EARTH RETAINING STRUCTURE AND RETENTION SYSTEMS
Classification

- Load support mechanism – externally or internally stabilized
- Construction concept – fill or cut or “bottom-up” or “top down”
- Systems rigidity – rigid or flexible wall
Types of RWall

- Rigid Retaining Walls
  - gravity walls
  - cantilever walls & counterfort (ribs ~20’)
- Flexible Wall Systems
  - sheet piles & soldier piles
  - braced excavations, bulkhead walls, tieback cuts
- Internally Stabilized Reinforced Soil
EARTH RETAINING STRUCTURES

Externally Stabilized

In situ Walls

Structural
(Chapter 7)
(Cut Walls)

Sheet-pile*
Soldier pile-lagging*
Cast-in-situ
- Slurry Walls
Bored pile
- Contiguous
  - Tangent pile
  - Secant pile
- Non contiguous

Braced

Chemical
(Chapter 9)
(Cut Walls)

Jet Grout
Deep Soil Mix

Gravity
(Chapter 4)
(Fill Walls)

Mass Concrete
Stone Masonry

Semi-Gravity
(Chapter 4)
(Fill Walls)

Cantilever
Counterfort
Buttress

Gravity Walls

Modular Gravity
(Chapter 5)
(Fill Walls)

Crib
Bin
Gabion
Concrete Module

Hybrid Walls

Tailed Segmental
Low Density Fills

Internally Stabilized

Mechanically Stabilized
(Fill Walls)
(Chapter 6)

Metallic and Polymeric
reinforcing strips,
grids and sheets
Anchored Earth
Reinforced Soil Slopes

In situ Reinforced
(Cut Walls)
(Chapter 8)

Soil Nailing
Micro Pile

* can also be used in fill conditions
• Externally Stabilized Systems
  – Soil is not fundamental part of system
  – Gravity Walls
    • Typically small true gravity wall
    • Crib
    • Gabion
    • Cantilevered

• Externally Stabilized Systems
  – In-Situ Walls
    • Either cantilevered, braced or tied back
    • Sheet Pile (often w/ soil anchors)
    • Soldier Pile
    • Slurry Walls (“cast in place”)
    • Soil Cement
(a) Externally Stabilized Systems
(b) Internally Stabilized Systems

- Internally Stabilized Systems
  - Soil Fundamental Part of System
  - Reinforced Earth
  - Soil Nailing
Figure 410-4  Typical Concrete or Stone Masonry Gravity Wall.  $D = \frac{H}{3}$, or 2 ft (0.6 m), or depth of frost, whichever is greatest. Use expansion joints at 90 ft (30 m) maximum. Do not use on soils having an allowable bearing pressure less than 1.5 tons/ft$^2$ (0.575 MPa).
Figure 410-5 Reinforced Concrete Cantilevered Wall. $D = H/3$, or 2 ft (0.6 m), or depth of frost, whichever is greatest. Use No. 4 reinforcement bars for $H$ less than 6 ft (1.8 m). Use expansion joints at 90 ft (30 m) maximum. Do not use on soils having an allowable bearing pressure less than 1.5 tons/ft$^2$ (0.575 MPa).
Figure 410.7 Reinforced Concrete Block Cantilevered Wall. For $D = H/3$, or 2 ft (0.6 m), or depth of frost, whichever is greatest. Use No. 4 reinforcement bars for $H$ less than 6 ft (1.8 m). Do not use on soils having an allowable bearing pressure less than 1.5 tons/ft² (0.575 MPa).
Figure 410-8  Earth Tieback Retaining Wall. Refer to manufacturer's literature for special details.
Figure 410-11  Concrete Crib Wall.  Refer to manufacturer's literature for special details.
Figure 410-18  Green Retaining Wall. Refer to manufacturer’s specifications for special details.
WHERE TO USE GEOGRIDS?

New Embankment Construction.

Geogrids provide practical solutions in conditions where landtake is limited or cost prohibitive (both financially and/or environmentally). Stable steep embankment slopes can be constructed reducing both earthwork quantities and minimising the environmental impact of such works. In steep mountainous terrain geogrids provide a practical cost effective option for the construction of embankment slopes. By using steep reinforced geogrid slopes an aesthetically "green solution" is provided (vegetation covered) with no otherwise obvious concrete structure present.

Slope Remedial Works.

In steep mountainous terrain the failure of sidealong embankments is not uncommon due to the build up of excessive pore pressures between the fill material and original ground. By minimising the need for sidealong filling geogrid embankments can provide an engineering solution that is significantly more reliably stable in both the long and short term to conventional methods of embankment reconstruction. The foundation of geogrid structures can be based on original ground and with the use of free draining material build up of pore pressures controlled. Geogrid solutions are also highly resistant to erosion due to the binding effect of the geogrid at the slope surface.
Temporary bridge abutment using steel facing mesh panel.

Incremental concrete panel wall.
Modular Block Retaining Wall Systems

THE TENSAR SOLUTION

Modular block concrete facing units offer yet another way to use the reinforced soil technique to form cost-effective retaining structures and bridge abutments. Modular block retaining wall systems have developed very rapidly over the last ten years, and are becoming the first choice solution in many situations.

The modular blocks are manufactured from high quality concrete in block making machines, and are available in a range of colours, styles and finishes. Some of the systems are designed to allow a facia of masonry or brickwork to be tied to the structure for architectural effect.

The modular block provides a hard concrete finish to a retaining structure, which may be preferred in many situations. However, the wide choice of available finishes adds interest and softens the look of the completed structure.

THE BENEFITS

The use of modular block retaining walls and bridge abutments offers all the advantages of the reinforced soil technique.

- Wide range of possible face types and colours
- Simple, rapid construction
- Certified systems
- Avoid or minimise the need for lifting equipment and numerous ancillary fixings