

PROGRESS REPORT ON RCBC

R W Newport

1. CHAMBER AND VACUUM ENCLOSURE

1.1 Chamber Assembly

In order to examine a more satisfactory chamber design the order for stainless steel forgings was delayed. The new design eliminates three major low temperature seals so that there are no large mechanical seals between high pressure and the main insulating vacuum, and the piston and bellows assembly can be removed through the main window flange. This latter feature which is primarily what we were seeking in our redesign removes ~ 2 months from any future removal of the piston-bellows assembly and removes this assembly from the critical path. We do not benefit by the same time during our first assembly in which we save only 1 month so that the delivery date is delayed by one month.

The cost of the chamber forging has risen but this is largely offset by the removal of some items such as studs and seals and machining costs.

A more detailed study of the beam exit window has removed the possibility of reducing the amount of invisible hydrogen because of deflections at the optical window support. The latest design has characteristics very close to those specified and virtually identical with those given on 27.4.77.

1.2 Main Window

The order for one main optical window has been placed and Schott's have reported that the quality of their stock blank is adequate. The optical properties of the Ramm chamber window on loan to the Rutherford Laboratory have been measured and it is considered to be optically satisfactory for RCBC. It does, however, appear to be made of K50 rather than BK7 which we have specified and it may be better to use the glass window at present in the Ramm chamber. We are waiting for Schott's to give a price for reworking such a window for use in RCBC.

1.3 Vacuum Tank

The manufacturing techniques appropriate to the beam entry/exit window section of the vacuum tank have been investigated. To maintain acceptable stresses in a suitable aluminium alloy, ie N8, the thickness has to be increased, probably to 3 mm (from 2 mm). Specifications are being prepared for tender action.

It has been established that quartz windows of suitable optical quality are available, but at considerably higher cost.

2. OPTICAL SYSTEM

2.1 Telecentric Lenses

The mounts for the lenses are being machined at Imperial College. The orders for the materials and for grinding and polishing of the elements have been placed. The promised delivery dates are in agreement with the programme.

The only outstanding order is for the coating of the elements, the placing of a contract has been deferred until we have received test pieces from the sub-contractor suggested by the grinding and polishing firm.

2.2 Lens Mounting Plate

A revised design, circular rather than triangular with kinematic mounts has been agreed and the system for attaching it to the optics trolley is being designed.

2.3 Illumination

Further tests of a representative system are planned.

Since it is already clear that space is at a premium the concept of a lighthouse contained within the re-entrant vacuum tank and hydrogen shield has been discarded and we are now looking at a simpler design with the beam splitters outside the vacuum tank. The design looks feasible although it is not possible for all six viewing ports to be the same size. The secondary ports will be restricted to about 140 mm diameter, which does not appear to affect any known plans for their use.

2.4 Data Board

Development of the alternative systems is continuing and we expect to make a decision early next year. Excellent results have been obtained with the pseudo-contact printing system, and life tests on relays have shown promising results. It is still necessary to test a modified capstan and to improve the masks for the Brenner marks.

We are expecting to obtain more representative samples of LED's from Plessey though we have established that the previously reported results are valid.

3. CHAMBER TEMPERATURE CONTROL SYSTEM

3.1 Valve Vessel

The forgings for the end plates have been ordered.

The design is virtually complete and we shall start tender action early next year.

The flow characteristics of the prototype valve have been measured and are linear over the required range. The complete valve has not, however, been received due to delays in the delivery of steel bellows. To avoid delays in delivery of the valves for the complete system an order has already been placed for all necessary bellows.

To reduce the chamber filling time ortho-para conversion will be carried out at $\sim 80\text{K}$. Although additional cooling of the chamber support is anticipated it has still to be established that the stress levels incurred are acceptable.

4. EXPANSION SYSTEM

4.1 Bellows

The first GRP bellows was produced last month and although there are some variations in thickness the uniformity is acceptable and the bellows is being prepared for attachment to the stainless steel piston.

4.2 Stainless Steel Piston

The steel piston and the assembly jig have not yet been delivered but the piston-bellows assembly is expected to be ready to deliver to CERN at the end of January.

4.3 Bellows Test Rig

This is expected to be assembled and vacuum tested by the end of the year.

A cryogenic test is planned for January before preparing to instal the piston-bellows assembly at the end of January.

4.4 Fibre-glass Epoxy Resin Piston

Manufacturing techniques are being examined in conjunction with industry. Moulding development is being carried out at Rutherford Laboratory.

5. VACUUM SYSTEM

There are still some safety aspects to be resolved but we expect a cost for our shopping list to be received shortly.

6. MECHANICAL HANDLING EQUIPMENT

6.1 Chamber Assembly and Withdrawal Trolleys

The design is being continued at CERN to ensure compatibility with the Northern area particularly with regard to the installation of guide rails.

6.2 Iron Structure Lifting Gear

The order for this component has now been placed.

7. ACCESSORIES FOR THE CONTROL AND MONITORING SYSTEM

There have recently been intensive discussions at CERN concerning the monitoring and data acquisition aspects of EHS. These discussions have clarified the overall philosophy and specifications are now being prepared for certain key items in the monitoring system.

8. IRON STRUCTURE

Nothing to report at present.

9. TRANSPORT TO CERN

Nothing to report.

10. PROGRAMME

The latest programme is attached. The points to note are:

10.1 A delay of one month for the chamber delivery resulting from the new chamber design (see 1.1).

10.2 The increased slack in the piston-bellows assembly programme which also results from the redesign of the chamber.

10.3 The maintenance of the programme for the telecentric lenses after the placing of contracts.

10.4 Although the overall timescale has been extended by one month, there are now less items on the critical path and less uncertainties in the assembly programme.

11. FINANCIAL STATEMENT

A financial statement valid on 1.12.77 is attached.

This now shows a substantial commitment which is in fact in advance of the forecast made at the time of signing of the Contract. When expressed as a percentage of the latest cost estimate at prices valid on 15.2.1977 it is 35% which is to be compared with our forecast of 20%.

The latest cost estimate shows an increase of 5% over the contract price. However, since most of the price revision is related to the items for which we have made commitments, it is probably more realistic to take the increase as a percentage of the commitment. This indicates an increase of 12.5% which is of course still comfortably within the contingency but not by a sufficient margin to allow the purchase of a second window to be accepted.

Technology Division
Rutherford Laboratory

6 December 1977

FINANCIAL STATEMENT
 RAPID CYCLING BUBBLE CHAMBER FOR EHS CERN
 PROJECT NOs NA91500 - NA91799 INCLUSIVE
 PROGRESS STATEMENT AS AT 1.12.77.

ITEM	INITIAL COST ESTIMATE 15.2.77	LATEST COST ESTIMATE * 1.12.77	COMMITTED TO 1.12.77	FORECAST DELIVERY DATE	TOTAL SPEND IN PRIOR YEARS	ACTUAL SPEND IN CURRENT YEAR TO 1.12.77	SPEND FORECAST 1977-78
	£	£	£		£	£	£
1. Chamber & Vac Enclosure	297,235	290,396	122,460	30.10.79	-	-	
2. Optical System	86,925	86,925	976	31.11.79	-	-	
3. Chamber Temp Control	46,640	46,640	2,508	30.10.79	-	-	
4. Expansion System	58,488	58,488	-	30.10.79	-	-	
5. Vacuum Systems	36,559	36,559	-	30.10.79	-	-	
6. Acc for Control etc	17,798	17,798	-	30.10.79	-	-	
7. Mech Handling Equipt	29,120	29,120	2,179	30.10.79	-	-	
8. Iron Support Structure	78,000	117,956	127,687	31.8.78	-	-	
9. Transport to CERN	18,200	18,200	7,045	-	-	-	
10. Miscellaneous	1,040	1,040	-	-	-	-	
	670,000	703,122	262,855	-	-	-	

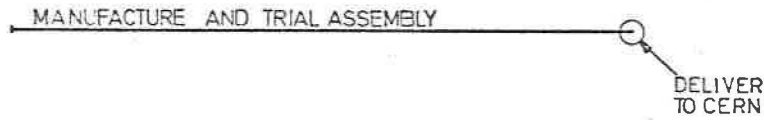
Contract Price £670,000 (+ 15% Contingency)
 at 15.2.77 prices.

* at 15.2.77 prices.

All prices exclude VAT.

9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

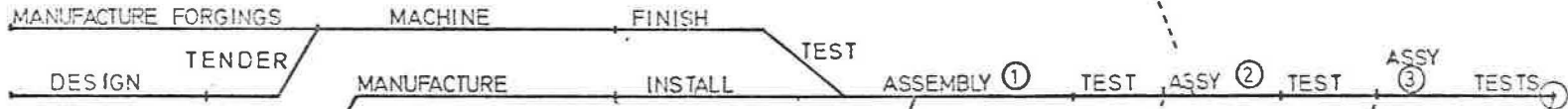
IRON
STRUCTURE



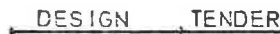
CHAMBER
WINDOW



CHAMBER
SYSTEM



CHAMBER
TROLLEY

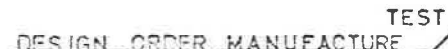


VALVE
VESSEL



DELIVER
TO CERN

VALVES



PISTON &
BELLONS
ASSEMBLY



DELIVER
TO CERN

VACUUM
ENCLOSURE



LENSES



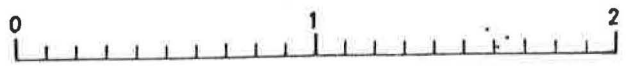
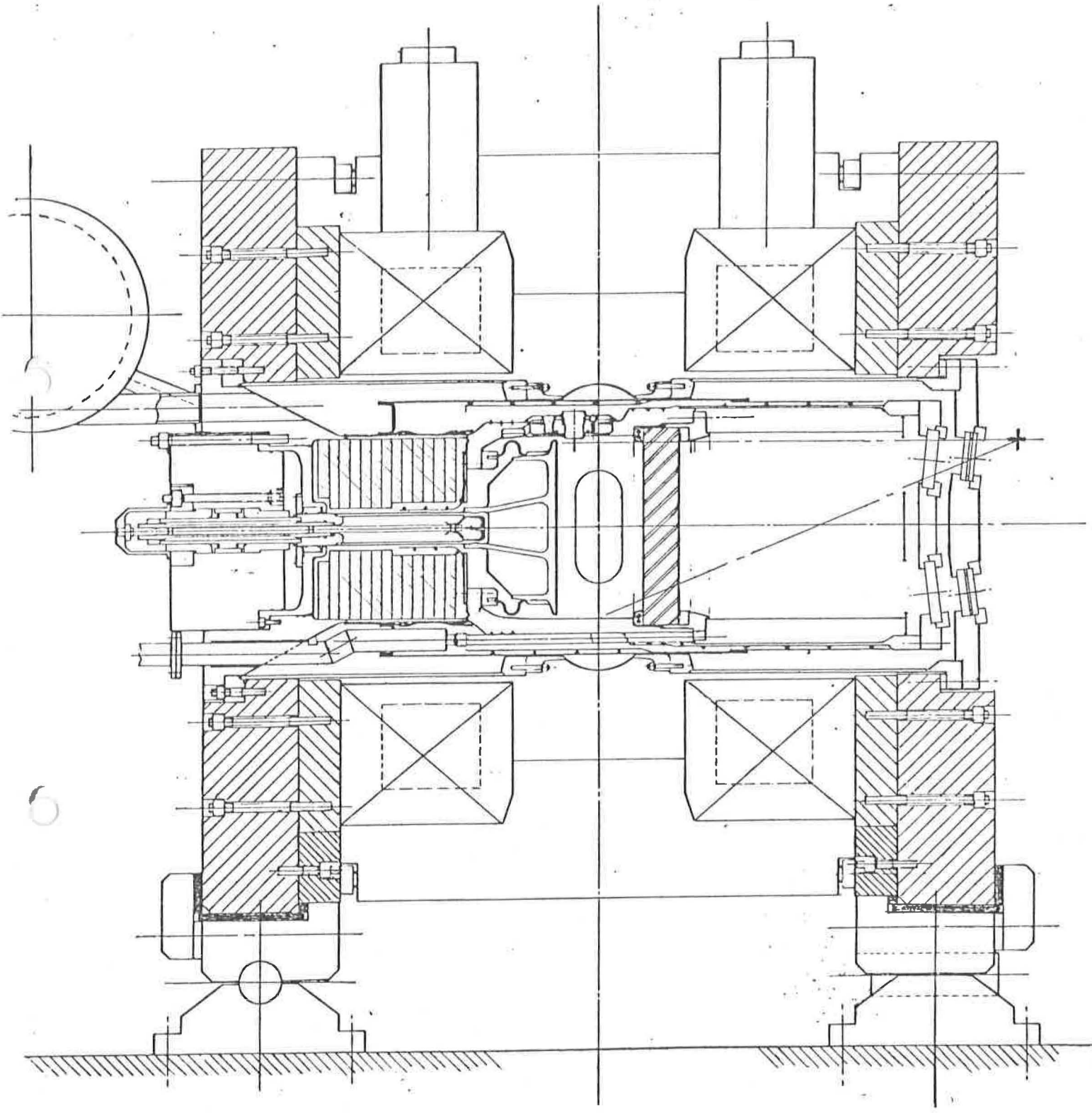
S O N D J F M A M J J A S O N D J F M A M J J A S O N D

1977

1978

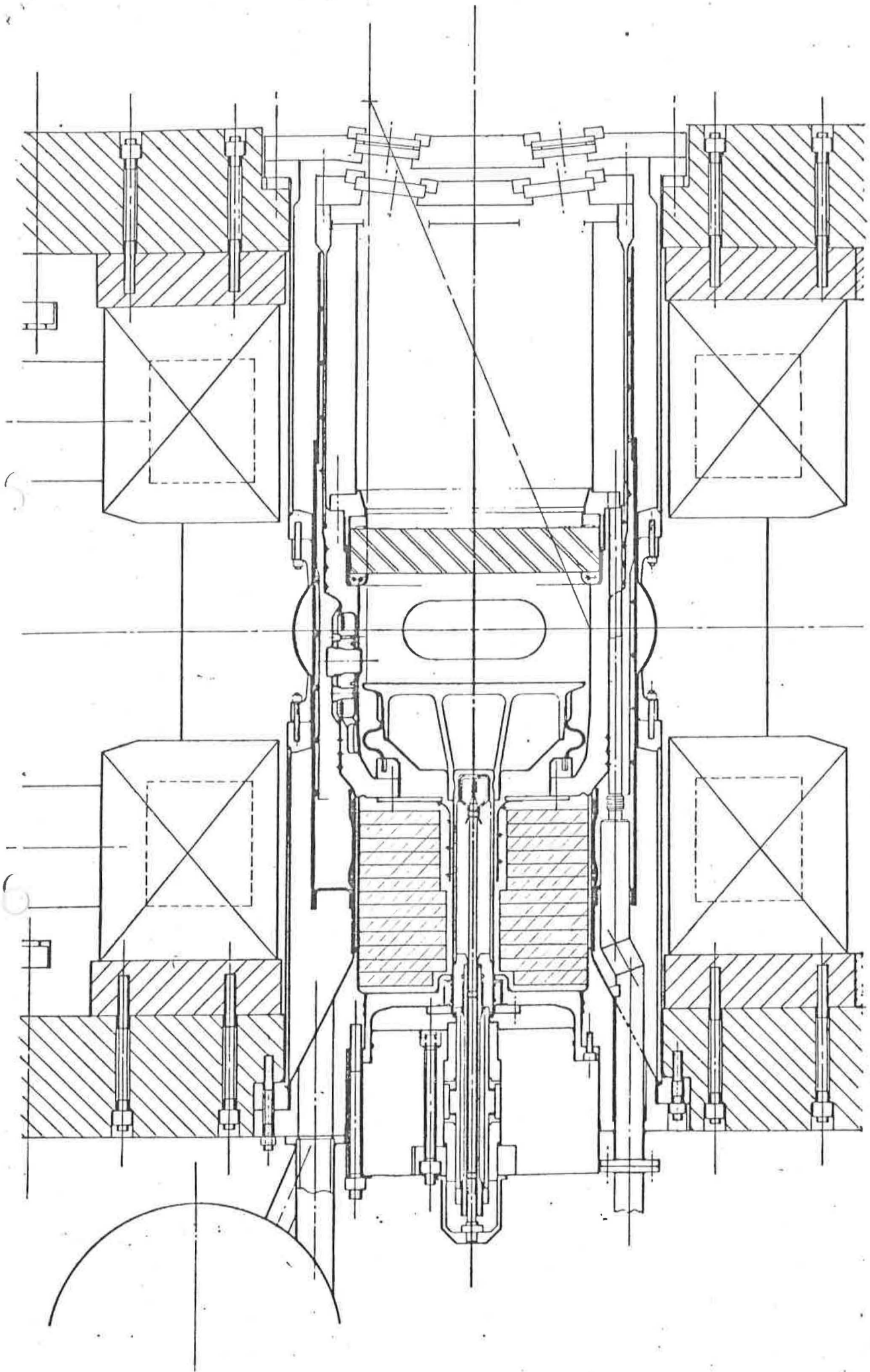
1979

RCBC PROGRAMME 7-12-77



ORIGINAL SCALE METRES

SCHEMATIC ILLUSTRATION OF RCBC



ORIGINAL SCALE METRES

SCHEMATIC ILLUSTRATION OF RCBC