 worth is directly attributable to extras or alterations which the contractor has been instructed to carry out by the issue of Site Works Orders. While at the tender stage the requirements were portrayed on four drawings, in the event seven working drawings have been issued. All drawings have been examined by the project group, and such additional facilities as have been provided have been mutually agreed. The emergency lighting and provision of warning stations was not included in the original scheme. The rest of the increase on this item, to the extent of some £20,000, is attributable to the cost of fixing trunking, and the cutting and welding of the latter to suit the curved nature of all runs, and the provision and erection of a considerable quantity of steelwork as brackets. Full details of this will be revealed in the final account with the contractor.
6. In the experimental and bubble chamber areas, the extras authorised by the issue of site works orders amount to about £5,000. Here again, initially the requirements were shown on the same four drawings as referred to above, but subsequently seven additional detailed working drawings have been issued. The remaining increase is attributable to the provision and erection of steelwork to carry conduits and trunking, and to fabrication of junctions and bends to the latter.
7. The tunnels were not included in the original scheme. The requirements are shown on drawings. The estimated final cost of this work is as stated.
8. The main electrical installation in the Control Room and Preparation Area was carried out under an earlier contract. The work now included under this item covers the installation in the extension to the preparation area together with some consequential alterations to the existing installation. It also included for the supply and erection of vertical facing to the illuminated ceiling of the control room.
9. The scale of the installation in the laboratory and office block has been increased, and a generator room has been added to the building as originally conceived. The tender figure was based on four drawings; the final installation conforms with six detailed drawings, and included the provision of some 2,000 cycles supply not originally contemplated. Extra expense has been incurred consequential to the moving of partitions and in the insertion of switch drops within the metal partitions. Approximately £3,500 has been committed on minor alterations and additions resulting from the issue of Site Works Orders.
10. Owing to the lack of knowledge concerning the requirements for the Motor Alternator House, a P.C. sum only was included. As the design of the power plant proceeded, it became evident that two separate buildings would be necessary.

In addition, therefore, to the Motor Alternator House with lubricating oil plant basement and control room annexe, there is the converter house complex which includes the air conditioning plant room, Substation No. 12, and the water treatment and Heat exchanger plant room. The working drawings comprise no less than nine sheets and represent a major increase in facilities over what was originally adumbrated.

11. Space limitations in the Heat Exchanger room, and the decision to install a treatment plant for the raw water make up to the cooling towers resulted in the decision to construct an additional pump house adjacent to the towers to accommodate the raw water circulating pumps as well as the treatment plant. This building was not therefore contemplated at the time tenders were invited. The intimate connections with the remainder of the buildings, the need for getting the installation put in without delay, coupled with the relatively small amount of electrical work, led to the decision that the work should be done under this contract. The final cost is estimated at £914.
12. The electrical installation in the air conditioning plant room is included under the converter house complex, of which it forms a physical part. The work chargeable to this job number under this contract is the electrical trace heating in the magnet room basement. The need for this was not established until some time after this contract had been placed.
13. The electrical work under Job No. 921 comprises the lighting and small power installation to the Trades Waste Sump. The need for this installation was not known at the time of inviting tenders; the magnitude of the work did not seem to be such as to justify fresh contract action.
14. The reference to the provision of temporary works is probably self-explanatory. This item covers the provision of such temporary lighting and other connections as the Resident Engineer may from time to time have deemed essential. The need is inescapable and the scale modest in relation to the size of the job.
15. A small amount of work, proper to the Phase II, was carried out in the Assembly and Test Building under this contract, prior to the letting of a new contract. This was done in order to permit an early start of building operations on the extension. This work comprised consequential alterations in the existing building.
16. All the extra items which have been fed into this contract have been financially approved beforehand. The work to be executed is now very well advanced, final completion is expected by August 1961.
17. In addition to the sums shown in Paragraph 3, there is an amount of the order of £2,000 to which the contractor is entitled under C.V.C. Moreover it is thought likely that the Contractor may well submit a claim which, were it to be conceded in full, might represent a further £5,000. The tentative nature of these two figures must be stressed as they are little better than inspired guesses at this stage.
18. To summarise, the position therefore is as follows:-

Anticipated Total Contract Sum	125,932
C.V.C. say	2,000
Possible Claim "	5,000
GRAND TOTAL say	<u>£133,000</u>

19. This report has been prepared in the light of all available information at present date. While it is believed to present an accurate picture of the ultimate value of the contract, it must be emphasised that neither the physical work nor the settlement of all quantities, bills and star rates have been completed, the possibility of some further adjustment cannot be altogether excluded.

7 GeV Proton Synchrotron

Contract with Z.D. Berry for Pipework Services CON/SWO/2121

1. This Contract was placed on 4th September 1958, in the sum of £65,181 against an estimated cost of £69,000.

Although the final account is not yet settled, and indeed work under this contract is not expected to be finished until the beginning of August, it is now possible to show in some detail where the extra expenditure has been incurred.

2. The comparison between the contract as let, and the anticipated final cost, inclusive of dayworks and overtime working, but excluding C.V.C. and possible claims is as follows:-

<u>Job No.</u>	<u>Item</u>	<u>Contract Sum</u>	<u>A.F.C.</u>	<u>Difference</u>
6900	Magnet & Target Room	1,972	5,231	3,259
6901	Experimental Area	8,179	8,265	86
6902	Tunnels	-	40	40
6903	Preparation Area	-	200	200
6904	Office & Laboratory Bldg.	7,219	9,095	1,876
6905	Motor Alternator Bldg.	2,850	3,446	596
6906	Converter House Complex	1,320	2,680	1,360
6907	Cooling Towers	-	520	520
6908	Cooling Water Circuit	43,463	91,690	48,227
6921	Drainage	178	661	483
6931	Non-productive time	-	1,161	1,161
6950	Temporary works	-	3,012	3,012
6613	Heavy Liquid Bubble Chamber	-	285	285
6800	Extension to Assembly & Test	-	2,200	2,200
6813	Bubble Chamber Plant Room	-	2,100	2,100
	Possible surplus material say	-	1,000	1,000
	TOTAL	£65,181	£131,586	£66,405

It will be noted that not only known works cost considerably more than was originally envisaged, but that a number of new items have been introduced as the design of the overall project developed.

3. The majority of the extra work executed in the magnet rooms comprises a long series of items small in themselves, all of which were covered by instructions issued to the Contractors by means of 70 separate Site Works Orders. It represents alterations to pipe runs necessitated by the need to clear temporary partitions, electrical trunking, new doorways, datum positions for the survey team and some re-arrangement of services specifically requested by the project group. The only major item was the sum of £786 to cover the provision of settlement joints.
4. The cost of the work in the experimental area accords very closely with the original contract sum. The item relating to the preparation area covers the work consequential to the small extension to the building.

5. A generator room was added to the laboratory and office block to which mechanical ventilation was required. The provision of extra low silhouette fans was included in this contract. Fourteen Site Works Orders were issued to the contractor, covering in the main modifications to suit the form of building construction adopted. In particular, it became necessary to provide steelwork in the form of channels and angle irons to support radiators and pipework.
6. At the time of inviting tenders, little was known about the motor alternator building, but it was becoming apparent that two buildings would be required instead of one. Provisional sums only were therefore included in the contract proposals to cover the Heating, Hot Water, Compressed Air, and Gas Services to these buildings. In the event, the scope of this work has turned out to be more extensive than was envisaged. The present assessment is based on admeasurement of the services actually installed, valued at the rates contained in the contract.
7. It is in regard to the pipework associated with the cooling water circuits that the dominant excess on this contract has occurred. The prime cause is the increase in cooling load that has arisen, including the decision that the eight main phase splitting transformers should be water cooled, which has resulted in larger pipe sizes and extended runs. For example, the main raw water pipes have been increased from 14" to 24" diameter, and much of the 4" and 8" clean water pipes in copper to 6" and 9" dia. respectively. The cost of valves, thermal insulation and supports, all go up as a consequential, as well, of course, as the labour component in handling the much larger and heavier materials in the limited space afforded in the ducts which were designed for the smaller sizes. The re-assessment of the cooling load which took place after the contract had been let delayed the ordering of the copper pipes. By the time that sub-orders were placed, a substantial increase in the price of copper had occurred.

The decision to install each heat exchanger in the form of two separate units has resulted in additional pipework and valves. In general, there are far more tees with isolating valves than were originally expected.

An indication of the great expansion of these services is given by the fact that while the tenders were based on five drawings, no less than twenty-three working drawings have been issued by the Consulting Engineers.
8. The temporary works cover the provision of temporary heating to the Magnet and Injector Rooms, the Experimental Area, Converter House, Motor Alternator Building, and to running temporary steam and condense lines to a point inside Matthew Hall's workshop. It also includes for the maintenance of these services, together with some gas and air lines, and their ultimate removal. Instructions have been issued to the contractor on 37 Site Works Orders and are regarded as being proper to the discretion of the Resident Engineer.
9. The task of installing the heating and piped services in the extension to the Assembly and Test Building, and in the Bubble Chamber Plant Room, together with a small amount of work in the Heavy Liquid Bubble Chamber was entrusted to Z.D. Berry in the interests of speed and continuity of civil contractors. The work is subject to admeasurement at rates contained in the schedule incorporated in the contract, which had been established as competitive by recent competition.
10. There may be some surplus material, not exceeding three figures in value, occasioned by design modifications which may be an inescapable commitment and a sum of £1,000 has therefore been included to deal with this item.

11. In addition to the sums shown in Paragraph 3, there is an amount of the order of £2,000, to which the contractor will be entitled under C.V.C. Moreover, it is thought likely that the Contractor may well submit a claim which, were it to be conceded in full, might represent a further £11,000. The only justification for advancing these figures is that we are led to believe that the actual cost to the contractor has amounted to about £130,000. Z. D. Berry may therefore submit a claim with a view to obtaining some profit. 10% has therefore been included, of which £2,000 is felt to be a justified C.V.C. payment.

12. To summarise, the position therefore is as follows:-

Anticipated Total Contract Sum		£131,586
C.V.C.	say	2,000
Possible Claim	"	11,000
GRAND TOTAL	"	£145,000

13. This report has been prepared in the light of all available information at the present date. While it is believed to present an accurate picture of the ultimate value of the contract, it must be emphasised that as neither the physical work nor the settlement of all quantities, bills and star rates have been completed, the possibility of some further adjustment cannot be altogether excluded.

G. M. Harbert