

Mirror Blank for 4.2m Telescope

Although the 4.2m telescope was central to the NHO proposals which were accepted by the SRC in November 1974 and October 1975, the planning of the NHO necessarily starts with financial approval for the two smaller telescopes. The Forward Look envisages that funds might be made available for the 4.2m telescope starting in the financial year 1978/1979. This delay in the start of the 4.2m programme raises a difficulty in the purchase of a suitable mirror blank, which may have serious repercussions both on the programme and on costs.

The Primary Mirror of the Large Telescope. The diameter of the large telescope was determined having regard to the cost and availability of mirror blanks using modern low-expansion materials. The only available blank is the last of a production run of Cervit, made by Owens Illinois. The material is the same as that used with outstanding success in the 3.9m Anglo-Australian Telescope and in the 4.0m telescopes at Kitt Peak (USA) and Cerro Tololo (Chile). The blank has been inspected by Messrs. Grubb Parsons, acting for SRC; it was found to be at least as good as the previous mirror blanks, and it can be machined to provide a mirror aperture of at least 4.2m diameter. No further production of large Cervit blanks is planned by Owens Illinois, since re-starting the process would involve a heavy capital expenditure on a new furnace and casting shed. At the same time there is a continuing demand for Cervit material, particularly for laser work, and there is a danger that this demand might lead to the 4.2m blank being cut up and sold in smaller pieces.

A similar material, Zerodur, has been used by Messrs. Schotts in Germany for the manufacture of mirror blanks up to 3.5m diameter. The present costing and programme of the SRC 4.2m telescope is based on a rough estimate from Schotts, who are considering extending their casting process to allow the manufacture of a sufficiently large blank. Further enquiries are now showing that the time scale via Schotts is very extended, and further that the costs are likely to exceed our estimates by a large amount. As for Owens Illinois, a major factor in the costs is the necessity to construct a new casting tank, as it now seems unlikely that a 4.2m blank can be cast simply as an extension of the recent production run for the 3.5m and other telescopes.

The 4.2m telescope project is therefore faced with a very serious and urgent problem. There is a real possibility that the only mirror blank which can be used with reasonable costs and on a reasonable time scale may not remain

available for a start on the programme as presently envisaged by SRC. The immediate purchase of the blank, which would cost about £500,000, cannot be contemplated by SRC at the present stage of the NHO, when in particular the inter-Governmental negotiations over the use of the La Palma site are expected to extend over a further several months at least. The loss of the blank, which may occur before the end of 1977, would on the other hand involve an extra cost to the project of about £1.3M; furthermore, it would remove all possibility of completing the telescope before the presently programmed date of November 1984. On the existing plans, the use of the Cervit blank would save about one year.

A note by the Project Manager (Mr Goodsell), attached to this statement, sets out the financial and programme details which are affected by this situation.

F Graham Smith

SCIENCE RESEARCH COUNCIL

Royal Greenwich Observatory

NORTHERN HEMISPHERE OBSERVATORY PROJECT

4.2m Telescope

The current programme for the design and construction of the 4.2m telescope on the La Palma site hinges on approval being given for the purchase of the main mirror blank in April 1978.

The programme length thereafter depends upon which of two alternatives is adopted, these alternatives being the purchase of a CERVIT blank from Owens-Illinois, Toledo, USA, or a ZERODUR blank from Schott Glaswerke in Germany.

At present it is understood that the CERVIT blank remains available to us but this situation will not obtain indefinitely. We have therefore based the construction programme on the use of a ZERODUR blank. Since this would require the construction of a new furnace by Schott, the lead time is of the order of six years and completion and commissioning of the 4.2m telescope will not be possible before November 1984. The production of the mirror forms the critical path on this programme.

Considering now the acquisition of the existing CERVIT blank, the critical path then becomes that of production of the telescope mounting. Completion and commissioning of the telescope can be brought forward to March 1984 and since the critical operations are under more direct control it may well be possible to improve on this date by possibly a further 3 or 4 months.

Apart from the saving in construction time, which must reduce the impact of inflation on the total cost, there is the very real saving in the cost of the mirror blank. For the CERVIT blank we were quoted a price of \$ 800,000 in November 1975. Allowing for US inflationary trends and the current exchange rate it is estimated that the present price of this blank would be approximately £500,000. The ZERODUR blank would be considerably more expensive; current information is that the price including incidental costs associated with the furnace lining, could be as high as £1,800,000.

The advantages of an early purchase of the CERVIT blank are therefore:-

Cont...

1. A cost saving of about £1,300,000 together with a reduction in the inflation cost element of the project.

2. The ability to bring the telescope into use at least 8 and probably 12 months earlier than November 1984.
3. Avoidance of a "single supplier" purchasing situation, with its attendant risks.
4. Continuity of building work on site which must reduce total costs.
5. Avoidance of the need to rebuild the Project Team in the event of a delay between the completion of Phase I and the start of Phase II of the programme for the NHO.

A strong recommendation is made therefore that efforts should be made to secure the CERVIT blank for use in the NHO either by placing a letter-of-intent with the manufacturers or by taking out an "option to purchase" for a comparatively small sum. This would enable planning to proceed freely on the best economic programme.

W A Goodsell
PROJECT MANAGER
NHO
4 April, 1977