INSTALLATION OF ASPHALT-FIBERGLASS LININGS FOR RESERVOIRS AND CATCHMENTS

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INTRODUCTION

The following description of materials and procedures used for installing asphalt-fiberglass linings is based on the installation of two small reservoirs in 1962 and 1963. These asphalt-fiberglass linings are still in excellent condition eight years after installation. The lining is tough, not ordinarily subject to wind damage, and can be installed with simple equipment by properly supervised unskilled labor.

Performance of the 1962-63 linings has been so good that a project has been initiated to develop even better and lower cost materials. It is hoped that the project will be completed before December 1971. In the interim the materials and procedures described in the following discussion can be used to construct good asphalt-fiberglass linings.

MATERIALS

Basecoat asphalt:

Asphalt emulsions are preferred for basecoats because they are easier to apply and will cure faster after application than cutback asphalts. The emulsions should have an asphalt content of 60 percent or greater, and the asphalt should have a minimum penetration rating of 100. Rapid setting cationic and slow setting anionic asphalt emulsions have been used successfully, indicating that the type of asphalt emulsion is not critical, except that the emulsion should be reasonably stable in storage. Storage temperatures should be above 45°F. Emulsion that has settled in storage and cannot be remixed should not be used.

If cutback asphalts must be used, they should be of the rapid curing type with the asphalt dissolved in a volatile solvent such as naptha. Asphalt content should be at least 50 percent to avoid excessive seepage of cutback through the fiberglass. The primary disadvantage of cutbacks is that they must be heated and must be applied by spraying.

The above asphaltic materials should be available wherever asphalt is used for road construction.

Sealcoat asphalt:

The sealcoat asphalt used was a roofing type asphalt-clay emulsion with a minimum solids content of 48 percent. It was

purchased under the name of Flintkote C-13-E Emulsion as a product of Pioneer Division, The Flintkote Company, P.O. Box 2218, Terminal Annex, 5500 S. Alameda St., Los Angeles, California.[1/]

Fiberglass matting:

The fiberglass matting is constructed from multiple length chopped glass strands bonded in mat form with a small quantity of water soluble polyester resin. The matting is specified by weight in ounces per square foot. For catchment surfaces and shallow reservoirs, the 3/4 and 1 ounce matting has been successfully used. For reservoirs over 10 ft deep, it may be desirable to use heavier matting. The fiberglass matting used was Owens-Corning M-700 chopped strand mat purchased from Thalco, 6431 Flotilla St., Los Angeles, California.

SPRAY EQUIPMENT

A portable spray unit was constructed from the following components.

Pump: The pump is a positive displacement gear pump, with a 125 psi spring loaded relief valve, rated at 4 gallons per minute output when operating at 200 rpm and 100 psi discharge pressure. It is a Roper model 2K20, manufactured by the Roper Pump Company, Commerce, Georgia.

1/ Trade and company names are included for the benefit of the reader and do not imply any endorsement or preferential treatment of the product listed by the United States Department of Agriculture.

Engine: The power source is a 4 cycle, single cylinder gasoline engine, rated 9 horsepower at 3600 rpm, with an integrally mounted clutch and starter-generator.

Gear reduction: Necessary speed reduction between engine and pump is obtained in two steps. Speed reduction of 2 to 1 is derived by different sized sprockets in a chain drive between the engine and a gear reducer. The remaining 10:1 reduction is obtained with a model A-21, 10:1 ratio gear reducer manufactured by the Durst Corporation, Box 298, Beloit, Wisconsin.

Spray nozzles: Deflector type spray nozzles, of one-piece construction with no internal vanes or screens, are used. The nozzles have a 9/64-inch orifice and provide a wide, flat, and uniform spray nozzle. They are No. 1/8 K18 nozzles manufactured by Spraying Systems Company, 5201 Randolph Street, Bellwood, Illinois. Two nozzles, about 20 inches apart, are used on the end of a spray wand. A shut-off valve is used in the handle of the wand.

Hoses: The pump intake hose is about 6 ft of 1 1/2-inch I.D., solvent resistant, heavy walled artifical rubber hose. A 40-inch length of 1-inch I.D. steel pipe is fitted on the intake end of the hose so that it can be inserted into the bung of an asphalt barrel, permitting the material to be pumped directly from a barrel or from a heated tank. The

lower end of the pipe is bevelled at a 45° angle to allow entry of fluid while it rests on the bottom of the barrel.

Spray hoses are solvent resistant, high pressure, artificial rubber. Inside diameter is 3/4-inch if hose length does not exceed 50 feet. If more than 50 feet of hose is used, the I.D. of the spray hose should be 1-inch to reduce friction losses in pumping.

SUBGRADE PREPARATION

The subgrade for the lining should be as smooth as it is economically feasible to prepare. Before installation the area is hand raked to remove rocks greater than 1-inch diameter, and other debris laying on the soil surface. Larger rocks partially buried in the soil may be left in place if there are no sharp projections or corners which might puncture the lining or prevent it from conforming to the soil surface. The upper surface of any rocks not removed should merge smoothly with the surrounding soil surface. Figure 1(a) illustrates some examples of acceptable and non-acceptable, partially buried rocks.

The soil is then compacted to provide a firm base. This can be done with a compaction roller or a rubber tired vehicle. Any depressions formed during rolling are filled and recompacted to achieve a uniform slope. If regrowth of vegetation is believed to be a problem, the area is treated with a soil sterilant. With liquid soil sterilants, this can be done before rolling to provide moisture for compaction. Asphalt-fiberglass linings should not

be installed over penetrating type plants such as nut sedge (Cyperus rotundus). Such plants must be completely removed or killed to prevent growth through the lining and thereby damaging it.

The edges of the lining are buried in a trench at the perimeter of the area. The trench is a minimum of 6 inches deep and 6 inches wide. For catchments, the trench is constructed on top of a berm around the edges of the area. These berms should ordinarily be only high enough to prevent water from running off the plot at points other than the outlet, usually about 6 to 8 inches high and 18 inches wide at the top. The interior side of all the berms should have a gradual slope which smoothly merges with the catchment surface. An illustration of good and poor berm design is presented in Figure 1(b).

LINING INSTALLATION

The asphalts used can be either cutbacks (solvent based) or emulsions (water based). Emulsions can be applied by spraying or brooming, using industrial floor brooms with soft bristles. Cutbacks usually have to be heated to 150°F minimum and applied by spraying.

In spray applications, a tack coat of asphalt is sprayed under each strip of fiberglass at a rate of 1/4 gal per yd^2. (This tack coat is not used for broom application.) The fiberglass matting is then unrolled on the soil surface. Care should

be taken to prevent wrinkles while laying the matting. Sufficient asphalt is then applied to saturate the matting and bond the fiberglass to the underlying soil. For broom application the asphalt is poured from buckets and spread with the brooms. Both broom and spray applications usually require 1/2 to 3/4 gallon of asphalt per yd^2. The next strip of fiberglass is unrolled in place with approximately 4 inches overlap and coated with asphalt. Lap joints will be bonded by the asphalt. This is continued until the entire area is covered.

On catchment areas the fiberglass strips are laid transverse to the slope, starting at the lower edge. On other installations the strips should be laid up and down the slope. The fiberglass strips should be of sufficient length to lay across the bottom of the trench at the perimeter of the area. After application of the first asphalt coat, the trenches are partially backfilled to prevent wind from penetrating under the covering. The trench is completely backfilled after application of the final sealcoat.

Any "fishmouth" wrinkles at the lap joints should be repaired to prevent water leakage under the wrinkle. This is easily accomplished by cutting the wrinkles lengthwise along the center of the wrinkle and pressing the cut edges flat. A patch of fiberglass is then placed over the cut area and saturated with asphalt.

The asphalt applied to the fiberglass is allowed to cure until it is no longer "tacky" before application of the sealcoat(s). This curing time is dependent upon the type of asphalt used and

the weather conditions. During sunny warm weather, asphalt emulsions usually cure in about 1-2 weeks, and cutback asphalts usually cure in about 2-4 weeks. Precipitation occurring during the curing period usually will not damage the basecoat asphalt, but installations should be scheduled for periods of clear weather if at all possible.

The sealcoat of asphalt-clay roofing type emulsion is applied, after the basecoat is cured, at a rate of approximately 1/3 gallon per yd^2. Application can be made by spraying or by spreading with brooms. Spraying is facilitated by diluting the roofing emulsion with about 2-3 gallons of water per 50 gallons of emulsion and mixing thoroughly. Application with brooms does not require dilution of material. Adequate coverage of lap joints is easier with brooms than with spraying. The material is brushed against the laps to fill any small voids that might be present. A single, carefully applied sealcoat of roofing emulsion will be adequate for catchment surfaces and should be adequate for reservoirs not exceeding 10 feet in depth. One or two additional sealcoats may be needed if water depth will exceed 10 feet. Sealcoats usually require 2 days of clear weather for curing. Rain on uncured sealcoats can seriously damage them.

MAINTENANCE

Any lining must be maintained. Asphalt-fiberglass linings should be carefully inspected at least every 6 month and any damage should be immediately repaired. Holes caused by mechanical

damage are easily repaired by covering with a patch of fiberglass matting and saturating the patch with asphalt. Grass or sedges growing through the lining can be killed by periodic use of a weed burner, followed by reapplication of a sealcoat to the damaged area. Large plants can be removed by cutting the lining to permit digging them out, followed by patching the cut area.

A new sealcoat will have to be applied to exposed linings every 5 to 10 years, depending on the quality of the material used and the care with which it is applied. The need for a new sealcoat will be indicated by the exposure of the white fiberglass. Linings ordinarily covered by water or sediment should have an indefinite life except in some localities where unusual soil bacteria may consume the asphalt.

FIGURE 1(a). ILLUSTRATION OF ACCEPTABLE AND NONACCEPTABLE BURIED ROCKS.

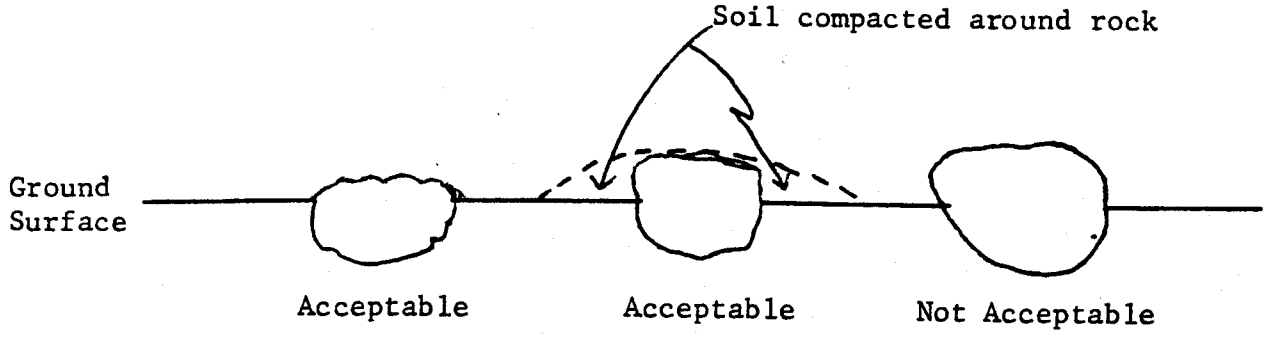

FIGURE 1(b). ILLUSTRATION OF CORRECT PROCEDURE FOR BERM CONSTRUCTION.