Sandbagging Techniques

US Army Corps
of Engineers

Kansas City District Participation

Sandbag demonstrations and training classes are put on by flood engineers each year at the request of local communities.

A Steadfast Flood Fighting Tool

Sandbags are used to:

- **Prevent overtopping of levees**
- **Direct a river's flow**
- **Construct ring dikes around boils**
- **Weight down saturated levee back slopes**
- **Anchor plastic sheeting and straw bales**
- **Build buttresses on back slopes and toes of levees**

A Steadfast Flood Fighting Tool

Sandbags are used to:

- Prevent overtopping of levees
- Direct a river's flow
- Construct ring dikes around boils
- **Weight down saturated levee back slopes**
- **Anchor plastic sheeting and straw bales**
- **Build buttresses on back slopes and toes of levees**

Sandbag Construction

Treated burlap sacks are preferred by Seattle District.

- 14 inches wide, 24 inches long.
- Fill two-thirds full (untied).
- Use tied bags (filled slightly fuller) to hold plastic sheeting or straw bales in place.

Fill Materials

- Sand is by far the best material for filling and shaping bags.
- Silt, clay or gravels may be used if necessary.
- Alternatives:
  - Straw bales
  - Concrete Jersey Barriers
  - Ecology Blocks

Correct Filling Procedures

- A two- or three-person operation.
- Use proper lifting techniques.
- Form a 1-1/2 inch collar and empty a No.2 shovel of material into bag.
- Use gloves to protect hands and fill bag two-thirds full.
- Haste makes waste.

Correct Filling Procedures

- A two- or three-person operation.
- Use proper lifting techniques.
- Form a 1-1/2 inch collar and empty a No.2 shovel of material into bag.
- **Use gloves to protect hands and fill bag two-thirds full.**
- **Haste makes waste.**

Correct Filling Procedures (Cont.)

- Consider vehicle transportation and access to the flood site when bags are filled at a distant location.
- Specialized filling equipment is commercially available for large scale operations.

Proper Placement

- Remove debris from area.
- Place bags lengthwise and parallel to direction of flow with the open end facing upstream.
- Fill low spots first and start at the downstream end and 1 foot landward from river.

Proper Placement

- Remove debris from area.
- Place bags lengthwise and parallel to direction of flow with the open end facing upstream.
- Fill low spots first and start at the downstream end and 1 foot landward from river.

Proper Placement (cont.)

- Fold the open end of the bag under the filled portion.
- Place succeeding bags tightly against and partially over-lapping the previous one.
- Offset adjacent rows by one-half bag length.
- Compact and shape by walking on each bag.

Proper Placement (cont.)

- Fold the open end of the bag under the filled portion.
- Place succeeding bags tightly against and partially over-lapping the previous one.
- Offset adjacent rows by one-half bag length.
- Compact and shape by walking on each bag.

Single Stack Placement

- Use single stacked placement where there is no streamflow velocity or danger from floating debris.
- Generally not recommended to be above three courses or layers.
- Can be used as a barricade to protect structures.

Pyramid Placement Method

- Use to increase the height of sandbag protection.
- Place equal number of rows on the bottom as there are vertical rows.
- When the water is 1 foot below the top of the levee and predicted to rise 3 more feet, construct a 2-1/2 foot sandbag structure.

Pyramid Placement Method

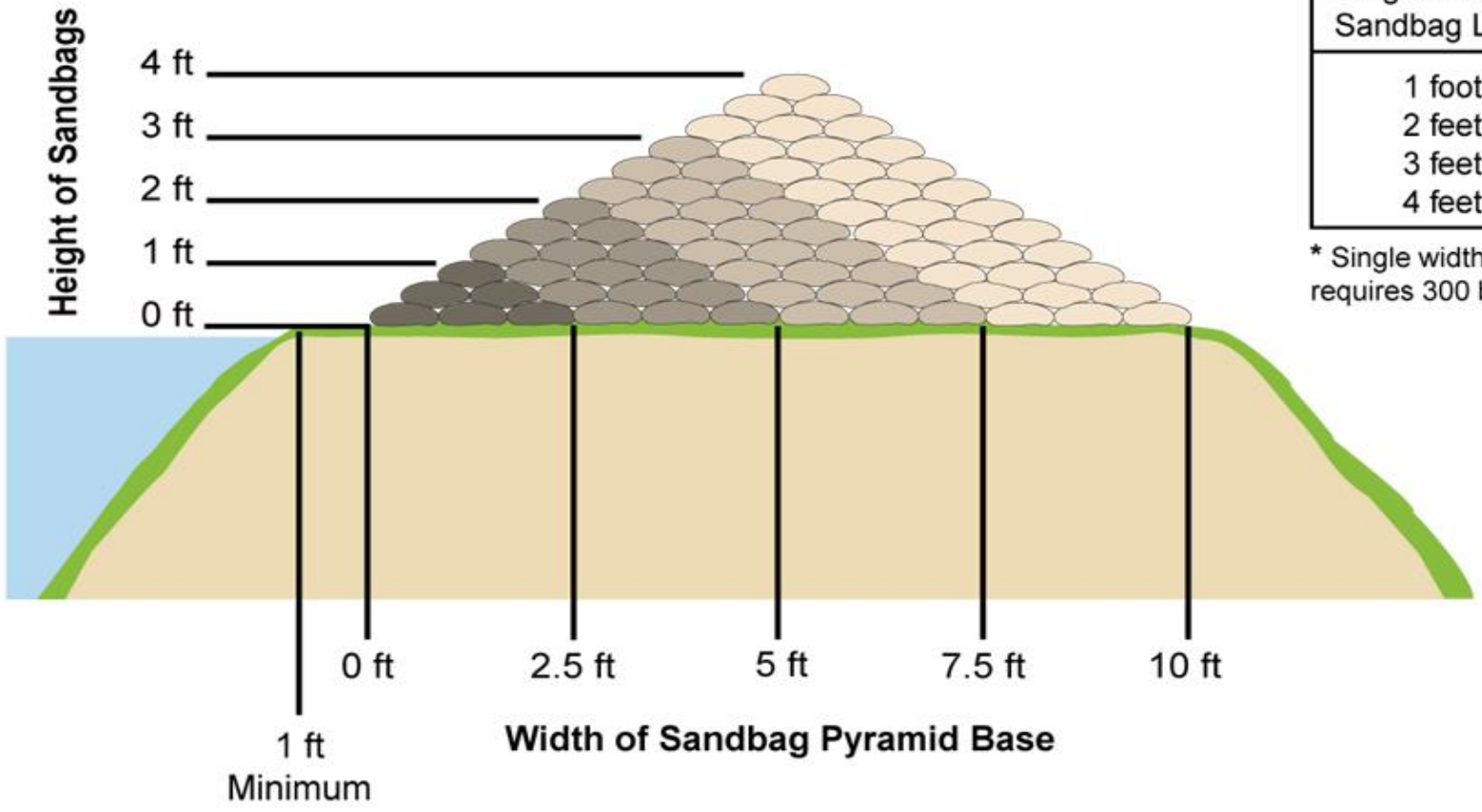
- Use to increase the height of sandbag protection.
- Place equal number of rows on the bottom as there are vertical rows.
- When the water is 1 foot below the top of the levee and predicted to rise 3 more feet, construct a 2-1/2 foot sandbag structure.

Pyramid Placement Method (Cont.)

Use this rule of thumb in determining dimensions of the pyramid:

- 1 bag in length equals about 1 foot
- 3 bags in width equal about 2-1/2 feet
- 3 bags in height equal about 1 foot

Typical Pyramid Sandbag Placement

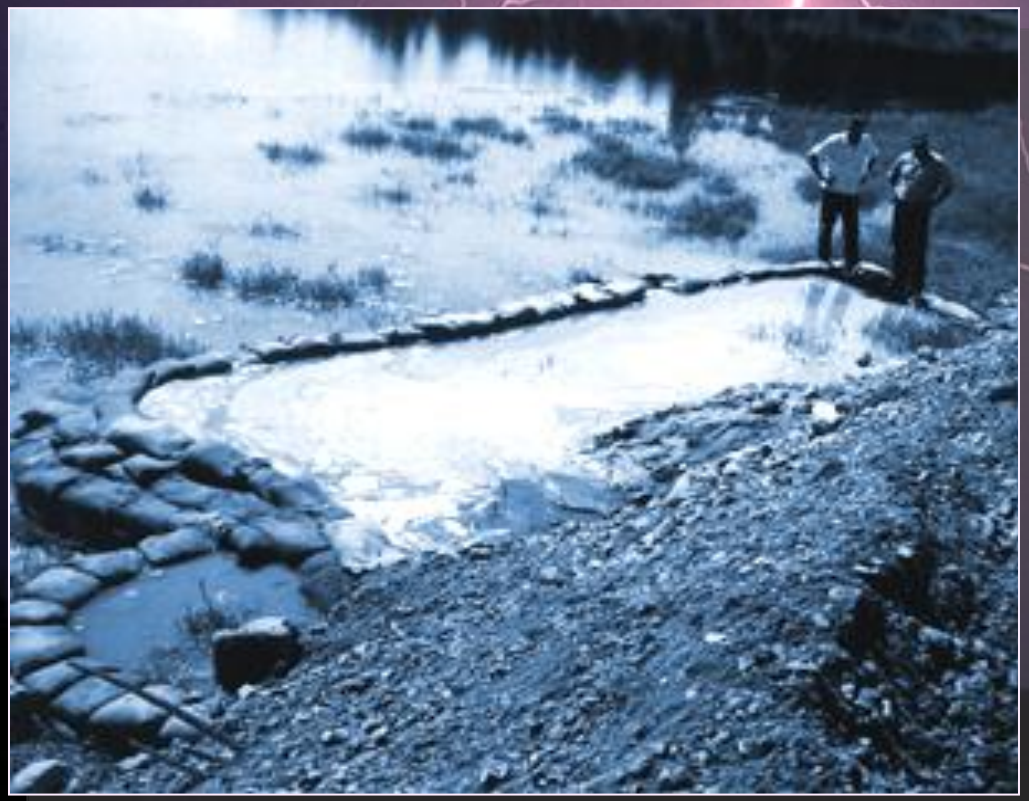


Bags Required Per 100 Linear Feet of Levee	
Height of Sandbag Levee	Bags Required
1 foot	600 *
2 feet	2100
3 feet	4500
4 feet	7800

* Single width course 1 foot high requires 300 bags per 100 linear feet.

Ringing Sand Boil Method

- Water seepage through the levee foundation or embank-ment can create a sand boil.
- Build ring dikes around a boil only when soil is being transported.
- There should be a minimum 2- to 3- foot radius from the center of the boil to the inside edge of the ring dike.



Ringing Sand Boil Method (cont.)

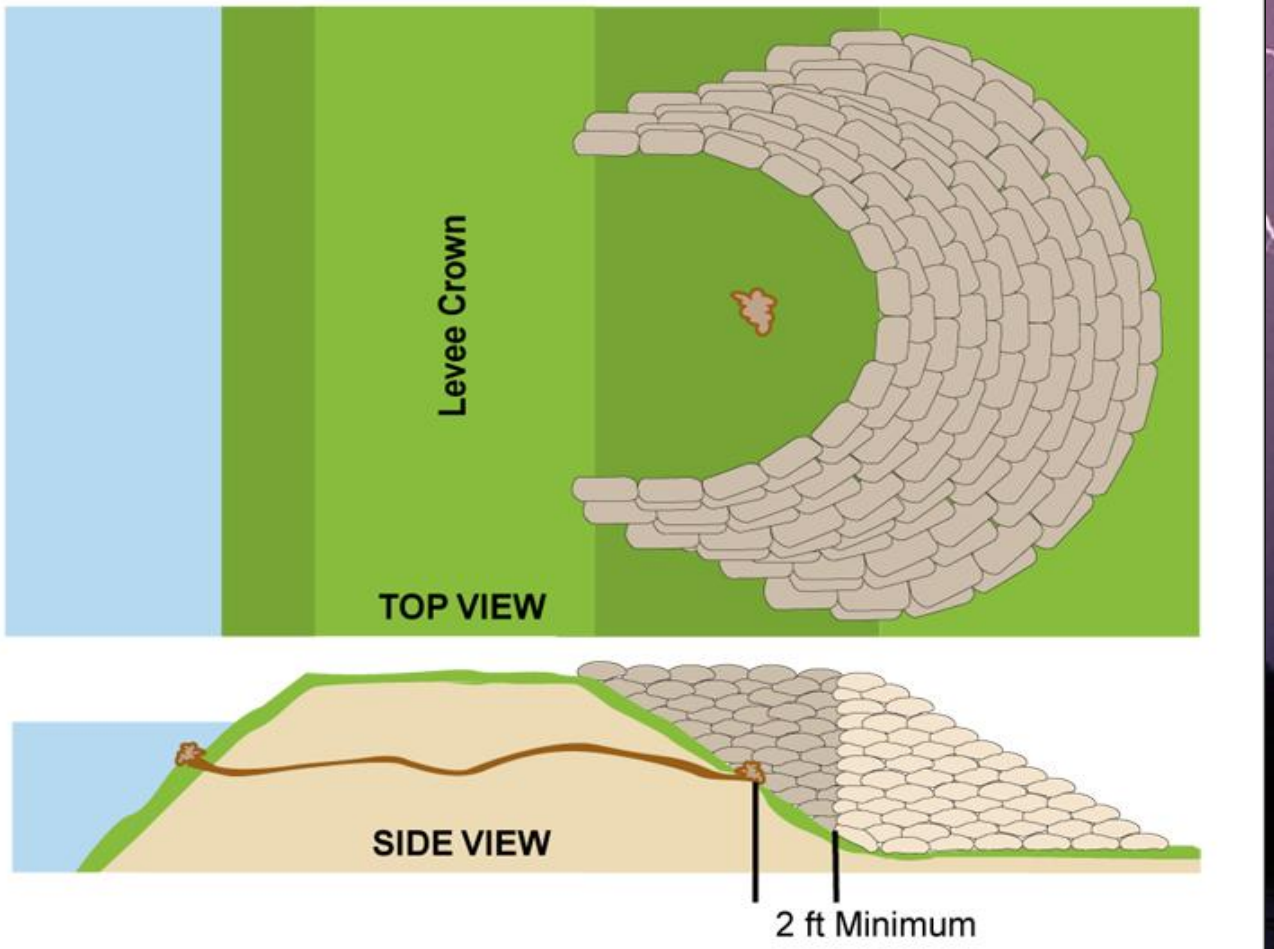
- Do not stop the flow as this will cause the boil to pop up somewhere else.
- Build an overflow section to allow clear water to exit ring dike.
- Continue raising ring dike until water runs clean.

Ringing Sand Boil Method (cont.)

- Do not stop the flow as this will cause the boil to pop up somewhere else.
- Build an overflow section to allow clear water to exit ring dike.
- **Continue raising ring dike until water runs clean.**

Ringing Sand Boils

- Minimum 2 ft radius from center of boil to edge of ring dike.
- Tie into levee if boil is near toe of levee.
- Build half-moon shaped ring dike if boil is on levee slope.



Safety Tips

Tip #1: Use proper lifting techniques.

Tip #2: Use work gloves and avoid contact with eyes and mouth.

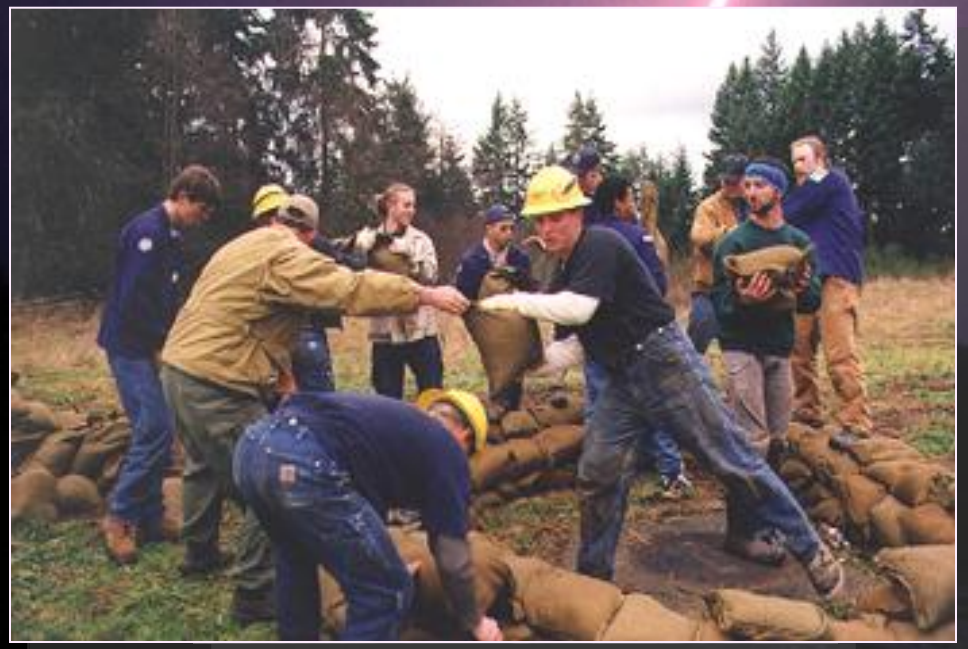
Tip #3: Wear adequate layered clothing and wear boots

Safety Tips

Tip #1: Use proper lifting techniques.

Tip #2: Use work gloves and avoid contact with eyes and mouth.

Tip #3: Wear adequate layered clothing and wear boots



Safety Tips

Tip #4: **Use caution around heavy equipment operators.**

Tip #5: **Wear with reflective material for night work.**

Safety Tips

Tip #4: Use caution around heavy equipment operators.

Tip #5: **Wear with reflective material for night work.**

U.S. Army Corps of Engineer Policy

- The Corps stocks sandbags to supplement state & local supplies
- Coordinate requests for sandbags with State Emergency Management Office.
- Locals are responsible for removal and cleanup.
- Corps flood engineers can provide technical assistance during sandbag operations

Make sure you study the Corps' latest brochure on proper procedures and tips on sandbag techniques.

For More Information

For more information on sandbag training see the Corps Sandbag Techniques brochure online at:

www.nwk.usace.army.mil/flood2007

US Army Corps of Engineers