Core Barrels

- To collect the core of the rock drilled, a device known as the core barrel is used.
- Core barrel retains rock core samples from drilling operations
- Its length varies from 0.5 to 3 m.
- There are three types of core barrel in use:
  - The single tube core barrel, and
  - Double tube core barrel.
  - Triple tube core barrel

Core Barrels

Single tube core barrel

- Most rugged, least expensive
- Consists of head section, core recovery tube, reamer shell, & cutting bit
- Often used as starter when beginning core operations
- Coring in homogeneous hard rock, (where the core does not wash away or crumble easily) and penetrating rock layers above the strata (where high core recovery is not essential).

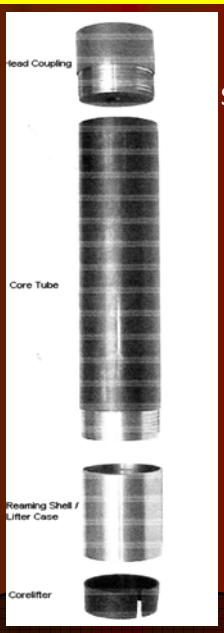
Core Barrels

- Single tube barrels are often used as a starter barrel during the beginning of coring operations.
- A single tube core barrel is suitable for homogeneous formations where the core is not eroded by flushing water and a solid core can be taken without risk of blockage in the barrel.

Core Barrels

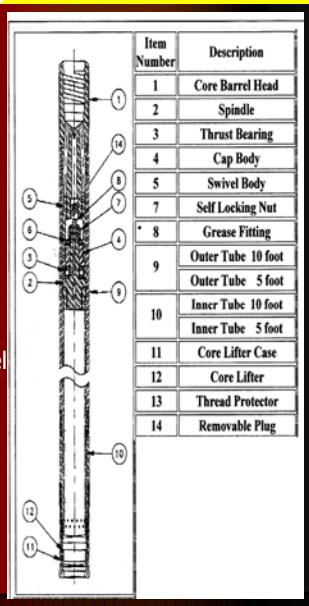
- The core lifter is placed within the bevel shell which has its inside conically shaped to receive the former.
- The core lifter is corrugated in the inner face and is a split ring.
- It occupies the wider portion of the bevel shell when drilling takes place so that it has little or no tendency to grip the core.
- After certain progress in drilling when the rods are lifted to take out the core, the split ring descends inside the bevel shell and grips the core.
- The latter may now be broken off by a twist and raised to the surface.
- The core lifter is replaced after about 250m of drilling.
- The larger particles of drill cuttings which the circulating water fails to carry up to the surface settle down in the mud bucket.

Core Barrels



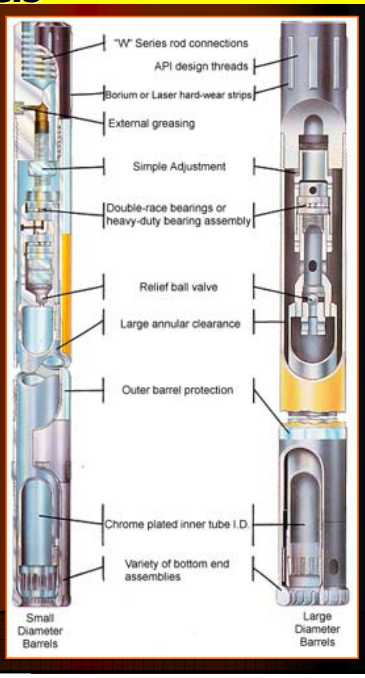
Single tube core barrel

Double tube core barrel



Item Number	Description
1	Core Barrel Head
2	Spindle
3	Thrust Bearing
4	Cap Body
5	Swivel Body
7	Self Locking Nut
8	Grease Fitting
9	Outer Tube 10 foot
	Outer Tube 5 foot
10	Inner Tube 10 foot
	Inner Tube 5 foot
11	Core Lifter Case
12	Core Lifter
13	Thread Protector
14	Removable Plug

Core Barrels



Core Barrels

- Double tube core barrel is the standard.
- Outer barrel rotates with cutting bit
- Inner barrel is either fixed or swivel type (with bearings) that retains core sample.
- Core diameters generally range from 21 to 85 mm (0.85 to 3.35 inch).
- NX core: standard diameter = 54 mm (2.15 inches)

Core Barrels

Double Tube Core Barrel (Swivel Type)

Outer Barrel Assembly

Inner Barrel Assembly

Triple Core Barrel

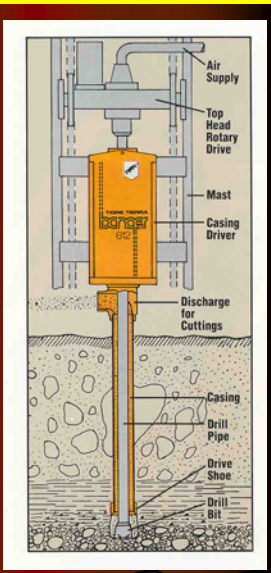
- Good for obtaining core samples in fractured rock and highly weathered rocks.
- Outer core barrel for initial cut and second barrel to cut finer size. Third barrel to retain cored samples.
- Reduces frictional heat that may damage samples.

Drilling Fluids

- Rotary wash with water, foam, or drilling mud (bentonitic or polymeric slurries), Revert.
- Fluids reduce wear on drilling and coring bits by cooling.
- Fluids remove cuttings & rock flour.
- Recirculate to filter fluids and to minimize impact on environment

Casing

- Temporary casing to stabilize borehole and maintain drilling operations
- Driven casing
- Drilled-in casing



Dual-Wall Casing

- Dual wall reverse circulation method
- Use in areas with expected large losses in drilling fluid
- Inner section for sampling
- Outer casing maintains fluids for drilling

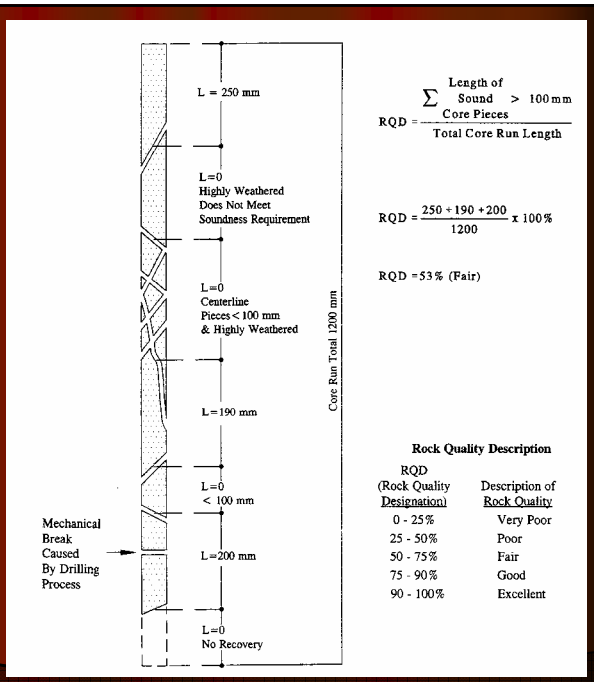
Core Recovery

- Core Runs taken in either 5- or 10-foot sections (1.5- or 3-m sections).
- Log the amount of material recovered.
- *Core Recovery* is percentage retained.

Rock Quality Designation (RQD)

- The RQD is a modified core recovery.
- Measure of the degree of fractures, joints, and discontinuities of rock mass
- RQD = sum of pieces > 100 mm (4 inches) divided by total core run.
- Generally performed on NX-size core

Rock Quality Designation



$$RQD = \frac{\sum \text{Length of Sound Core Pieces} > 100\,mm}{\text{Total Core Run Length}}$$

$$RQD = \frac{250 + 190 + 200}{1200} \times 100\%$$

RQD = 53% (Fair)

Rock Quality Description

RQD (Rock Quality Designation)	Description of Rock Quality
0 - 25%	Very Poor
25 - 50%	Poor
50 - 75%	Fair
75 - 90%	Good
90 - 100%	Excellent

Core Recovery

- Cores should be stored in either wooden boxes or corrugated cardboard box.
- Box marked with boring number, depth of core run, type core, bit type, core recovery (CR), rock type, RQD, and other notes.
- Core operations should be documented:
- Loss of fluid, rates, sudden drop in rods, poor recovery, loss of core

Storage of Cores and Bore Hole Logging

- The fundamental objective of core drilling is to collect sub-surface samples in the shape of core and accompanying sludge material in order to study their mineral assemblage, chemical composition, rock structure, physical strength for various purposes.
- After removing the core from the core barrel, it should be placed in the core box in the exact order in which it is taken from ground.

Storage of Cores and Bore Hole Logging

- The core box is a shallow tray 1 metre long with partitions running length-wise between which the core fits into. Each compartment is 1-1/16" to 1/8" wider than the core diameter.
- The core box may be wood with hinged or screwed cover (or) with mild steel with rounded grooves or rectangular core compartments.
- As the core from each run is placed in the box, a wooden block upon which the depth of the hole is written should be placed after the last piece of core of each run.
- Each run is thus separated and thus shows the exact depth at which it was made. The arrangement of core in core box is done the different ways.

Storage of Cores and Bore Hole Logging

- BOOK FASHION: It is like reading a book starting from LEFT and proceeding to RIGHT

Storage of Cores and Bore Hole Logging

- SNAKE FASHION: It starts from LEFT to RIGHT in the first groove. Once the first groove is completed the cores are placed from RIGHT to LEFT in the second groove and so-on and so forth

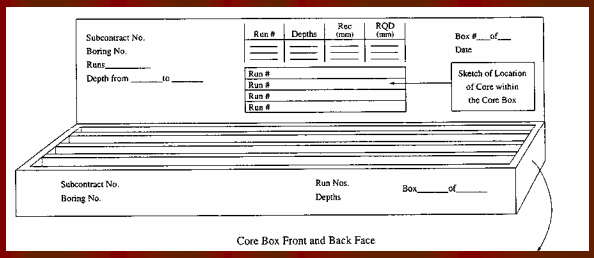
Storage of Cores and Bore Hole Logging

- A third system which is less frequently used is the reverse of book fashion (i.e) starting from RIGHT to LEFT

Storage of Cores and Bore Hole Logging

- Book Fashion is preferred the most as it speeds up logging, identification of footage at any point in the hole and lessens chances of error.

Core Recovery

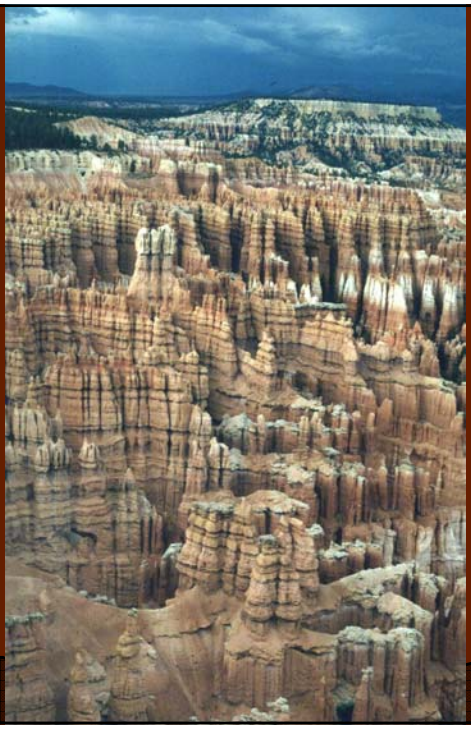


Core Box Front and Back Face

Care & Preservation of Rock Cores

- Routine: rock samples in core boxes
- Special: enclose core in plastic sleeves
- General: avoid exposure to shock and vibration during handling and transport.
- Non-natural fractures may result from excessive movements, temperatures, and exposure to air.
- Storage for future reference

Storage of Rock Core Boxes



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: rate, CR, Rock Quality Designation (RQD).
  - Appreciate role of geologic mapping in obtaining information on rock masses.