

23CE707: GROUND IMPROVEMENT TECHNIQUES

Topic: Modification by Inclusions and Confinement

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Soil Reinforcement

- Technique used to improve soil strength and stiffness.
- Uses geo-engineering methods and reinforcing inclusions.

Types of Soil Reinforcement

- • Strip Reinforcement
- • Grid Reinforcement
- • Sheet Reinforcement

Reinforced Earth

- Soil strengthened with rods, strips, fibers, geotextiles or geogrids.
- Interaction occurs through frictional resistance.

History of Reinforced Earth

- Modern reinforced earth concept introduced by Henry Vidal (1969).

Mechanically Stabilized Earth (MSE) Walls

- Flexible retaining structures reinforced with strips or geogrids.

Components of MSE Walls

- Facing Unit
- Backfill Soil
- Reinforcement Material

Principle of Reinforced Earth

- Soil carries compression.
- Reinforcement carries tensile stresses.

Soil-Reinforcement Interaction

- Interaction occurs through friction and adhesion.

Advantages of Reinforced Earth

- Economical, flexible, easy construction, reduced settlement.

Reinforced Embankments

- Used on soft foundations to improve stability.

Geosynthetic Reinforcement

- Used with embankments, slopes and soft soils.

Geo-strip Reinforcement

- High tensile strength, durability, corrosion resistance.

Applications of Geo-strips

- Retaining walls, embankments and MSE structures.

Introduction to Geogrids

- Polymeric mesh used for soil reinforcement.

Functions of Geogrids

- Reinforcement
- Confinement
- Load Distribution
- Stabilization

Applications of Geogrids

- Retaining walls, pavements, slopes, embankments.

Benefits of Geogrids

- Improves structural integrity and prevents failure.

In-Situ Ground Reinforcement

- Ground improvement without soil replacement.

Ground Anchors

- Structural elements transferring tensile loads to stable strata.

Applications of Ground Anchors

- Retaining walls, towers, excavations, marine structures.

Rock Bolting

- Method used to stabilize rock excavations and tunnels.

Functions of Rock Bolts

- Pin unstable blocks and create compressive stresses.

Types of Rock Bolts

- Slot-and-Wedge Bolts
- Grouted Bolts

Rock Bolt Design Guidelines

- Length to spacing ratio > 2 .
- Provide adequate anchorage.

Soil Nailing

- Passive reinforcement using steel bars installed into soil.

Construction of Soil Nailing

- Excavate → Drill → Insert Nails → Grout → Shotcrete Facing

Types of Soil Nails

- Grouted
- Driven
- Self-Drilling
- Jet-Grouted

Advantages and Limitations

- Economical and flexible.
- Not suitable for excessive groundwater conditions.