

Ham 22 - Antenna conventional

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A radio system consists of three major sub-systems: the transceiver, a power supply, an antenna. Obviously without a power supply, nothing can work. With adequate power, the transceiver will send out a signal, but it goes no where without an antenna. Even a hand-held transceiver will greatly benefit with a separate, real antenna.

The antenna may add gain in one direction at the expense of another direction. In every case, the antenna system and its feedline (coax) attenuate the signal supplied from the radio. The antenna contributes all the radiated power. Every antenna design is a trade-off between performance, size, and cost. Another common consideration is many neighborhoods prohibit visible antennas. Consequently, stealth antennas are by far the most common approach.

In general, the higher the antenna, the better it will perform. However, with height comes exposure to lightning. Another issue with outdoor antennas is wind-loading or how well the antenna and the tower will survive strong winds. Conventional wisdom is to disconnect your radio before a thunderstorm, but that defeats its use as a weather device.

Our considerations for antenna will be stealth, installable by a person without high climbing or electrical skills, and mitigate the risk of lightning and wind. All antennas are a compromise. Beam, yagi, vertical, and myriad variations, while they are effective, do not lend themselves to our constraints.

A common VHF antenna is the J-Pole. You can build one for a few bucks. The 'KB9VBR' manufactured unit is a highly-regarded, widely-used antenna. The positive is it only costs \$70. The negative is that overall length is about 69". Its conductive metal must be isolated from a metal mast. Ferrite beads must be used to isolate the coax from acting as a counterpoise. Yes, I have two, and it works. A dual band VHF/UHF looks different. www.jpole-antenna.com.

Numerous other manufacturers have their custom, specialized designs. Most work well. The Diamond X-50A is a colinear design wrapped in fiberglass. The positive is it withstands winds to 135 mph, the negative is length of 66". The cost is about \$100. Yes, I have one, and it works like a champ. Diamond X-50A from ham radio sites.

One of the first effective modern technology designs is the Compactenna, by Dr. Jack Nilsson, N8NDL, <https://compactenna.com>. This is a non-line-of-sight antenna with an elliptical pattern, which relies on dispersed paths much like a WiFi system, making it more effective in a cityscape and around hills. The great positive is antenna height of 7.5" tall with a 2 radial, dropped counter-poise mount. Total height is about 20". A 9" version works even better. The negative is the antenna is over \$100 plus a home-brew counterpoise mount. The SWR on UHF has deep notches near 1:1 with a high near 1.5:1. Yes, I have seven! No better for mobile, small spaces, or terrain is an issue. Order: COMPACTenna 2M-440 from ham radio sites.

Remember ham is experimenting and design is about trade-offs. Location and mounting are extremely important and determine which will work better for your application. To mitigate lightning and wind, the antenna must be mounted under the cone of protection of the structure. In other words, under a roof or lightning protection system.

The National Electrical Code (NEC) and NFPA 780 specify zone of protection. NEC 810.15 states: *Masts and metal structures supporting antennas shall be grounded in accordance with 810.21, unless the antenna and its related supporting mast or structure are within a zone of protection defined by a 46 M (150ft) radius rolling sphere.*

Attics are often the preferred choice. Under a porch or veranda is another choice, which provides less barriers. Keep the antenna far enough from people to mitigate radiation effects.

A typical parts list illustrates the required components.

Antenna	Select one preferred for location	Online ham vendors
Counterpoise / mount	As required for antenna	Online ham vendors
Coax >25'	RG213 w/ PL259 on ends (0.41")	ABR or other name brand, avoid Amazon
Coax <25'	RG8X w/ PL259 on ends (0.24")	ABR or other name brand, avoid Amazon
4 Ferrite beads/chokes	mix 31, snap-on, fit to coax at antenna	Palomar engineering
SMA to SO-239 cable	only comes male SMA for connection to handheld	Online ham vendors
SMA female to female	Adapter for Baofeng, etc.	www.amazon.com
Floor flange, 1-1/4"	Galvanized, pipe	Hardware store
Pipe & elbow	Fittings for your space. Steel or PVC as needed	Hardware store
Wall penetrator or	low voltage electric box or SO239 barrel connect	As required
Window feedthrough	Home brew, see below	Or manufactured

Life is good. Enjoy!

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