

# Advanced Diamond Core Barrel

## Scientific Application

The Advanced Diamond Core Barrel (ADCB) coring system may be used to attempt to recover continuous core samples from firm to well lithified sedimentary or igneous formations when Advanced Piston Corer, Extended Core Barrel, and Rotary Core Barrel (APC/XCB/RCB) coring techniques are ineffective. The ADCB provides a crucial alternative technique using diamond coring technology to attempt to improve recovery of formations that are difficult to core with conventional rotary coring tools.

## Tool Operation

The ADCB uses a 6¾ in. bottom-hole assembly (BHA) and requires some (~20 m) lateral support (i.e., deployment in an existing hole) to commence coring. The ADCB relies on rotation of the drill string to advance the hole while the 7¼ in. drill bit trims the core sample.

## Design Features

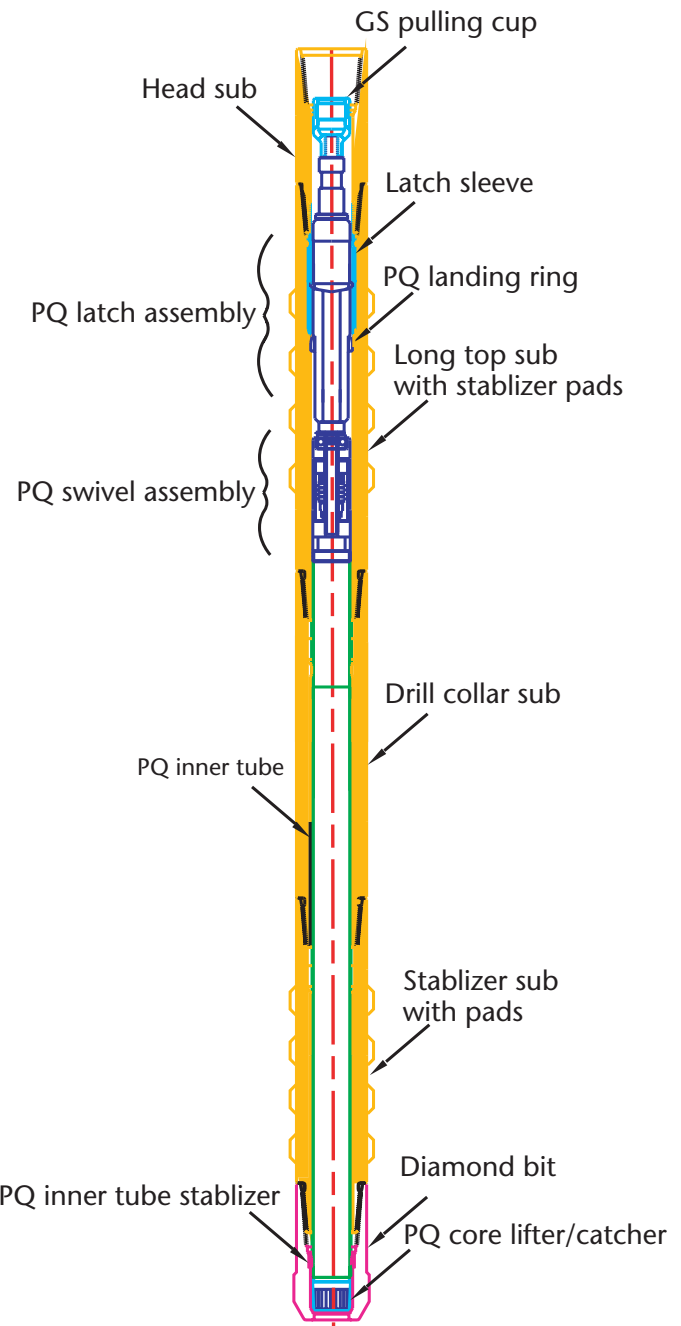
### 1) Improved Core Quality

The ADCB uses a diamond mining-style bit to trim the core and incorporates a pressure indicator to monitor core jams.

*Benefit:* May improve core recovery in hard formations, interbedded firm and hard formations, and poorly consolidated formations that are difficult to recover with the RCB and XCB.

### 2) Improved Hole Stability

The ADCB's 7¼ in. mining-style thin-kerf diamond bit produces a smaller and smoother borehole wall than rotary drilling, and the 6¾ in. BHA provides a "packed hole" with a narrow annulus.



**Schematic of the ADCB showing the bit, outer core barrel, and inner core barrel. The ADCB is an adaptation of a mining style "PQ" coring assembly.**

*Benefit:* Hole stability is improved in hard formations, which requires less time for reaming and hole cleaning and reduces stuck pipe problems.

### 3) Low Fluid Invasion of Core

The ADCB diamond bit creates a fine rock powder (i.e., not rock chips or cuttings); therefore, hole cleaning requires less fluid velocity, circulating rates are lower, and the core is not directly exposed to high-pressure fluid from the bit jets.

*Benefit:* Reduces fluid invasion (i.e., “core flushing”) and improves core quality in porous and water sensitive formations.

### 4) Improved Log Quality

The ADCB diamond bit produces a smooth 7¼ in. hole rather than the larger and more rugose borehole walls typical of rotary coring.

*Benefit:* Electric log quality is improved by better pad contact and smaller hole diameter (7¼ vs. 9⅞ in.).

## ADCB Specifications

### Core Size

The PQ3 mining-style bit produces cores with a 3.27 in. (83 mm) diameter when optional split steel or lexan liners are used. The PQ bit, which does not use liners, has a core diameter of 3.345 in. (85 mm).

### Core Length

Typically 15 ft (4.75 m) to reduce core weight and problems with core jamming in the core barrel. A 30 ft (9.5 m) version is also available.

## Equipment

The inner core barrel has a positive indicator latch to confirm inner core barrel latch-in.

Diamond stabilizers on the outer core barrel reduce core barrel vibration.

Bit types include diamond impregnated for hard rock, polycrystalline diamond compact (PDC) for friable rock, and surface-set diamond bits for sedimentary formations.

## Typical Operating Range

### Formation

Designed for hard or well-cemented sediments and igneous formations.

### Recovery

May be higher (relative to XCB and RCB) in formations that are difficult to core, such as fractured hard rock or rubble and interbedded hard and soft formations.

## Limitations

Does not recover soft sediments and granular formations (such as sand, gravel, or coral debris).

Cannot be used for bare rock spud.

The ADCB requires good weight-on-bit control and use of the active heave compensator.



**ADCB bit showing circulation test.**

The inner core barrel and core may be pulled before coring the full 4.75 m length if the core jams.

Depth range is limited by the number of 6¾ in. drill collars (presently ~350 m) available. The 8¼ in. drill collars above the 6¾ in. drill collars will not fit in the hole made by the ADCB. Thus, the pipe must be tripped to change to a rotary bit and BHA to enlarge the hole, then a second pipe trip is made to return to ADCB coring. ADCB cores are of larger diameter than APC or rotary cores. This presents problems in shipboard core processing and curation.