

## CONSTRUCTION SPECIFICATION

### MI-183. BENTONITE SEALANT

1. SCOPE

The work shall consist of applying and mixing bentonite, and compacting bentonite-treated soil required by the drawings and specifications.

2. TIMING

Construction work covered by this specification shall not be performed between November 1 and the following April 15 unless the site conditions and/or construction methods to be used have been reviewed and approved in writing by the NRCS engineer or their designated representative.

3. MATERIAL

Bentonite shall be a free flowing, high swelling, granular sodium bentonite. Bentonite shall be American Colloid Company, Volclay SG-40; Wyo-Ben, Envirogel-10; or equivalent and meet the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
10 (2.0 mm)	100
20 (0.841 mm)	60-100
200 (0.074 mm)	0-20

4. APPLICATION

a. Bentonite shall be applied to soil that is free of all vegetation, trash, roots, frozen soil, snow or ice, stones over 2 inches (50 mm) in diameter or other objectionable material.

b. Slopes to be treated shall be 3:1 or flatter.

c. Holes shall be filled with on-site material compacted.

d. Bentonite shall be spread uniformly at the specified application rate of \_\_\_\_ pounds (total) of bentonite per square foot (\_\_\_\_kg (total) of bentonite per m<sup>2</sup>). The thickness of the finished compacted blanket shall be 8 inches (200 mm). Bentonite-treated soil shall be placed in two 4-inch (100 mm) finished lifts at a rate of 1/2 of the total bentonite in each lift.

e. The preferred method for applying bentonite is distributing 100-pound (45 kg) bags of material in marked grid patterns. Each square of the grid should be of the proper square footage to be covered by a 100-pound (45 kg) bag of bentonite.

Bentonite may also be applied using an agricultural seed or lime spreader or other equipment as approved by the engineer. Pre-measured tarpaulin or drop cloths spread in different locations shall be weighed after spreading material over them to ensure that the proper rate is being applied. Spreaders must be a drop type. Broadcast spreaders are not acceptable.

5. MIXING

Bentonite shall be thoroughly mixed with a disk, roto-tiller or other suitable mixing equipment approved by the NRCS engineer or their designated representative. A recommended procedure to achieve adequate mixing is as follows:

- a. After applying bentonite at the required rate for the first lift, chisel plow cross-directional a minimum of three passes each direction to a depth of 8 inches (200 mm) across the entire pond area.
- b. Disk plow cross-directional a minimum of two passes each direction to a depth of 6 inches (150 mm) across the entire pond area.
- c. Compact soil to meet the requirements under Section 6, Compaction.
- d. Place soil for the second lift, approximately 6 inches (150 mm).
- e. Apply bentonite at the rate for the second lift and chisel plow cross-directional a minimum of three passes each direction to a depth of 6-8 inches (150-200 mm) across the entire pond area.
- f. Disk plow cross-directional a minimum of two passes each direction to a depth of 6 inches (150 mm) across the entire pond area.
- g. Compact soil to meet the requirements under Section 6, Compaction.

6. COMPACTION

The methods of compaction listed below are intended to achieve 90 percent of the maximum density as determined by the Standard Proctor Test, ASTM-D 698.

- a. Bentonite-treated soil shall have a water content sufficient to secure compaction. When kneaded in the hand, it will form a ball which does not readily separate when struck sharply with a pencil and will not extrude out of the hand when squeezed tightly. Water should be added to the soil (or dried if too wet) before applying bentonite to yield a sufficient water content.
- b. The thickness of the finished compacted blanket shall be 8 inches (200 mm). The thickness of each finished compacted lift shall be 4 inches (100 mm). Each lift shall be compacted by traversing the entire surface with not less than two passes of a pneumatic-tired roller exerting a pressure of not less than 50 pounds per square inch (345 kPa), a flat steel wheel roller exerting not less than 100 pounds per inch (8.5 kg/mm) of width of roller or by vibrating compactor.

An alternative to heavy compaction equipment is a wheel type tractor, with a minimum 100 horsepower, (75 kW) traversing the entire surface with not less than five passes. Tractors must exert a pressure of not less than 10 pounds per square inch (70 kPa).

Compaction with a sheepsfoot roller or a track type tractor shall not be allowed.

- c. A protective cover layer of 12 inches (300 mm) of on-site material shall be applied over the bentonite-treated blanket to protect it from drying cracks.

7. SAFETY

Dust mask and goggles shall be worn by all personnel on the site during bentonite application and mixing for protection against bentonite dust.

8. OPERATION AND MAINTENANCE

During hot, dry periods, ponds shall be inspected for drying cracks. Should drying cracks begin to develop, the entire exposed pond area shall be watered.

If the bentonite-treated blanket develops major cracks that watering will not heal, the blanket shall be re-disked and compacted as required in Section 6, Compaction.