

Lightning Protection, VLA Control Building

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July 18, 2002

Introduction

Lightning can and has caused extensive damage to electronic equipment in the VLA CB (Control Building.) This document describes the LPS (Lightning Protection System) at the CB and action required to maintain its integrity.

Description

An aerial cable over the top of the building connects to lightning rods, ground cable along the parapets, and down conductors on major corners of the building. Down conductors connect to 8' ground rods and radials in an attempt to provide an alternate path for direct lightning strikes. Bonding all the ground conductors reduces potential gradients across the building.

All conductive cables leading into the building have ground shields bonded to building ground at the building entrance. In addition, many signal conductors are protected by gas tube suppressors at or near the building entrance.

Implementation

Installers and maintenance personnel are required to bond cable shields and armor to building ground on new and repaired conductors that lead into the building. The bonding shall be performed to provide a conductive, gas tight connection.

In addition, each conductive signal wire for new installations leading into the building must be connected to a gas tube suppressor at or near the building entrance. The ground side of the gas tube must be bonded to building ground through a ground braid of at least 1" in lateral dimension that is as short as possible. Connections must be soldered or connected with a gas-tight connection such as a punch block, solder, or cad-weld. The gas tubes shall have a firing threshold of 90 v. A small resistance of ~10 ohms and or inductor of ~10 microhenries should be installed in series with the signal lines before the suppressor for current limiting.

All conductive conduits, plumbing, or other piping must be bonded to building ground at the building entrance. Existing installations, such as the wyecom and wyemon, will not be required to have the gas tube protection on the signal conductors. The bond to ground on the cable ground shield should be sufficient to protect adjacent equipment from damage, and the wyemon and wyecom equipment has proven sufficiently robust not to require additional protection.

It is recommended that additional transient protection, such as a silicon avalanche diode (General Semiconductor Transzorb), be installed on each metallic signal conductor at the circuit board.

The diode is connected between signal and ground. Its conducting threshold is to be selected based on the susceptibility of the circuit it is protecting. Doing so will suppress smaller transients that are insufficient to jump through cable insulation but can be large enough to overcome circuit susceptibilities. Tranzorbs can be important for the application, but are not necessary to protect adjacent equipment.

The AC power system shall be protected following commonly accepted practice.

Verification

A representative of the ES Division will periodically inspect the LPS for compliance, perform any needed maintenance, and report installations that violate the LPS requirements. The inspection will be conducted annually before the onset of the lightning season which begins typically around 1 July. The ES Division will establish a procedure, checklist, and log for the inspections.

References:

1. "Site LPS Modifications" by Guy Stanzione, October 16, 1997.
2. "Implementation Meeting #2" by William Brundage and Richard Perley, February 2, 1989.
3. "Implementation Meeting #2, VLA Lightning Protection" by William Brundage and Richard Perley, January 26, 1989.
4. "Assessment and recommendations concerning VLA site lightning/grounding protection" by Rick Perley and Ken Bartos, August 12, 1988.

*Please note: If you need paper copies of the references or this memo please contact Lori Appel, lappel@nrao.edu or ext. 7310.