

National Radio Astronomy Observatory  
Tucson, Arizona  
July 31, 1992

## MEMORANDUM

To: 12 m Memo Series

From: P. R. Jewell

Subject: Evaluation of Feedleg Insulation

We have evaluated four types of insulation for possible use on the 12 m feedlegs. These are

- Thermazip Type TMZ 475 (white Tedlar jacket & 1" Polyurethane foam)
- Thermazip Type TMZ 350 (white PVC jacket & 1" fiberglass wool)
- Celotex Thermax Aluminum Foil-Backed Insulation (1")
- 3M Adhesive Aluminum Foil No. 425.

Thermazip is manufactured by Accessible Products of Tempe, Arizona. It is sold primarily as pipe insulation. It attaches to itself with a fitting similar to zip-lock bags, and would be very convenient for the 12 m feedlegs. We have been using Celotex on the 12 m feedlegs for the last 3 years. Fitting this rigid insulation around the feedlegs plus attached cables resulted in a large box that substantially increased feedleg blockage of the primary reflector. For this reason, it would be advantageous to install a more snugly-fitting insulation. We will continue to blow air through the interior of the feedlegs (see accompanying 12 m memo by J. Lamb).

To evaluate the insulation we constructed four small frames of 2x4" wood, with interior dimensions of 21" x 9.75". The cross-sectional area of the frame is similar to that of the 12 m feedlegs. We then wrapped the frames in the four types of insulation and sealed the ends with aluminum tape. Through the top of the frame we drilled a small hole about 1 cm across, just big enough through which to insert a thermometer. The plain foil with no insulation was used as a control for the experiment.

Measurements were made on 27 and 29 July 1992. Each day we first checked the temperatures of each box inside the Steward Observatory building, then moved them to the roof. The temperature was then measured approximately every half hour for 4-5 hours, from late morning to early afternoon. It was sunny on both days, with some clouds moving

in during the last hour of the 29 July measurements. On 27 July, we placed the boxes upright so that the angle of incidence of the sun's rays was very oblique. On 29 July, we laid the boxes on their sides, with one end slightly propped up by a 2x4 on its side. On 29 July, in addition to measuring the interior temperatures of the boxes, we also measured the exterior skin temperatures using a Fluke temperature meter and probe.

The results from 27 July 1992 are shown in Figure 1. The Thermazip PVC jacket with fiberglass insulation exhibited the longest time constant to temperature change. It was noticeably better than the Thermazip Tedlar with foam insulation, and slightly better than the Celotex. Similar results obtained for the 29 July 1992 measurements, shown in Figure 2. Figure 3 shows the skin temperature measurements. The PVC jacket seemed to run slightly cooler than the Tedlar. It is of interest that when some light clouds moved over the sun, both the PVC and Tedlar exhibited a drop in temperature not seen with the foil. This may indicate that the white-colored jackets have better IR emissivity than the aluminum foils.

## CONCLUSIONS

The PVC jacket and fiberglass insulation seemed to have the best insulation properties of the four tested. Since these combinations of jackets and insulations were the only ones sent to us by the manufacturer we cannot separate the performance of the jacket from the insulation. The fiberglass insulation should have a higher thermal resistance than the Polyurethane foam and probably accounts for most of the difference. However, the PVC jacket may also have a slightly lower skin temperature than the Tedlar, although not by much. The manufacturer rates the Tedlar jacket as their best product for exterior use because of its resilience to solar UV and caustic chemical or environmental agents. The PVC jacket is also recommended for exterior use.

We conclude that the Thermazip products with 1" of fiberglass insulation and PVC or Tedlar jackets are acceptable products for 12 m feedleg insulation.

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# Feed Leg Insulation Tests

27 July 1992

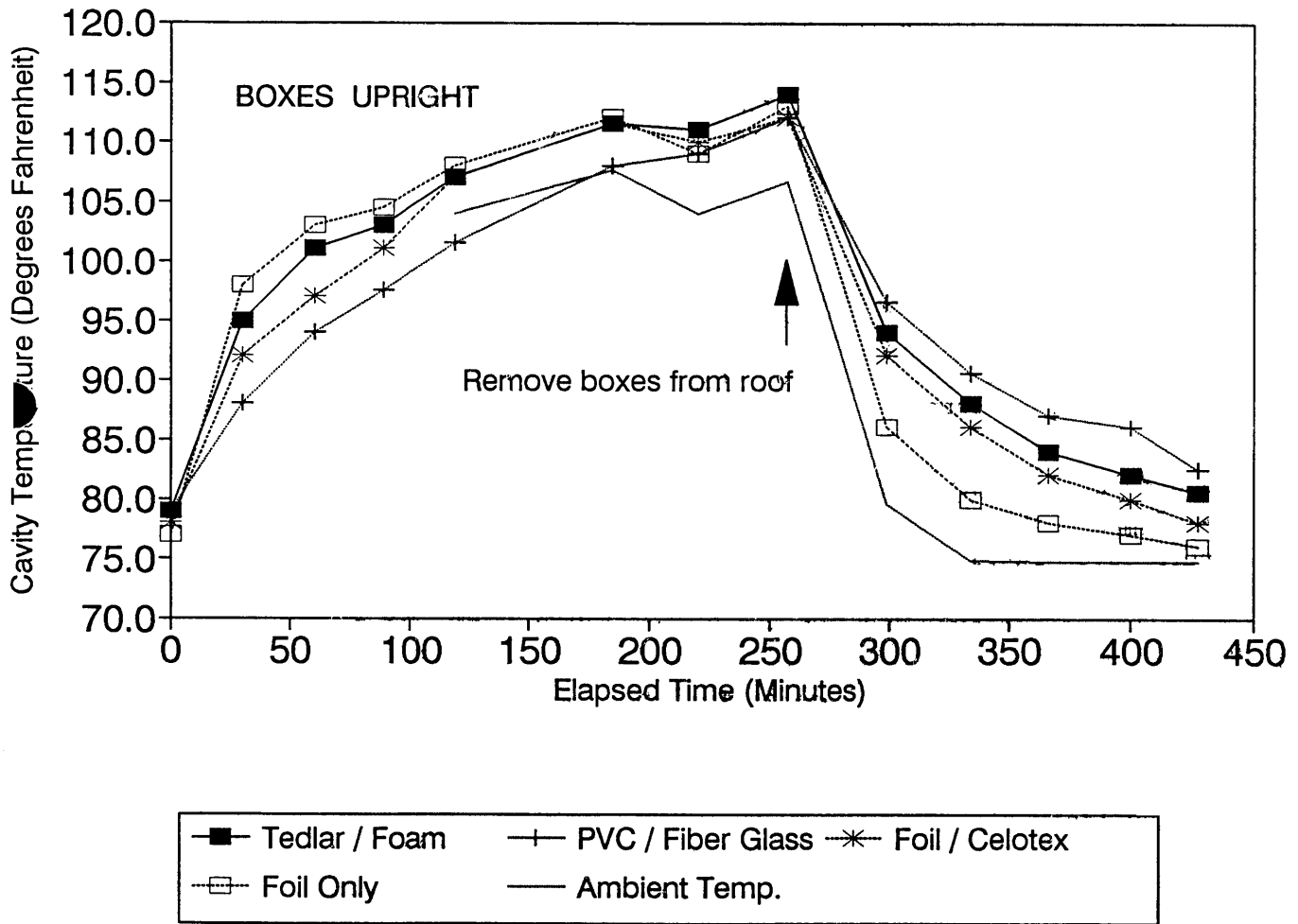


FIG. 1

**Feed Leg Insulation Tests**  
29 July 1992

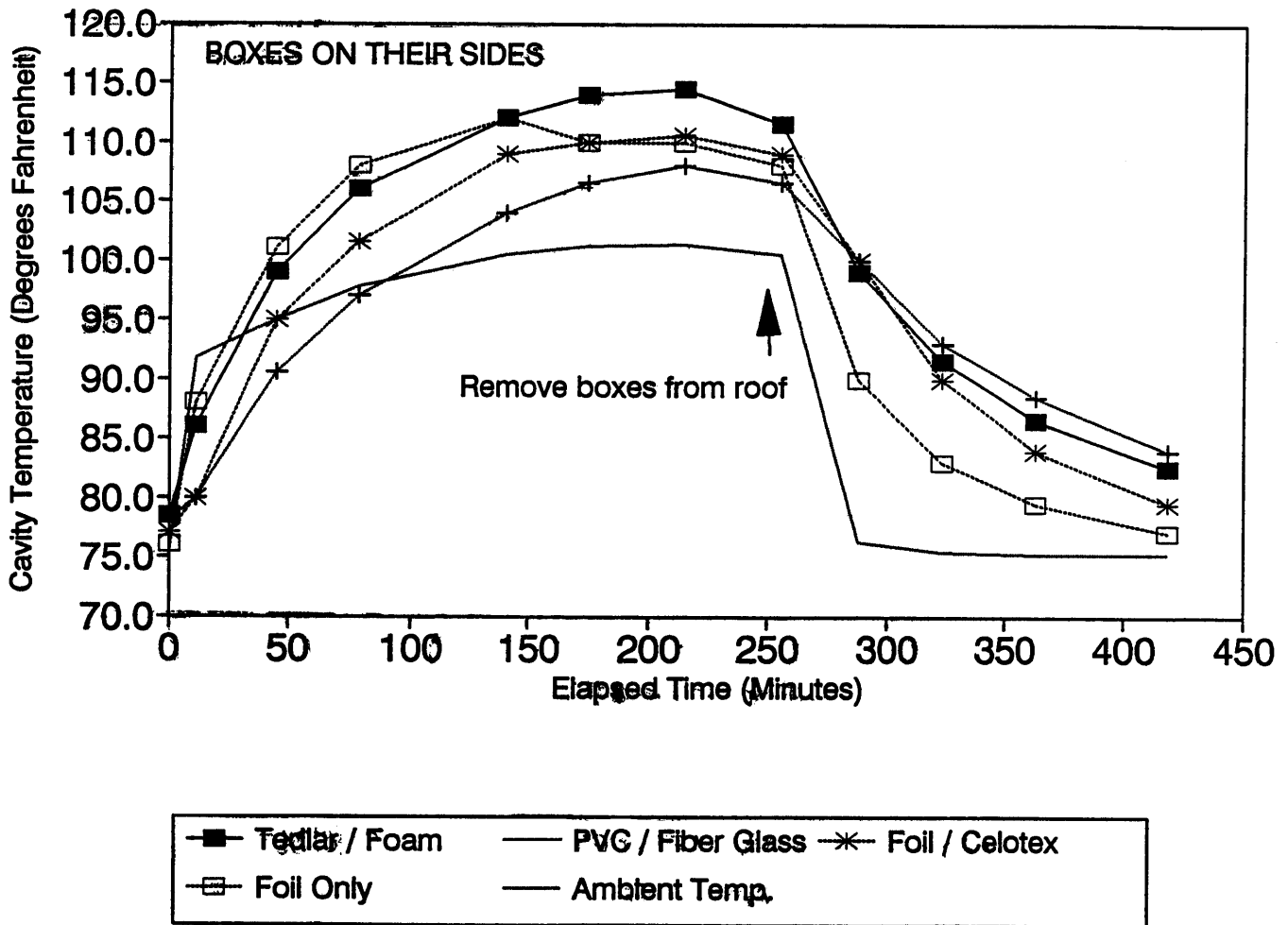


FIG. 2

### Feed Leg Insulation Skin Temperatures 29 July 1992

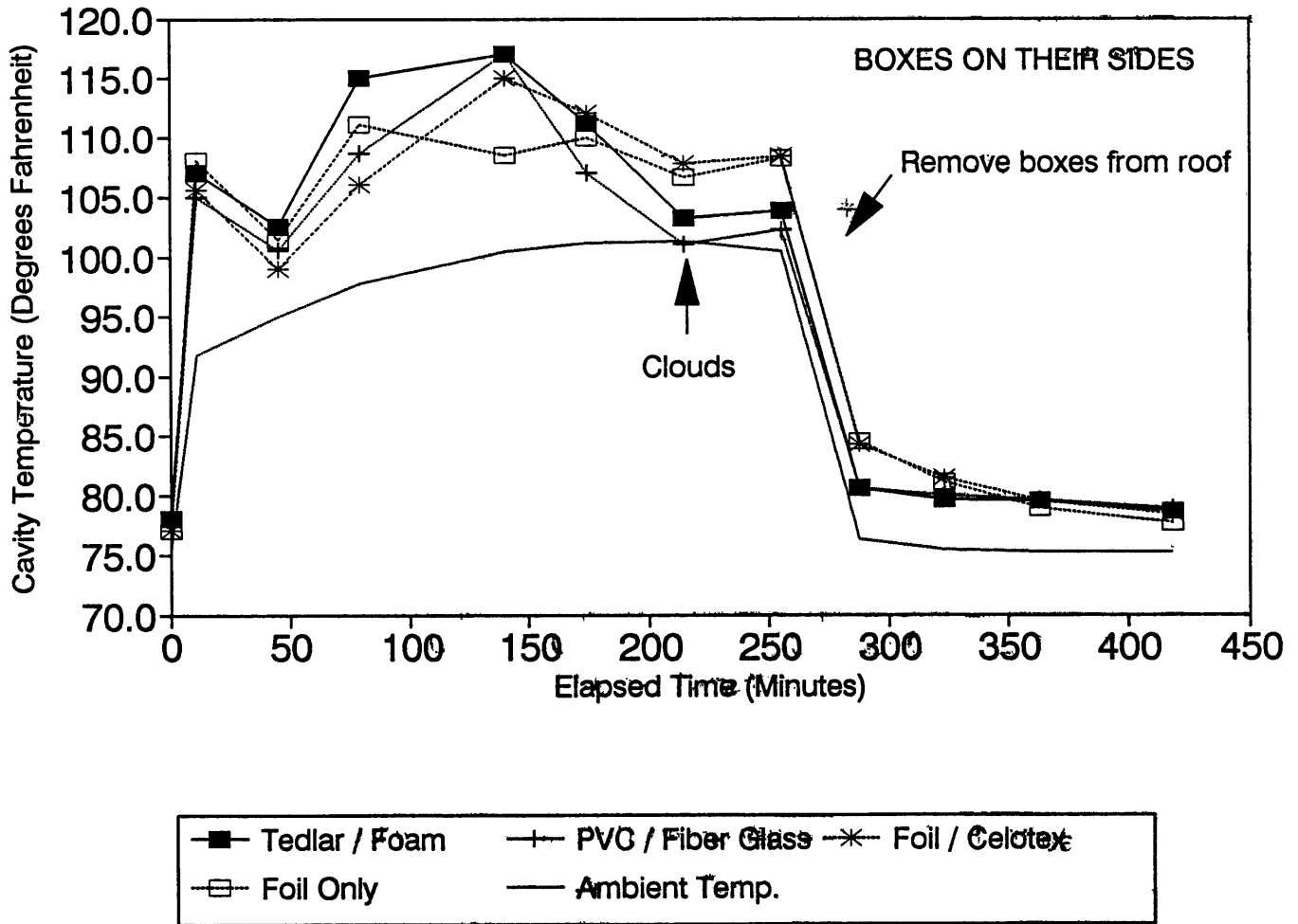


FIG. 3