Fundamentals of Onshore Drilling

Fundamentals of Drilling

Directional Drilling – Fields of Aplication

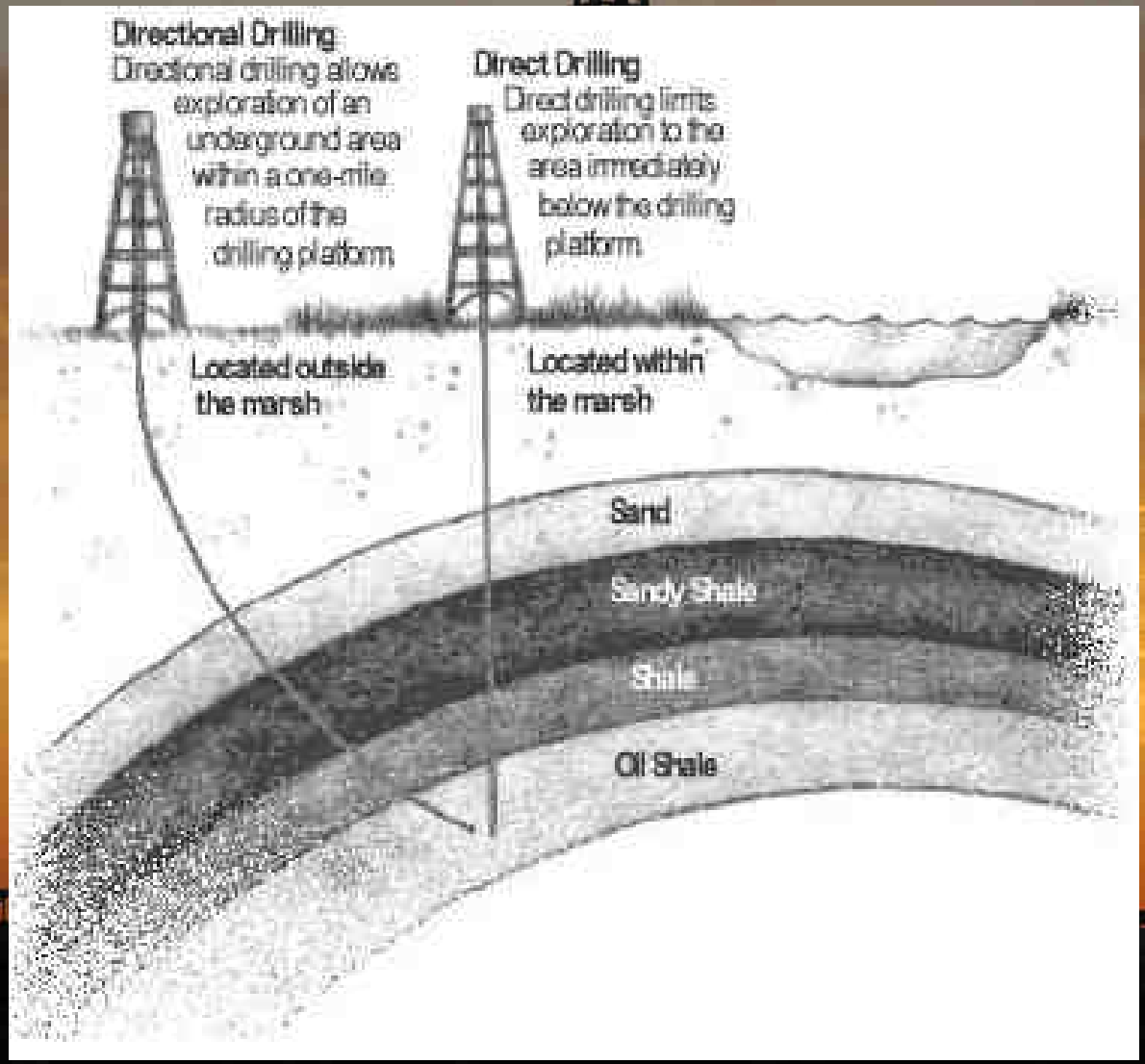
presentation No. 3

references:

- Bernt S. Aadnoy, Iain Cooper, Stefan Z. Miska, Robert F. Mitchell, Michael L. Payne: ***Advanced Drilling and Well Technology***. SPE 2009, ISBN: 978-1-55563-145-1.
- Robello G. Samuel, Xiushan Liu: ***Advanced Drilling Engineering – Principles and Design***. Gulf Publishing Company, Houston Texas, 2009, ISBN: 978-1-933762-34-0.
- ***World Oil´s Handbook of Horizontal Drilling and Completion Technology***. Gulf Publishing Company, Houston, Texas 1991, ISBN: 0-87201-361-8.
- ***A Primer of Oilwell Drilling***. Petroleum Extension Service, Houston, Texas 2001, ISBN: 0-88698-194-8.
- ***Directional Drilling and Deviation Control Technology.*** French Oil and Gas Industry Association Technical Committee, 1990.

Reasons for Directional Drilling / Deviation Control

1) to reach a planned target area



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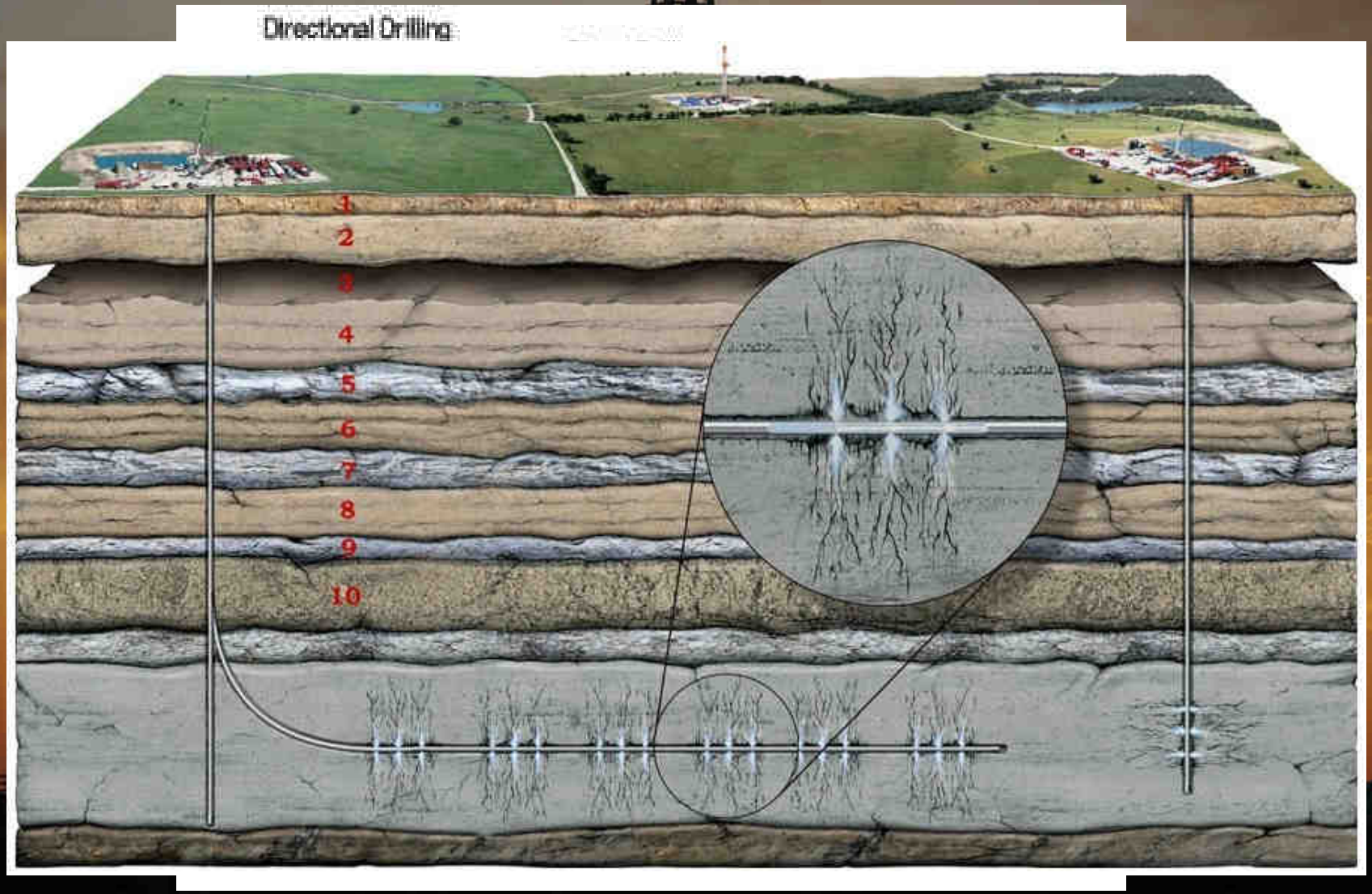

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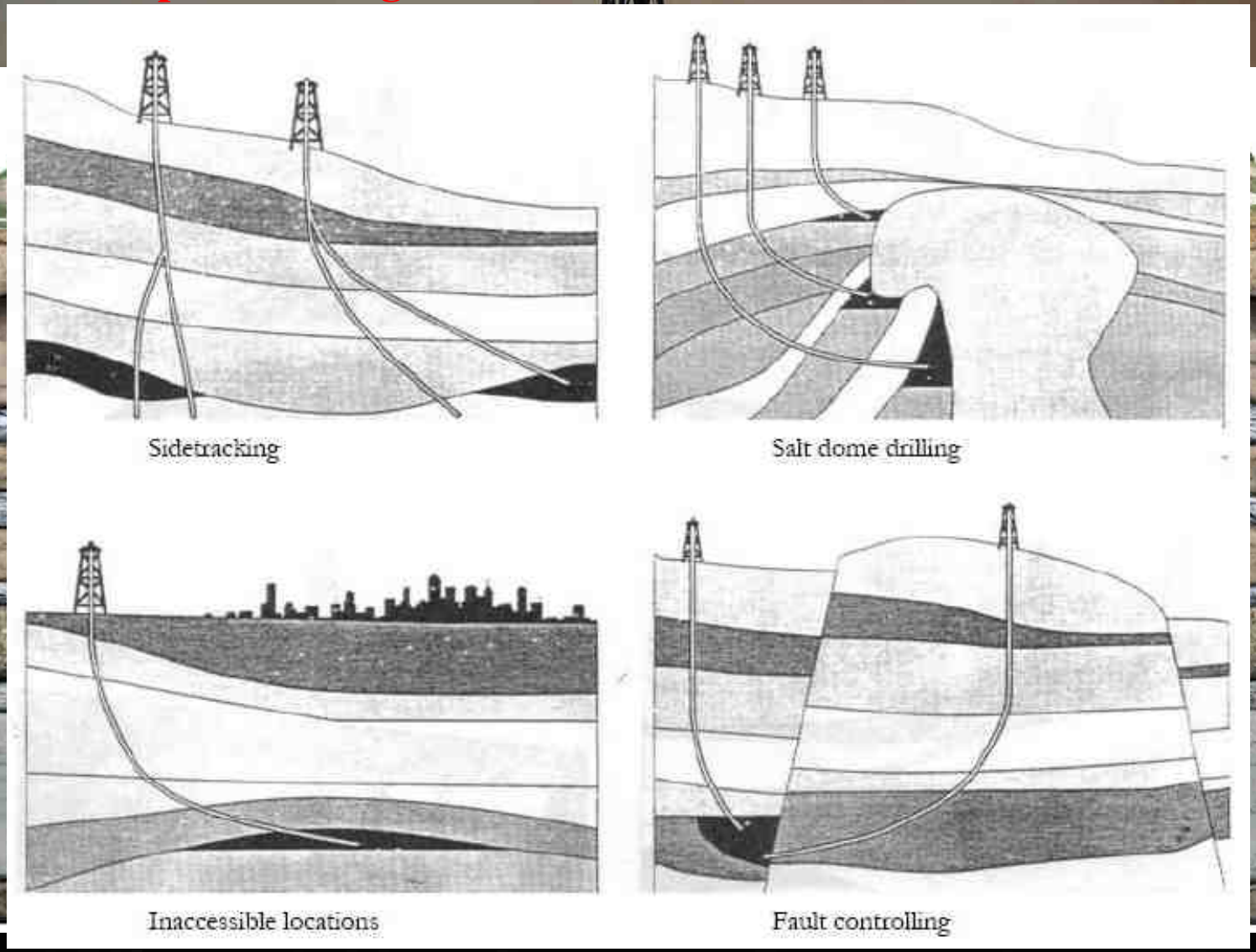
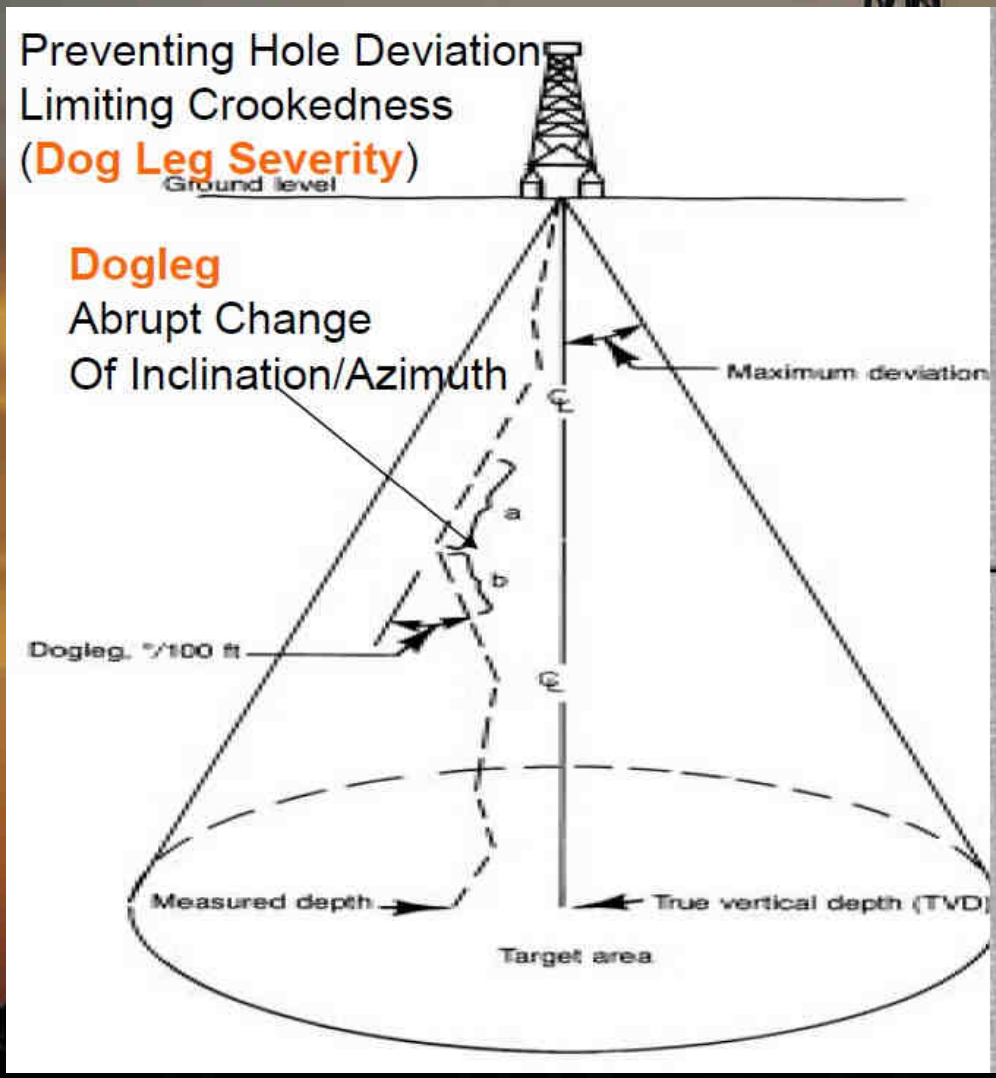
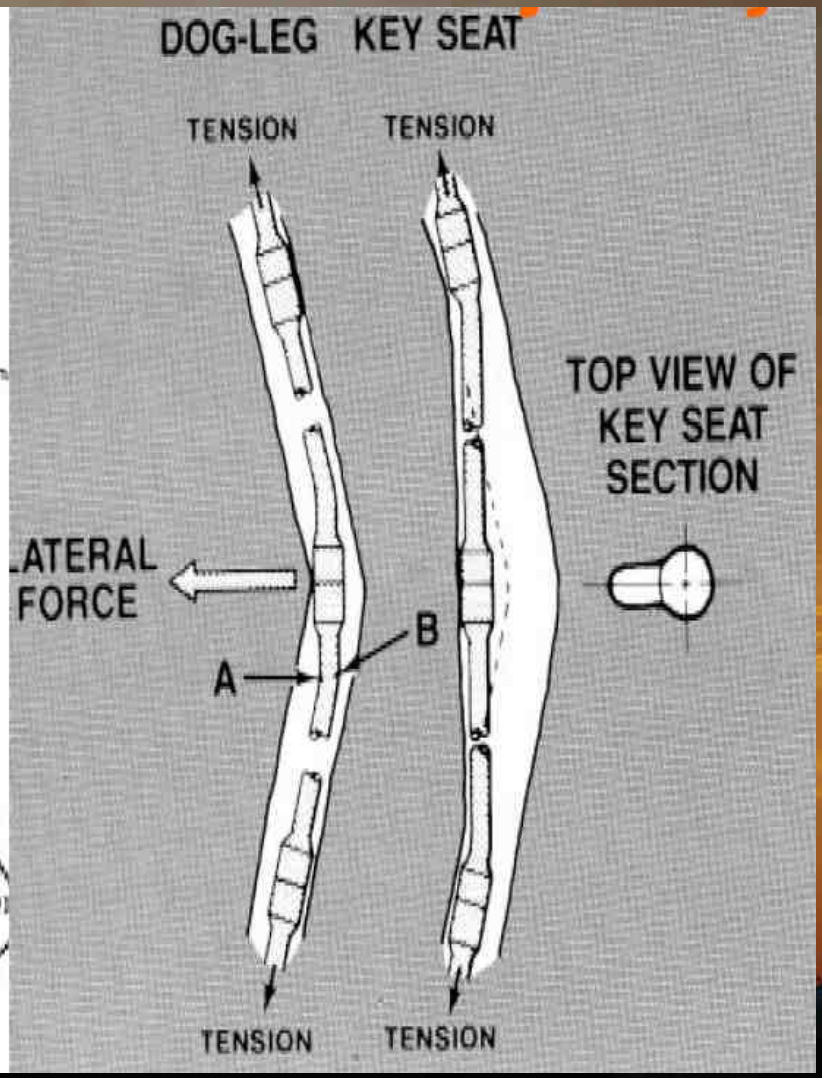


Screwing / Unscrewing Drillpipe

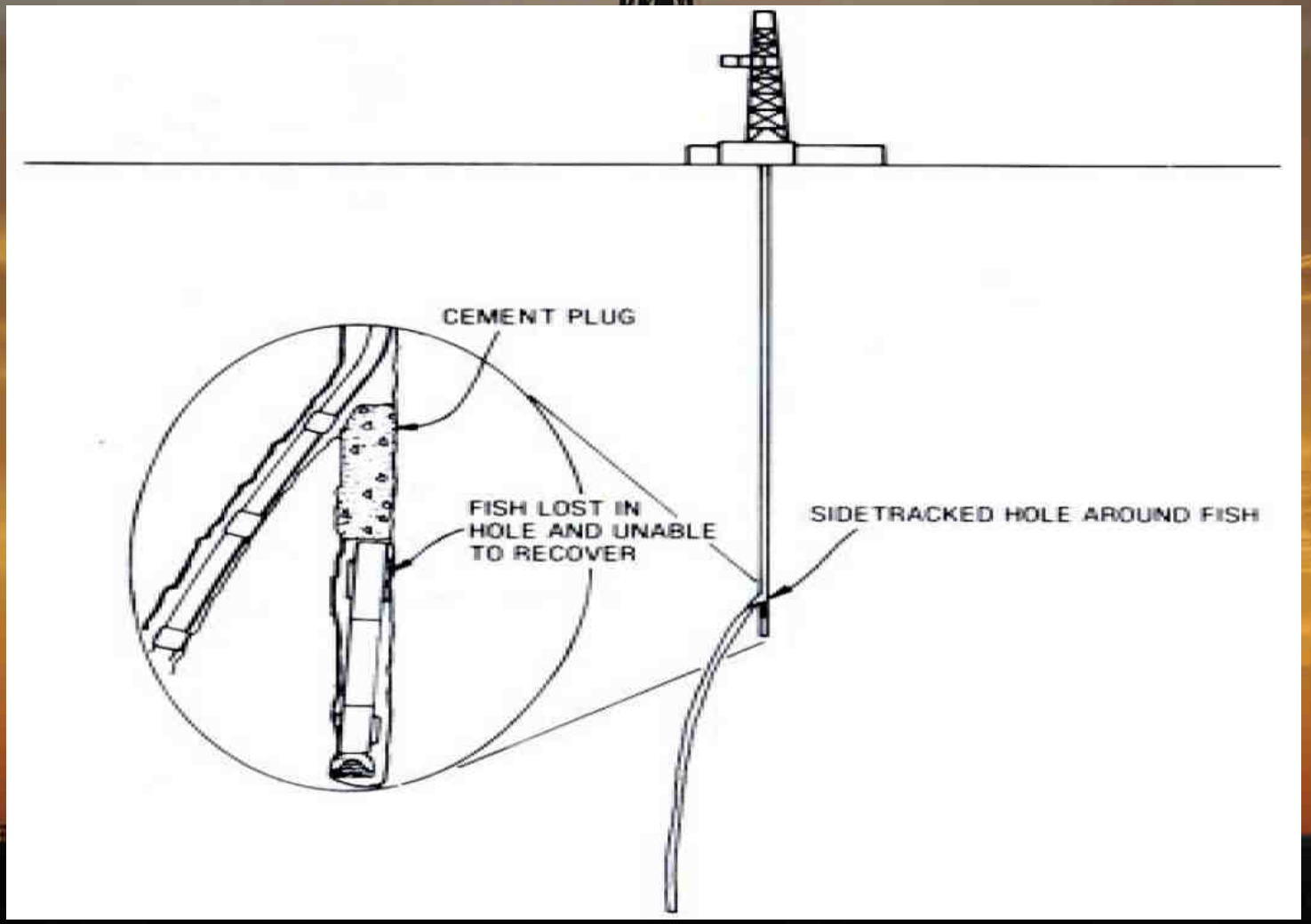
2) to obtain / control a planned hole trajectory



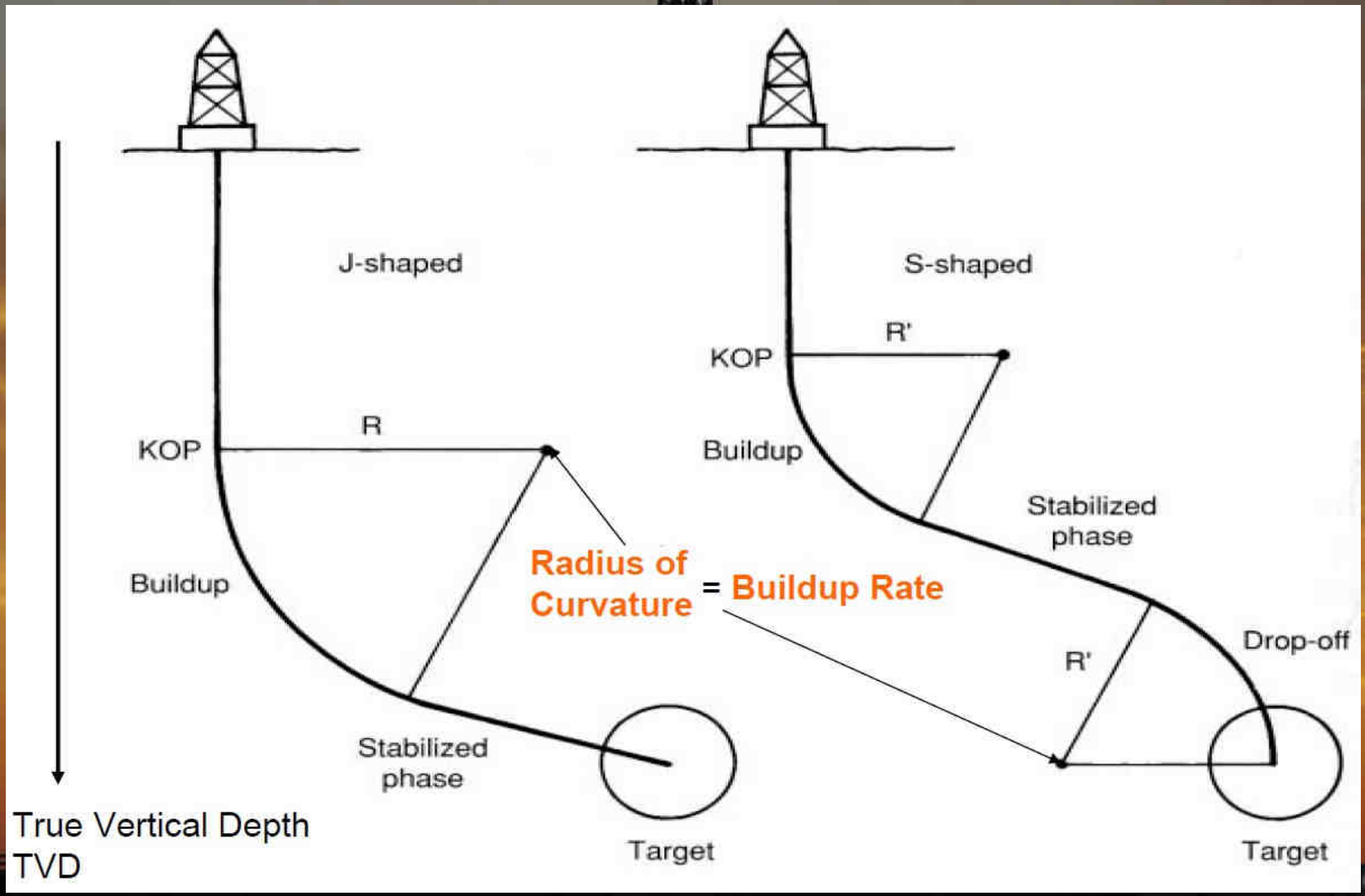


Screwing / Unscrewing Drillpipe

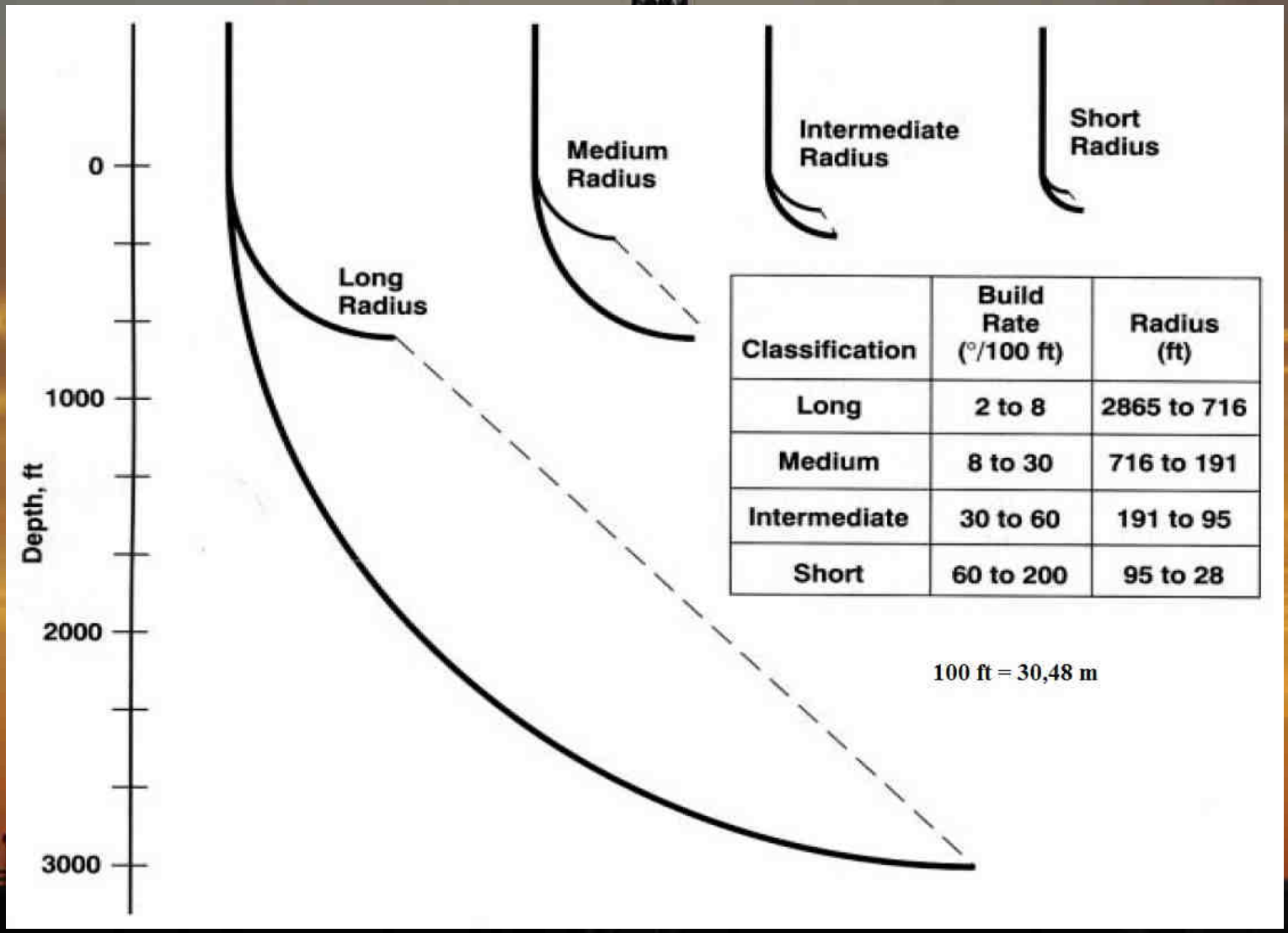
3) to sidetrack or abandon a portion of a hole



Terminology of Directional Well Profiles



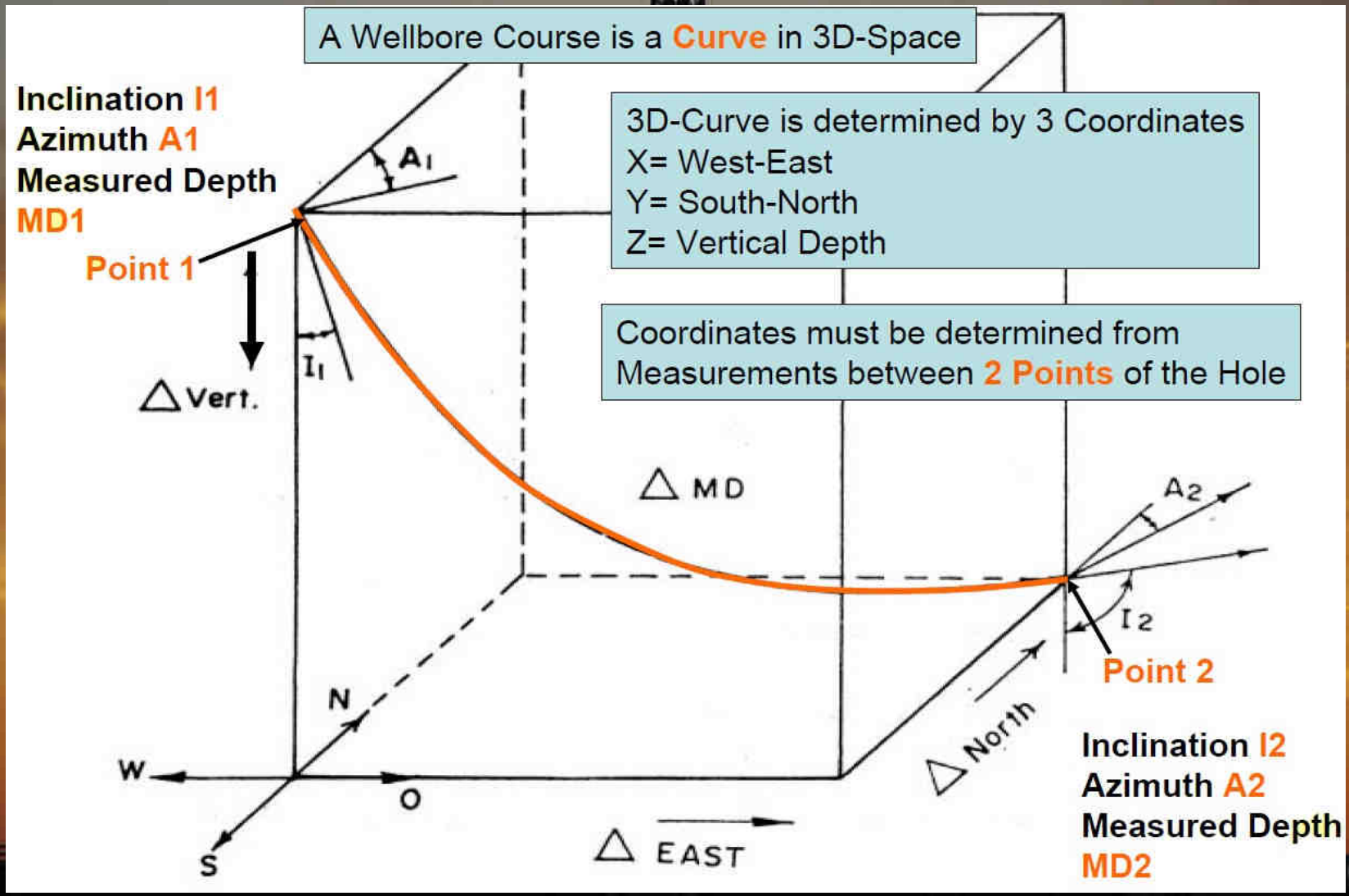
Classification of Buildup - Rates



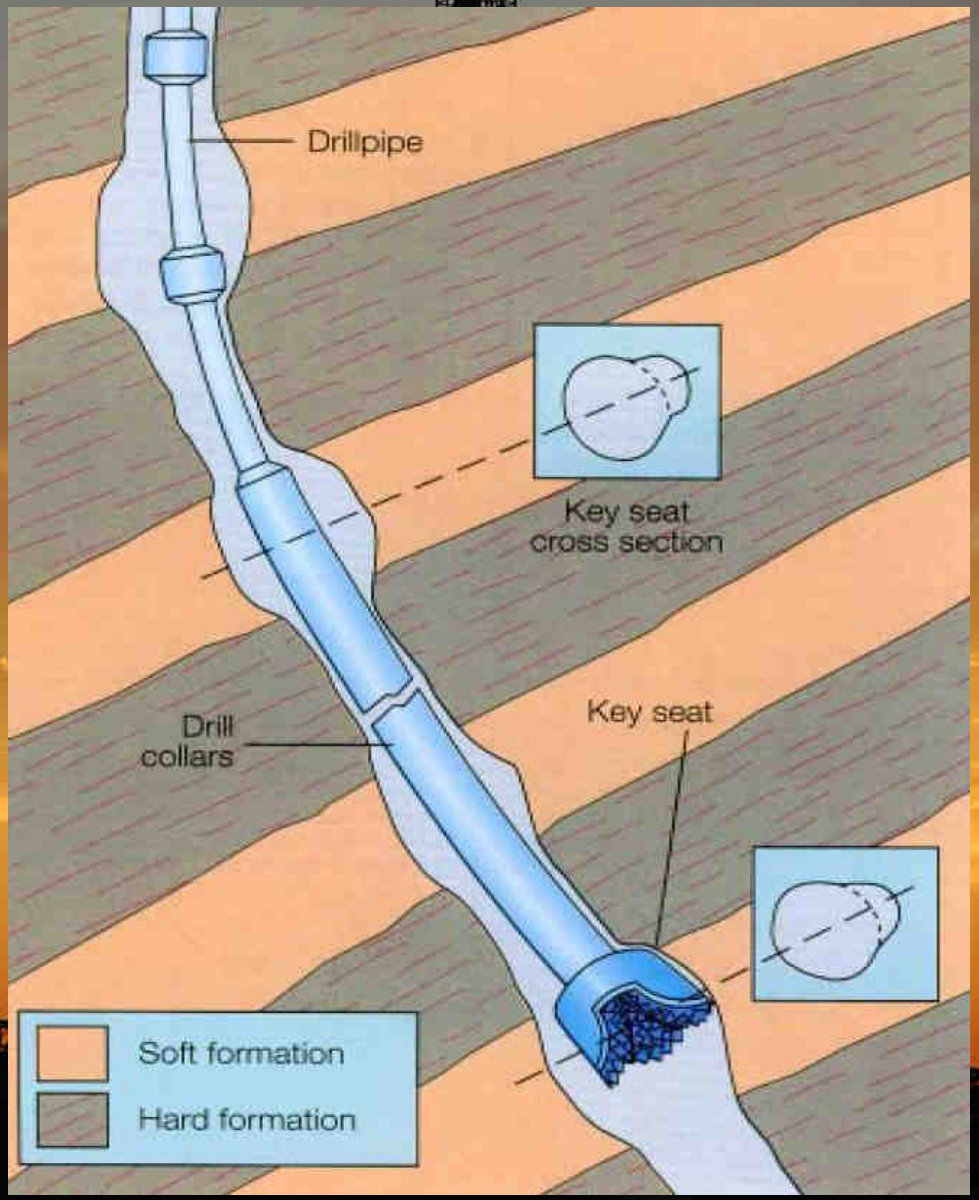
Classification	Build Rate (°/100 ft)	Radius (ft)
Long	2 to 8	2865 to 716
Medium	8 to 30	716 to 191
Intermediate	30 to 60	191 to 95
Short	60 to 200	95 to 28

100 ft = 30,48 m

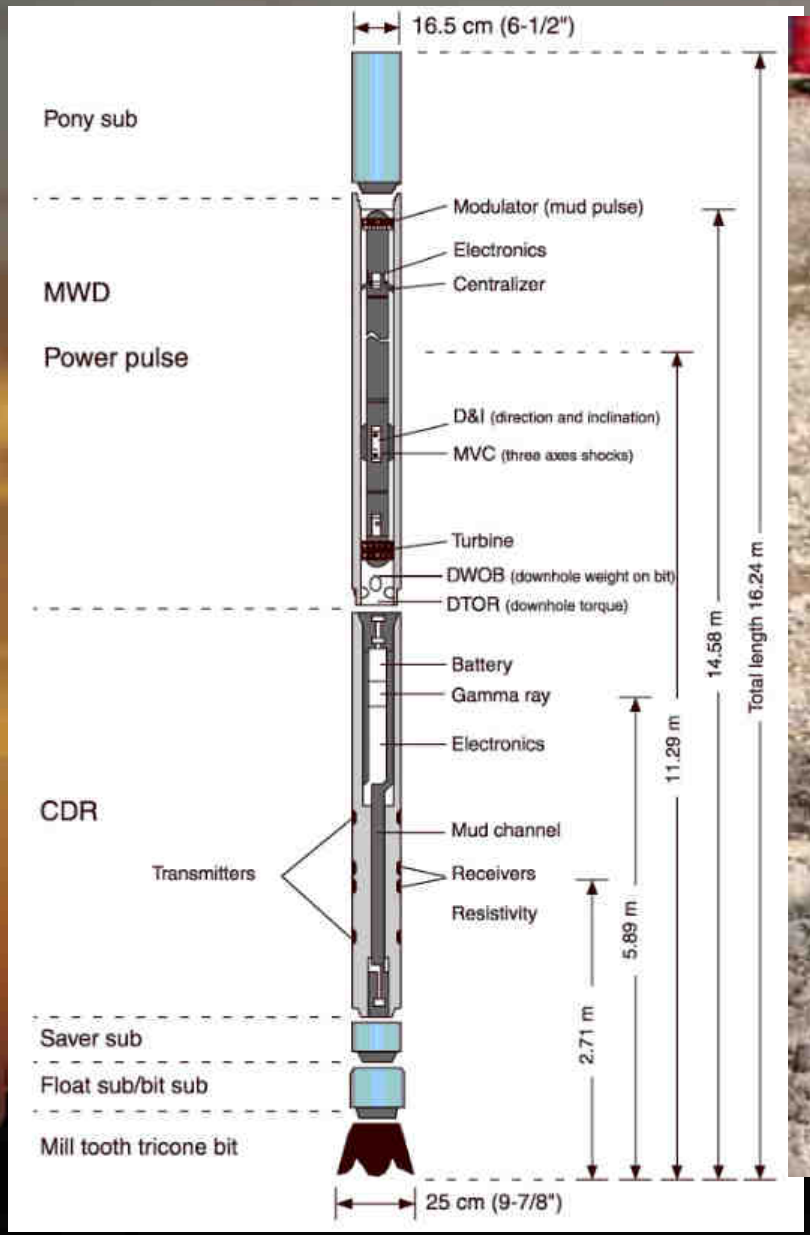
Measuring the Wellbore Course



Key Seat Buildup in Doglegs

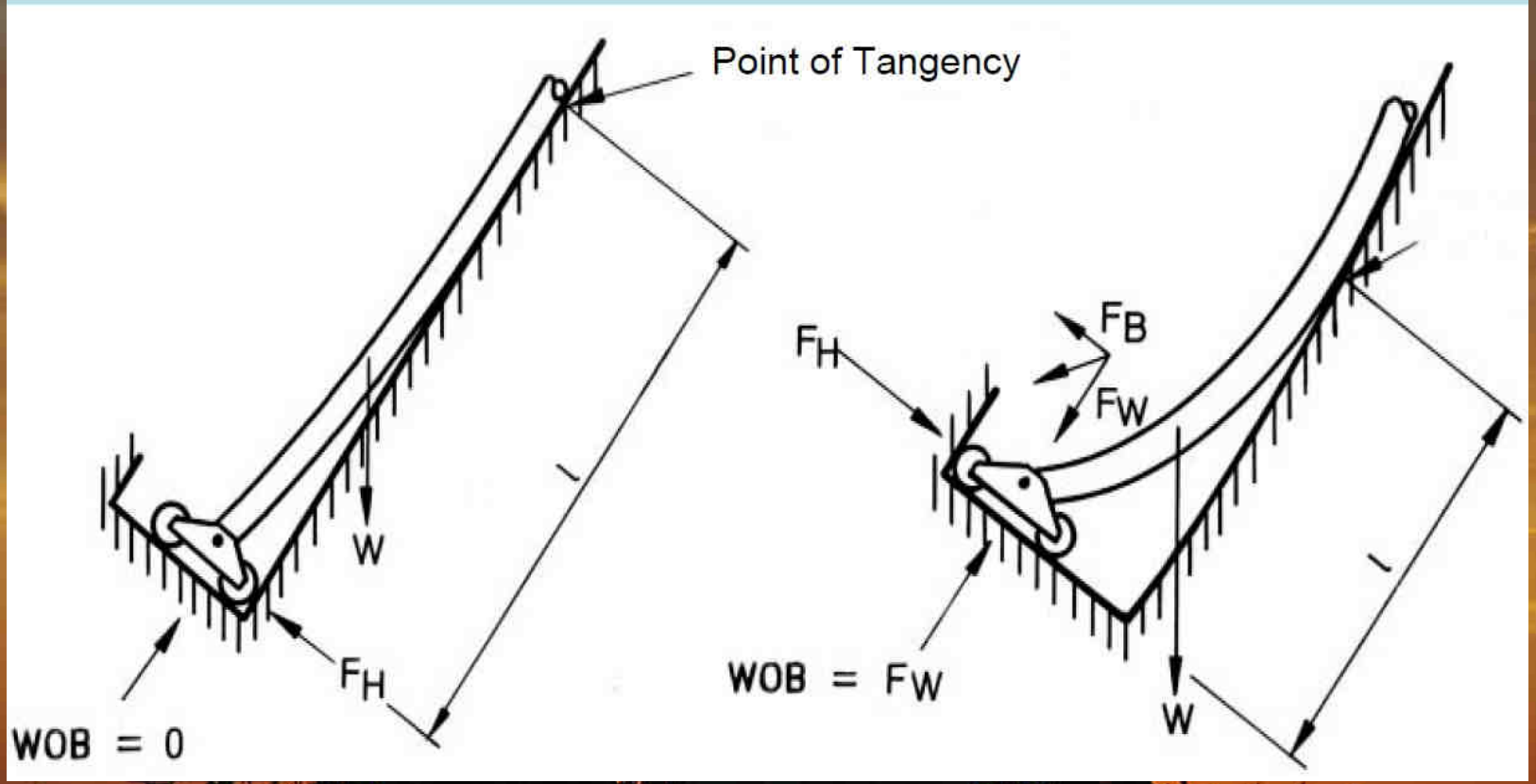


Measurement While Drilling (MWD) Techniques

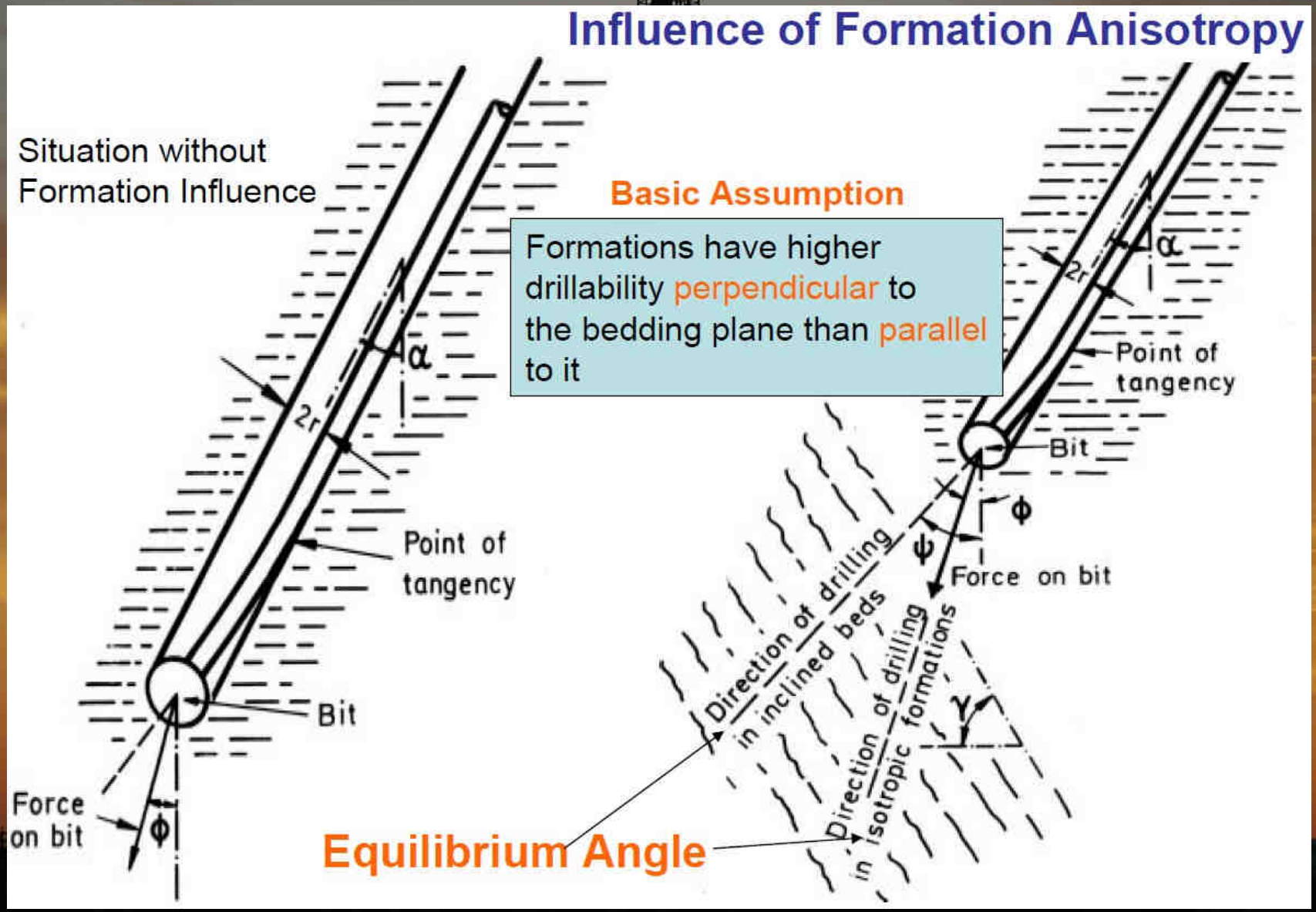


Why Hole Deviation Occurs?

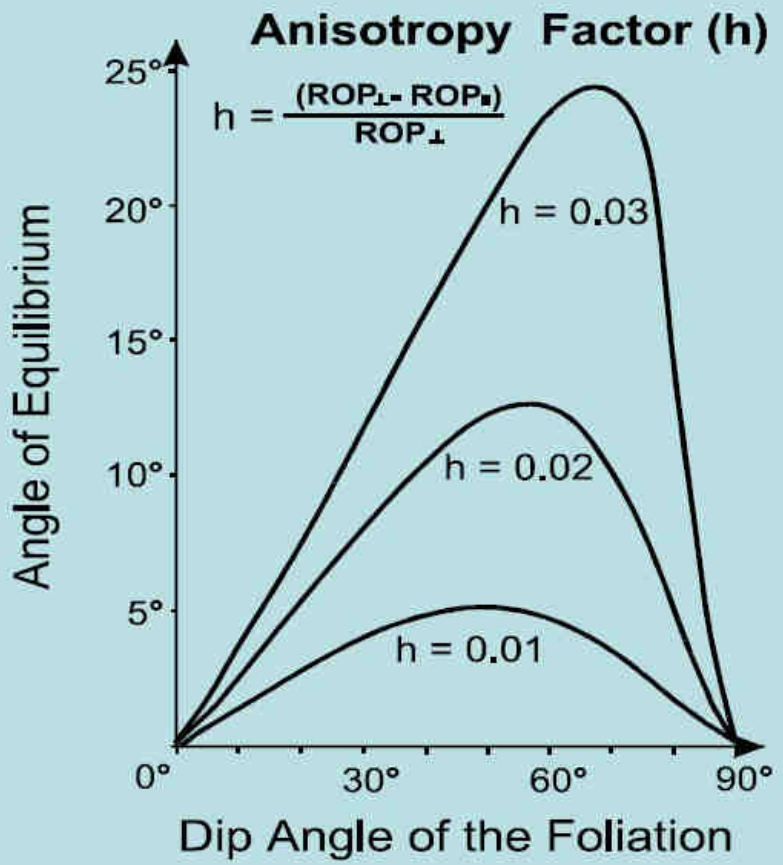
Equilibrium of Forces at Bit – Cartwheel Analogy

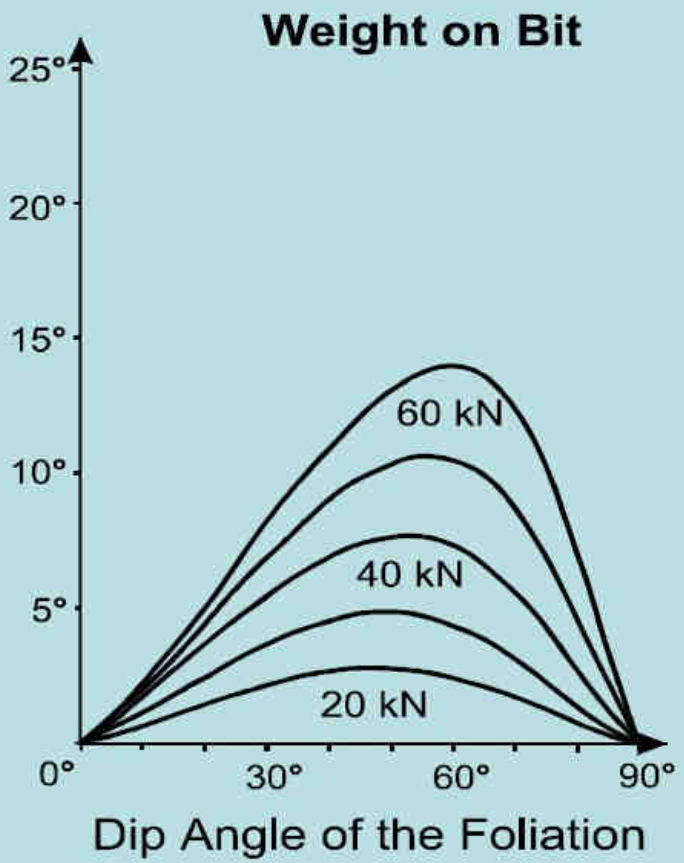


Why Hole Deviation Occurs?



Equilibrium Angle dependent on Foliation Dip Angle, Factor of Anisotropy and WOB

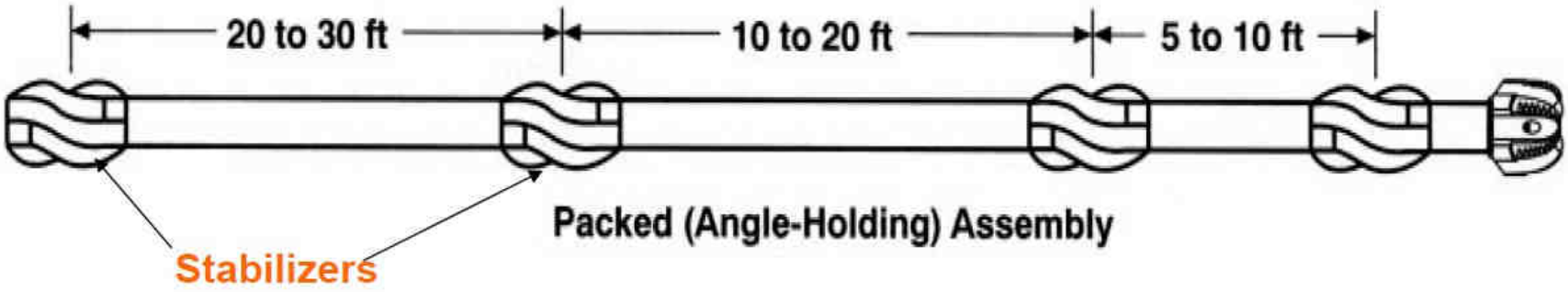




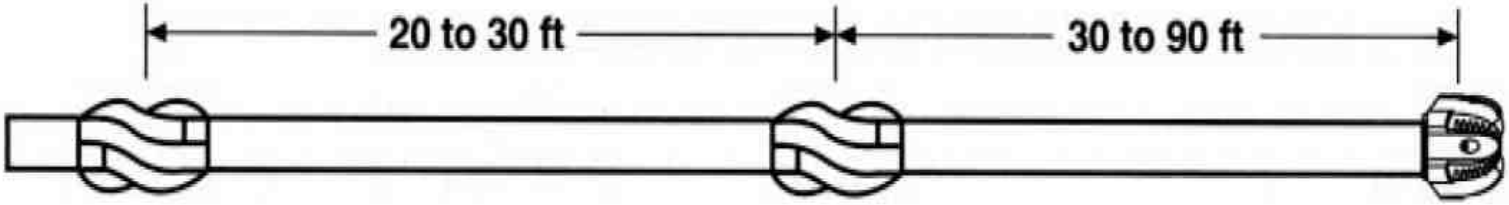
Calculated for 6“-Borehole

Controlling Hole Inclination by Bottom Hole Assembly (BHA)

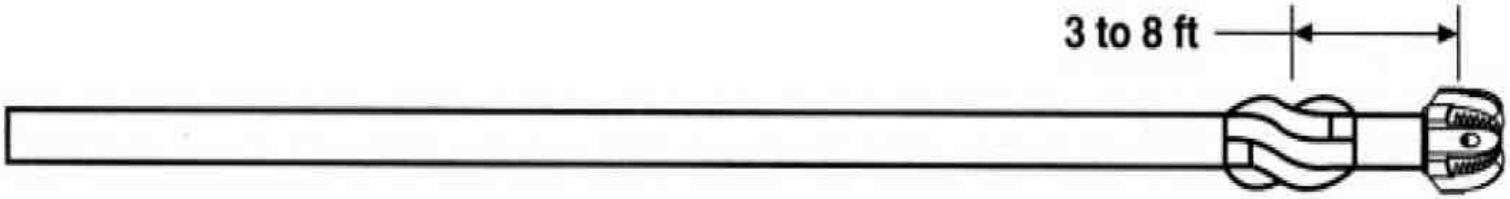
BHA=Assembly of Drill Collars and Stabilizers



Packed (Angle-Holding) Assembly

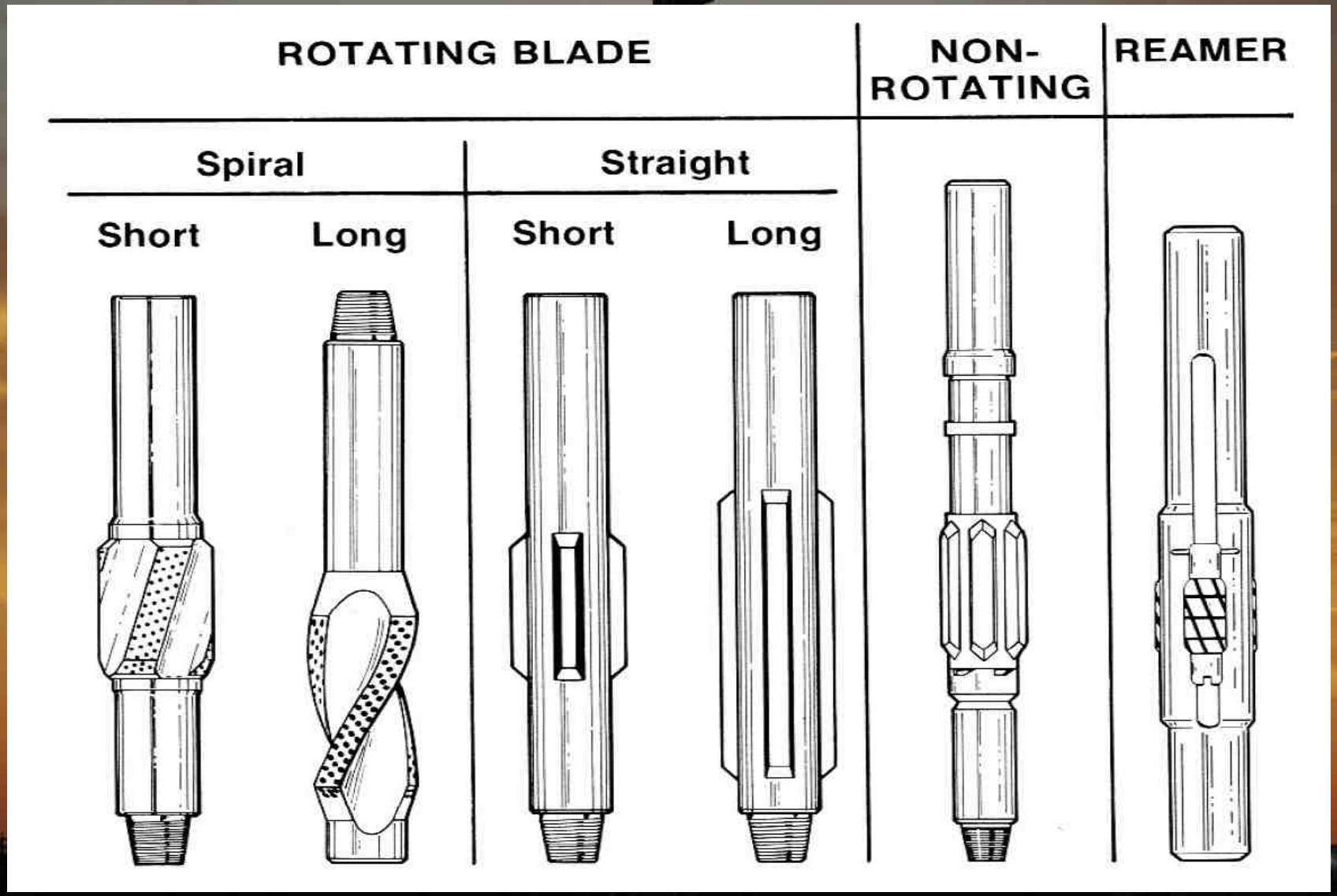


Pendulum (Angle-Dropping) Assembly

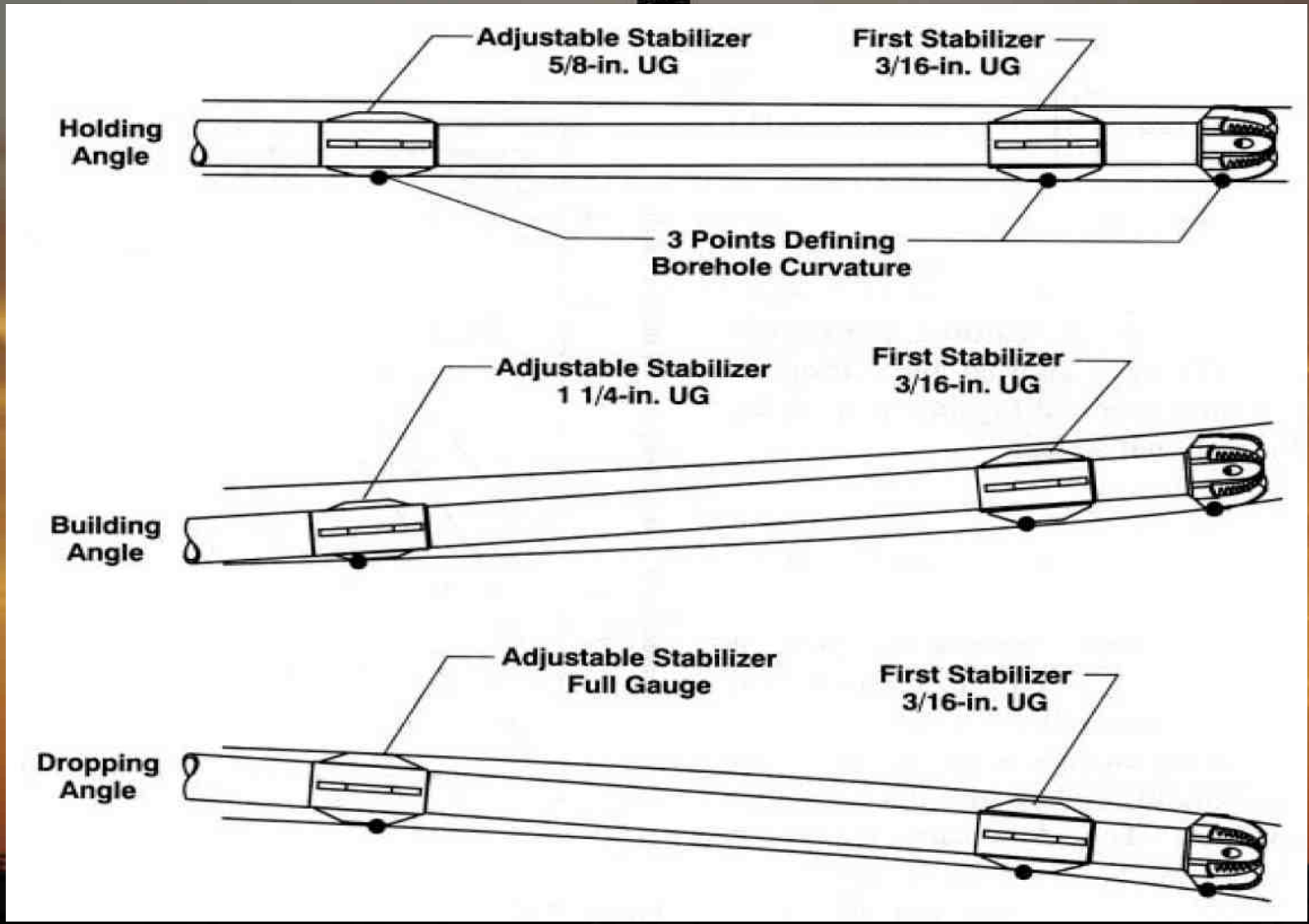


Fulcrum (Angle-Building) Assembly

Basic Types of Stabilizing Tools



Controling Hole Inclination with Adjustable Stabilizers



Controlling Wellbore Trajectory with Steerable DHM

Positive Displacement Motor (PDM)

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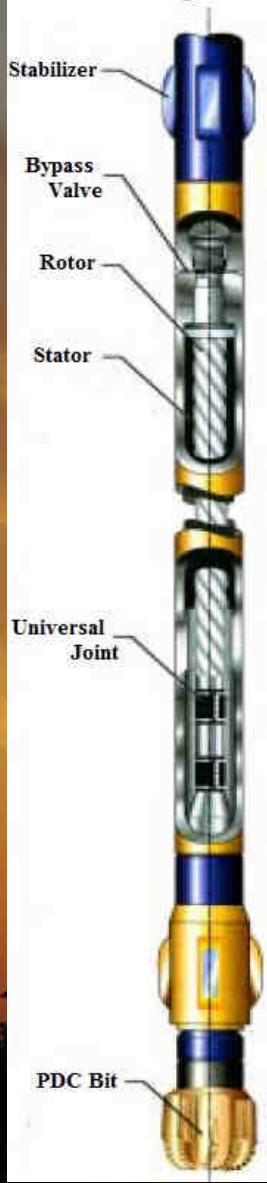
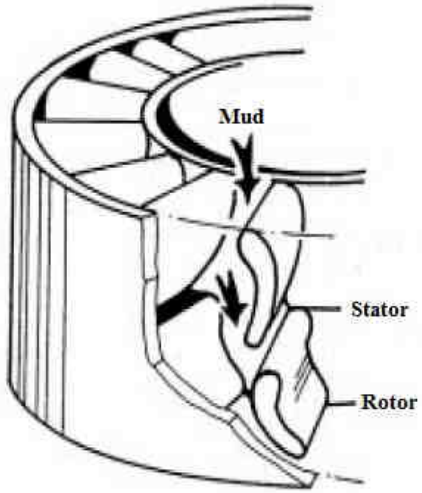
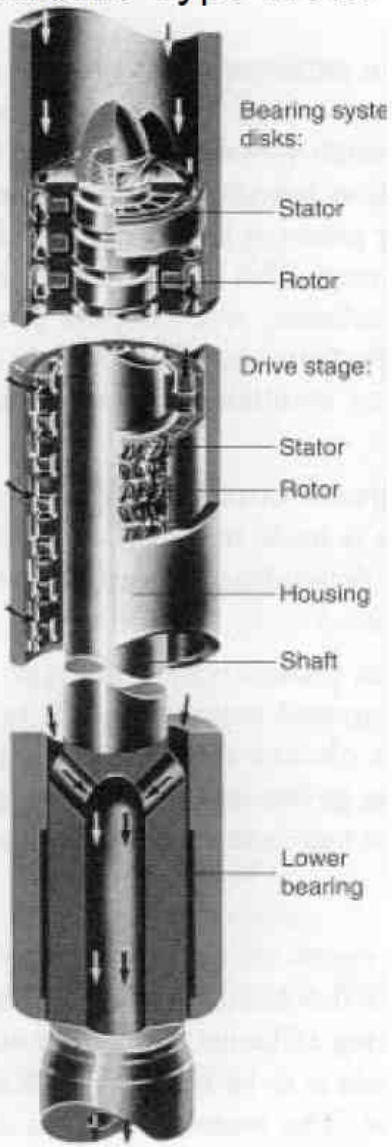


Characteristics of PDM
Low – Medium RPM
High Torque
Ideal for Roller Cone Bits

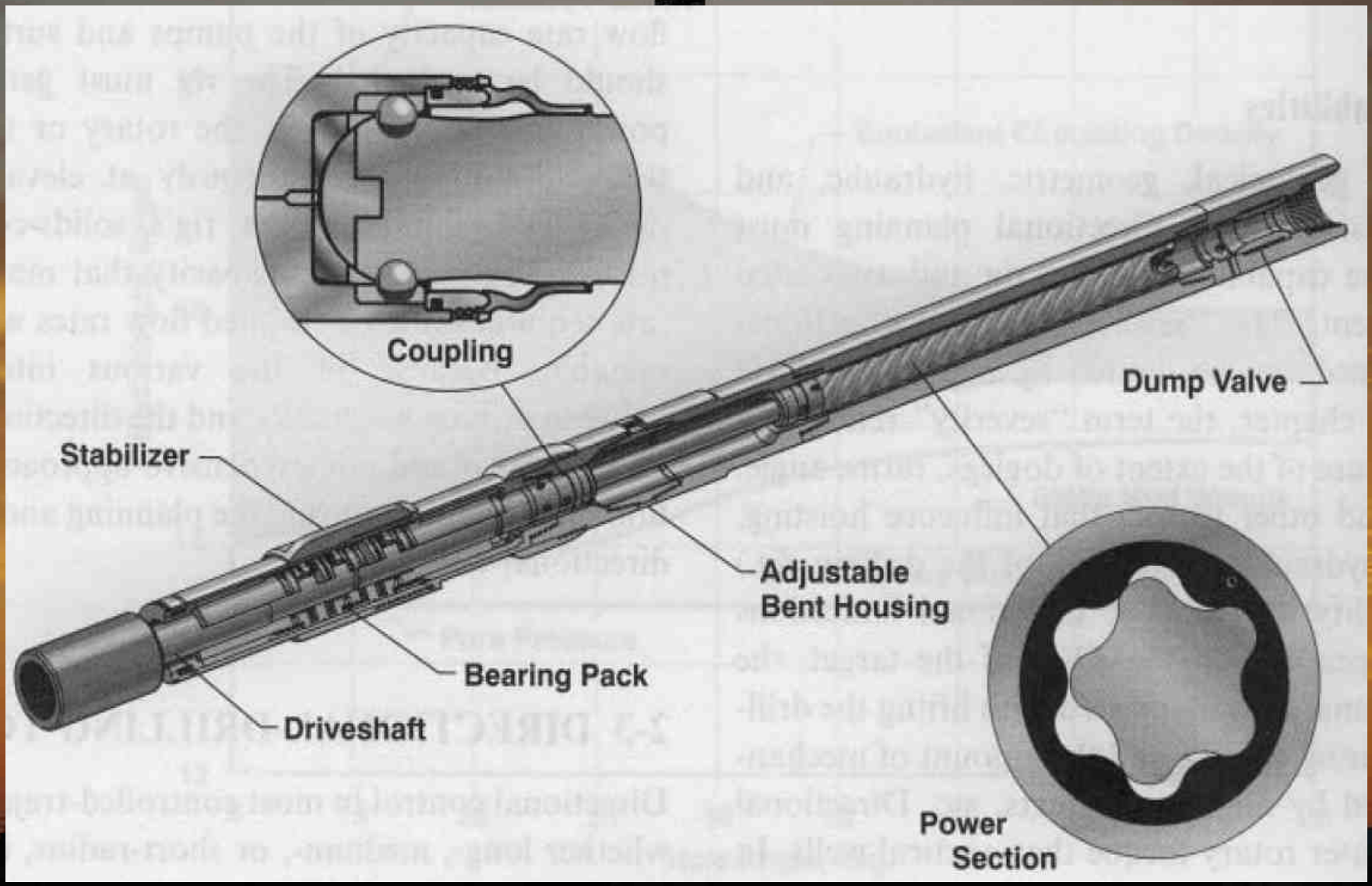


Characteristics of Turbines
High RPM
Ideal for Diamond Bits

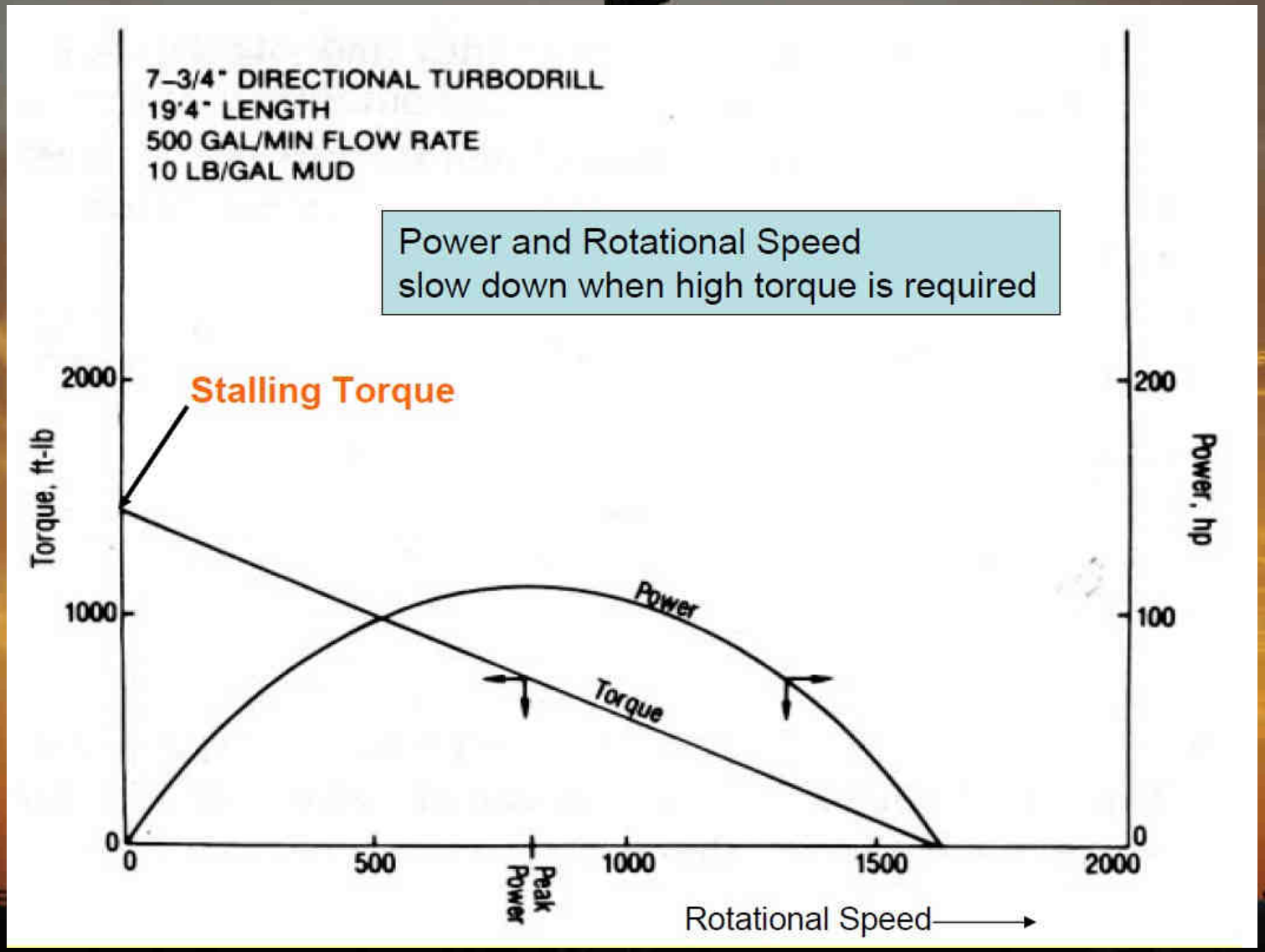
Turbine Type Motor



Positive Displacement Motor Components

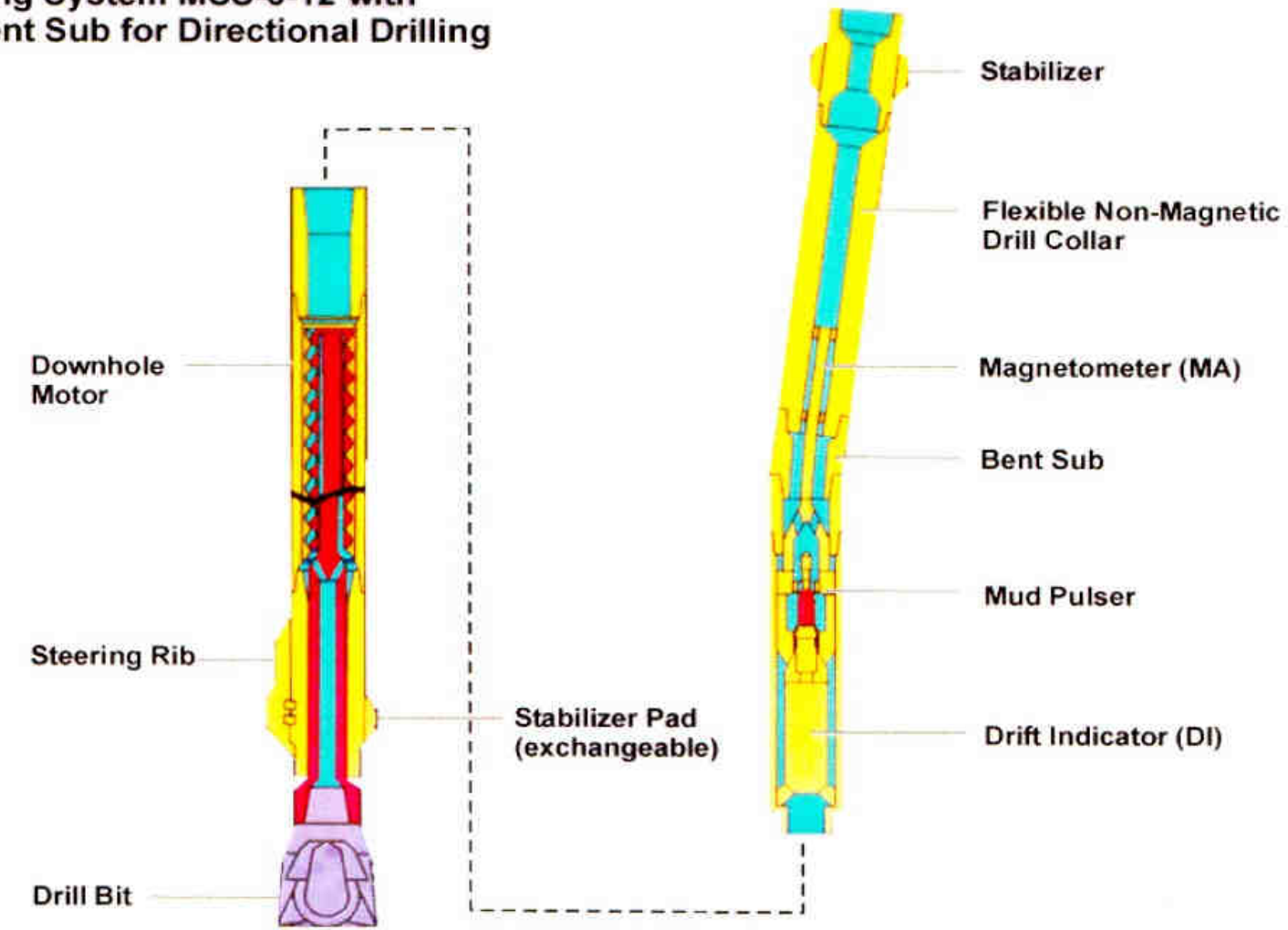


Performance Characteristic of Drilling Turbines

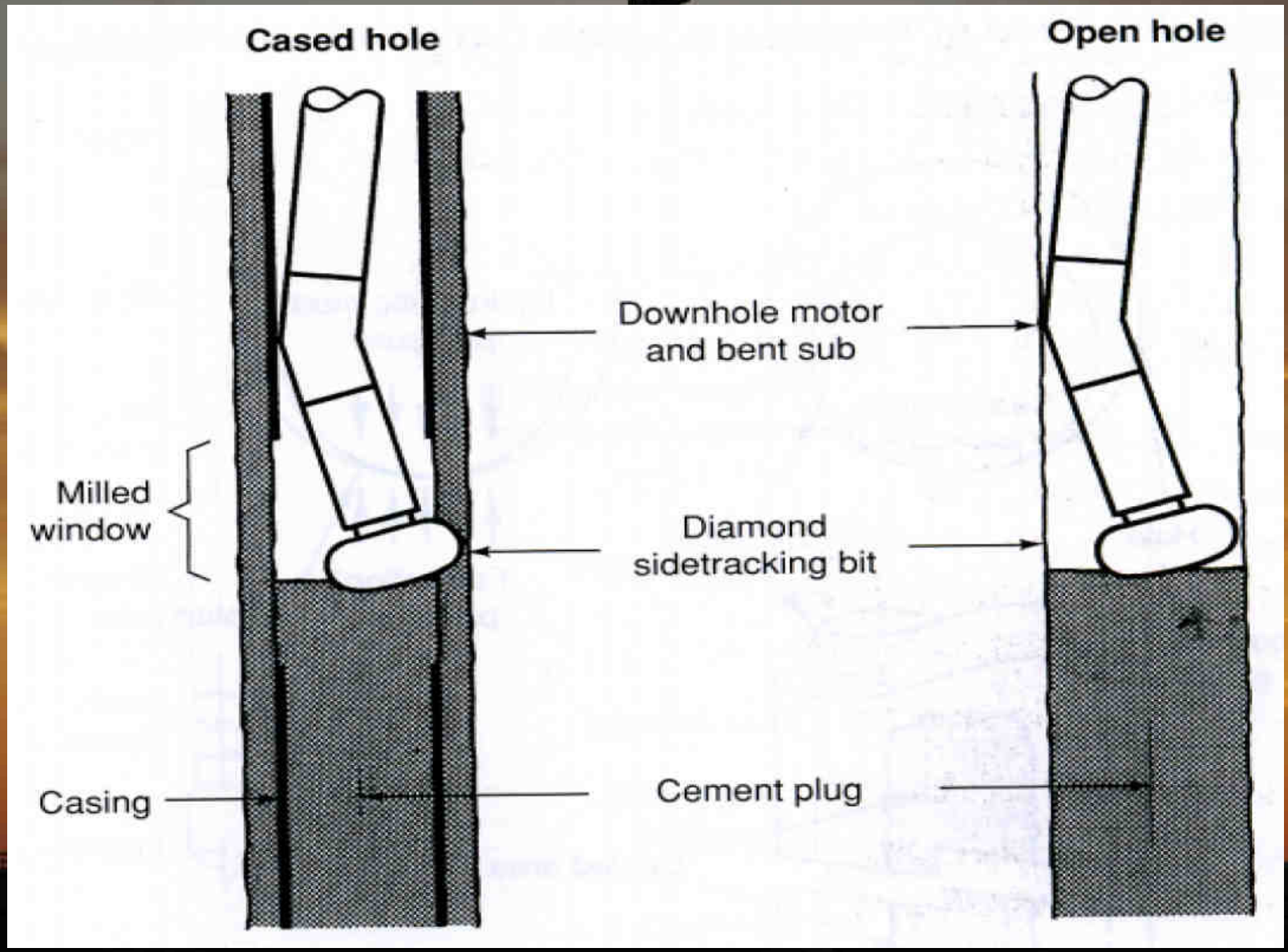


Directional Drilling with DHM – Steering Systems

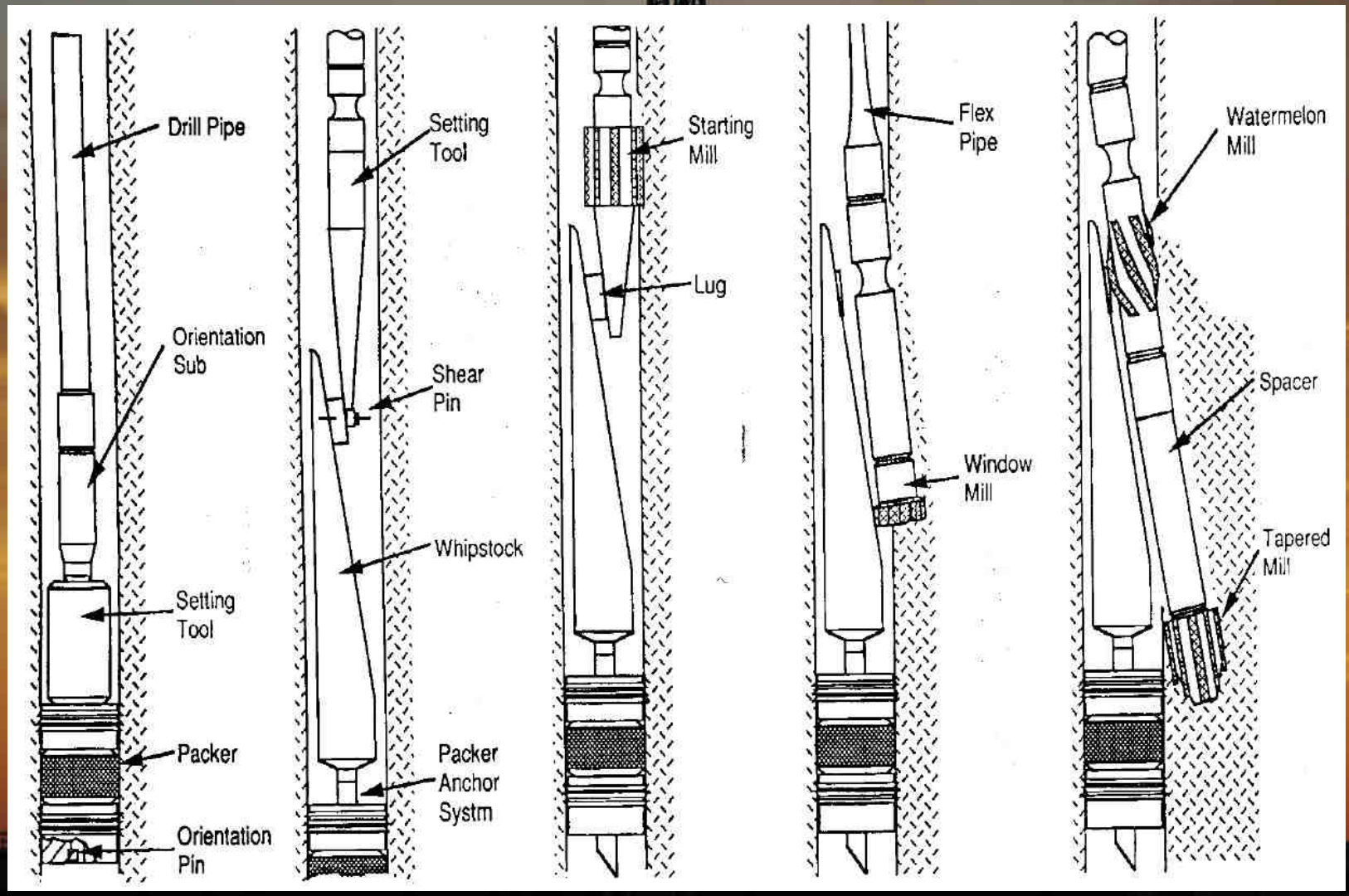
Motor Steering System MSS-6-12 with DIMA and Bent Sub for Directional Drilling



Open Hole and Cased Hole Sidetracking with a Cement Plug



Sidetracking with Oriented Whipstock Technique



THE END!!!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