

Exploratory Drilling



Dheeraj Kumar

Soil Exploration



Failing Truck Mounted Rig



All-Terrain Rig

Soil Exploration



Wireline Rig



Water Boring from Barge
for Bridge Crossing

Soil Exploration



Track Mounted Rig

Track Rig



Drilling & Sampling of Soil & Rock

- *Objectives:*
 - Recognize various drilling techniques
 - Be familiar with undisturbed vs. disturbed sampling methods
 - List rock exploration methods
 - Familiarity with core bits & barrels
 - Observations to be made during drilling, including Rock Quality Designation (RQD).
 - Appreciate role of geologic mapping in obtaining information on rock masses.

Soil & Rock Drilling

- Soil Exploration
 - Advancing a Boring/Borehole
 - Sampling (Drive, Undisturbed)
 - Transport of Samples to Laboratory
- Rock Exploration
 - Rock Coring and Non-coring Techniques
 - Logging of Rock Core (CR and RQD)

Selection of Drilling methods

- Depth of drilling: all drilling methods have certain limitations;
- Sample recovery: type of samples desired, i.e. soil, groundwater, disturbed or undisturbed, frequency of sampling, yield estimation;
- Target lithology: well installation completed in unconsolidated or consolidated formation.
- Health and Safety
 - Level of contamination
 - High yield of formation may produce high pressures;
 - Underground fire hazards in gaseous areas

Selection of Drilling methods

- Access and Noise
 - Terrain roughness;
 - Space and height limitations;
 - Municipal noise ordinance
- Disposal of drilling fluids and cuttings
 - Contaminated cuttings and groundwater may have to be handled as hazardous wastes and be transported to landfill or special waste disposal facilities.
- Lithology and Aquifer characteristics
 - Soil type (sand, clay, boulders)
 - Depth to water table
 - Depth to bedrock
- Cost

Drilling Methods

Methods which do not use circulation (drilling) fluids

- Displacement boring
- Driven wells
- Solid-stem auger
- Hollow-stem auger
- Sonic drilling

Drilling Methods

Methods which use circulation (drilling) fluids to carry drill cuttings to the surface

1. Rotary Drilling

- Rotary (direct) Drilling
- Reverse Circulation Rotary Drilling (RC)
- Dual-wall Reverse Circulation Drilling

2. Percussion Drilling

- Cable-tool percussion
- Air percussion down-the-hole hammer
- Air percussion casing hammer
- ODEX percussion down-the-hole hammer

Drilling Methods

Common name of method	Materials in which used	Method of advancing the hole	Method of sampling	Value for foundation purposes
Auger boring	Cohesive soils and cohesionless soils above groundwater elevation	Augers rotated until filled with soil and then removed to surface	Samples recovered from material brought up on augers	Satisfactory for highway exploration at shallow depths
Well drilling	All soils, rock, and boulders	Churn drilling with power machine	Bailed sample of churned material or clay socket	Clay socket samples are dry samples Bailed samples are valueless
Rotary drilling	All soils, rock, and boulders	Rotating bits operating in a heavy circulating liquid	Samples recovered from circulating liquid	Samples are of no value
Test pits	All soils. Lowering of groundwater may be necessary	Hand digging or power excavation	Samples taken by hand from original position in ground	Materials can be inspected in natural condition and place