

CONSTRUCTION SPECIFICATION

MI-184. FLEXIBLE MEMBRANE LINERS

1. **SCOPE**

The work shall consist of furnishing, installing and field testing flexible membrane linings as specified herein and/or as shown on the construction drawings.

2. **MATERIALS**

All lining material shall be free of damage or defect. Each package delivered to the job site shall be marked with the name of the material, the manufacturer's name or symbol, the quantity therein and the thickness or weight of the material.

The manufacturer shall provide written certification of all of the following items:

- a. The material is suitable for the intended use;
- b. The expected service life of the flexible membrane under the anticipated conditions
- c. The physical properties of the liner.

Shop drawings will be furnished to the designer for approval before proceeding with field work. Items to consider in the shop drawings include, but are not limited to:

- a. Extent, size and details of the lining.
- b. Termination and methods of sealing around penetrations.
- c. Manufacturer's written instructions for the storage, handling, installation, inspections and field splices, seams and joints.

The liner will be factory fabricated into panels as large as is practical for placement. Factory made seams will have a strength of at least 80% of the specified sheet strength.

After fabrication, the lining will be packaged for minimum handling in the field. Shipping boxes will be substantial enough to prevent damage to contents.

3. **SUBGRADE PREPARATION**

The area to be lined shall be drained and allowed to dry until the surface is firm and will support the personnel and equipment that must travel over it during the installation of the lining.

All banks and fills within the area to be lined must be shaped to the slopes and elevations as shown in the construction drawings.

The supporting surface slopes and foundation to accept the liner shall be stable and free from deviations of more than 3 inches (75 mm). If the flexible membrane is to be placed on cohesive soils, the subgrade shall be firm and dense. A layer of sand may be used to provide a cushion subgrade.

The foundation area for flexible membrane linings shall be smooth and free of projections that might damage the lining. Stumps, roots, large sharp rocks and hard clods shall be removed. Coverage by equipment tracks or roller shall provide a smooth surface prior to liner installation.

If the construction drawings require a sterilant, it shall be applied to the subgrade at the rate recommended by the manufacturer.

An anchor trench shall be excavated completely around the area to be lined at the planned elevation of the top of the lining. The trench shall be 8 to 10 inches (200 to 250 mm deep and about 12 inches (300 mm) wide.

4. PLACING THE LINING

Membranes shall be installed in accordance with the manufacturer's recommendations. A manufacturer's representative and the inspector will be present during liner placement.

Membranes shall be carefully spread over the subgrade so they lie in a relaxed state.

At least 12 inches (300 mm) of the top of the lining shall be placed in the anchor trench and anchored with compacted backfill.

The temperature range for membrane installation is 41°F (5°C) to 104°F (40°C).

All field splices, seams and joints shall be made in accordance with the manufacturer's recommended technique, using materials furnished for that purpose. They shall maintain their integrity through the expected life of the lining. Where laps are used, the upslope panel shall lap over the top of the downslope panel. The contact surfaces of the panels will be wiped clean to remove all dirt, dust, moisture or other foreign materials. Any wrinkles will be smoothed out. All field splices, seams and joints will be inspected and approved prior to placement of the soil cover material.

Pipes through the liner shall be attached to the liner with a shroud, fabricated by the manufacturer, and will be firmly affixed to the liner with adhesive and a stainless steel clamp.

Any damage to the liner will be patched with the lining material itself and shall be performed in accordance with the manufacturer's recommended procedures. Patches shall overlap the main panel by at least 6 inches (150 mm) on all sides. Any wrinkles will be smoothed out.

Placement of cover soil material shall commence immediately following approval of the liner placement. The soil material to be used for protective cover shall be free of large clods, sharp rocks, sticks and other objects that would puncture the lining. The cover soil material shall be placed to the depth as shown on the construction drawings without damage to the membrane .

When placing concrete (reinforced or unreinforced) over a flexible membrane liner, place an 8-ounce nonwoven geotextile over the flexible membrane liner prior to placement of the concrete.

Upon completion of liner installation, the contractor shall provide a letter stating that the liner was installed according to the plans and specifications and the manufacturer's recommendations.

5. FIELD TESTING

During liner installation, the contractor shall perform field tests. The frequency and type of testing shall be in accordance with the manufacture's recommendations and at other times at the request of the inspector. All splices, seams, joints and repairs shall be checked during and after installation by use of the testing methods recommended by the manufacturer.

Final inspection of the liner installation shall include checking for its functional integrity.