

## PROGRESS REPORT ON RCBC

R W Newport

## 1. CHAMBER AND VACUUM ENCLOSURE

1.1 Chamber Assembly

The chamber machining and assembly specification together with all necessary drawings (some 45 in all) has been prepared and the tender action is being prepared by our Contracts Department. Provisional discussions with a number of manufacturers have resulted in some revisions, particularly with respect to the attachment of heat exchangers. The assessment of the job will be difficult so we are allowing tenderers extra time to reply and are now asking for replies by July 24th. Also during our provisional discussions some indication of timescales was given, and although our original estimate was adequate some of the leading Contractors will have difficulty meeting the timescale due to other commitments. Because of this we have extended the delivery time for the chamber assembly to nine months.

The chamber assembly forgings are expected to be delivered by the end of June. The hydrogen shield end plate has now been designed with adequate stiffness.

1.2 Main Window

We have received a revised delivery date for the window from Schotts to Grubb Parsons of the end of June and have a date of the end of September for the completion of polishing.

1.3 Window Gasket

Discussions are taking place with potential manufacturers and we expect to start a formal tender action shortly.

1.4 Vacuum Tank

Both rigid and flexible beam entry/exit window sections have been examined. None of the designs allow the physics specification to be met with respect to radiation length.

It has been proposed that initially a plain cylindrical section  $\sqrt{5\frac{1}{2}}$  mm thick will be provided and that we develop a composite window section.

## 2. OPTICAL SYSTEM

2.1 Telecentric Lenses

The doublet elements have been completed and delivered to Balzers for coating.

The lens design is being re-optimised now that the characteristics of the small windows have been defined.

The rough machining of the lens mounts is well advanced.

The lens programme is still ahead of schedule.

## 2.2 Lens Mounting Plate

The design is now complete and a tender action is being prepared.

## 2.3 Illumination System

Using a non-imaging concentrator the energy requirement for a single flash tube has been reduced from 80-100 joules to 20-30 joules/flash.

A life test has been carried out at 36 joules, pulsing at 15 Hz for 2.5 seconds in every 8.5 seconds. After one million cycles no detectable loss of light output was measured. Further life tests at higher energies are to be carried out including some tests in a 1 Tesla field.

The investigation of the use of a laser has now been discontinued. Although adequate intensities were obtained, attempts to reduce 'speckle' were not considered to be successful.

Tests on a light trap for the beam splitters have been performed satisfactorily.

## 2.4 Data Board

The final design is well advanced and some components have been ordered for evaluation.

The revised format was issued to users in March and at present no adverse comments have been received.

## 2.5 Cameras

After  $7.5 \times 10^6$  cycles the test rig was dismantled for examination and modification, a number of defects were found but are not considered to affect the design.

# 3. CHAMBER TEMPERATURE CONTROL SYSTEM

## 3.1 Valve Vessel

The tender action has started and replies are called for the end of June.

## 3.2 Valves

The complete set of valves has been ordered and delivery is expected by the end of August.

## 3.3 Control System

All control elements have been ordered.

#### 4. EXPANSION SYSTEM

##### 4.1 Bellows

We have now made three bellows, the first two were of similar quality but the third is of more uniform thickness. The last two have been machined in preparation for comparative stiffness tests.

##### 4.2 Bellows Tests

The trial piston-bellows assembly using the first bellows was delivered to CERN at the end of March and installed in the MAQUETTE. Some 50,000 expansions were performed under various conditions before a leak developed at the piston-bellows joint, a modification has been designed and prepared for re-assembly which is taking place at present. The joint in question is not typical of the final assembly and probably failed due to differential thermal contraction. Although some difficulties were experienced in obtaining the desired operating conditions no problems have been encountered with the bellows as such.

##### 4.3 Piston

A full size model of half a piston has been made to check assembly techniques. This has now been cut up to check the filling and to provide samples for mechanical testing. A new design of piston-drive shaft joint has been made to avoid differential contraction problems. We have started making parts for a first prototype piston.

##### 4.4 Hydraulic System

The main valve has been tested for  $10^7$  cycles and there appear to be no problems apart from the accumulation of magnetic particles which will be removed by a filter.

Tests of a pilot valve in a shielded enclosure have started and although satisfactory performance was obtained with a modified loop gain changes are being made to the shielding before carrying out further tests.

#### 5. VACUUM SYSTEM

The order for all mechanical pumps, valves and gauges has been placed.

A control simulator has been built for development and test purposes.

Plans are being made to test a diffusion pump under the design pressure conditions.

#### 6. MECHANICAL HANDLING

The chamber trolley has been designed and a contractor selected.

The rails for assembly at the Rutherford Laboratory have been ordered.

7. ACCESSORIES FOR CONTROL AND MONITORING

The DANA digital multimeter has been delivered to Credshire for incorporation in the data logger. The data logger is expected to be delivered at the end of June.

8. IRON STRUCTURE

Final machining is well advanced and is expected to be completed by mid-July. Trial assembly is expected in August although there may be some delays due to the drilling and tapping of additional holes for a shielding plate.

9. TRANSPORT TO CERN

Nothing to report.

10. PROGRAMME

The latest programme summary is attached. Since the last meeting the complete programme has been reassessed and revised the main points to note are -

10.1 A delay in the completion date to January 1980 due to delays in starting the tender action for the chamber machining and assembly arising from the complexity of the job, the extra time allowed for tender action and the anticipation of a longer delivery period based on provisional discussions with potential contractors.

10.2 The maintenance of 2-3 months slack in the timescales for major sub-systems.

11. FINANCIAL

A financial statement valid on 1 June 1978 is attached points to note are -

11.1 The increased estimate for the chamber and vacuum enclosure which is for the machining and welding of the chamber assembly.

11.2 The total cost estimate which is ~10% higher than the initial cost estimate bearing in mind that about 50% of the money has already been committed and that including the anticipated cost of the chamber this rises to >60% of the latest cost estimate.

11.3 The commitment is within a few per cent of the prediction made in May 1977.

11.4 Although no substantial payments have been made at present the payments made by 1st April are expected to reach £400,000 and for the benefit of CERN we still expect to spend close to £300,00 by the end of 1978.

Technology Division  
Rutherford Laboratory  
8th June 1978

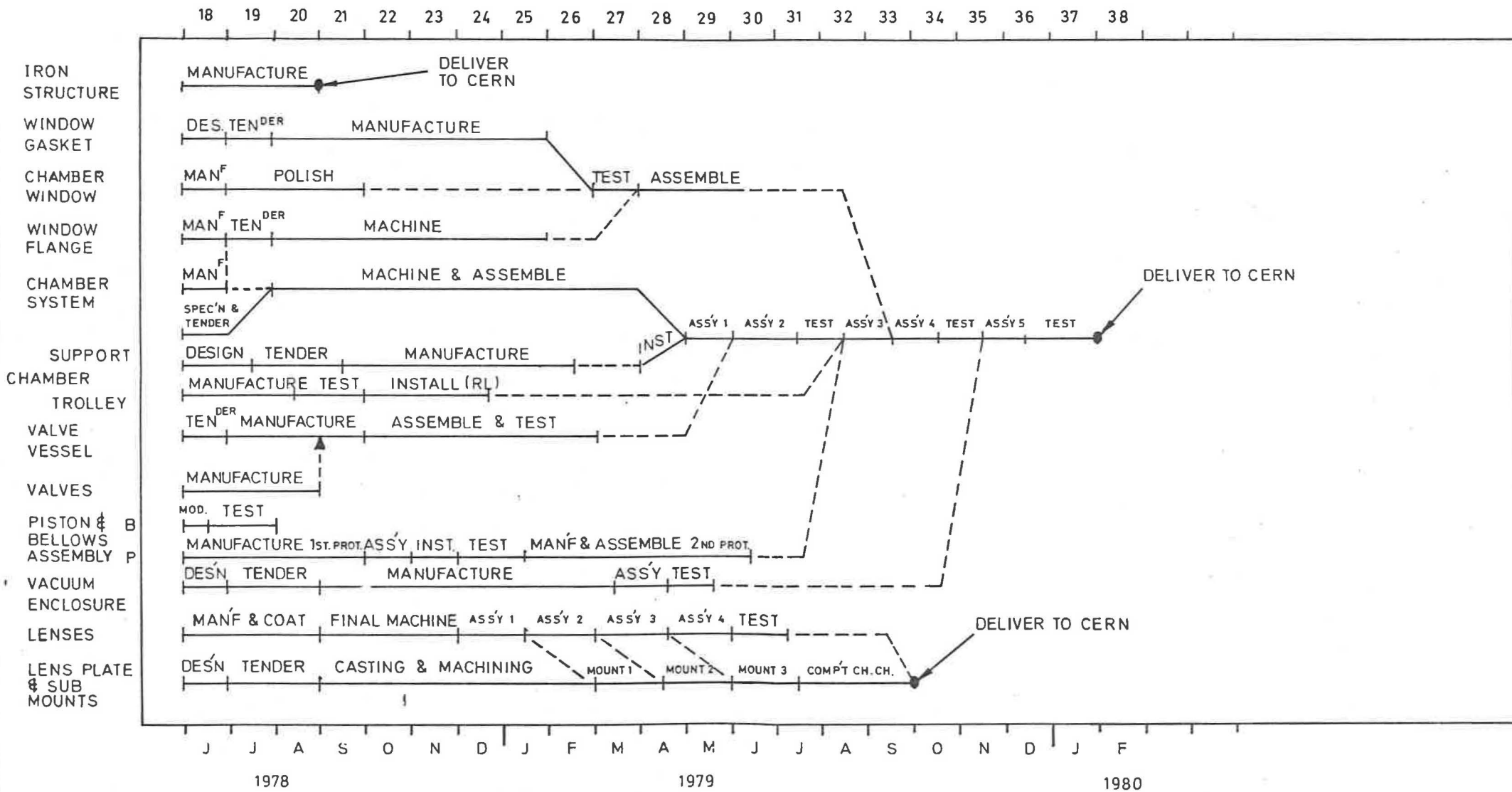
FINANCIAL STATEMENT  
 RAPID CYCLING BUBBLE CHAMBER FOR EHS CERN  
 PROJECT NOs NA71500 - NA71799 INCLUSIVE  
 PROGRESS STATEMENT AS AT 1 JUNE 1978

ITEM	INITIAL COST ESTIMATE 15.2.77	LATEST COST ESTIMATE * 1.6.78	COMMITTED TO 1.6.78	FORECAST DELIVERY DATE	TOTAL SPEND IN PRIOR YEARS	ACTUAL SPEND IN CURRENT YEAR TO 1.5.78	SPEND FORECAST 1978/79
	£	£	£		£	£	£
1. Chamber & Vac Enclosure	297,235	311,096	128,600	31.1.80	331	-	-
2. Optical System	86,925	86,925	4,887	31.11.79	-	-	-
3. Chamber Temp Control	46,640	46,640	21,269	31.1.80	-	-	-
4. Expansion System	58,488	58,488	3,509	31.1.80	-	-	-
5. Vacuum Systems	36,559	51,394	48,647	31.1.80	-	-	-
6. Acc for Control etc	17,798	17,798	3,785	31.1.80	-	-	-
7. Mech Handling Equipmt	29,120	29,120	11,224	31.1.80	-	-	-
8. Iron Support Structure	78,000	117,956	127,687	31.8.79	-	-	-
9. Transport to CERN	18,200	18,200	7,045	-	-	-	-
10. Miscellaneous	1,040	1,040	-	31.1.80	-	-	-
	670,000	738,657	356,653	-	331	-	400,000

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

\* at 15.2.77 prices.

All prices exclude VAT.



RCBC PROGRAMME 31 MAY 1978