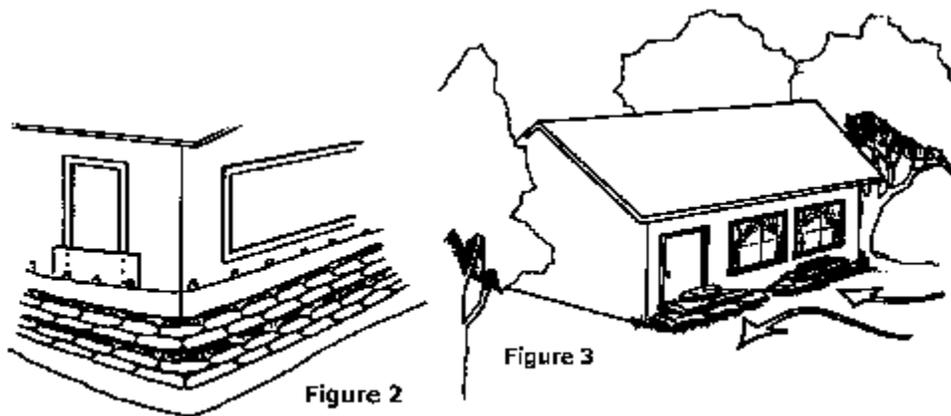


Protecting structures with sandbags

Protecting structures ▲

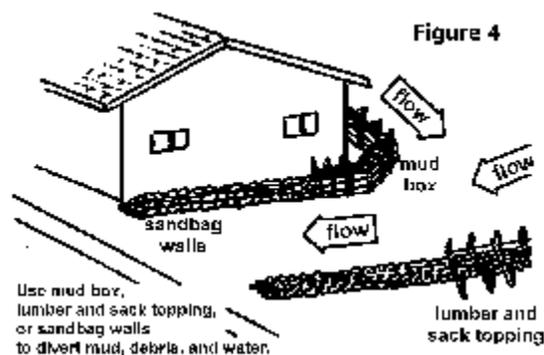
Although each house is a unique situation, the following method is used for protection of buildings and other structures near creeks or lakes and in similar situations where water is rising with little or no current.

Lay plastic sheeting on the ground and up the building walls to a point at least one foot above the predicted water elevation, and far enough out on the ground to form a half pyramid of sandbags (see Figures 2 & 3). Secure plywood over doors and vents. Overlap plastic sheeting and sandbags at corners of buildings.



Diverting water away from homes ▲

Homes may often be protected from flood water by redirecting the water flow as shown in Figure 4. 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.



Protection of slopes ▲

The "raincoat" method is used to prevent further saturation of levee or hillside slopes (see Figure 5). Plastic sheeting is laid out flat on the slope, and stakes are driven into the ground just above the area to be protected. The stakes are four feet apart with a one-foot stagger. The plastic sheeting is secured to the stakes with tie-down buttons or small round rocks and rope.

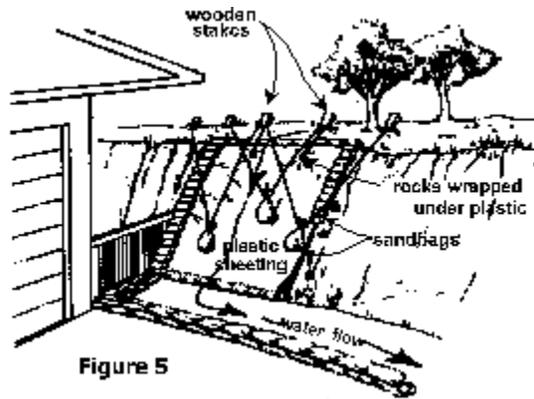


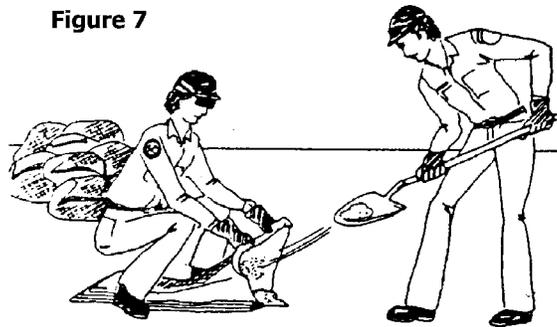
Figure 5

Use a crisscross method of tying off the sandbags or substitute tires if sandbags are not available. Place a solid row of sandbags on all edges of the plastic sheeting (half on the ground and half on the plastic sheeting).

Sandbagging ▲

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 shoveler should use rounded scoops of fill until the bag is approximately one-third to one-half full. A completely full bag of wet sand or soil will be too heavy to work with. While shoveling, avoid extra movements (turning or twisting of the back) as this will tire you out sooner. The bag holder should bend at the waist until the elbows are resting on the knees while he is holding the bag open (see Figure 7).

Figure 7



Sandbag construction ▲

The use of sandbags is a simple but effective method of preventing or reducing damage from flood water or debris (see Figure 8).

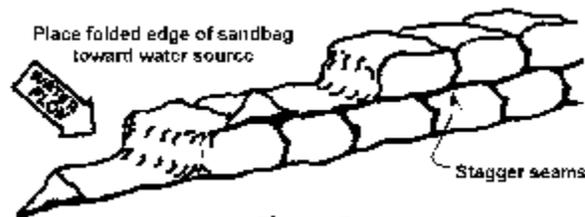


Figure 8

Suggestions for constructing sandbags follow:

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

Materials required for 100 lineal feet of sandbag wall		
Height above ground	Bags required	Cubic yards of sand
1 foot	600-800	10 to 13
2 feet	1400-2000	23 to 33
3 feet	2200-3400	37 to 57
4 feet	5300	88
5 feet	7600	137
6 feet	10000	167



Flood Fighting: How To Use Sandbags

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Emergency Management Branch
Walla Walla, Washington 99362-1876
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Sandbag Construction

The use of sandbags is a simple, but effective way to prevent or reduce flood water damage. Properly filled and placed sandbags can act as a barrier to divert moving water around, instead of through, buildings. Sandbag construction does not guarantee a water-tight seal, but is satisfactory for use in most situations. Sandbags are also used successfully to prevent overtopping of streams with levees, and for training current flows to specific areas.

Untied sandbags are recommended for most situations. Tied sandbags should be used only for special situations when pre-filling and stockpiling may be required, or for specific purposes such as filling holes, holding objects in position, or to form barriers backed by supportive planks. Tied sandbags are generally easier to handle and stockpile. However, sandbag filling operations can generally be best accomplished at or near the placement site, and tying of the bags would be a waste of valuable time and effort. If the bags are to be pre-filled at a distant location, due consideration must be given to transportation vehicles and placement site access.

The most commonly used bags are untreated burlap sacks available at feed or hardware stores. Empty bags can be stockpiled for emergency use, and will be serviceable for several years, if properly stored. Filled bags of earth material will deteriorate quickly.

Commercial plastic sandbags, made from polypropylene, are also available from most bag suppliers. These will store for a long time with minimum care, but are not biodegradable. Thus, they have to be disposed of, or will remain around for a long time. Do not use garbage bags, as they are too slick to stack. Do not use feed sacks, as they are too large to handle. Use bags about 14-18" wide, and 30-36" deep.

A heavy bodied or sandy soil is most desirable for filling sandbags, but any usable material at or near the site has definite advantages. Coarse sand could leak out through the weave in the bag. To prevent this, double bag the material. Gravelly or rocky soils are generally poor choices because of their permeability.



Sandbag barriers can easily be constructed by two people, as most individuals have the physical capability to carry or drag a sandbag weighing approximately 30 pounds.

How to fill a sandbag



Filling sandbags is a two-person operation. Both people should be wearing gloves to protect their hands. One member of the team should place the empty bag between or slightly in front of widespread feet with arms extended. The throat of the bag is folded to form a collar, and held with the hands in a position that will enable the other team member to empty a rounded shovel full of material into the open end. The person

holding the sack should be standing with knees slightly flexed, and head and face as far away from the shovel as possible.

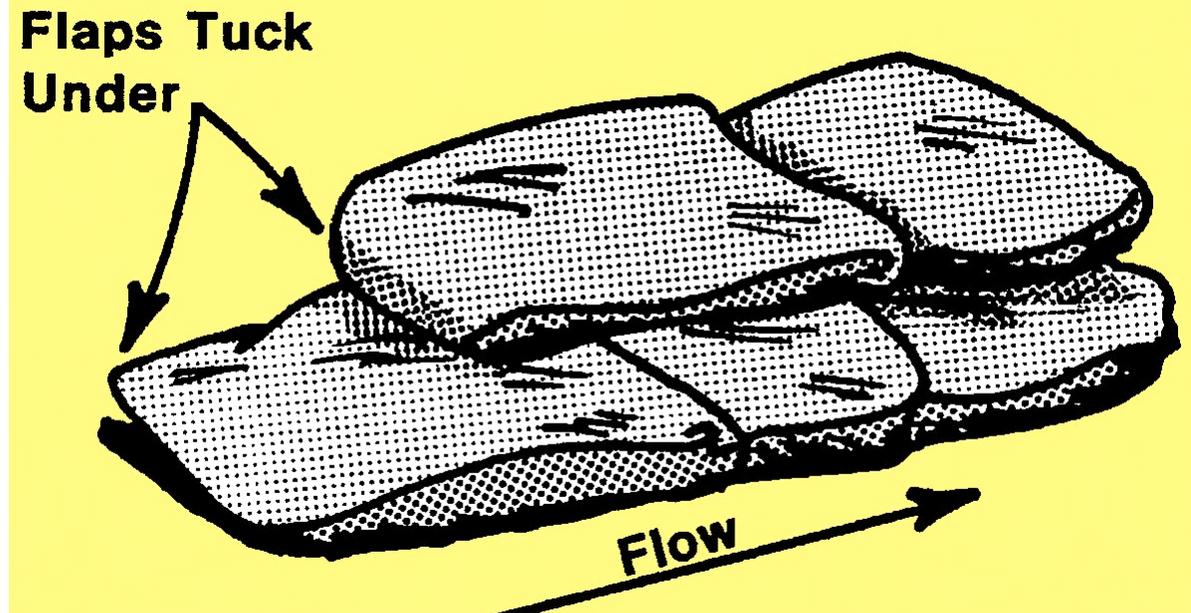
The shoveler should carefully release the rounded shovel full of soil into the throat of the bag. Haste in this operation can result in undue spillage and added work. The use of safety goggles and gloves is desirable, and sometimes necessary.

Bags should be filled between one-third ($1/3$) to one-half ($1/2$) of their capacity. This keeps the bag from getting too heavy, and permits the bags to be stacked with a good seal.

For large scale operations, filling sandbags can be expedited by using bag-holding racks, metal funnels, and power loading equipment. However, the special equipment required is not always available during an emergency.

Sandbag placement

Remove any debris from the area where the bags are to be placed.



Fold the open end of the unfilled portion of the bag to form a triangle. If tied bags are used, flatten or flare the tied end.

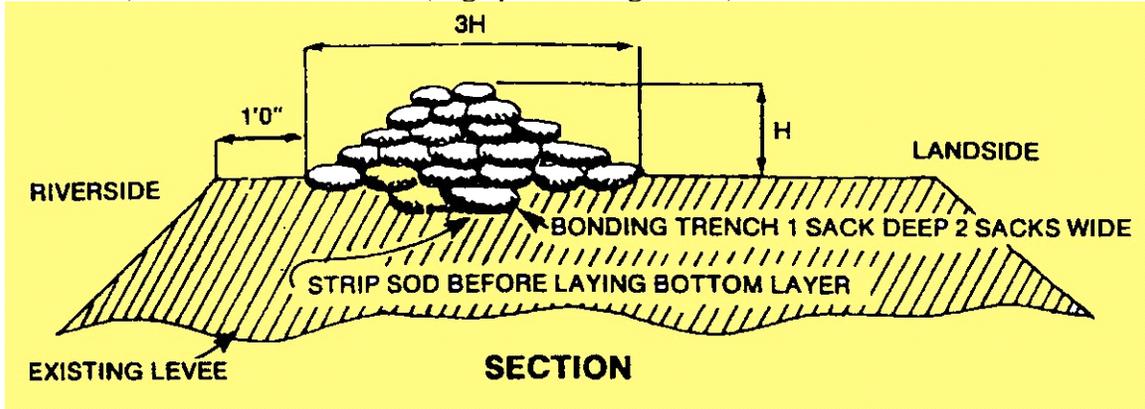
Place the partially filled bags lengthwise and parallel to the direction of flow, with the open end facing against the water flow. Tuck the flaps under, keeping the unfilled portion under the weight of the sack.

Place succeeding bags on top, offsetting by one-half ($1/2$) filled length of the previous bag, and stamp into place to eliminate voids, and form a tight seal.

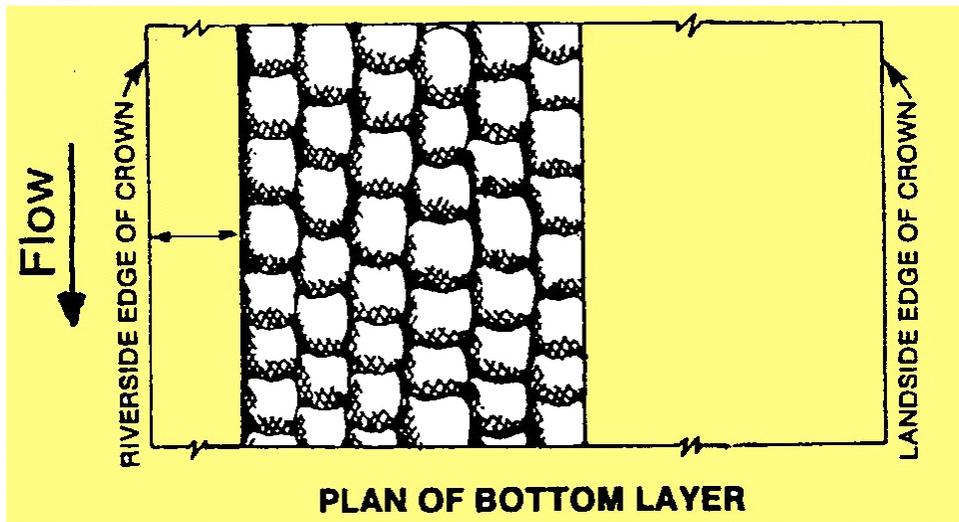
Stagger the joint connections when multiple layers are necessary. For unsupported layers over three (3) courses high, use the pyramid placement method.

Pyramid Placement Method

The pyramid placement is used to increase the height of sandbag protection. Place the sandbags to form a pyramid by alternating header courses (bags placed crosswise) and stretcher courses (bags placed lengthwise).



Stamp each bag in place, overlap sacks, maintain staggered joint placement, and tuck in any loose ends.



Ringed boils

A boil is a condition where water is flowing through or under an earth structure (such as a levee) that is retaining water. Free flowing water wants to move to lower elevations. If a levee is stopping floodwaters, the water may be able to find weak points to enter. This action is called "piping". If the water finds a large enough path, the flow will become visible, and is a serious threat to the integrity of the levee. Most boils occur in sand, silt, or some combination.

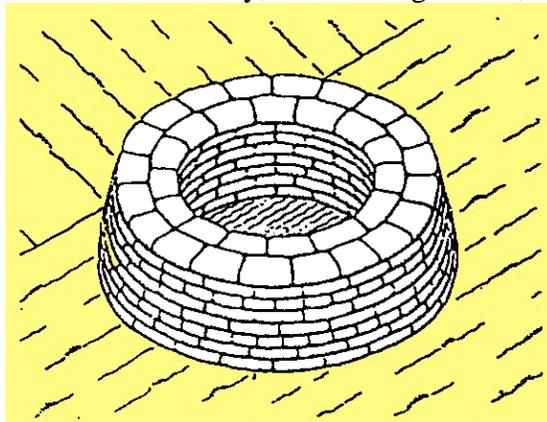
A boil is found on the landward side of the levee, or in the ground past the levee toe (the exact distance varies with local conditions). Possible boil sites can be identified by free standing or flowing water (other than culverts, pumps, etc). A boil can be found only by

close inspection. A prime indicator is water bubbling (or "boiling"), much like a natural spring. Another is obvious water movement in what appears to be standing water.

Carefully examine the water for movement. Boils will have an obvious exit (such as a rodent hole), but the water may be cloudy from siltation, or the hole very small. If there is any movement in the water, carefully approach the site, disturbing the water as little as possible. Let the water settle, and look at the suspected site. If you see the hole, examine it carefully. If the water flow is clear, there are no problems as yet. If there is no distinct hole, the water flow is not a threat. Monitor the site regularly for changes, and take no other actions.

A dirty water flow indicates that the soil is being eroded by the water, and that could mean failure of the levee. A boil ring is the best solution. The idea is to reduce the water flow until the water is flowing clear, but not to stop the water flow. This acts as a relief valve for the water pressure; the water continues to flow, but is not eroding the material. If the water flow is stopped, the pressure will remain, and another boil will form.

Ring the boil with sandbags, with the first bags back 1-2 feet from the boil. More, if the soil is unstable. Build the first layer in a circle, 2-4 bags across, and then build up, bringing each layer in. If possible, keep the interior face straight. Build the ring wall with the means for water to flow out, leaving a gap in the wall, or using pipes. Adjust the flows until the water slows, and becomes clear. Monitor the ring wall constantly. Raise or lower the height of the wall as necessary, maintaining a slow, clear flow.



The height should be only enough to create enough head to slow flow so that no more material is displaced, and the water runs clear.

Notes:

Do not sack a boil which does not put out material.

The entire base should be cleared of debris and scarified.

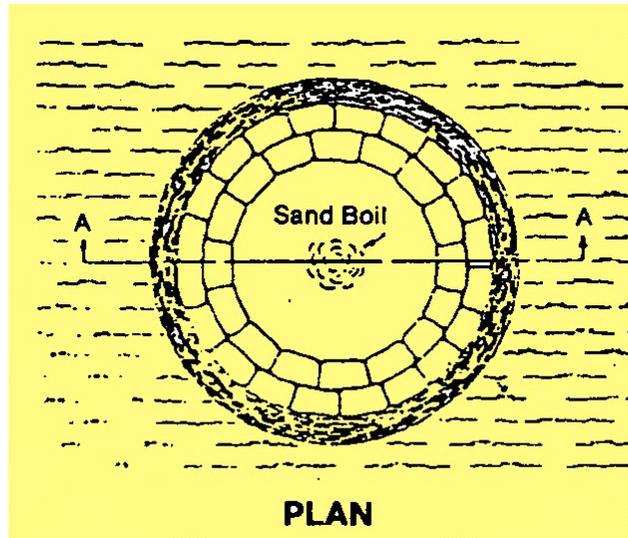
Tie into the levee if the boil is near a toe.

All joints must be staggered.

Be sure to clear the sand discharge.

Never attempt to completely stop the flow through a boil.





Corps of Engineers Sandbag Policy

Local governments, flood control districts, and other government agencies, are responsible for maintaining a supply of sandbags adequate to cover anticipated emergencies.

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