



GENERAL GUIDELINES

1. The most commonly used bags are treated burlap or woven polypropylene about 24 inches by 14 inches. Unused empty bags can be stockpiled for emergency use and will be serviceable for years, if kept dry and properly stored out of the sun and weather. Filled bags of earth material will deteriorate quickly. In an emergency any kind of bags can be used.

2. Untied sandbags are recommended for most situations. Tied sandbags should be used only for special situations or for specific purposes such as filling holes, holding visquine or straw bales in place or to form barriers backed by supportive planks or aluminum sheet piles.

3. Untied bags should be filled approximately 2/3rds full. Tied bags can be filled more, but leave enough neck so that it can be tied properly.

4. A sandy soil is most desirable for filling sandbags but any other available material such as silt, clay, gravels or a mixture of these may be used. Sand is a pervious material and additional weight is obtained when the soil in the sack gets saturated, and sand filled sacks shape really well. Clay materials are difficult to fill bags with and are difficult to shape. Gravels are too pervious and are very difficult to shape. In emergencies, when vehicle access is cut off, use the back side of the levee or adjacent dry field to obtain the sandbag material. Sandbag levees can be constructed by two people. Teams are better. A filled sandbag weighs 40-50 pounds.

5. Sandbag filling operations can be accomplished at or near the placement site, or at centrally located filling sites such as fire stations, or other public works, or at sand borrow pits. If the bags are to be prefilled at a distant location, due consideration must be given to transportation vehicles and placement site access. In many cases, access may be only by boat, tractor or helicopter.

Sandbag Measurements

- 1 Pallet = 1 Ton (approx) = 75 Full Bags
- 1 Pallet = 75 Bags
- 1 Semi-Truck = 1,500 Bags = 20 Pallets
- 1 Tandem Truck of Sand = 10 Cubic Yards
- 10 Cubic Yards of Sand @ 30# Bag = 1,200 Bags
- 12 Cubic Yards of Sand @ 30# Bag = 1,450 Bags
- 1 Bag = 30# (approx)
- 1 Bag = 1 1/2 Cubic Feet (approx)
- Bags 55-60 percent filled provide best engineering properties

Estimating Bag Requirements

PLAN OF BOTTOM LAYER

BAGS REQUIRED PER 100 LINEAR FEET OF LEVEE	
Height Above Levee	Bags Required
1 foot	600*
2 feet	2100
3 feet	4500
4 feet	7800

*Single width course requires 300 bags per 100 linear feet, on foot high

Rule of Thumb
Width 3X (times) height.



PROPER SANDBAGGING TECHNIQUES

Sandbagging can be an effective flood-fighting tool and is a simple, effective way to prevent or reduce flood water damage. Although sandbags do not guarantee a watertight seal, they are a proven deterrent to costly water damage. Proper sandbag filling and placement methods increase productivity of sandbagging operations. Below are safety tips and proper procedures that are designed to minimize work-related injuries and maximize essential time.

Safety First! Follow the tips below to ensure safety for ALL personnel:

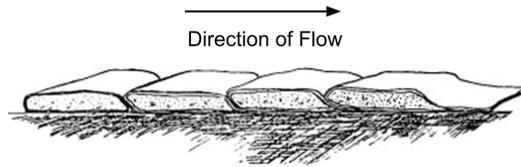
- Use proper lifting techniques to avoid injury and fatigue. Lift with your legs and bend at the knees to avoid injury to your back.
- Sandbags are treated to prevent deterioration when stored. Use work gloves and avoid contact with your eyes and mouth. Always wear safety goggles or glasses.
- Stay in eye contact with heavy equipment operators and keep alert for truck backup alarms.
- Flood waters can be polluted. Use rubber gloves and appropriate clothing if contact with water is unavoidable.
- Wear adequate clothing in layers and watertight boots. Reflective material on outer clothing is essential for night work.



HOW TO FILL A SANDBAG

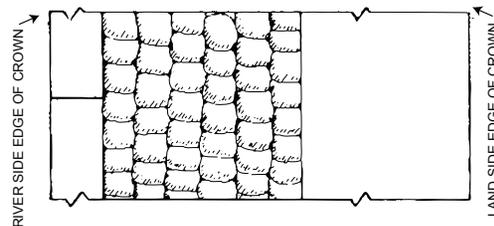
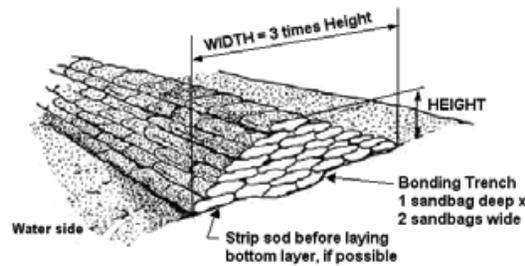
Normally, filling sandbags is a two- or three-person operation. One member of the team should place the bottom of the empty bag on the ground slightly in front of wide spread feet with arms extended. The throat of the bag is folded outward about 1-1/2 inches to form a collar and held with the hands in a position that will enable the second team member to empty a rounded No. 2 shovel full of material into the open end. The shoveler should carefully release the shovel full of material into the throat of the bag. Haste in this can result in undue spillage and added work. The third team member stock-piles and/or stacks the 2/3rd full open sacks. The use of gloves is necessary so as not to injure hands during the filling operations. The use of safety goggles is desirable, especially during dry and windy days. For large scale operations, filling sandbag can be expedited by using bag holding racks, funnels on the back of the dump trucks used for sanding operations and various power loading equipment.

PLACEMENT

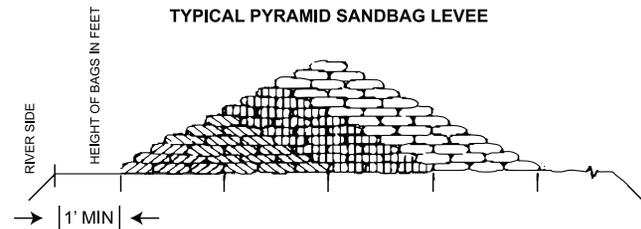


Remove any debris from the area where bags are to be placed. Place the 2/3rd filled bags lengthwise and parallel to the direction of flow, with the untied open end of the bag facing downstream. Initially fill the low spots before placing bags the full length of the area to be raised. Always keep the slope of the top of the sandbags the same as the adjacent water surface slope. Start the sandbag operation about one foot landward from the river's edge at the levee top. Place succeeding bags with the bottom of the bag tightly and partially on the open end of the previous bag. Offset adjacent rows or layers by one-half bag length to eliminate continuous joints. To eliminate voids and form a tight seal, compact and shape each bag by walking on it and continue to walk on it as succeeding layers are placed.

STACKING SANDBAGS



PYRAMID PLACEMENT METHOD



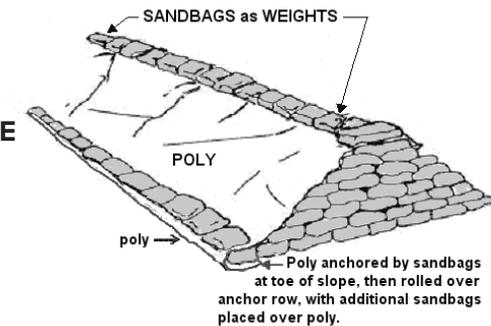
Width of bottom of bags for various heights in feet
 Calculation of number of sandbags required per one foot raise in levee height

$$N = \frac{3H+9H^2}{2}$$

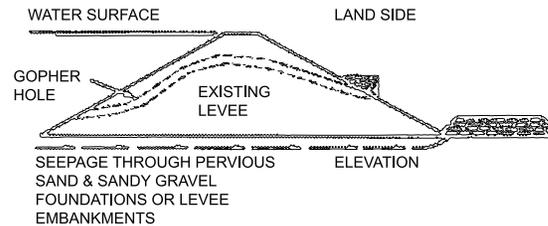
- when H = 1 N = 6
- when H = 2 N = 21
- when H = 3 N = 45
- when H = 4 N = 78

1 bag length equals about 1 foot
 3 bag widths equals about 2-1/2 feet
 3 bags high equals about 1 foot

SEALING THE LEVEE

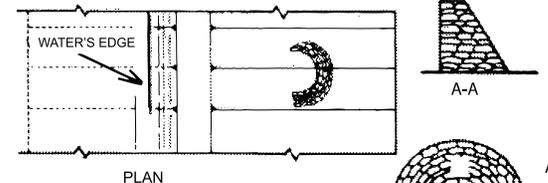


RINGING SAND BOILS



Notes:

1. Do not sack boil which does not put out material.
2. Height of ring dike should be only sufficient enough to create enough head to reduce flow through boil so that no more material is displaced and boil runs clear.
3. Never attempt to completely stop flow from boil.
4. Build an overflow section, so water over tops ring dike in a controlled manner. Divert overflow water away from the ring dike over visquine or by other methods to reduce erosion on levee slope.



Notes:

1. Minimum of 2 foot radius from center of boil to edge of ring dike.
2. Tie into levee if boil is near toe.
3. If boil is on levee slope, build half moon shape ring dike on levee slope.

Pyramid placement is used to increase the height of sandbag protection. Place the sandbags to form a pyramid by laying equal numbers of rows on the bottom as there are vertical courses. It is very important to compact each bag in place by walking on it, butting the ends of the sacks together, maintaining a staggered joint placement and folding under all loose ends.

COLLECTION, STORAGE AND DISPOSAL

The New York State Department of Environmental Conservation encourages reuse of sand bags to the extent it can be reasonably accomplished given limitations of location, health of homeowners, availability of labor, etc. Sandbags that have not come into contact with contaminated floodwater can either be stored for reuse or debagged. Sandbags which have come into contact with floodwater and/or contaminated with raw sewage, industrial chemicals, petroleum products, etc. must be disposed of at a municipal solid waste landfill. Uncontaminated sand can be used as fill or aggregate in upland areas.