Interoffice

VLB ARRAY MEMO No. 374

National Radio Astronomy Observatory

Socorro, New Mexico

August 1, 1984

To: B. Peery

From: Jon Spargo, VLA Safety Officer

Subject: Comments on VLB Array Memo No. 363

As Peter Napier has asked me to provide consultation to the VLBA in matters of general safety, fire protection and life safety, the following will deal with those subjects as pertains to the design and use of the VLBA Antenna Site Control Building.

In general I have no problems with the proposed use of the building or for the most part its contents. However, I have found several areas that I feel demand some additonal consideration.

In reference to paragraph 02, the intended method of tape storage is in conflict with Federal Standard RP-1, paragraphs 501-1 thru 501-3. The final resolution of this problem will depend upon the total number of tapes to be found within the building at any given time. If that number is large, i.e., more than 10 to 20 tapes, all three paragraphs apply. If the number is small, then paragraph 501-1 only need be adhered to.

In reference to paragraph 08, the construction of an essentially windowless building presents special problems for fire department operations in fighting a fire. Buildings such as this are usually total losses, even with early fire department arrival, unless there is an automatic supression system and means provided for fire fighters to ventilate the building and attack the fire.

I am also informed that this building will be located as close to the antenna as possible without interfering with antenna motion. The lack of windows and proximity to the antenna raises the question of safety for the "local" operation of the antenna for quick repairs or when a visiting repair team must work on or near the antenna. In the absence of visibility, the local operator (inside the building) must have a fail-safe method of communication with the people working on or near the antenna. In addition the antenna should be provided with numerous emergency stop switches that can be easily accessed by anyone working on the antenna.

Even with these precautions, there is no guarantee that people will use them. Our experience at the VLA shows that even veteran technicians often forget to notify operations when they are working on antennas. In the absence of a fool-proof method of local operation of the antenna I would suggest that you consider providing a visual means for the operator to determine that it is safe to place the antenna in motion.

In assessing the potential risk from fire to the building and antenna. I find that there are fire protection problems with reference to paragraphs 5, 9, 13, 14 and 15. Since the building will not be occupied on a 24 hour basis, I feel that an automatic fire detection and supression system should be installed in the building. The system must be supervised so that an alarm/or trouble can be investigated immediately. Some of our sites will be in remote areas so a pressure tank sprinkler system will be necessary. Some will be in areas with no public fire protection or will have long response times. This makes reliable automatic protection mandatory.

With reference to paragraph 5, the fuel load of the building and contents is usually much higher than you think. Floor and ceiling tiles, paint, furniture, electronic equipment, cables, tapes, etc. provide a good fuel load for a fire. As well, it is often the case that we are lulled into a false sense of security by the use of so-called "flame retardant" materials. In most cases flame retardant means that the materials are treated with chemicals so as to raise their ignition temperature. They will indeed burn when that temperature is reached. As well, their combustion products are much deadlier to humans because of the additonal chemicals. The presence of electrical and electronic equipment provides a potentially excellent source of high temperature ignition for these materials.

With reference to paragraph 9, what kind of insulation will be used, what is its combustability, fuel content and smoke production?

With reference to paragraph 13, what kind of cable ways and bundles will be installed? What kind of wall penetrations? Will there be underfloor detection and supression?

With reference to paragraph 14, a potential problem exists from exposure of the antenna to fire by virtue of its proximity to the building. If, for example, the VLBA antennas were coated with foam type insulation in a manner similar to the VLA antennas, a large fire in the nearby building would have a high probability of destroying the antenna as well.

With reference to paragraph 15, who will the smoke detectors alert when nobody is there and who will operate the fire extinguishers? Remember that OSHA says if you provide a fire extinguisher you must also provide training in its use and maintain the learned skill.

In the final analysis the protection provided should be considered in view of the total investment for each antenna. My rough estimate is that the value of the antenna, building and equipment will probably be about 3 to 5 million dollars. My opinion is that the expenditure of 30 thousand dollars per site (1% or less) will provide fire detection and supression equipment capable of 95% protection of the investment on a 24 hour basis.

References for the above discussion can be found in:

Federal Standard RP-1
OSHA - CFR 1910 Subpart L
NFPA standards 90A, 220, 96, 70, 70B, 70E, 72E, 80, 12A, 12B, 101, 78, 24, 232, 72D, 72B, 204, 13 & 22

JS/sb