Flood Fighting: How To Use Sandbags

U.S. ARMY CORPS OF ENGINEERS **BUILDING STRONG®**

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 might 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.

Commercial plastic sandbags, made from polypropylene, are available from most bag suppliers and hardware stores. These will store for a long time with minimum care, and are not biodegradable. Thus, they have to be disposed of after use, or will remain around for a long time. Another option is untreated burlap sacks, often available at feed or hardware stores. Empty bags are biodegradable, and can be stockpiled for several years, if properly stored. Filled burlap bags of earth material will deteriorate quickly. In either case, rodent control is strongly recommended during storage.

Do not use garbage bags, as they are too slick to stack. Avoid the use of feed or seed sacks, as they are too large to handle when filled even half full. If they must be used, keep the weight of filled bags down to what can be handled by one or two people (no more than 60 pounds). Where possible, 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 are best built by a group of people working as a team. Insure that the individuals have the physical capability to carry or drag a sandbag weighing approximately 30-50 pounds (depending on dampness and type of sand). They should wear work clothing and gloves.

How to Fill a Sandbag – Filling sandbags is usually a two-person operation. The use of safety goggles and gloves is recommended. One member of the team places 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 stands with knees slightly flexed, and head and face as far away from the shovel as possible.

The shoveler carefully releases the rounded shovel full of soil into the throat of the bag. Haste in this operation can result in undue spillage and added work. 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.

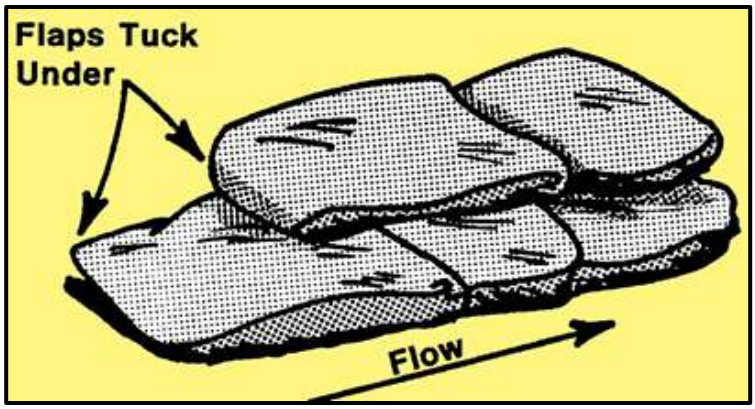
For large scale operations, filling sandbags can be expedited by using bag-holding racks, funnels, or power loading equipment. The special equipment required is not always available during an emergency, but can be fabricated using available materials, and should be identified in local flood response plans.

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

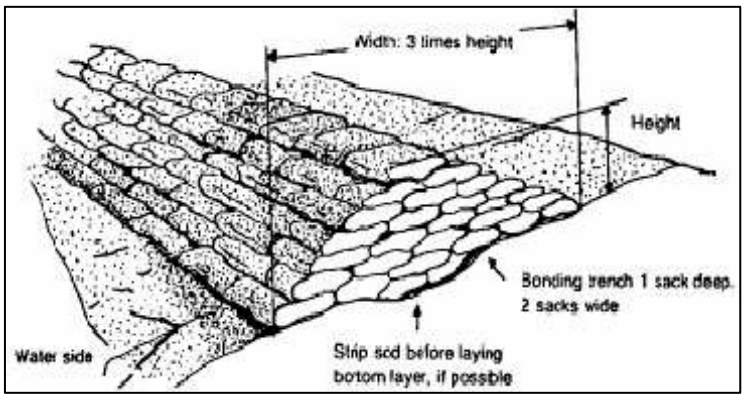
Fold the open end of the unfilled portion of the bag to form a triangle. If tied bags are used, flatten or flare the tied end.

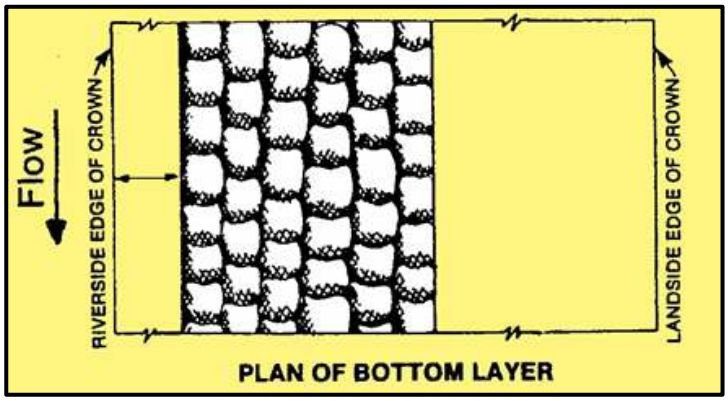
Place the partially filled bags lengthwise and parallel to the direction of flow, with the open end facing against the water flow. Tuck the flaps under, keeping the unfilled portion under the weight of the sack.

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 (below).





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.

Estimating materials – Use the table below, and assume 40 pounds of sand per bag. A 3 foot levee, 500 feet long, requires 22,500 bags, so you need (40 * 22,500) ÷ 2000 = 450 tons of sand. The weight of sand varies locally.

DIKE HEIGHT	50 FT	100 FT	200 FT	250 FT	300 FT	350 FT	400 FT	450 FT	500 FT
1 Foot	300	600	1,200	1,500	1,800	2,100	2,400	2,700	3,000
2 Feet	1,050	2,100	4,200	5,250	6,300	7,350	8,400	9,450	10,500
3 Feet	2,250	4,500	9,000	11,250	13,500	15,750	18,000	20,250	22,500
4 Feet	3,900	7,800	15,600	19,500	23,400	27,300	31,200	35,100	39,000

Ringing 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.

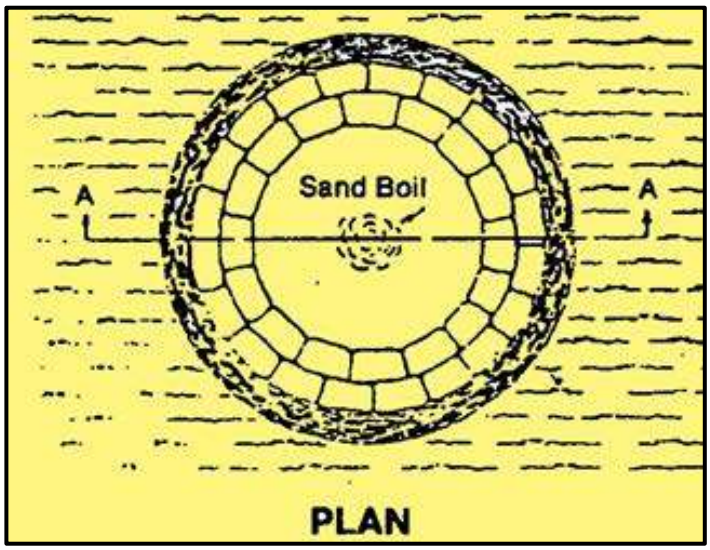
Carefully examine the water for movement. Boils will have an obvious exit (such as a rodent hole), but the water may be cloudy from siltation, or the hole very small. If there is any movement in the water, carefully approach the site, disturbing the water as little as possible. Let the water settle, 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.

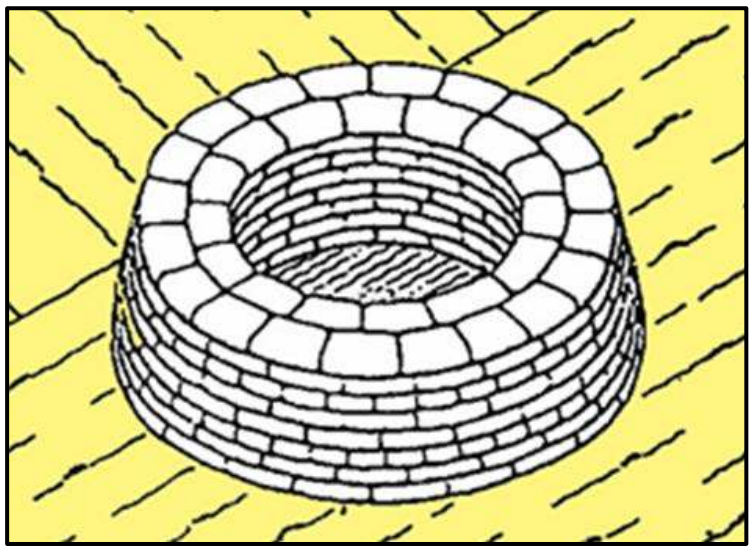
A dirty water flow indicates that the soil is being eroded by the water, and that could mean failure of the levee. A boil ring is

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 slow flow such 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.

Use loose earth between all of the sacks.

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 – Non-federal governments are responsible for maintaining a supply of sandbags adequate to cover anticipated immediate needs. At the discretion of the District Commander, a portion of the District's stockpile may be loaned to meet a specific local flood emergency. The Walla Walla District maintains a limited sandbag stockpile to augment local jurisdictions during actual flood emergencies, but can access a national contract for additional supplies. We will issue only to agencies or governments, through the designated emergency manager. Individual citizens requesting sandbags will be directed to their local government.

Unused stocks must be returned to Walla Walla District as soon as the emergency is over, unless otherwise released to the supported jurisdiction. Consumed stocks must be replaced in kind, or paid for by the local interests, unless the District Commander directs otherwise This applies only to those jurisdictions within the Walla Walla District's area of operation, the Snake River basin.

For Further Information – Refer to the Walla Walla District Flood Fight Handbook: Preparing For a Flood, available for download at the link below. Contact the District Readiness Office, as noted below, for a copy.

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