

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCEGENERAL PURPOSES COMMITTEEBubble Chamber Plant Room

(Note by the Nuclear Equipment Project Committee)

1. The G.P.C. approved a sum of £55,000 for the construction of a building to house the plant associated with the hydrogen and heavy liquid bubble chambers in NI/GP/59/4. Earlier a sum of £200,000 was approved NI/GP/58/18 for the plant to be provided by the Rutherford Laboratory for the hydrogen bubble chamber.
2. When a more accurate cost of the building became available it was apparent that the sum of £55,000 would be exceeded. However it was not clear under which heading certain items such as generator ventilation, E.T. transformer and cabling should be charged and it was felt that the total for buildings and plant might still be covered by the £255,000 available.
3. It is now established that this total will be inadequate to complete the work and it is anticipated that an increase of £40,000 will be needed. The revised estimates are

Building	£110,000
Plant	<u>£185,000</u>
Total	<u>£295,000</u>
4. The following is an approximate analysis of the building cost.

Cost associated solely with the hydrogen bubble chamber.	£36,000
Cost associated solely with the heavy liquid bubble chamber.	£12,000
Cost associated equally with both bubble chambers	£42,000
Cost of the sub-station to serve the bubble chamber plant room and the lab. and office block extension.	<u>£20,000</u>
Total	<u>£110,000</u>
5. Although the building is nearing completion and a large part of the plant has been ordered actual payments amount to only a fraction of the total. In addition to the £40,000 a contingency of £15,000 is proposed to cover the final cost. This does not take into account any future wage increases which may give rise to claims under CVC 2.
6. Approval is therefore requested for a revised estimate of £295,000 plus £15,000 contingencies.

L. B. Mullett
Chairman, N.E.P.C.

Mr Bowles

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27th October, 1960

Addendum to NI/GP/60/42

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

GENERAL PURPOSES COMMITTEE

BUBBLE CHAMBER PLANT ROOM

Note by the Secretary

As requested by the Committee, a more detailed explanation of the increases in the estimated cost of the bubble chamber plant room has been included with the request for an increased financial approval which has been sent to the A.E.A. A copy is enclosed for information.

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BUBBLE CHAMBER PLANT ROOM

The G.P.C. has now approved an increase in the above scheme of £20,000 plus a contingency of £15,000 making a new total of £290,000. The original Treasury approval was given on 16th April 1959 ref: DM/35/336/02 and FIN/71/4 for £250,000 and this was amended to £255,000 by your letter dated 24th September 1959 ref. FIN/56/1.

The increased G.P.C. approval does not include provision for the electricity sub-station which the G.P.C. decided had been wrongly added to this scheme when the decision was made to house it in an annexe to the plant room. The sub-station will now be charged to the provision for site services.

The original approval and the latest estimate for the plant room are:-

	<u>Original Approval</u> £000	<u>Latest Estimate</u> £000
Buildings	55	90
Plant	200	185
Contingency on the plant estimate	-	15
	<u>255</u>	<u>290</u>

The sum of £55,000 was the estimate for the construction of the building to house plant associated with the Hydrogen and Heavy Liquid Bubble Chambers. Although the general requirements for plant were known it was impossible to plan in detail and, as a first estimate, a building of the Arcon type with a floor area of 5000 sq.ft. and a 5 ton travelling crane was suggested. The total cost for this was given as £55,000 and a reasonable division for this type of building would be

	£
Architects	30,000
M & E Services	20,000
Fees	5,000

After seeking advice of H.M. Inspector of Factories it was decided to isolate the hydrogen plant in a building adjacent to the main plant room and separated from it by reinforced concrete walls. The hydrogen compressors are housed in this room and driven via shafts through this concrete wall, from motors sited in the main plant room.

Safety considerations also led to the siting of the safety vessel in a concrete pit instead of on an open hardstanding as originally planned.

On the recommendation of H.M. Inspectors certain items such as a gas holder and storage cylinders were sited some 25 feet away on an open hard-standing.

At the same time information from industry on the detailed space requirements of the plant made it necessary to increase the total area from 5000 sq.ft. to 6,600 sq.ft. In addition it was found essential to provide forced ventilation for the four 1 M.W. generators installed in this building for energising the bubble chamber magnets. An 8 ton crane was needed for the assembly of this equipment.

The cost of connecting services to the building and of the cost of electric cabling were underestimated in the original estimate. It has also been found necessary to allow a considerable figure for attendance on installation. This could not be foreseen until details of plant had been discussed with the suppliers.

The present estimated cost of £90,000 is sub-divided into

1. Architects	£46,500
2. M & E Services	35,500
3. Fees	8,000

The estimated increase of £16,500 on item 1 and £15,500 on item 2 as compared with the first estimate are due to the changes described in the previous paragraph, the increases due to the separate changes being approximately as follows:-

Architects

Main plant room	£12,500
Safety vessel pit and hardstanding	4,000

M & E Services

Ventilation for generators	£5,000
Incoming mains and cabling	7,000
Attendance on installation, lighting and hydrogen detection	3,500

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7th October 1960

BUBBLE CHAMBER PLANT ROOM

(Explanatory Note to Paper NI/GP/60/42)

1. The Bubble Chamber Plant Room is a building of 9,000 sq. ft. in area and is 26 ft. to the eaves. The building with its hardstanding was designed to accommodate the following plant to serve principally the Hydrogen Bubble Chamber:-
 - 1.1 The hydrogen compressors for providing high pressure gas to the liquefiers.
 - 1.2 The Motor Generator sets for providing Direct Current for energising the Bubble Chamber Magnet.
 - 1.3 A refrigerated/liquefaction plant provided principally for the refrigeration required on the Hydrogen Bubble Chamber but also providing liquid hydrogen for general use in laboratories.
 - 1.4 A safety system to detect escaping hydrogen and a dump tank to enable liquid hydrogen to be safely jettisoned in an emergency.
 - 1.5 A high pressure pipe system including provision for purging the pipe lines with nitrogen.
 - 1.6 A cooling system for the Magnet.
 - 1.7 Corblin Compressors for the chamber expansion circuit operating at approximately 200 pound per sq. inch. together with ancillary plant.
 - 1.8 Sub-Station Plant.
2. The Sub-station ~~is~~ referred to in 1.8 is an Annex to the main area, and is used to feed other buildings in addition to the equipment in the Bubble Chamber Plant Room. The sub-station comprises an 11 Kv circuit breaker, a 1 MVA transformer and low voltage distribution switchgear. The building also accommodates a 7.5 MVA transformer which was previously ordered on the NIMROD vote when the Bubble Chamber was to have been fed from the NIMROD Sub-station. Since the ^{new} Sub-station serves other buildings it is considered that it could be charged to the Site Services vote which, when prepared, took into account that additional sub-stations would be required.

3. Provision of a forced ventilation system is necessary to cool the motor generators and maintain the building at a reasonable temperature. Both the sub-station and ventilation plant are being provided by the Southern Works Organisation.

4. When the Heavy Liquid Bubble Chamber Project was authorised the Annexe to accommodate the new Bubble Chamber was sited so that use could be made of the existing generators, cables and services. Although this measure saved an appreciable further expenditure, some additional plant and services became necessary which ^{it is now apparent cannot} ~~could not~~ be provided within the present Plant Room Building estimate. Paragraph 4 of paper NI/GP/60/42 shows the allocation of the proposed new estimate which can reasonably be associated with the two schemes. To arrive at these figures certain charges have had to be allocated on the basis of floor area. The items being provided under the new Plant Room Building estimates are as follows:-

<u>Item</u>	<u>£</u>
Building	42,000
Safety Vessel Pit	3,200
Service Tunnel	1,300
Sub-station Plant and Building	19,500
Crane	5,000
Forced ventilation for M.G. Sets	5,000
Heating	1,300
Hydrogen detection	2,000
Incoming mains	4,700
Lighting	2,200
A.C. Cabling	5,000
D.C. Cabling	4,500
Attendance on Installation	5,800
	101,500
Fees (approximately)	8,500
	110,000

5. The Heavy Liquid Bubble Chamber plant estimate provides the following:-

- 5.1 Bubble Chamber
- 5.2 Expansion Cycling System
- 5.3 Illumination and Photography
- 5.4 Temperature Control and Evacuation Plant
- 5.5 Safety, Dumping and Filling System
- 5.6 Mechanical Handling
- 5.7 Magnet
- 5.8 Control gear and Instruments

The Heavy Liquid Bubble Chamber Building Estimates provide for the following:-

- 5.9 Building Works and Services in the Bubble Chamber Annex
- 5.10 Propane detection
- 5.11 Crane in the Annex

The tables in paragraphs 4 and 5 show that no item has been included twice.

The estimate for the sub-station should have been submitted for approval from the Site Services vote, but it was thought that the costs could be met from the authorised Bubble Chamber Building and Plant estimates.

6. To summarise the whole Plant Room scheme, the old and new costs are as shown below:-

	Original Estimate £	Present Estimate £
Buildings (excluding special services & sub-station)	55,000	85,000
Provision of a sub-station	-	19,500
Provision of Special Services for Plant (i.e. forced ventilation)	-	5,000
Plant	200,000	185,000
	<u>255,000</u>	<u>295,000</u>
Contingency on Plant	-	15,000
	<u>255,000</u>	<u>310,000</u>

P. BOWLES