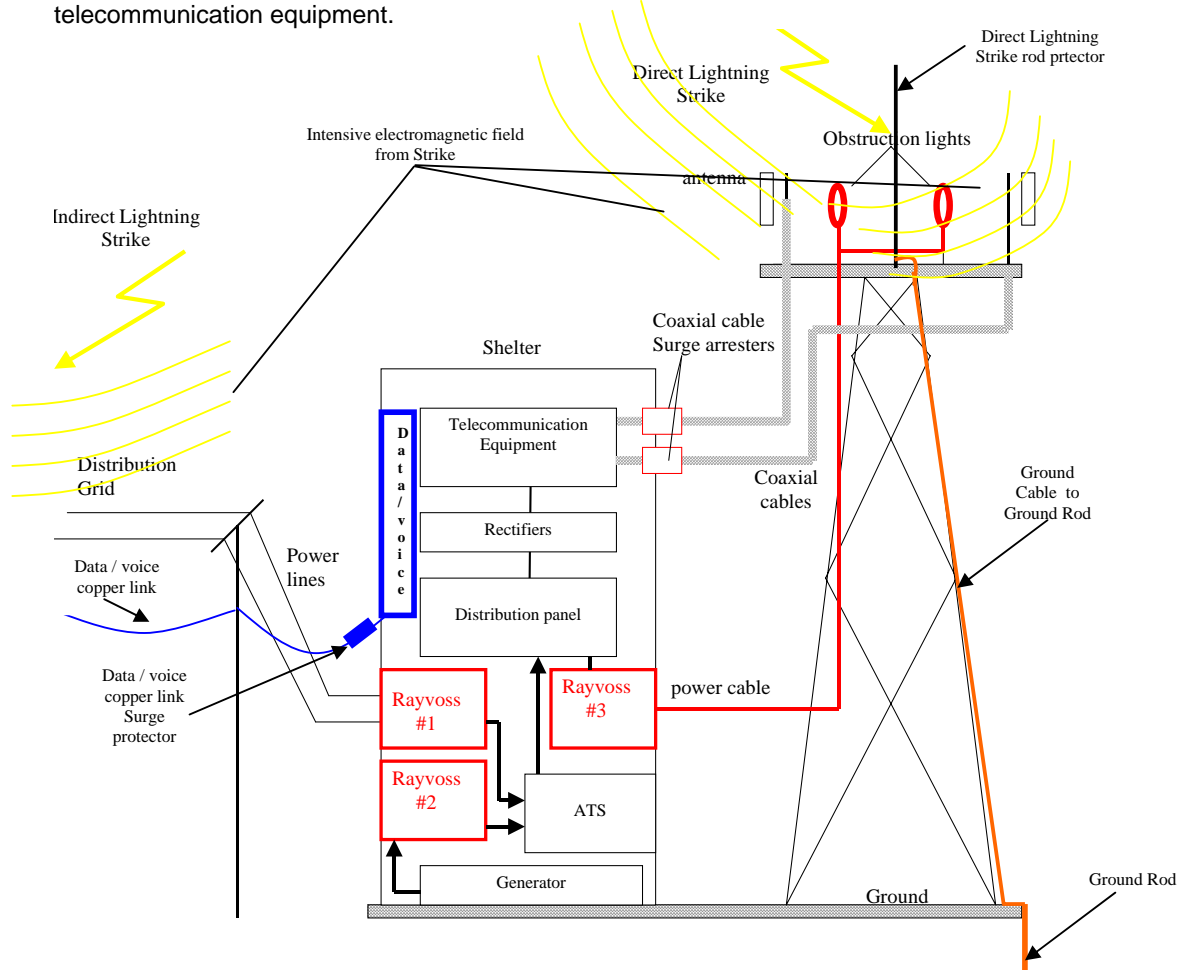


TOTAL SURGE PROTECTION OF TELECOMMUNICATION SITES FROM DIRECT AND INDIRECT LIGHTNING STRIKES

A typical telecommunication site consists of a shelter or facility, which houses the telecommunication equipment, and the antennas tower. Such a site is usually located in areas with high risk of exposure to lightning strikes causing damages to the telecommunication equipment.



The equipment is subjected to surges caused by **direct lightning strikes** on the tower structure, as well as **indirect strikes** which induce surges on the power lines, data/voice lines and also Tx/Rx coaxial lines. The protection from the effect of these two types of lightning strikes is explained below:

Direct Lightning Strikes

According to the international standards (IEC, IEEE), when lightning hits the structure of the tower, 50% of the lightning current is diverted to the ground via the external lightning system of the installation (lightning rod). The other 50% of the current, which can be as high as 100kA (10/350µs), is distributed among the electrical power cables, data/voice lines and the coaxial cables entering the structure.

In case of the telecommunication tower showed above, a direct lightning strike on the tower will generate by induction severe surge currents on the power wires that feed the obstruction lights. These surges will hit the equipment inside the shelter via the power distribution panel. It is therefore necessary to install a Rayvoss TVSS system at the power wires feeding the obstruction lights in order to divert the surge current to the earth before hitting the equipment. This is Rayvoss #3 in the above diagram.

A direct lightning strike on the tower will also produce surge currents on the data/voice copper links and coaxial cables that connect the telecommunication equipment to the shelter. In order to protect the equipment from surge induced damages of the RF modules and other equipments, it is recommended to install appropriate data/voice copper protectors and coaxial cable surge arresters at the location where the data/voice copper and coaxial cables enter the shelter.

Indirect Lightning Strikes

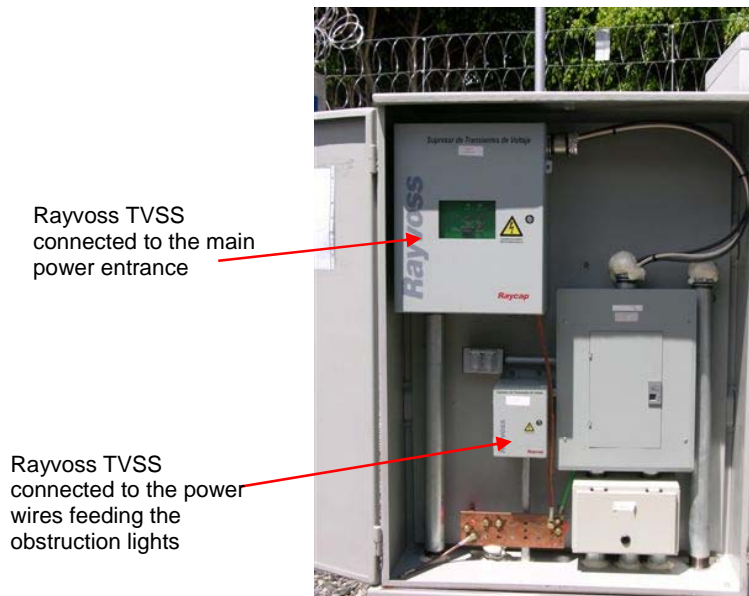
Lightning strikes that do not hit the tower directly can damage the equipment because they generate surge currents on the copper data/voice links, Rx/Tx conductors and also on the utility grid. These surges hit the equipment via copper data/voice connected to equipments, coaxial Rx/Tx down conductors and the power lines which connect the distribution panel of the shelter with the utility grid. A Rayvoss TVSS system should be installed on the power service entrance of the shelter after the main breaker AC input. This is Rayvoss #1 shown in the above diagram. Also must be connected an appropriated copper data/voice protector to divert incoming surges on the data/voice links and Rx/Tx coaxial protector.

A third TVSS system (Rayvoss #2) should be installed between the generator output and the ATS. This system will protect the equipment (including the electronic controller of the ATS) from surges generated during switching on/off of the generator or caused by a storming condition during emergency operation with the auxiliary power source (AC generator).

In summary, for total protection of a telecommunications site, the following protection devices will be required:

1. A direct lightning strike rod protector, with its associated ground cable to ground and ground rod.
2. A TVSS device on the AC power service entrance of the equipment.
3. A TVSS device on the generator AC input of the ATS.
4. A TVSS device on the power AC wires that feed the obstruction lights.
5. A Coaxial cable surge arresters, one for every RF cable entering the shelter.
6. And a data/voice protector links that come inside the shelter.

The following picture shows a typical example where 2 Rayvoss TVSS systems are used for the protection of a site in Guatemala:



This is the normal practice that almost all operators follow in the Central American region.