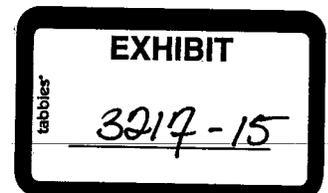
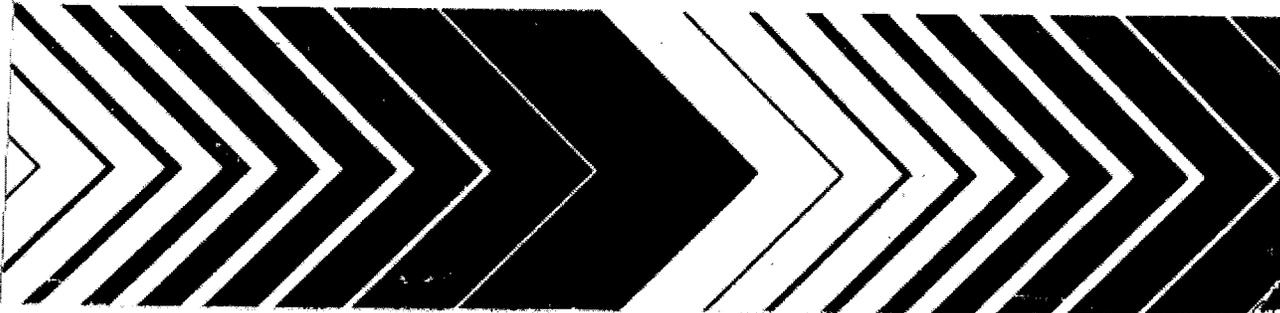


Research and Development



# Lining of Waste Containment and Other Impoundment Facilities



6.3.2.2.3 Water table--If not accounted for properly in the design, a rising water table can result in built-up hydrostatic pressures below the liner and eventually cause uplift or bursting of the liner.

#### 6.3.2.3 Design and Engineering Factors--

These factors are related to the design's inability to account for:

- Site-specific conditions, such as the type of soil and the quality of the bedrock underneath the site and the climatological conditions that could result in heavy rains, freezing of support soils, freezing of the waste, etc. In colder climates where ice can form on the surface of an impoundment, the formation of ice can damage a liner if taken protective measures were not included in the design. In the spring months when ice breaks up, large floating chunks can easily puncture and rip the surface of an FML. Rip-rap and other forms of slope protection have been used to protect the FML.
- Limitations in how a material such as an FML should be used in a design for a containment unit. For example, a highly plasticized FML used without a protective soil cover to line a surface impoundment located in a region with high levels of solar radiation would probably fail after a short service life.
- Adequate mechanical compatibility between the different components of the liner system, such as the proper selection of the sidewall slopes and bedding layers between an LCRS and an FML. Low coefficients of friction between layered components of liner and drainage systems on slopes may result in serious slippage of the waste on the liner and failure of the liner.
- The effects of exposure to the constituents of the waste liquid or leachate on the properties of the FML.

Ultimately the design for a waste containment unit needs to minimize the mechanical stresses on an FML because a material under prolonged stress below its tensile strength will lose strength and may ultimately fail. This type of long-term failure would probably occur when the material was stressed biaxially. Several FMLs have been shown to have rather high elongations or when stretched in one direction at a time, but it has been observed that biaxial stresses can cause an FML to break or split at low elongations.

#### 6.3.2.4 Factors Related to Construction--

6.3.2.4.1 Poor subgrade compaction--Compaction of the subgrade is an essential step in obtaining a relatively firm and unyielding support for the FML. If compaction is poor, then wave action or foot traffic can easily cause sloughing of the side slopes. Subsidence and differential settlement can result from added pressures created as the impoundment or landfill is filled, causing localized strains and possible failure of the FML.