

## PROGRESS REPORT ON R C B C

R W Newport

## 1. CHAMBER AND VACUUM ENCLOSURE

1.1 Chamber assembly.

Specifications for stainless steel forgings went out early in August and we have received offers for all components. Delivery dates are in agreement with our programme estimates, prices are 10% higher than our estimates.

A satisfactory design of the inflatable gasket has been achieved by allowing more initial deformation of the indium.

A simplified beam exit window with less invisible hydrogen looks feasible.

The detailed stress and vibration analysis is almost complete and apart from a low frequency ( $\sim 55$  Hz) transverse vibration which will need to be damped there do not appear to be any difficulties.

1.2 Main window

Neither company asked to tender has replied yet, due to difficulties in obtaining a glass blank. A meeting held at RL on 14.9.77 with Schotts has resolved all of the difficulties and a modified specification has been sent to the polishing firms. The current Schott schedule could lead to programme difficulties unless an existing stock blank is suitable.

From tentative cost estimates it looks as if our own estimate was high. Because of timescales we recommend ordering two windows at the same time.

## 2. OPTICAL SYSTEM

2.1 Telecentric lenses

A revised design with a greater field angle ( $\sim 23.5^\circ$ ) has been accepted. The tender action for materials for the lens components has been carried out and a supplier chosen. Material for the lens bodies has been ordered. A tender action for grinding, polishing and coating the lens elements is proceeding. The detailed programme for the lenses shows a delivery date some 3 months earlier than our previous programme.

2.2 Lens mounting plate

A new scheme in which lenses and capstan units will be mounted on individual sub-frames for each channel is being designed. Also the lens plate has been moved away from the vacuum tank to allow better access for direct viewing and for a polaroid camera.

### 2.3 Illumination

Tests on a full size representation using a pellicle beam splitter, the correct filter, coated Scotchlite and an aperture of f/11 have shown that >100 joules/flash is needed with a linear flash tube. There are no problems providing a suitable power supply but at 15 Hz the flash tubes will have to be water cooled.

### 2.4 Data board

Samples of Plessey LED material have been tested photographically and the results support the information provided by Plessey. These tests were carried out using an f1 lens suitable for mounting in the final databoard. We are however actively searching for alternative solutions which do not make us entirely dependent on one particular manufacturer. To this end tests have been made at CERN using a BEBC type data board. Using a lens and LED's the results are not particularly encouraging since high currents causing frequency shifts to the red end of the spectrum result and the life of the LED's is uncertain at such currents. However a novel scheme without lenses using light guides with relay operated shutters and flash tubes has been devised. Optical tests so far are extremely promising. This scheme relies on the pseudo-contact scheme suggested by us for the physics bits. In this scheme a well collimated beam of light produces a high contrast image despite there being an 0.5 mm gap between the film and the data board.

Tests on an 8 element pseudo-contact physics bit data board have been successfully carried out.

### 2.5 Capstan drive units

Further tests at 15 Hz have shown that 30 milliseconds is available for data board exposure. Tests to determine if a higher operating speed is feasible will be resumed after a more powerful drive motor has been obtained. This is expected by the end of the year.

## 3. CHAMBER TEMPERATURE CONTROL SYSTEM

### 3.1 Valve vessel

The detailed design is well advanced and a prototype control valve incorporating a bellows seal has been ordered, delivery is expected by the end of the year. Stainless steel forgings for the end plates are included in the general tender action for forgings.

Calculations on the chamber filling rate suggested that this will be ~ 20 hours, which is somewhat longer than originally intended. This is due to the refrigerator characteristics and the high load imposed by ortho-para conversion. Ortho-para conversion at higher temperature levels and better interception of heat conducted by the chamber support are being investigated and could lead to a substantial improvement in the filling time.

## 4. EXPANSION SYSTEM

### 4.1 Bellows

The moulds for the fibreglass epoxy bellows were received at the beginning of September and the first silicone rubber former is being prepared. The first bellows is expected in October.

4.2 The stainless steel test piston is out for manufacture and is expected early in November. The design now incorporates a fibreglass epoxy insert so that both joints on the bellows are now similar to those incorporated in the final design. .

#### 4.3 Bellows test rig

Components are now being made at CERN to modify the BEBC 1 metre diameter MAQUETTE for use as bellows test rig.

It is now expected that all components including a piston-bellows unit will be ready in time for the system to be assembled before the end of the year. Although this is later than the first programme envisaged it is still anticipated that a complete bellows-piston assembly will be available on the original timescale.

or early  
Jun 78

#### 4.4 Fibreglass epoxy resin piston

The design is well advanced and test pieces for the junction with the drive shaft have been delivered.

### 5. VACUUM SYSTEM

The pump specifications and the flow diagram have been agreed apart from a few details.

A basic module containing Roots and rotary backing pumps with associated instrumentation have been designed.

Discussions are now taking place with Edwards High Vacuum concerning certain safety aspects.

### 6. MECHANICAL HANDLING EQUIPMENT

#### 6.1 Chamber assembly and withdrawal trolleys

A system suitable for the Northern Area at CERN has been agreed in principle and is being designed.

#### 6.2 Iron structure lifting gear

This has been designed and has received CERN safety approval.

### 7. ACCESSORIES FOR THE CONTROL AND MONITORING SYSTEM

#### 7.1 Components specification.

This is proceeding satisfactorily and agreement has been reached with CERN regarding certain key items which are to be used in other parts of EHS.

### 8. IRON STRUCTURE

A contract is being placed with the British Steel Corporation in Sheffield for the manufacture, trial assembly and delivery to CERN for the complete structure. The quoted delivery is 44 weeks giving some 3 months slack with respect to our promised delivery to CERN. However, the cost is appreciably

higher than our original estimate. The increase is largely due to a number of technical changes and also due to inflation. Some of the changes were imposed by the requirements of another experiment. CERN have been notified of the increased price and of that part of the increase associated with the rotation of the structure for the other experiment.

No further action is considered necessary at present since it was agreed some time ago that claims against the contingency would be examined early in 1978 when we had accumulated enough data on the cost of major items.

#### 9. TRANSPORT TO CERN

Included in the contract for the iron structure was the cost of transport to CERN; this sum is in good agreement with our original estimate.

#### 10. PROGRAMME

A revised network for the RCBC programme at RL is attached. At present there are few changes from the original programme. Points worth noting are:

1. The increased slack in the iron structure programme.
2. The uncertainty in the chamber window programme which has yet to be resolved. Alternative (1) corresponds to the use of an existing stock blank which has yet to be checked for quality whereas (2) corresponds to a new blank from the next scheduled melt of BK7. If the latter is the basis of the offer then we would propose to carry out pressure tests at RL using a metal window. We are also considering re-working a heavy liquid chamber window.
3. The reduced time-scale for the manufacture of the lenses.

#### 11. FINANCIAL SUPPORT

The first quarterly financial statement is also attached. The only point worth noting is the revised estimate for the iron structure which is based on the actual contract price.

Also attached is the latest information on the variation in the indices for materials and wages costs. To the end of August these indicate an increase in the contract price of 4% though some of the figures are at present only provisional.

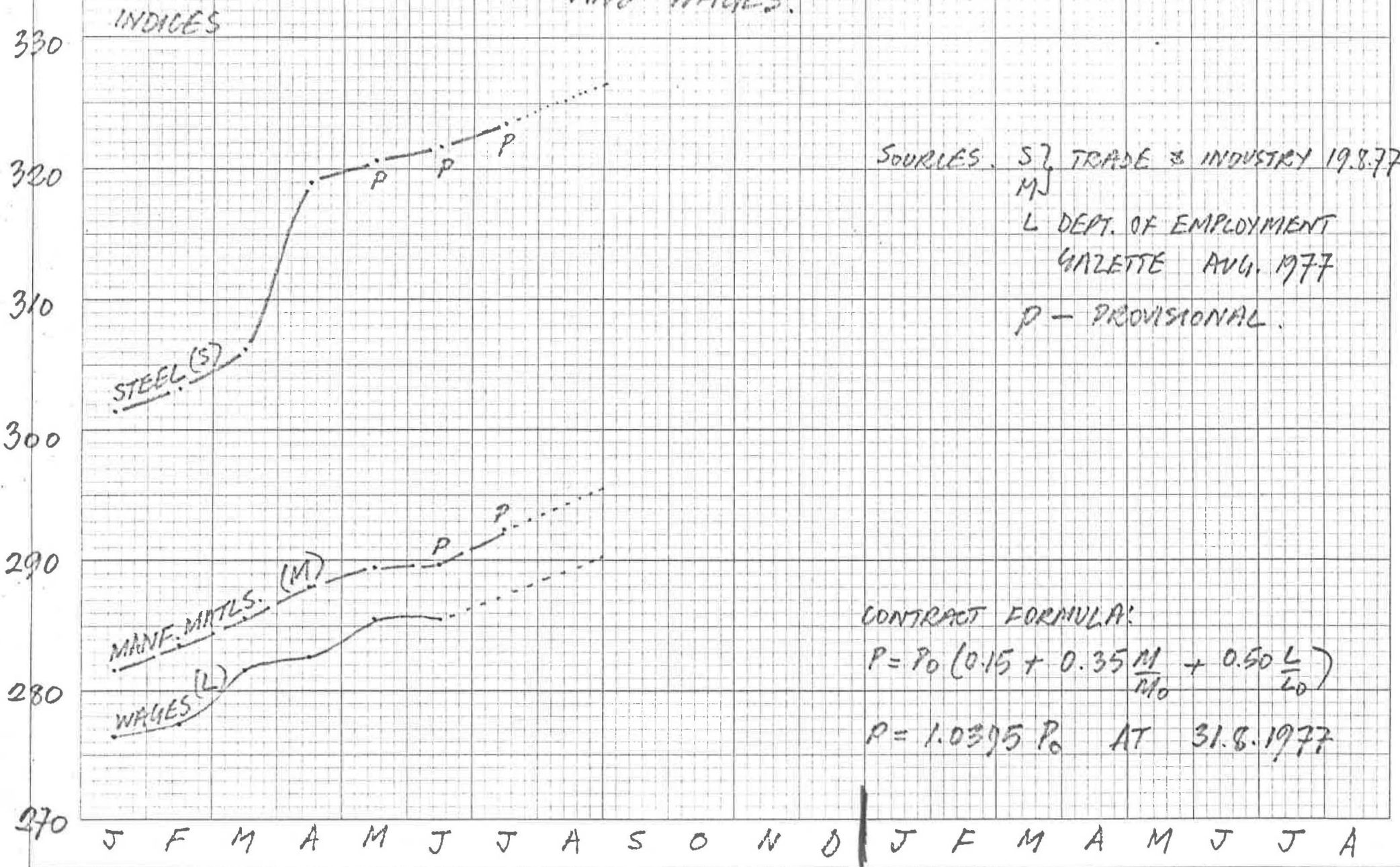
29 October 1977

FINANCIAL STATEMENT  
 RAPID CYCLING BUBBLE CHAMBER FOR EHS CERN  
 PROJECT NOs NA91500 - NA91799 INCLUSIVE  
 PROGRESS STATEMENT AS AT 31.8.77

ITEM	LATEST COST ESTIMATE	COMMITTED TO	FORECAST DELIVERY DATE	TOTAL SPEND IN PRIOR YEARS	ACTUAL SPEND IN CURRENT YEAR TO 31.8.77	CURRENT YEAR	SPEND FORECAST 1977-78
	£	£		£	£	£	£
1. Chamber & Vac Enclosure	297,235	240.25	30.9.79	-	-		
2. Optical System	86,925	-	31.11.79	-	-		
3. Chamber Temp Control	46,640	-	30.9.79	-	-		
4. Expansion System	58,488	-	30.9.79	-	-		
5. Vacuum Systems	36,559	-	30.9.79	-	-		
6. Acc for Control etc	17,798	-	30.9.79	-	-		
7. Mech Handling Equipt	29,120	-	30.9.79	-	-		
8. Iron Support Structure	114,364	-	31.8.78	-	-		
9 Transport to CERN	18,200	-	-	-	-		
10. Miscellaneous	1,040	-	-	-	-		
	* £706,369	£240.25	-	-	-		

Contract Price £670,000 (+ 15% Contingency)  
 at 15.2.1977 prices  
 \* at 15.2.1977 prices

# VARIATION OF INDICES FOR PRICES AND WAGES.



SOURCES: S] TRADE & INDUSTRY 19.8.77  
M] L DEPT. OF EMPLOYMENT  
GAZETTE AUG. 1977  
P - PROVISIONAL.

CONTRACT FORMULA:  

$$P = P_0 \left( 0.15 + 0.35 \frac{M}{M_0} + 0.50 \frac{L}{L_0} \right)$$

$$P = 1.0395 P_0 \quad \text{AT} \quad 31.8.1977$$

1977

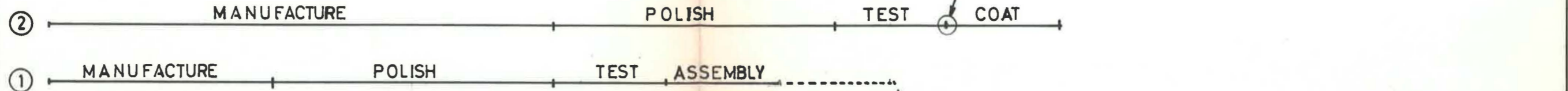
1978

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

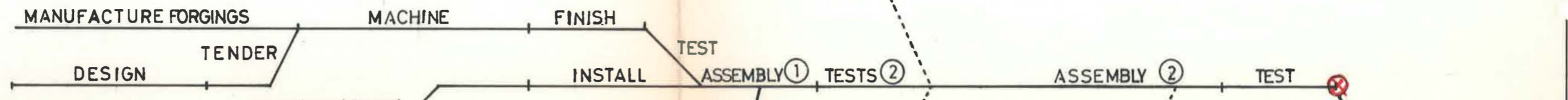
IRON  
STRUCTURE



CHAMBER  
WINDOW



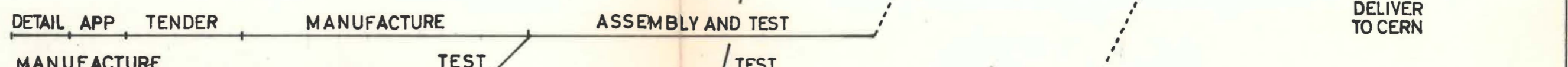
CHAMBER  
SYSTEM



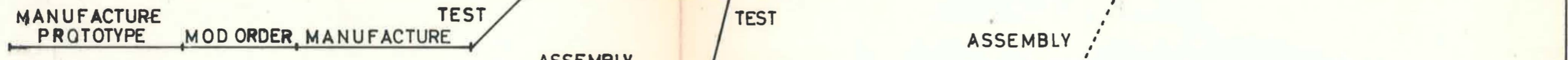
CHAMBER  
TROLLEY



VALVE  
VESSEL



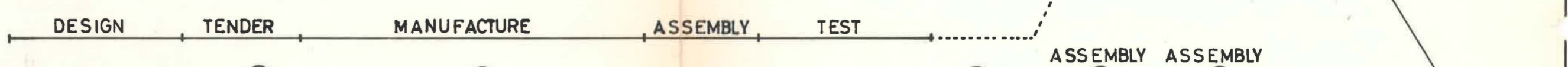
VALVES



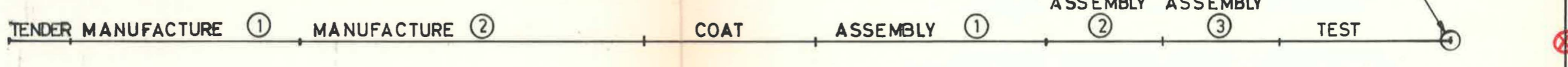
PISTON &  
BELLOWS  
ASSEMBLY



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

1977

1978

1979

RCBC PROGRAMME 23-9-77

5.10.77