multiplied by the correcting factor 0.6 to give the true effective area, and from this the wind pressure can be found. This wind pressure on the extension mast is taken as acting at a point E that is at the middle of the exposed length H. (i.e. half the amount sticking up above the rotator or mast). The bending load caused by the extension tube loading is found by multiplying the effective wind load on the extension at point E by its distance B_1 above the bottom of the tube: ie. half the exposed length plus the part in the rotator clamp. These two bending loads are added together to give the whole bending load or sideways load on the rotator and extension tube. Using these figures, the bending load in the mast or tower can also be found. Note that the extension tube should have a factor of safety of 2; i.e. it should be able to carry twice the maximum bending load.

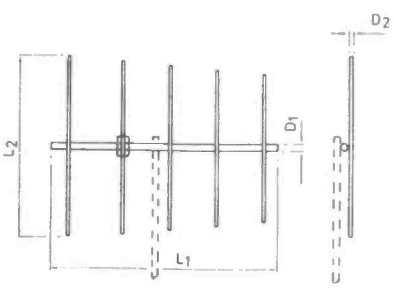

FIG.4 Vertically polarised aerial

Ice

In the UK, ice is very unpredictable factor, but an aerial with layer of ice on it will offer a greater resistance to any wind than an aerial of the same size with no ice. There are no firm guidelines to go by here, so for practical purposes, applicable to average icing conditions in the UK, adding 25% to the final value of wind resistance should be adequate. The method of calculating wind resistance shown is not intended to be precise but merely to enable the average amateur to get some idea of the kind of forces that are acting on the aerial system and mast. Where there are any special local wind conditions due to high rise buildings etc., these must be taken into account individually.

The structure

In addition to any wind load

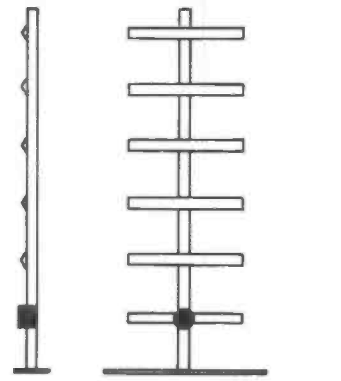
FIG.5.
Flat aerial elements induce a substantially higher wind loading than round ones.

imposed by the aerial system, the mast or tower must also withstand the wind load induced by the structure itself. In general, the structure of the mast or tower must be capable of withstanding twice the maximum load imposed on it, including its own wind load. When commercially made structures are concerned, the manufacturer would have taken all these loads into account and included a suitable safety factor when specifying the maximum horizontal head load that a particular mast or tower can carry. Usually a safety factor of between 2 and 3 is applied.

Fig. 7 shows a typical self-supporting post-mounted structure with the basic wind loads indicated. The combined effect of the two wind loads FA (for the aerial system) and FM (for the mast structure) is to try and tip the whole lot over about a fulcrum, point 0, at the base; this is the overturning force F_T. Counteracting this is the force due to

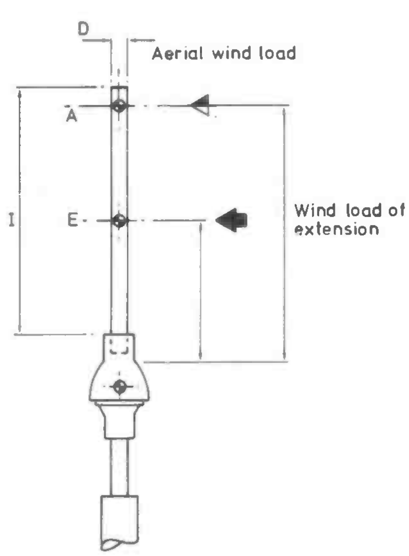

FIG.6. Rotator loading

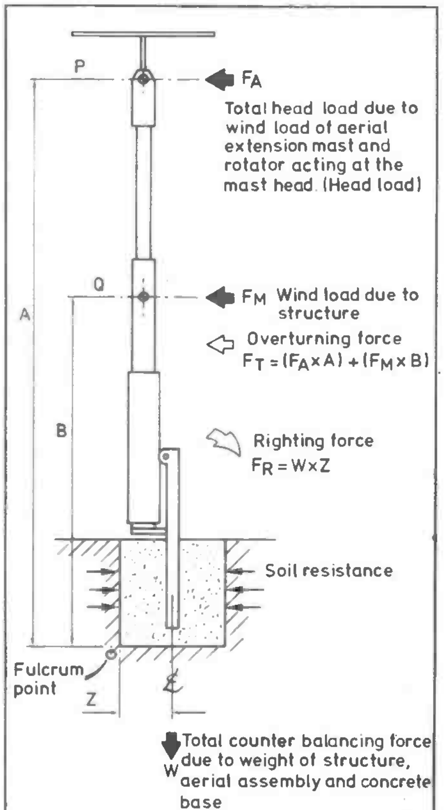

FIG.7. Effect of wind loads on self supporting masts or towers.

the combined weight of the aerial system, the structure and the foundation base. All of these act in the direction of arrow W, trying to right the structure; this is the righting force F_2. In addition there is a certain amount of resistance from the ground, which, depending on soil conditions is acting in favour of the righting force. So long as the whole of the righting force F_R is equal to or greater than the overturning force F_O, the structure will remain upright. The overturning force F_T is a combination of the wind load F_A effectively acting at the mast head P, multiplied by its height A above the fulcrum point 0; plus, the wind load F_M at point Q, multiplied by its height B above point 0, thus:

$$F_T = (F_A \times A) + (F_M \times B).$$

Similarly the righting force F_R is equal to the combined heights W multiplied by the distance Z from point 0, plus any resistance due to the soil, thus:

$$F_R = (W \times Z) + \text{soil resistance}.$$

In addition to the overturning force F_T imposed by the combined wind loads, there is also a certain amount of bending taking place in