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May 6, 1976

ENGINEERING MEMO #107

Dr. David H. Gurinsky
Metallurgy Division
Brookhaven National Laboratories
Upton, New York 11973

Dear Dr. Gurinsky:

Enclosed you will find photographs of brake springs (broken and not broken), and of brake assemblies as installed on the 140-ft telescope. Also enclosed are drawings of the brake spring, the mating toggle plates, and the piston rod which is moved by the brake cylinder piston thereby exerting pressure on the toggle plates and forcing the brake to release. I marked up these photos to make them more sensible to you.

Another enclosure is a sketch of the 140-ft telescope with the approximate locations of the brake assemblies as indicated. From this you can see the two axis motion of the telescope. The upper motion is the upper gear girder and is referred to as declination motion. The lower and larger gear girder is hour angle motion.

The declination axis has two brake assemblies and the hour angle has three for a total of five identical units.

Each brake assembly is designed to exert 210,000 pounds force on the girder. The brakes are spring set, hydraulically released.

Each brake assembly contains ten each, brake springs which are U-shaped (see drawing 32D00004). The material, yield, and hardness is shown on the drawing.

Setting inside the U-shaped assembly of ten brake springs is a hydraulic cylinder, piston, toggle plate assembly. When the brakes are released, the cylinder presses downward against the bottom of the brake spring, and upward through the toggle plates in the .750 inch notches in the spring to force the top of the spring open.

Additional refinements tie the entire spring assembly together and brake buttons engage the gear girder when the brakes are set.

Our failure history is as follows. Originally there were six brake assemblies installed. (The additional one was on the declination axis and was removed before we began operation because it was calculated that it wasn't needed. This one has been our source of spare parts).

The brakes operated well until May 1974 (about ten years of operation) with maintenance as specified. In May 1974, we replaced one shoe in each of two assemblies. The broken shoes were sent to Goodyear for their analysis. A copy of their findings is enclosed. Adjoining shoes (not broken) were sent to a laboratory to x-ray and test for flaws. No flaws were found.

For almost two years, nothing else happened, until February of this year. Then we found in the third assembly two shoes broken and one cracked. Finally in April 1976, we had two broken shoes in the fourth assembly.

Thus broken shoes have been replaced once in four of the five assemblies.

How does one get to Green Bank, W. Va.? One way is to fly to Washington, D.C. and drive to Green Bank. This is about a four and one half hour drive.

Another way is to fly to Washington (Washington National Airport) and catch Piedmont Airlines flights to Charlottesville, Virginia. There are three Piedmont flights to Charlottesville per day at 1:00 P.M., 5:45 P.M., and 10:00 P.M. From Charlottesville you can arrange to catch the NRAO shuttle which leaves Charlottesville daily at 9:00 A.M. except Saturday and Sunday.

An alternative would be to rent a car and drive to Green Bank over the route on the map that I have enclosed.

We would be pleased if you were to come to Green Bank and look at our problem as soon as possible. If convenient for you, we would prefer your visit to be on Wednesday as this is our maintenance day-however, this is just a convenience for us, and it is not essential that you come on Wednesday.

I believe that I have given you all the information that might be useful at this point. Please call me if anything is unclear, and I would appreciate hearing what you think after you have looked over this information. I can be reached at the phone number listed on the heading of this letter.

Yours truly,

James F. Crews

James F. Crews, Head
Telescope Operations Division

PS: Another enclosure!
A copy of our letter
to BNL's Mr. Irving J. Polk.