

Designing with Geotextiles

Nanjundaswamy P.
Department of Civil Engineering
S J C E, Mysore

Design methods

Design by

- **Cost and Availability**
- **Specifications**
- **Function**

Design by Function

- **Separation**
- **Reinforcement**
- **Filtration**
- **Drainage**
- **Combined functions**

Designing for Filtration

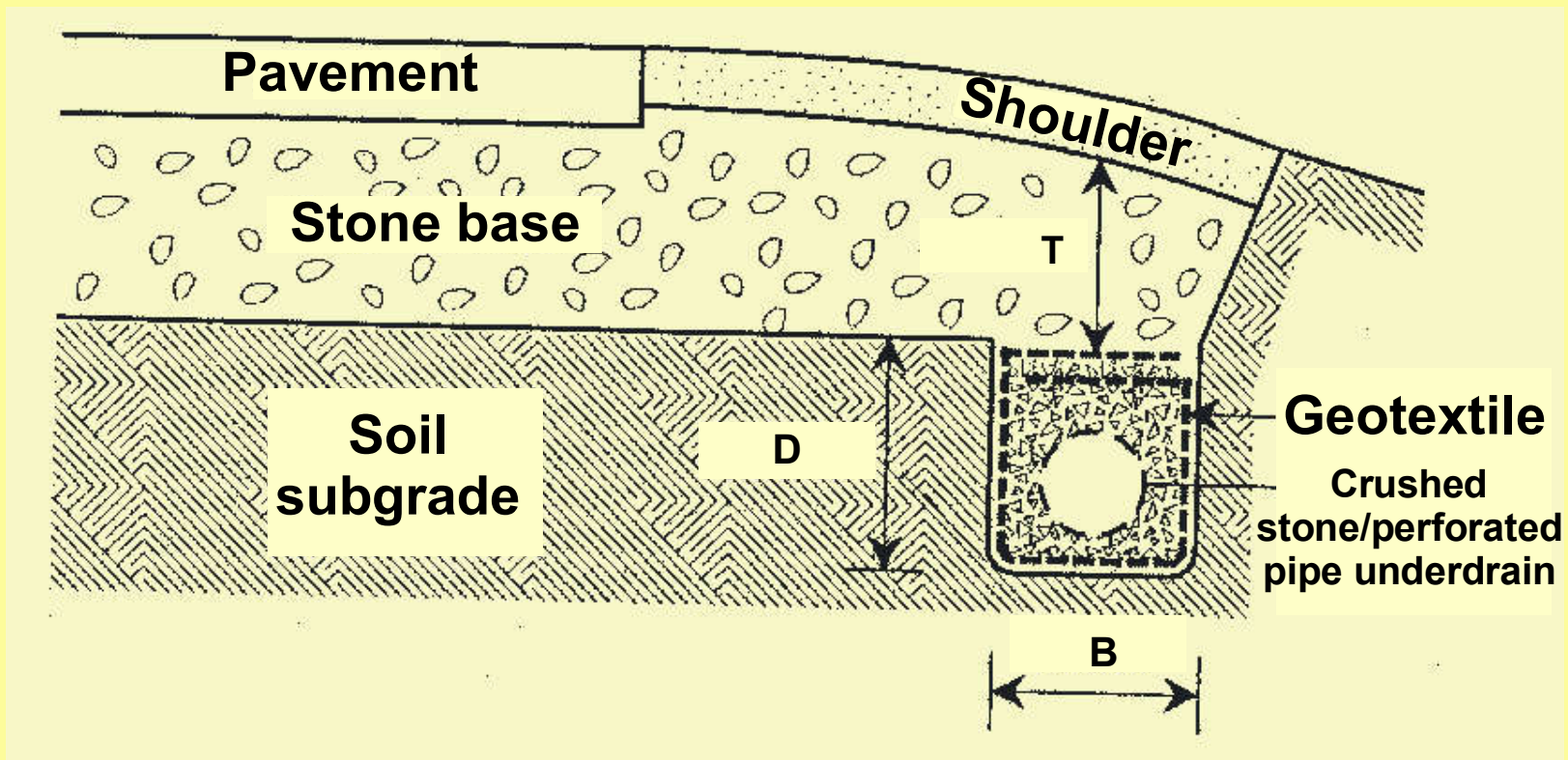
Aim:

The equilibrium soil-to-geotextile system that allows for adequate liquid flow with limited soil loss across the plane of the geotextile over a service lifetime compatible with the application under consideration

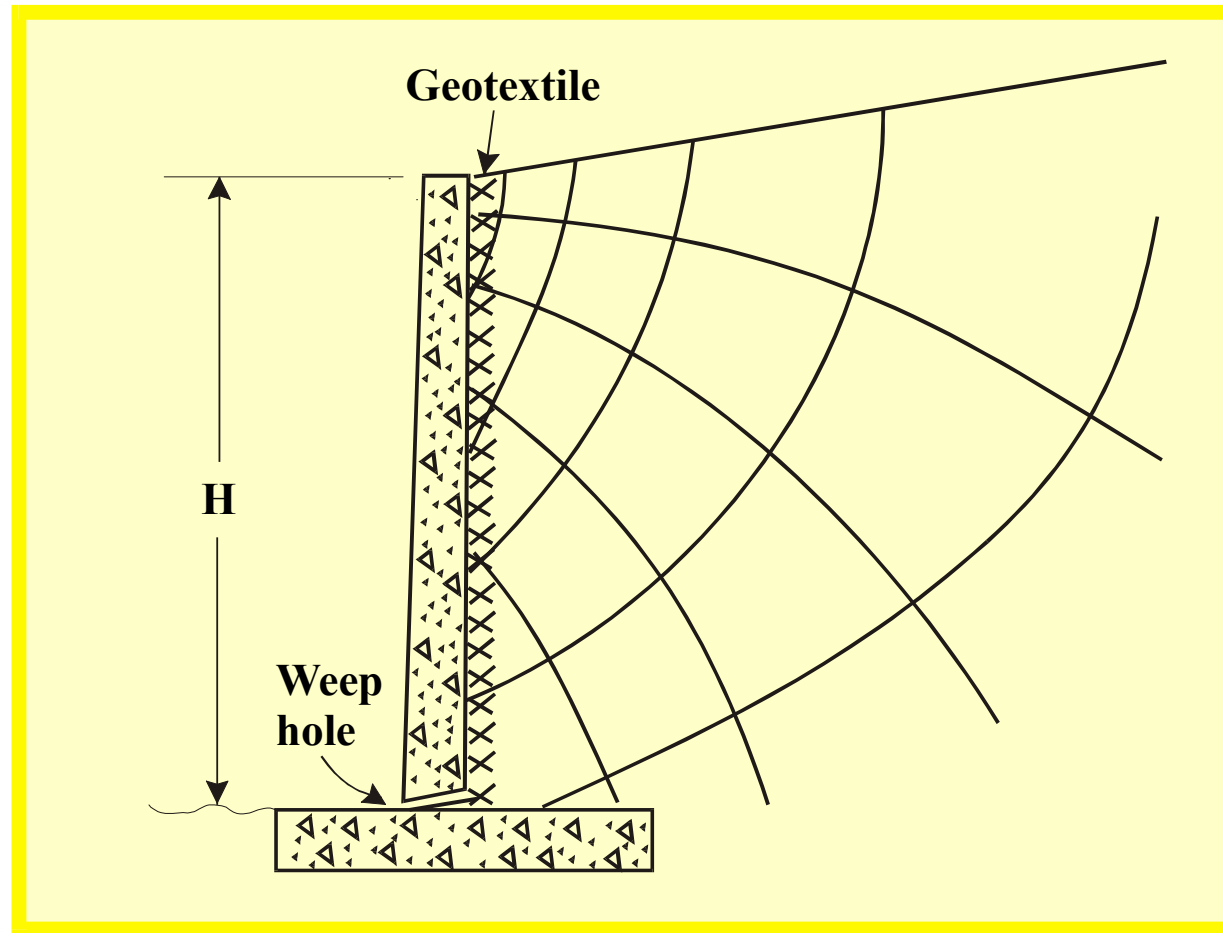
Designing for Filtration

- **Behind retaining walls**
- **Around underdrains**
- **Beneath erosion control structures**
- **Silt fences**

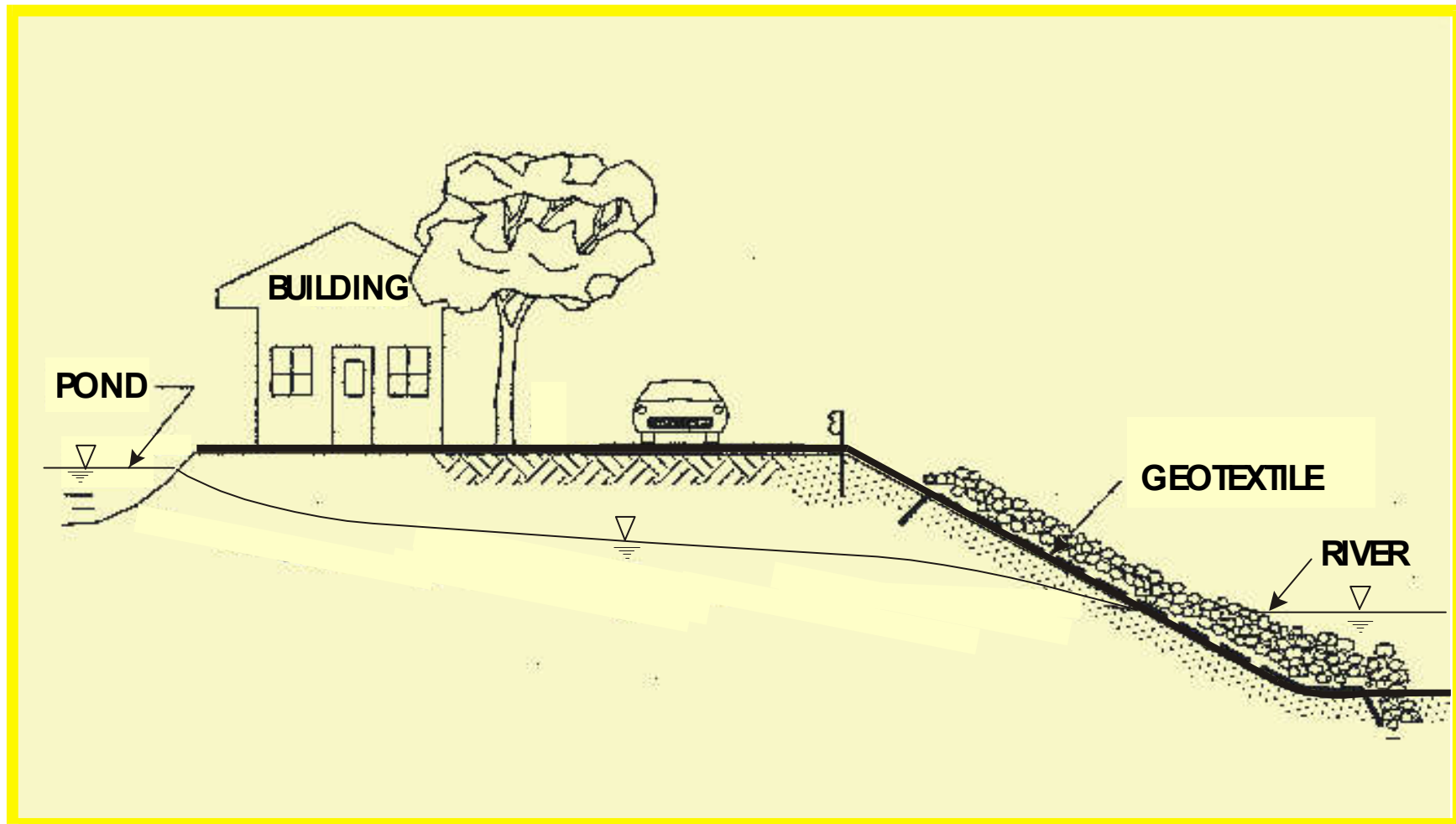
Designing for Filtration



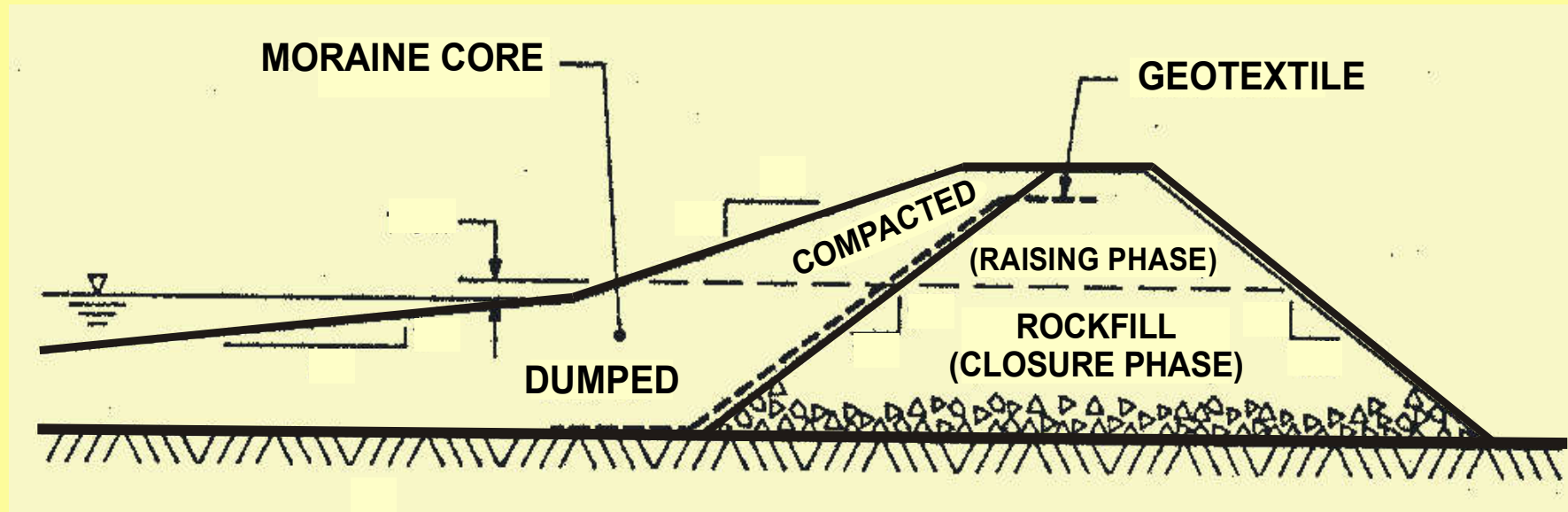
Designing for Filtration



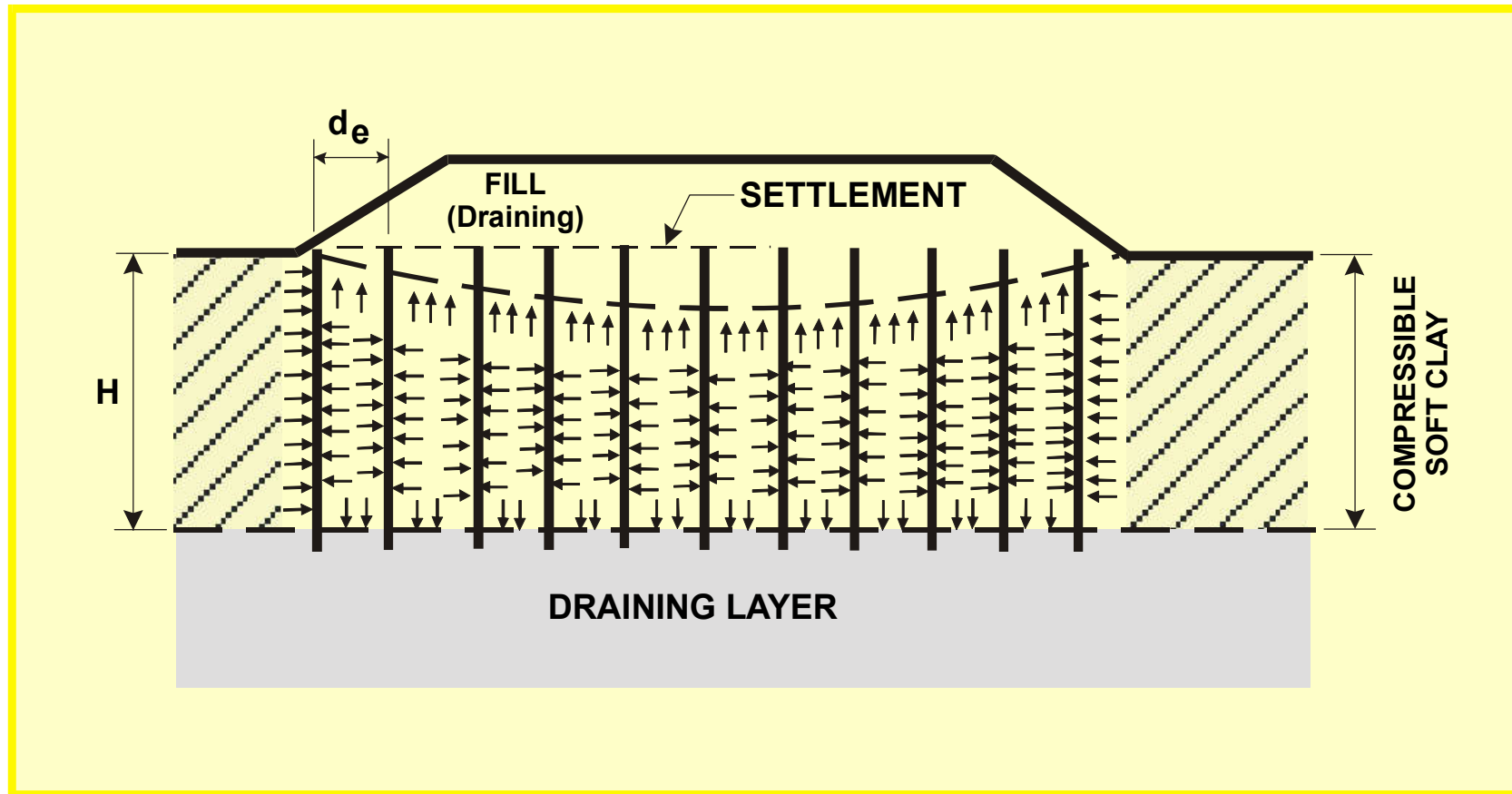
Designing for Filtration



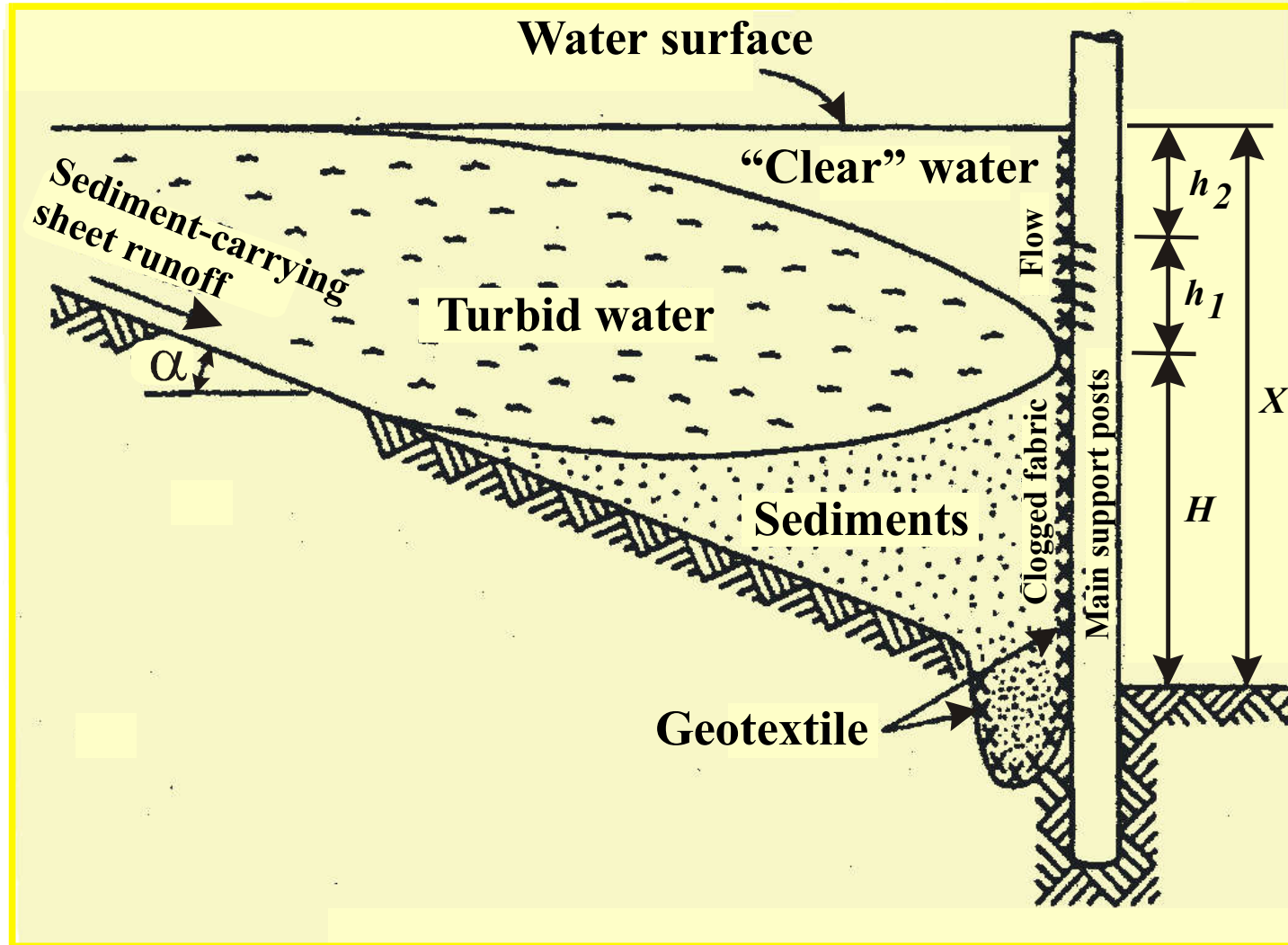
Designing for Filtration



Designing for Filtration



Designing for Filtration



Designing for Filtration

Criteria:

- **Permeability**
- **Soil Retention**
- **Long term flow compatibility**

Designing for Filtration

Permeability:

- **Permittivity**

$$\psi = \frac{k_n}{t}$$

Designing for Filtration

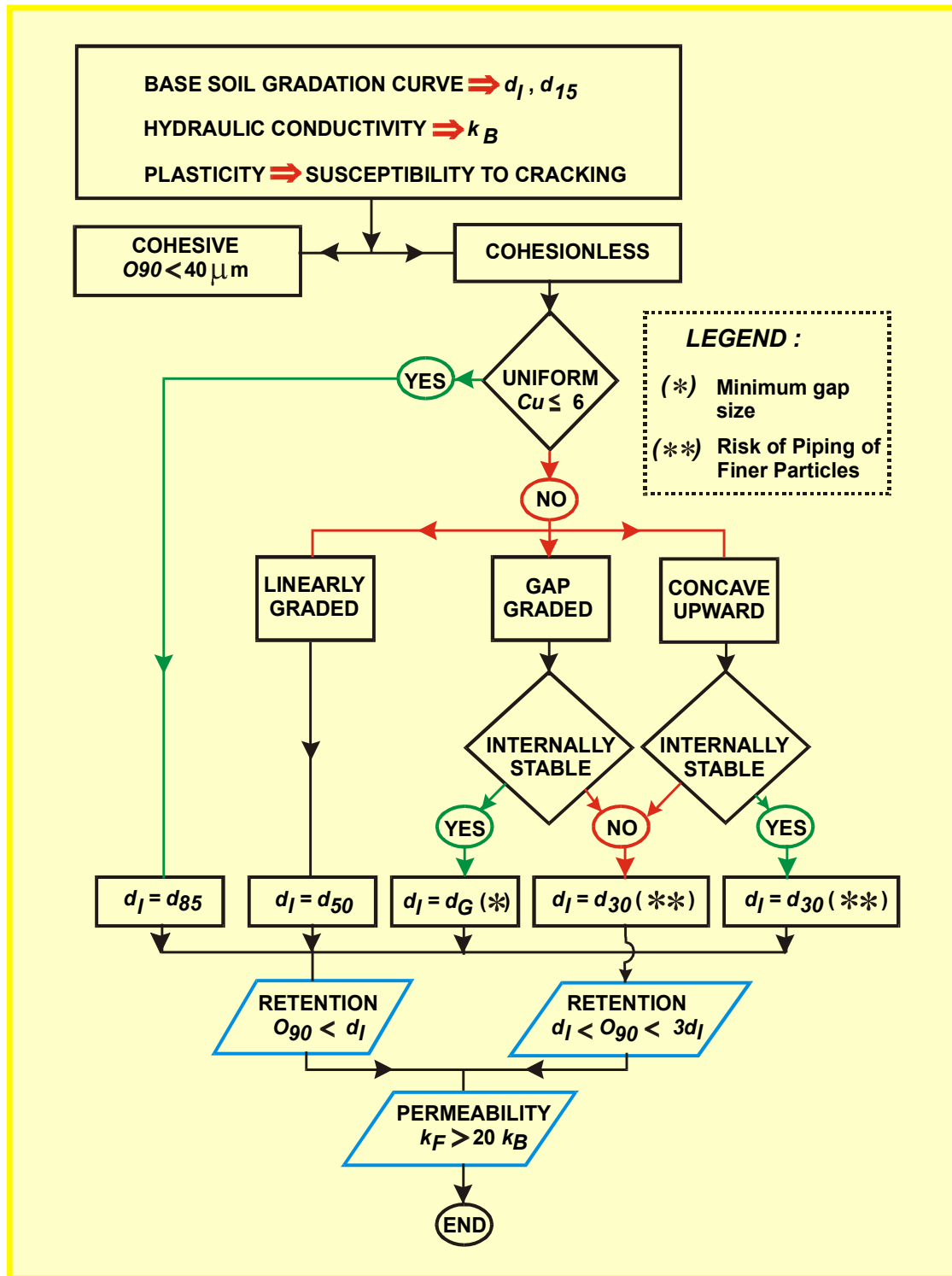
Soil retention:

- Apparent opening size (AOS)
- Filtration opening size (FOS)

$$O_{95} < (2 \text{ or } 3) d_{85}$$

Filter Selection

- By index tests on base soils (Lafleur, 1999)



Modify



Designing for Drainage

Aim:

The equilibrium soil-to-geotextile system that allows for adequate liquid flow with limited soil loss within the plane of the geotextile over a service lifetime compatible with the application under consideration

Designing for Drainage

- **Earth dams**
- **Drain behind and base retaining walls**
- **Beneath a surcharge fill**
- **Beneath railroad ballast**
- **Capillary migration breaks**

Designing for Drainage

Criteria:

- **Permeability**
- **Soil Retention**
- **Long term flow compatibility**

Designing for Drainage

Permeability:

- **transmissivity**

$$\theta = k_p t$$

Designing for Drainage

**Soil retention
&
Long-term flow compatibility**

- **Same as filtration**



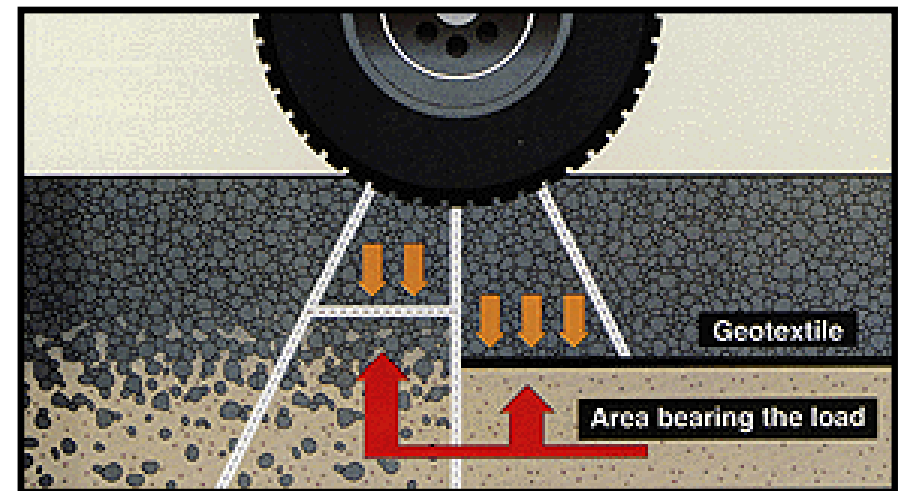
Designing for Separation

Aim:

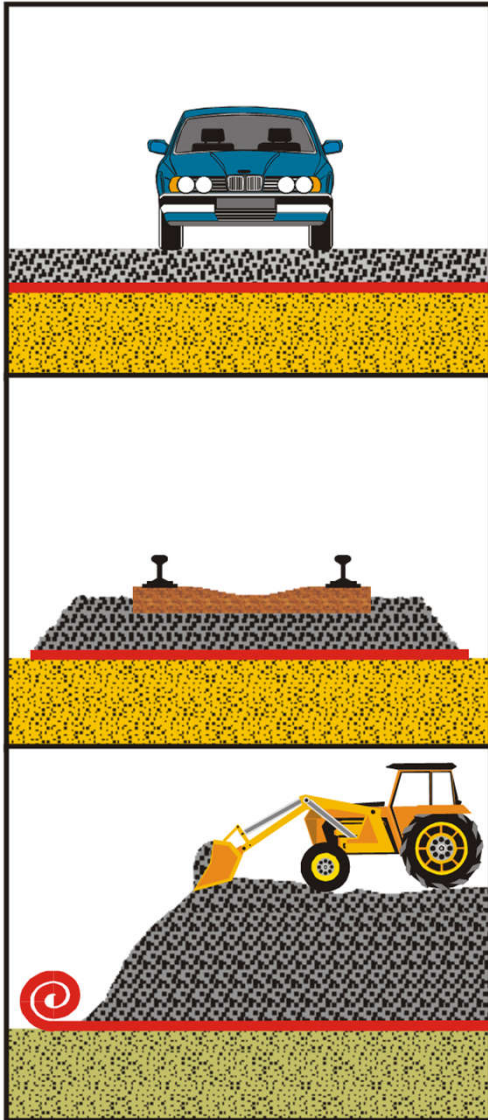
The placement of a flexible porous textile between dissimilar materials so that the integratiy and functioning of both materials can remain intact or be improved

Designing for Separation

- Subgrade and base in roads
- Subgrade and ballast in railroads
- Foundation and embankment soil
- Various zones in earth dams
- Old and new asphalt layers
- Beneath
 - Sidewalk slabs
 - Curb areas
 - Parking lots
 - Sport and athletic fields



Designing for Separation



Designing for Separation

- Burst resistance
- Tensile strength
- Puncture resistance
- Impact (Tear) resistance