PROGRESS REPORT ON RCBC

R W NEWPORT

1. CHAMBER AND VACUUM ENCLOSURE

1.1 Chamber Assembly

After the last meeting of the Construction Committee there was some delay in placing the contract with the firm which is to produce the stainless steel forgings, due to its unwillingness to accept some of the conditions of the contract. When agreement was eventually reached after Christmas revised delivery dates were also accepted. The effect is to delay the delivery of the forgings from mid April to mid May for the first component and to early June for the last components. The net effect of these later deliveries, together with some small revisions to the assembly and test programme is to delay the completion of the work on the chamber by two weeks to the end of October.

The material has now been produced and sample analysis is close to specification, the largest discrepancy being with respect to carbon which is 0.035% cf 0.030% as specified.

The machining drawings are being prepared. The positioning of the beam exit window agreed after the recent visit of Mr R Watt of SLAC has led to some delay. We are in fact still waiting for drawings from SLAC to allow a comparison to be made with the SLAC 40-inch chamber but are satisfied that the deflections at the window flange are not substantially worse than in the previous design.

We have reduced the chamber volume by various dimensional changes and by introducing an annular plug (see Fig 1), which also reduces liquid velocities and provides for a ring ofrear fiducials which can be seen by all cameras.

1.2 Main Window

The blank is reported informally to be of better quality than specified and is expected to be delivered to Grubb Parsons on time.

We have a provisional cost for re-working a CERN Heavy Liquid Chamber Window but are still waiting for a formal reply.

1.3 Window Gasket

The design is being re-examined to see if the latest SLAC 40-inch modifications can be incorporated.

An indium shaping jig has been designed.

1.4 Vacuum Tank

The beam entry/exit window section is being redesigned to accommodate the large deflection associated with a spillage of liquid hydrogen from the chamber.

2. OPTICAL SYSTEM

2.1 Telecentric Lenses

We have taken delivery of all glass blanks. Most of the test plates have been produced and have been checked at Imperial College. The elements for the doublets have been produced and a contract for coating them has been placed.

The lens design will shortly be re-optimised now that the material properti and the test plate data have been obtained. The properties and thicknesses of the small windows have to be finalised before this can occur.

The lens programme is ahead of the original schedule by some months.

2.2 Lens Mounting Plate

The casting drawing has been agreed and discussions with potential manufacturers have begun. The lens mounting sub-assemblies and film gate mounts are being designed.

2.3 Illumination

Tests have been carried out with a double flash tube assembly showing that satisfactory exposures can be obtained with a dissipation of 40 joules per flash tube.

We are waiting for delivery of flash tubes with a more suitable geometry which will be life tested with a prototype power supply which has been developed at the laboratory.

The alternative of using a laser for the illumination of the chamber is being examined in conjunction with laser manufacturers. Tests carried out with a neodymium YAG laser operated in the Q-switched mode and in the fixed Q-mode have shown that the energy requirements at 532 nanometres, obtained by frequency doubling, are entirely feasible ($\sim$5 m J). Further tests are planned to show how effectively 'speckle' can be suppressed.

Such a system looks very promising but using a single laser plus amplifier for all three channels would cost approximately twice the estimate made for the flash tube system.

The design using external beam splitters is now accepted. To avoid the effects of the large flares ($\sim$10-14cm diameter) which are produced by the small windows, these windows have to be tilted outwards through $\sim 7^{\circ}$. Although the distortion produced by these windows is increased by tilting i is only 10% worse than for the parallel case.

Reflections from the Scotchlite have been shown to be less than 1 mm diameter on film are not considered to be a problem.

2.4 Data Board

At our January Optics meeting we decided to use the shuttered fibre optics system employing pseudo contact printing. Test pictures show excellent definition and contrast.

A new format has been devised and will shortly be circulated to 'users'.

2.5 Cameras

Tests have been carried out with a capstan modified to suit the data board. Vacuum sunkdown over the chamber image is not impaired.

The more powerful hydraulic motor has been delivered and capstan frequencie of 19 Hz have already been achieved.

3. CHAMBER TEMPERATURE CONTROL SYSTEM

3.1 Valve Vessel

The design has been submitted to the official inspectors and we are taking account of their recommendations before taking tender action.

3.2 Valves

We are waiting for a formal price quotation for the control valves.

3.3 Control System

The flow diagram and control requirements have been agreed. A costing has been obtained for the control elements.

4. EXPANSION SYSTEM

4.1 Bellows

A second GRP bellows of similar quality to the first has been made.

4.2 Trial Piston-Bellows Assembly

The first bellows has been attached to the test piston and will be delivere to CERN after vacuum and stiffness tests at RL. This item is later than expected at the last meeting due to late delivery of components and some problems encountered during assembly.

4.3 Bellows Test Rig

The modified MAQUETTE has been assembled and cooled down. Apart from a few leaks some of which have already been cured the rig is ready to receive the piston-bellows assembly.

4.4 Plastic Piston

The design is complete and some trial moulding techniques have been investigated. Moulds have now been ordered.

The piston drive shaft design is being re-examined to increase the stiffnes It is expected that spurious pressure fluctuations due to a finite shaft stiffness will be less than $1\frac{1}{2}$ psi.

5. VACUUM SYSTEM

Prices for major components have been received. Although delivery dates ar satisfactory prices have risen more rapidly than inflation during the last year.

Detailed drawings of diffusion pumps have been received and are being assessed with regard to a 6 bar pressure requirement.

6. MECHANICAL HANDLING EQUIPMENT

The chamber trolley design is well advanced and the rail material has been specified. Static supports to allow rotation of the chamber during assembly are being considered, to ease access problems.

7. ACCESSORIES FOR CONTROL AND MONITORING

The digital voltmeter and scanner have been ordered for the monitoring system.

We have taken delivery of racks for some of the control system.

Vacuum and pressure tests have been successfully carried out on lead throug connectors for the vacuum tank.

8. IRON STRUCTURE

All major components have been cast and forged, as appropriate, and rough machined. Non-destructive tests of the end castings have been made. The quality is to specification - though we are still waiting for the official report.

We have called for small modifications to the final machining to accommodat changes in the vacuum tank. This will result in some additional cost.

At present the work is a little ahead of schedule.

9. TRANSPORT TO CERN

Nothing to report.

10. PROGRAMME

The latest programme summary is attached. Points to note are as follows:

10.1

A small delay in completion of the chamber and vacuum tank assembly (see 1.

10.2

The maintenance of substantial slack in the programme for certain key item such as the iron structure, main window assembly and vacuum tank.

10.3

The big improvement and good progress in the lens construction programme.

11. FINANCIAL STATEMENT

A financial statement valid on 1.3.78 is attached. Points to note are as follows:

11.1

Although the rate of commitment has slowed down it is still ahead of the initial forecast.

11.2

The latest cost estimate shows an increase of 7% over the initial cost estimate at 15.2.77 prices.

11.3

The increase in the estimate for the vacuum systems. This is due to a number of causes; price increases above the level calculated from the inflation indices, extra costs for providing certain safety features and some assembly costs for sub-systems.

11.4

The provisional price correction figure calculated from official price and wage indices for the period 15.2.77 to 1.3.78 is 1.079 ie. roughly an increase of 8%.

Technology Division
Rutherford Laboratory

10 March 1978

FINANCIAL STATEMENT
RAPID CYCLING BUBBLE CHAMBER FOR EHS CERN
PROJECT NOs.NA 91500-NA 91798 INCLUSIVE

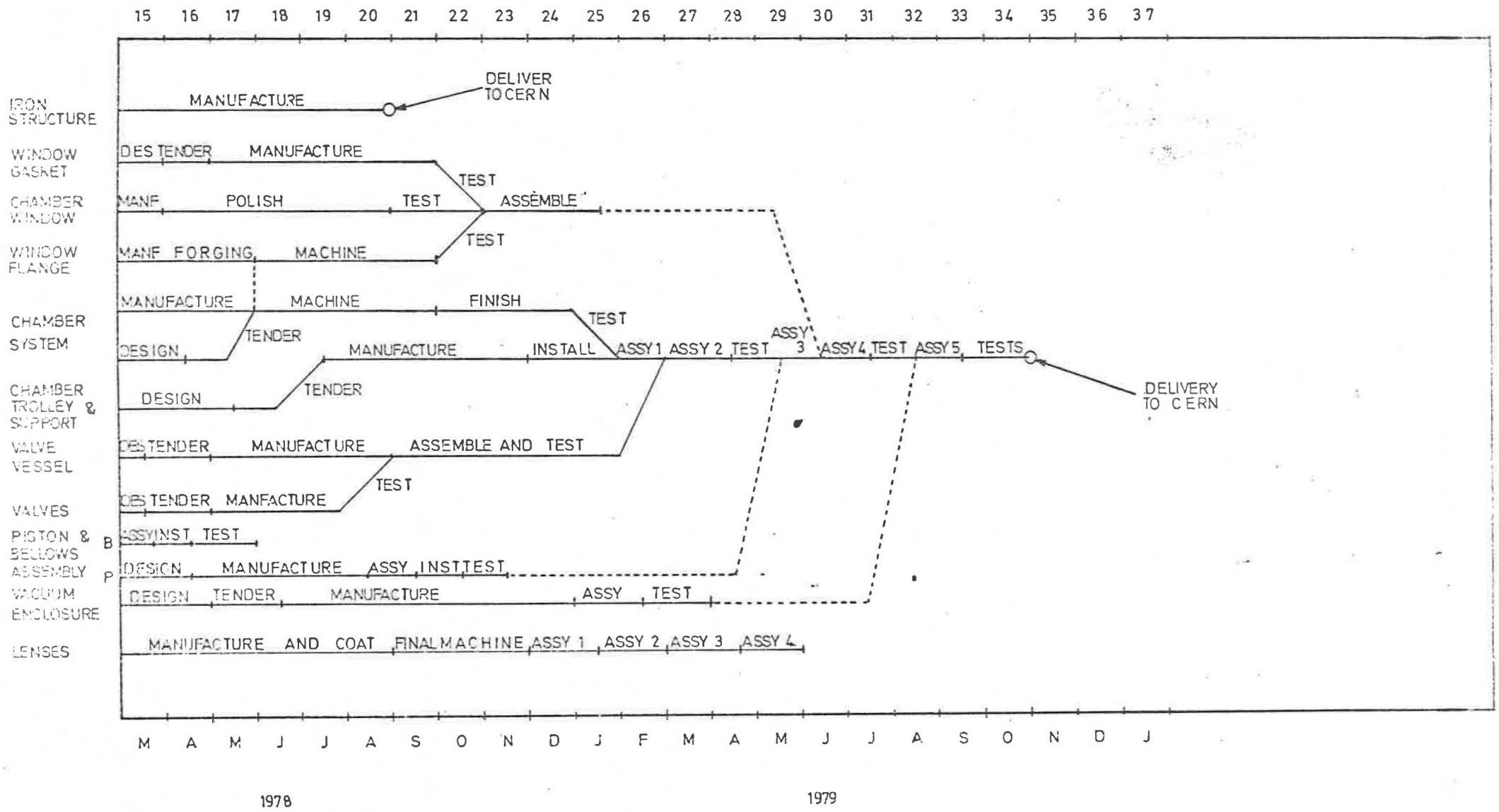
PROGRESS STATEMENT AS AT 1.3.78

ITEM	Initial cost estimate 15.2.77	Latest cost estimate* 1.3.78	Committed to 1.3.78	Forecast delivery date	Total spend in prior years	Actual spend in current year to 1.3.78	Spend forecast 1977-78
	£	£	£		£	£	£
1. Chamber & Vac.Enclosure	297,235	290,396	122,360	30.10.79	-	224	-
2. Optical System	86,925	86,925	1,035	31.11.79	-	-	-
3. Chamber Temp.Control	46,640	46,640	2,508	30.10.79	-	-	-
4. Expansion System	58,488	58,488	3,509	30.10.79	-	-	-
5. Vacuum Systems	36,559	51,394	-	30.10.79	-	-	-
6. Acc. for Control etc.	17,798	17,798	3,785	30.10.79	-	-	-
7. Mechanical Handling Equip.	29,120	29,120	2,174	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	-	30.10.79	-	-	-
	670,000	717,957	270,103		-	224	11,000

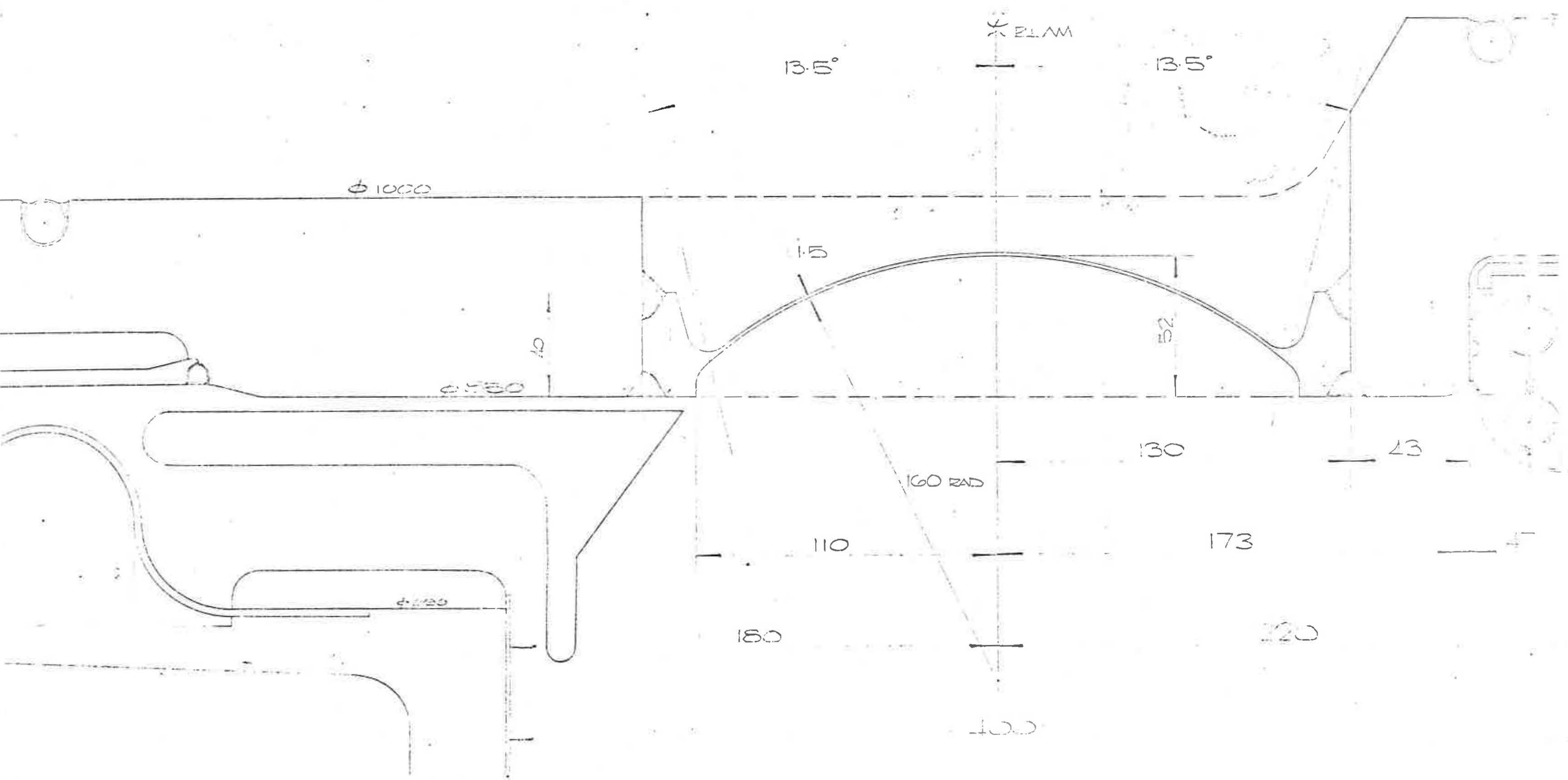
Contract price £670,000 (+15% contingency) at 15.2.77 prices

* at 15.2.77 prices.

All prices exclude VAT.



RCBC PROGRAMME 1 MAR 1978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13·5°
ϕ 1000
1·5
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130
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160 RAD
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180
220