

**State of California  
The Resources Agency  
Department of Water Resources**

**FLOOD FIGHTING  
METHODS**

**Volume II  
Revised 1987**



**Division of Flood Management  
Flood Operations Branch**

## **METHOD OF FLOOD FIGHTING ON LEVEES AND ALONG RIVER BANKS**

The main causes of levee failure during periods of high water are:

1. Seepage through or under the levee heavy enough to cause a "boil," and leaks through the levee caused by burrowing animals.
2. Erosion of the levee due to current or wave action; and
3. Overtopping resulting from river water-surface elevations higher than the levee.

The various emergency methods used to prevent levee failure from these causes are known as "flood fighting."

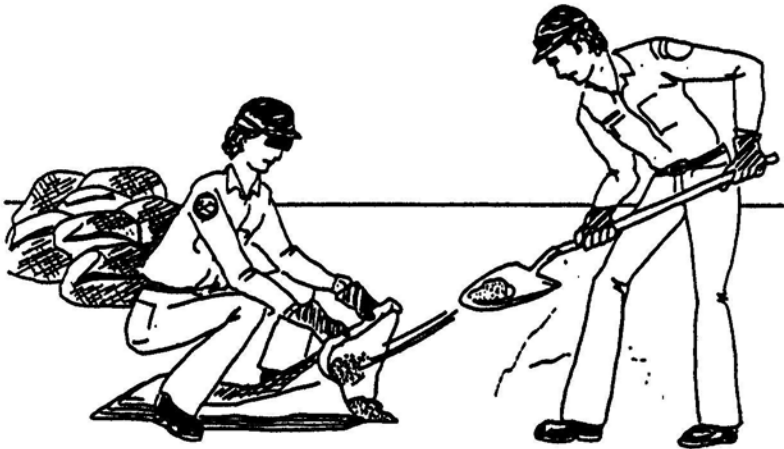
The flood fighting methods described in the following paragraphs have proved effective during many years of use by the Department and the Corps of Engineers. Structures other than levees may also require flood protection and should not be overlooked.

The various methods of treatment discussed below are illustrated in a number of sketches. However, all measures shown are temporary measures and cannot be expected to last for extended periods of time.

## Filling Sandbags

When filling sandbags you should work in pairs, with one person holding the bag while the other shovels in the fill material. The first shovel of fill will be placed on the lip of the bag to help hold the bag open. The bag holder should bend at the waist until the elbows are resting on the knees while he is holding the bag open. The shoveler should use rounded scoops of fill until the bag is approximately 1/3 full. While shoveling, avoid extra movements (turning or twisting of the back) as this will tire you out sooner. (See Figure 1.

Figure 1



## Sandbag Construction

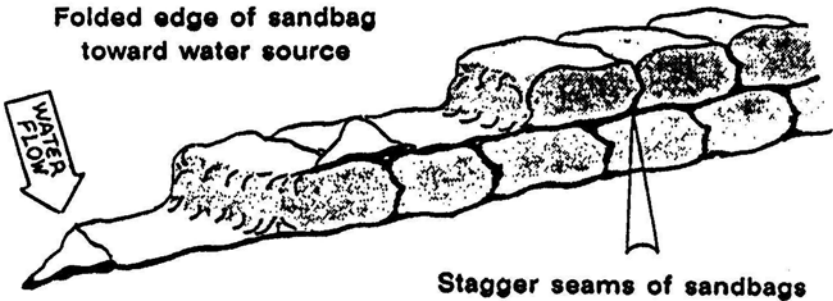
The use of sandbags is a simple but effective method of preventing or reducing damage from flood water or debris (see Figure 2). Suggestions for constructing sandbags follow:

1. Close-weave burlap bags are recommended for all sandbag construction.
2. Fold over the empty top of the bag in a triangle to keep sand from leaking.
3. Place each bag over the folded top of the preceding bag and stomp into place before placing the next layer of bags.
4. Stagger the second layer of bags, stomping each bag into place before placing the next.
5. Stomp each succeeding layer of bags.

Figure 2

Fill sandbags 1/3 full

Folded edge of sandbag  
toward water source



## Tying Sandbags

Most sandbags are used with the open end folded. In some cases, sandbags will have to be tied. Fill the bag 1/4 to 1/3 full of material. Grab one open corner (see Figure 3).

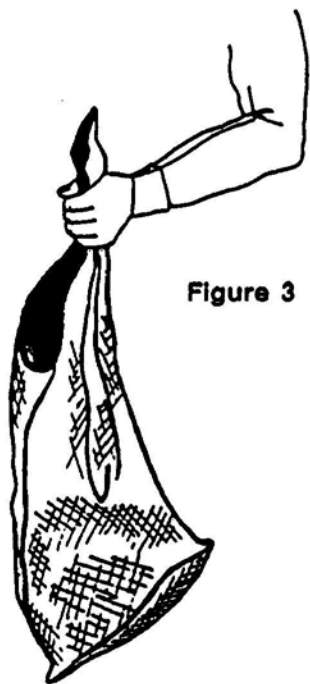


Figure 3

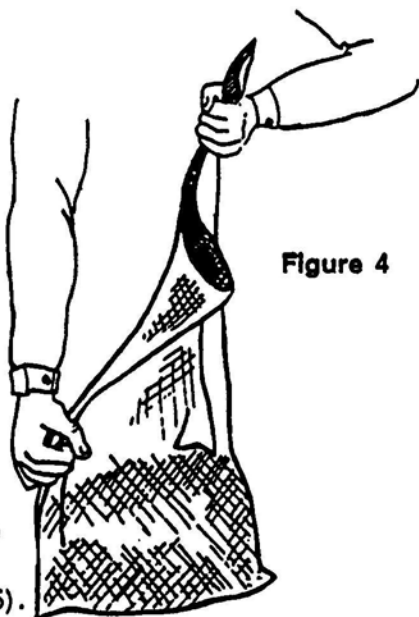


Figure 4

With your other hand grab the lower portion of the opposite side and spin it (Figures 4 & 5).

The long tail should now look like a piece of rope ( see Figure 5)

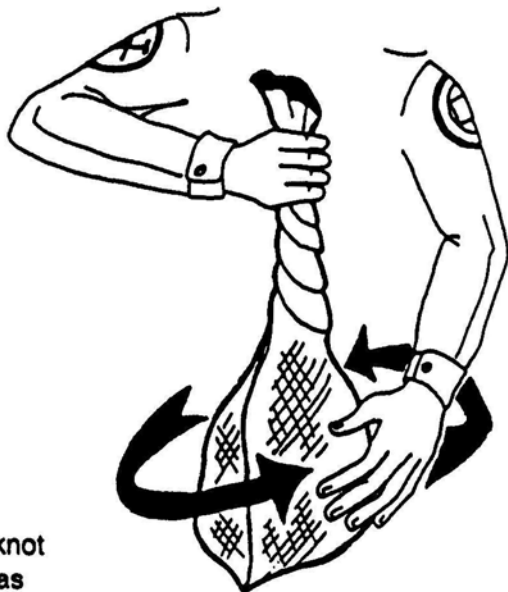


Figure 5

Now tie an overhand knot (pretzel knot) as low as possible on the bag (Fig. 6).



Figure 6



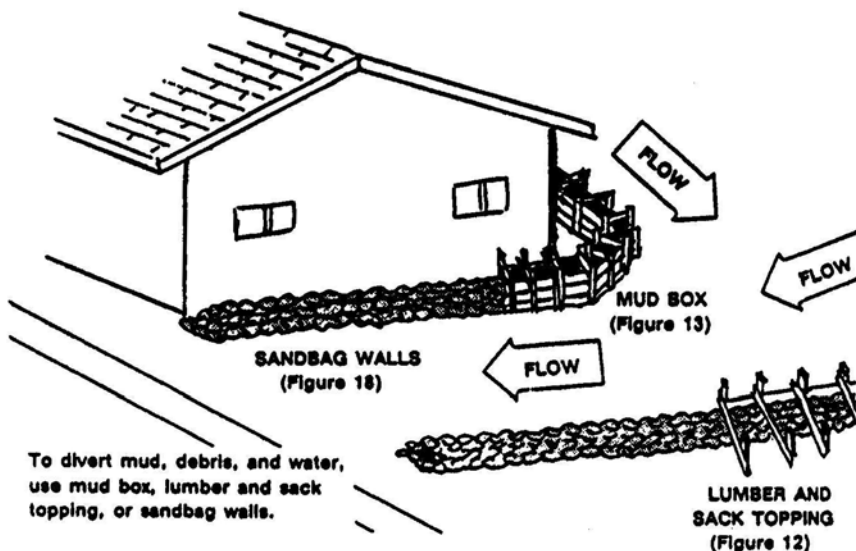
### **Diverting Water Away from Homes**

Homes may often be protected from flood water by redirecting the water flow as shown in Figure 17. The barriers will divert the water flow away from the structure. The sandbags or wooden barriers must be placed at an angle and must be long enough to divert the flowing water into the street gutter.

To prevent or reduce property damage, the methods

shown in Figure 17 may be helpful. Walls made of lumber or sandbags are constructed to channel the mud and debris away from any improvements.

Figure 17

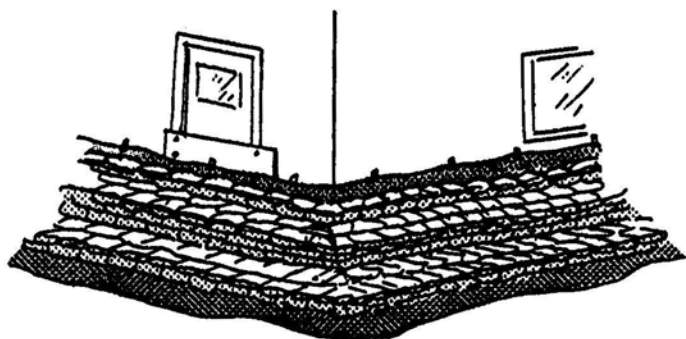


### Protection of Home or Structure

The following method is used for protection of buildings and other structures along lake shores and in similar situations where water is rising with little or no current.

Lay visquine on the ground and up the building walls to a point at least 1 foot above the predicted water elevation, and far enough out on the ground to form a half pyramid of sandbags (see Figures 14 and 18 ). Secure plywood over doors and vents. Overlap visquine and sandbags at corners of buildings.

**Figure 18**



### **Safe Work Habits**

When working on floods, observe all safety precautions. When moving materials or personnel by boat, all personnel must wear flotation devices. When working around or in water, lifelines and personal flotation devices must be used.

**Above all, don't panic!**