

# BUILDING ANTENNAS

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Almost all modern buildings contain lots metal parts inside. For example, any building has water pipes (as a rule copper), main wires, telephone wires, inner metal skeleton. Some building has a water (steam) heating system. The hidden metal parts can work as transmitting antenna. You only have to connect your transmitter to the metal in proper way.

In this article we discuss antennas based on domestic water heater system. Let's name the antennas 'Water Heater Antenna System', or just WHAS. Certainly, diagram directivity and efficiency of WHAS often are far from desirable. Anyway such antennas allow ham to be on the Air.

## Base of WHAS

Water steam pipes, which go from down to up through a building, create hidden metal structure. The question is: in what manner we can connect to the pipes in order to these ones work like an antenna. Below we discuss several ways how to do it.

Before you go to create your own WHAS please keep in mind the advice. Do not use powerful TX, limit your power to 50 (and below) watts. At large power, at first you may do a burn to your neighbors, at second large power can create unhealthy electromagnetic environment at your place.

My experiments show that there is no big difference in operation between WHAS designed either in brick or inside concrete building. At my experiments WHAS lose 2- 6 balls (at scale RS) to outdoor antennas. As rule WHAS lose more at operation on the higher HF amateurs bands. Efficiency WHAS dramatically falls from the 12-m band. However the antennas can work very well at the 160- 30 meters. By one from the bands WHAS sometimes work better the outdoor antennas. As rule WHAS is very noisy at working on receiving, so, use a separately receiving antenna.

## WHAS with Gamma Matching

WHAS used gamma matching is very simple in design and good in work. **Fig. 1** shows the design. As rule the WHAS works not bad on the most of ham HF bands.



**A Good Antenna for the 160 meters**

Electrical contact to battery of heating is done at two places, one near the ceiling another close to the battery of heating. Wire of gamma matching is located approximately in 5- 10 centimeters from the pipe of heating. For fixing the distance it is possible to use empty plastic bottles from soft drinks. The WHAS is connected to TX through an ATU. Ground of the ATU is connected to battery of heating. For better work the WHAS install ferrite rings (5- 20 ring with any permeability) at two ends of the coaxial cable going from TX to ATU.

## Two Wire Line WHAS

The WHAS works not at all location. Make an experiment at your place to check its work. Sometimes at some location the WHAS works very well. The WHAS has only one advantage - this one is very simple in design. **Fig. 2** shows the design. The pipes are connected to an ATU by any two wire open line or just by single wires.

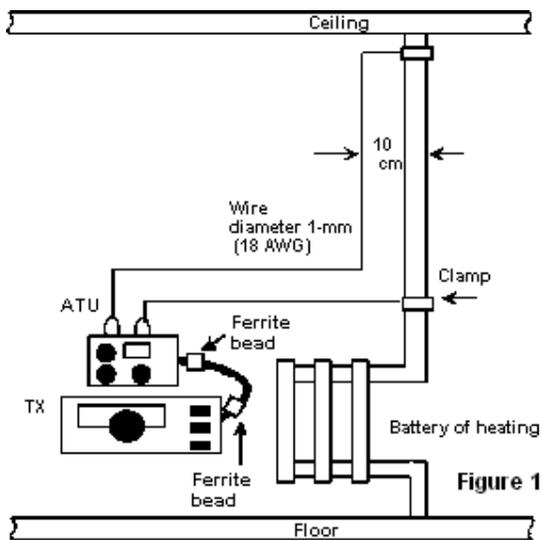


Figure 1 WHAS used gamma matching

For the antenna design you need two located near to each other heater pipes. The pipes make a substitute open two 'wire' line. The line is radiated by itself however if you are lucky and the substitute open two 'wire' line is terminated on something that can be an antenna (such case is not rare at all) the WHAS will work very efficiently.

Use an ATU with symmetrical output for the design. Other versa, if you have an ATU with unbalance output, find from experiments to which tube need to connect the ATU ground. For better work the WHAS install ferrite rings (5- 20 ring with any permeability) at two ends of the coaxial cable going from TX to ATU.

**Direct Feed WHAS**

Direct feed WHAS has efficiency less the two above described WHAS but this one is very easy to design.

Use direct feed WHAS if you can not use the two above described WHAS. Fig. 3 shows the design of direct feed WHAS. Design of the direct feed WHAS is simple. A clamp, which should provide good electric connection, put on a pipe at any place. An ATU output is connected to the clamp. A counterpoise of 5- 10 meters in length is connected to the 'Ground' of the ATU through known device 'Artificial Ground.'

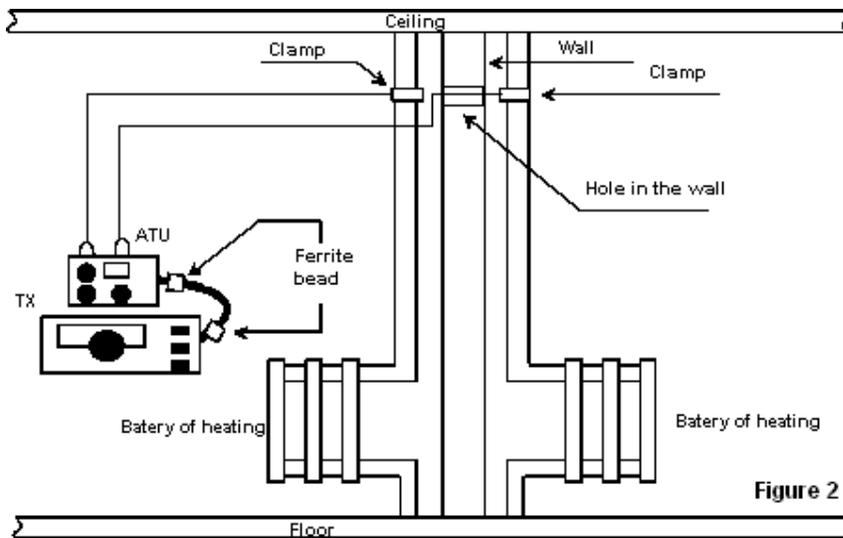


Figure 2 Two Wire Line WHAS

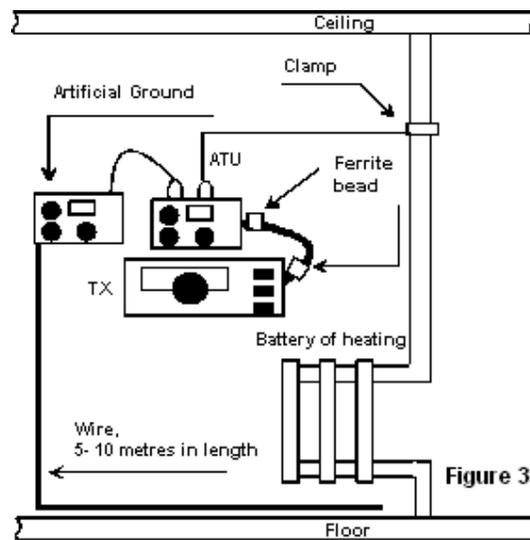


Figure 3 Direct feed WHAS

Usually the antenna can be matched at most of amateur HF bands. For better work the WHAS install ferrite rings (5- 20 ring with any permeability) at two ends of the coaxial cable going from TX to ATU.

At my experimenters with WHAS I have used ATUs and 'Artificial Ground' described in reference [1].

### References

1. Igor Grigorov. Antennas. Matching and Adjustment. – Moscow. RadioSoft, 2002. ISBN 5-93037- 087-7



Battery of Heating