

NATIONAL RADIO ASTRONOMY OBSERVATORY

TUCSON, ARIZONA

October 31, 1978

*25 Meter Millimeter Wave Telescope
Memo # 112*

To: M. A. Gordon

From: D. A. Webb

Subject: 25 Meter Meeting at Socorro with Jack Lancaster, Bill Horne,
Dale Webb, Mark Gordon, Julius Marymor

This memo represents my interpretation of the conclusions reached by the individuals in attendance at this 25 m meeting. The purpose for the meeting was to determine the next logical steps which should be taken on the 25 m project.

Step #1

We should contact each of the funding agencies who are currently building, or who have built a telescope on Mauna Kea to find out what companies they have dealt with on architectural engineering problems, actual construction of telescopes, domes, buildings; and site work, and other technical problems such as Environmental Impact Statements.

Step #2

Compile a list of eligible A/E firms with all known data, such as performance, competence, cost, responsiveness, etc. on each one.

Step #3

Let a contract to the best firm to do complete soils testing, do preliminary design on the foundations, design the mountain site facilities plan, design the base facility building and site plan, review proposed layouts of all actual buildings at the base facility and the mountain site. The A/E should also perform an independent cost estimate for the total project, based on all known information as of the time the contract is let. We may also want to have this firm participate in the preparation of the Environmental Impact Statement.

Since this contract would probably be too large to fund out of operation's moneys in one fiscal year, we could let this contract on a piecemeal basis. For example, we could provide the A/E with our best current information on telescope and astrodome weight, ice loading, wind loading and physical dimension, so that they could do a pre-preliminary foundation design, determine required soil tests, and then do the preliminary foundation design. This portion of the contract could probably be funded and at a reasonable cost if there were a promise or a funding contingent contract for add on design as referred to in the above paragraph.

Depending on how long it takes to obtain NSF design money, we could probably fund a fair amount of design out of operating funds, and if NSF money comes soon, we could let this contract almost immediately, based on the current design status.

Step #4

Although listed as step #4, this next list of "things to do" should be started on immediately.

Since we (NRAO/AUI) will probably have to be responsible for the stiffness and compliance of the structure, we have a lot more work to do to assure that the final design company has all of the information they need to do a complete design.

The specific items to be done in this area that were mentioned in this meeting are:

1. Define the tolerance for joints and joint alignment, (Field alignment).
2. Define the joint location tolerance.
3. Provide details on joint locations.
4. Review and possibly redesign the intermediate structure.
5. Determine the best surface plates and provide all specifications for the design company.
6. Provide a "typical joint".
7. Provide weld specification, or alternately, a weld and flange specification.
8. Determine and specify the stiffness and loads on azimuth and elevation drive gears and systems.
9. Specify the alignment tolerance, installation tolerance, etc., for the azimuth and elevation encoders.
10. Determine location, weight, and number of cables for control system, receivers, etc.
11. Provide all material specifications and give detail dimensions on structural members. We may need redesign if the reduced size of members require that non standard tubes be used, as the cost of small odd size tubes could be much too high.
12. Determine air conditioning requirements for telescope, receivers, etc.
13. Determine requirements for helium lines and specifications for location of compressors, weight of lines, etc.
14. Provide details of maximum and minimum weight at prime focus.
15. Provide dimensions required at prime focus to accommodate receivers or sub-reflectors.
16. Determine access method for focal point.
17. Determine dimensions and access for Cassegrain receiver room.
18. Provide detail specifications on wind loads and weight loads for astrodome.
19. Settle the design for wind loads as well as weight loads for the telescope. Apparently we have not yet determined whether the telescope will withstand 50 mph winds with the astrodome door open. This is a critical question and has bearing on the usefulness of the instrument.
20. We need to determine the dynamics up to the drive system or possibly design the total drive system.

Step #5

After we are formally funded for design we should go to the known telescope design and build companies such as Philco Ford, TIW Systems, E systems, Harris, Radiation, Inc., R.C.A., etc. We should first try for a fixed price design and build contract on the telescope and astrodome, or at least the telescope. If we have no bidders on that type of contract we would then go to a design contract which should get several bidders. We would contract with them to design the following:

1. Design the structural plan and assembly plan for all connections and joints.
2. Design an assembly plan for the erection of the telescope.
3. Provide definition for all tolerances.
4. Design a standard servo system based on what we have provided.
5. Design the screw adjustable connections for the surface plates and layout the actual locations of the screw holes based on surface plates which we provide.
6. Design cable trays and cable connections for power cables, control cables, signal cables.
7. Design cable wrap system.
8. Possibly design elevation and azimuth drive system.
9. Incorporate the positioning system designed by NRAO into the telescope design.

Step #6

It is probable that the astrodome design can be handled best by a structural engineering firm. There are apparently several firms that are competent in this area and in this case we would not look for a design and build contract, only a design contract which would produce detail assembly drawings, suitable for bid to a construction company. This contract could be let at the same time as the telescope design contract is let.

Step #7

Although possibly out of order in terms of time sequence, there is another action which should be taken, if possible, and as soon as possible. That action is the purchase of land in Kamuela for the NRAO Base Facility. It would be advantageous to NRAO to purchase an acre of land adjacent to the land now being purchased by the CFH and UK projects.

The major conclusions of the meeting were:

- A. A significant effort must be made by NRAO in the engineering area before we are ready to spend NSF design money. Some of the items in Step #4 have been completed, however they are now in the form of 25 m memos and are not tied together as part of a design package. Other items in Step #4 will require extensive time and effort to complete.

- B. The Steps #1-7 were written based on discussion among five individuals in a six hour meeting. Someone should now be delegated the responsibility of carefully considering all facets of the design and construction plans and pull together a comprehensive set of packages that can be given to the various companies. Our objective should be to split the work into conventional design, telescope design and build, and structural design of the astrodome.
- C. It would be advantageous to decide on a construction manager soon so that he could possibly help coordinate some of these efforts on a very "part-time" basis and would then be completely knowledgeable of the project when it is finished.