

MAY 1975

NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROJECT

JUNE 10, 1975

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SITE AND WYE

The Title II work is complete except that required by Amendment No. 8 to Subcontract No. VLA-5. The E/A firm is preparing estimates and bid packages for the second contract on Wye trackage which is scheduled to go out for bid about July 15, 1975.

Subcontract VLA-34; Burn Construction Company, Inc.; \$616,908.14:

This contract is 100% complete and final payment has been processed.

Subcontract VLA-65; George A. Rutherford, Inc.; \$2,386,000:

1. Floor slabs for the Control Building are 75% complete, lacking only the east mechanical equipment room. The laying of slump-block has begun on the exterior walls. Forms for the central core walls are complete. All nine metal-tube columns and two north wall concrete columns have been erected.
2. Masonry walls in the Cafeteria Building are 95% complete. Plumbing and electrical wiring is being roughed in.
3. Grading of the sewage lagoons has been completed and the water reservoir has been laid out.
4. Precast panels for the Control Building and prestressed concrete tees for both buildings have been manufactured in Albuquerque and await shipment.

This contract is estimated at 16% complete.

All seven waveguide manhole bottoms have been installed and extension rings have been delivered. Rough trenching between CW-9 and CW-8 is complete and grading is proceeding ahead of the waveguide installation. Approximately 700 feet of waveguide has been coupled, pressure tested, sleeved, and the protective coating tested. Approximately 400 feet of waveguide has been set to grade and backfilled in the trench.

ANTENNA DIVISION

Antenna

By the end of May the assembly of antenna No. 1 had reached the following stages:

1. The reflector back-up structure has been assembled in its position at the rear of the assembly building, the vertex room installed, insulated and installation of the inside paneling was in progress.
2. The antenna base is complete through the azimuth bearing support. The azimuth bearing, gear, the azimuth gear boxes, and the torque box section of the alidade have been installed. The torque box has also been connected to inner ring of azimuth bearing and the yoke arms installed on the torque box section. The platform installation is underway.
3. The elevation axle and elevation gear girder have been assembled. After installation of the elevation bearings on the axle this assembly will be ready for installation on the antenna.
4. Preliminary alignment checks have been completed on the azimuth bearing and pedestal. Inspection of manufactured components at manufacturers plant were conducted on the azimuth bearing and gear for antennas 1 & 2 with both bearings falling well within specifications. Bearing No. 1 is on site and installed with No. 2 in transit. Gear reducers for No. 1 and No. 2 were inspected with both azimuth and elevation gear boxes not reaching the required drive stiffness. All other physical requirements of the gear reducers were satisfactory. The elevation gear reducer stiffness was only slightly below that specified and the decision as to disposition of these reducers will depend on the results of the antenna tests as calculations show that the lowered elevation stiffness will not degrade antenna performance. The azimuth gear box stiffness is appreciably lower than that specified and will be corrected by the manufacturer (Philadelphia Gear) for later gear reducers and the present gear boxes which have been installed to permit continuation of assembly and performance of testing of the antenna will be replaced with gear reducers meeting specifications.

AUI furnished antenna components and equipment are on hand at the site with exception of the secondary reflector which is ready for customer inspection.

ELECTRONICS DIVISION

At the VLA site, the model vertex room has been erected and the feed ring and front end rack have been installed. The feed horns for the 6.0, 2.0 and 1.3 cm bands have been connected and pressurized and the waveguide interconnections to the front end rack have been tested. The front end has been cooled down several times and no further failures of the mixer diodes have occurred. At the present time the cryogenics compressor does not turn on automatically after a power failure, and as a result some cool-down tests have been interrupted by power failure which occurred outside of working hours. An automatic turn-on system will be installed next month. It has been decided to use aluminum dewars for the next set of antennas and four such units have been ordered for Vacronics Inc. and Metra Inc.

Installation of 1.25 km of waveguide on the southwest arm has started and is about 20% complete. In the initial stages of this operation most of the time was spent in checking procedures for aligning the waveguide and for getting the coupling flanges fitted without the jamming problems encountered in an earlier trial assembly. This last problem has been overcome by machining approximately 0.002 inches from the coupling sleeves to increase the tolerances slightly.

In Charlottesville the system testing of the prototype electronics has continued. Many of the problems encountered in the previous month have been overcome by small design modifications in the modules. As a result satisfactory measurements of the phase changes which result from path-length changes in the waveguide have been made. Spurious signals within the system have been the cause of several unwanted effects, and a high temperature coefficient of the oscillator phase at the antenna rack has been traced to an amplifier which was operating in an overloaded condition. It appears that switched isolators at the waveguide terminals of the modems will eliminate some standing-wave problems, and these are being procured and installed. Some problems also appear to be attributable to second and third harmonics of the millimeter-wavelength signals propagating in the waveguide. These are believed to be a problem in the test setup because the attenuator that simulates the loss in a 21 km length of waveguide does not function correctly for the harmonics because they do not propagate in the usual mode for rectangular wave guide. Not all of the observed effects in the waveguide simulation tests are yet understood, but a great deal of progress has been made, and the measured signal-to-noise ratios are satisfactory and close to the expected levels.

Tests of both the Westinghouse and TRG modems have now been made. The Hughes modems have been packaged but are awaiting Gunn oscillators before they can be tested in the system. The modems are, of course, the most important electronic units in the waveguide communication system, and the system tests made thus far have enabled us to specify their required characteristics in much more detail than was possible at the time of the initial procurement. As a result it has been decided to implement an NRAO design for at least some of the modems required for the next four antennas.

Tests of transmission of the digital monitor-and-control data over the waveguide system presented some initial problems, but have now been performed satisfactorily both to and from the computer at the central station. Some modification of the level detecting circuitry for the received signal is desirable however. The system controller for the delay and multiplier system has been retested after some modifications suggested earlier during the month, and it is now complete.

Overall, a great deal of progress has been made in testing the system during this month, but numerous problems remain. We have not yet made a test involving transmission of signals over the complete path from the front ends through the multipliers, but are close to reaching this point.

COMPUTER DIVISION

Asynchronous Subsystem

Early this month, the last major components of the control language CANDID were completed, and a decision was made to adopt this language as the top level of the asynchronous computer's initial data processing system. Further development of basic CANDID capabilities continued through the remainder of the month; also, many new functional operators were added to the system. Based on specifications previously outlined, coding was begun on CANDID operators which plot and display data arrays. Extensive work on the basic mathematical applications routines was begun, and these activities will be the dominant task of the Asynchronous Computer Group in the coming months.

Implementation of the data base design is continuing as planned, and simple manipulation of several data base-related routines using CANDID control was achieved. Design work continued on the interface to be implemented between CANDID and the data base itself.

A procurement of graphics display hardware proceeded.

Synchronous Subsystem

The group has devoted most of its effort this month to continued support and checkout of interfaces to NRAO built electronic equipment. The automatic restart feature to the three peripheral CPU's was added to the system, and software written to support it. About two man weeks were lost in attempts to trace and repair a subtle hardware malfunction.

PROJECT MANAGEMENT DIVISION

The take-up of the rail at the Lincoln Ordnance Depot is nearing completion and shipments are arriving at the site. Also, rail take-up at Redstone Arsenal is scheduled to commence around the middle of June.

Additional small quantities of rail have been located at the Sunflower Ammunition Plant. Transfer action for this rail is underway.

A larger and more adequate bus has been leased to accommodate the increasing number of employees at the site. This bus will serve until delivery of the 45 passenger bus procured for this purpose. A bus training program has also been initiated through the assistance of White Sands Missile Range transportation office.

Effort continues in readying the facilities for the June transfer of people and equipment. This move will complete the majority of employee relocations for 1975.

The contract with the Socorro Electric Cooperative has received the approval of the National Rural Utilities Cooperative Finance Corporation, the Rural Electrification Administration and the New Mexico Public Service Commission. These approvals complete those required to put this agreement in effect. Under this subcontract SEC will construct an approximate \$370,000 express feeder line to supply power to the site that requires no capital expenditures by the project.

Personnel

The personnel changes for the month of May are as follows:

<u>Division</u>	<u>Previous Level</u>	<u>Additions</u>	<u>Reductions</u>	<u>Current Level</u>
Site and Wye	6	0	0	6
Project Management	13	4	0	17***
Antenna	6	0	0	6
Electronics	30	1	0	31*
Computer	13	0		13**
Systems Integration	<u>1</u>	—	—	<u>1</u>
TOTALS	69	5	0	74

* Includes two part-time people.

** Includes one part-time person.

*** Includes one part-time person.



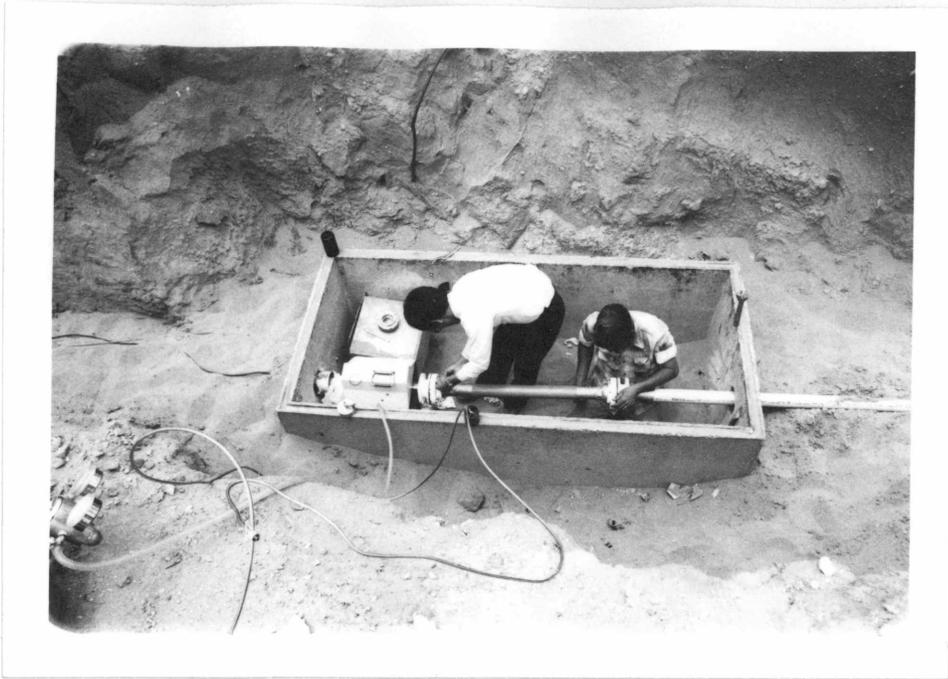
p6-75-1

Status of Control Bldg. Construction



p6-75-2

Status of Cafeteria-Recreation Bldg. Construction



p6-75-3

Installing Shutter for Waveguide Test - CW-9 Manhole



p6-75-4

Waveguide Run in Trench Ready for Test-



p6-75-5

Excavation of Waveguide Trench-
Note Drifting Sand from Winds



p6-75-6

Antenna Transporter Nearing Completion