

Executive Summary

Amateur radio operators, or “hams” as they are called, communicate with stations located all over the world. Some contacts may be local in nature, while others may be literally halfway around the world. Hams use a variety of internationally allocated frequencies to accomplish their communications.

Except for local contacts, which are primarily made on Very High and Ultra High Frequencies (VHF and UHF), communicating between any two points on the earth rely primarily on high-frequency (HF) signals propagating through the ionosphere. The earth’s ionosphere acts much like a mirror at heights of about 150 miles. The vertical angle of radiation of a signal launched from an antenna is one of the key factors determining effective communication distances. The ability to communicate over long distances generally requires a low radiation angle, meaning that an antenna must be placed high above the ground in terms of the wavelength of the radio wave being transmitted.

A beam type of antenna at a height of 70 feet or more will provide greatly superior performance over the same antenna at 35 feet, all other factors being equal. A height of 120 feet or even higher will provide even more advantages for long-distance communications. To a distant receiving station, a transmitting antenna at 120 feet will provide the effect of approximately 8 to 10 times more transmitting power than the same antenna at 35 feet. Depending on the level of noise and interference, this performance disparity is often enough to mean the difference between making distant radio contact with fairly reliable signals, and being unable to make distant contact at all.

Radio Amateurs have a well-deserved reputation for providing vital communications in emergency situations, such as in the aftermath of a severe icestorm, a hurricane or an earthquake. Short-range communications at VHF or UHF frequencies also require sufficient antenna heights above the local terrain to ensure that the antenna has a clear horizon.

In terms of safety and aesthetic considerations, it might seem intuitively reasonable for a planning board to want to restrict antenna installations to low heights. However, such height restrictions often prove very counterproductive and frustrating to all parties involved. If an amateur is restricted to low antenna heights, say 35 feet, he will suffer from poor transmission of his own signals as well as poor reception of distant signals. In an attempt to compensate on the transmitting side (he can’t do anything about the poor reception problem), he might boost his transmitted power, say from 150 watts to 1,500 watts, the maximum legal limit. This ten-fold increase in power will very significantly increase the *potential* for interference to telephones, televisions, VCRs and audio equipment in his neighborhood.

Instead, if the antenna can be moved farther away from neighboring electronic devices—putting it higher, in other words—this will greatly reduce the likelihood of interference, which decreases at the inverse square of the distance. For example, doubling the distance reduces the potential for interference by 75%. As a further benefit, a large antenna doesn’t look anywhere near as large at 120 feet as it does close-up at 35 feet.

As a not-so-inconsequential side benefit, moving an antenna higher will also greatly reduce the potential of exposure to electromagnetic fields for neighboring human and animals. Interference and RF exposure standards have been thoroughly covered in recently enacted Federal Regulations.