

FLEXIBLE MEMBRANES FOR WATER APPLICATIONS*

Since most golf courses in our area are not in a position to pump water directly from wells or from city water mains, ponds are used as reservoirs for irrigation water supplies rather extensively. Fortunately, most of these reservoirs are located on a heavy clay subsoil which seals itself readily preventing water loss through seepage. But for those areas where seepage will occur due to a permeable subsoil, flexible membranes might be considered as water barriers to prevent loss through seepage.

What types are available? How are they handled? What are their advantages and limitations?

The principal materials which have been used for these applications are plastic film, elastomeric sheet structures, and asphalt membranes.

Flexible membranes are relatively weak and subject to mechanical damage. Many are completely watertight, and, where protected from mechanical damage, provide water barriers that can be expected to function for many years without loss of effectiveness. If these membranes are to give the full performance of which they are capable, however, it is essential that good quality material be used and construction practices be adapted to the requirements of the material involved and the installation conditions.

When installing this material, subgrades should be smooth and firm; sharp projections such as sticks, roots, and stones should either be removed or covered with a cushion of a fine-textured earth material—such as sand or clay—to prevent puncturing of the membrane. Although a smooth, firm subgrade is desirable, plastic film and elastomeric sheeting can be installed on soft, wet subgrades without serious consequences.

The membrane should be anchored on slopes. This is accomplished by burying the top edge in a trench along the berm or shoulder. The depth and the width of the trench will depend on the length of slope. It is essential that the trench be deep enough and the backfill be compacted sufficiently to hold the liner securely in place. A trench, 1 foot deep and 1 foot wide, is usually adequate.

All flexible membrane linings, except butyl and EPT (ethylene-propylene terpolymer) rubber, must be covered to protect them from mechanical damage caused by weathering. An exception may be some modified polyethylene film that has recently become available. It is generally recommended that the cover material consist of 6" of fine textured earth, such as sand, topped with 6" of gravel. In some areas it is the practice to cover polyethylene linings with 1 foot of fine textured site material and add gravel only in those places where scour is observed.

The side slopes should be not steeper than 3:1 if the earth cover is to remain stable. If the slopes are steeper the cover tends to slide uncovering the membrane on the top of the slope.

Vinyl film must be buried if it is to be serviceable for more than short periods. The covering of vinyl linings in reservoirs and be limited to side-slopes, if the reservoir is designed so that some water will remain in it at all times. Where polyethylene is used, it is necessary to cover the bottom as well to prevent seams from opening, since there is no way of making strong seams in the field with polyethylene. To reduce cost, a combination of butyl and vinyl or polyethylene might be used with butyl on the side-slopes and film on the bottom. In this way covering

can be omitted, except for the bottom where the film must be covered.

It is not practical at this time to line large reservoirs, but in many small reservoirs where a lining is necessary, some form of flexible membrane may be the answer.

*Based on a paper to the American Society of Agriculture Engineers meeting by: C. W. Lauritzen which was reprinted in the April 1968 issue of "World Irrigation."

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