"بسم الله الرحمن الرحيم"

MOSUL UNIVERSITY
PETROLEUM & MINING ENGINEERING COLLEG

Well Drilling *ENGINEERING*

Lec. 1

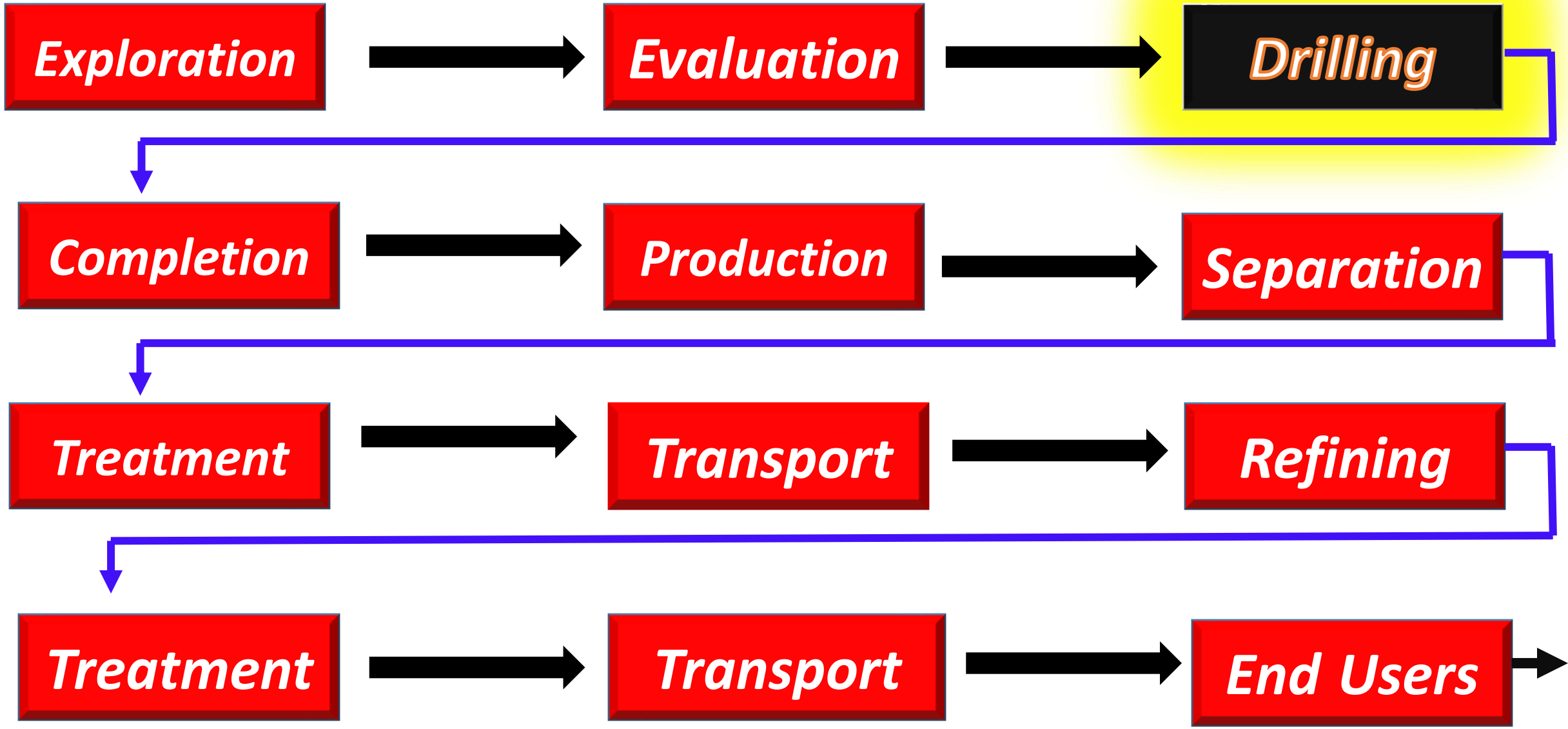
Date :29/9/2024

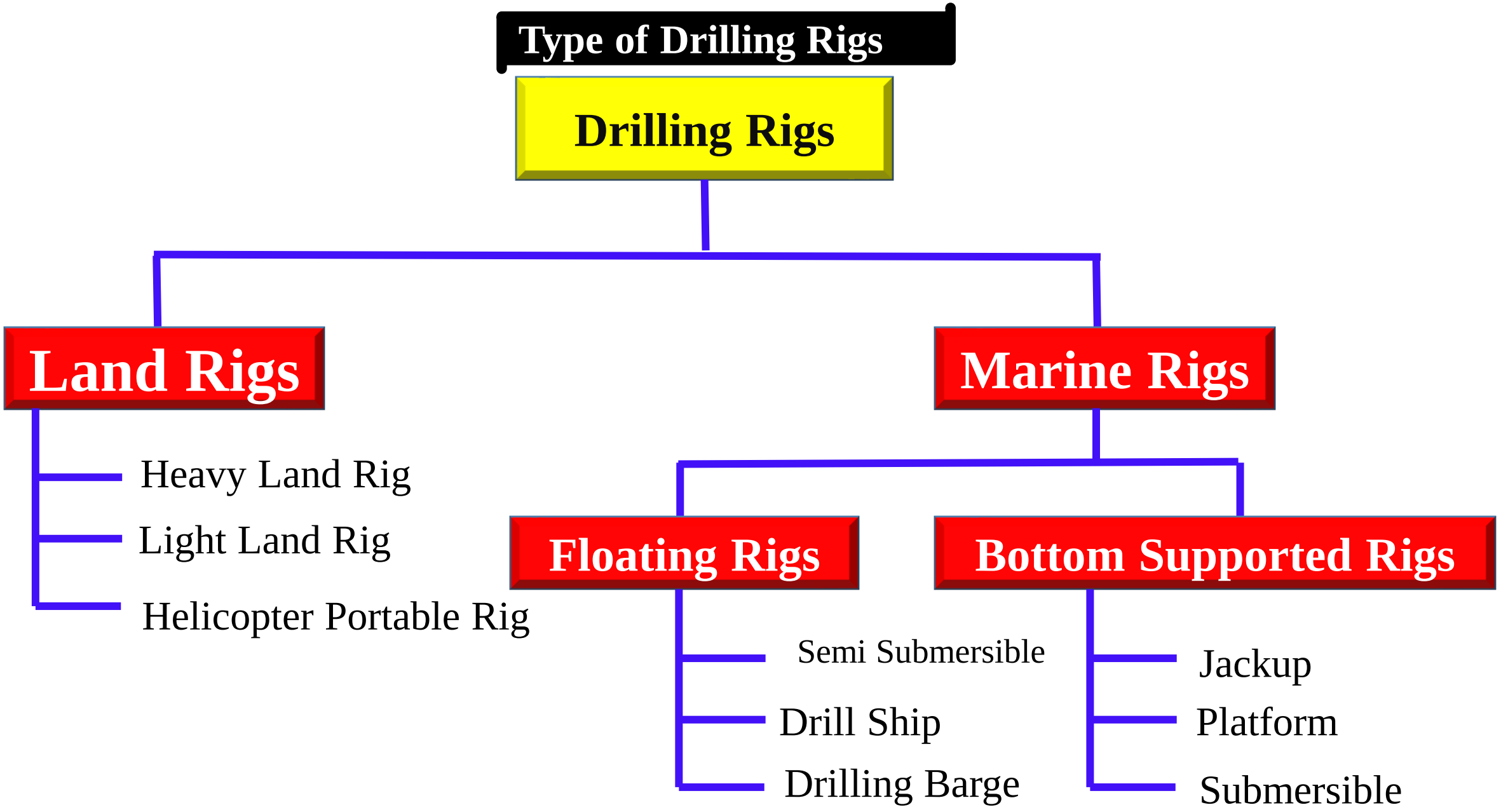
Dr. Mohammed Ali Alrashedi

What is mean the Drilling?

- ***Drilling*** is a mechanical technique for drilling and penetrating rock (Rock Formation) to reach places where hydrocarbons (oil & natural gas) are collected.

- ***Drilling*** can be considered as the second stage of oil production after exploration to reach the stage of oil production.


Exploration
Evaluation
Drilling
Completion
Production
Separation
Treatment
Transport
Refining
Treatment
Transport
End Users



A typical classification of rotary drilling rigs

Types of the Oil Rigs

1-Land Rigs

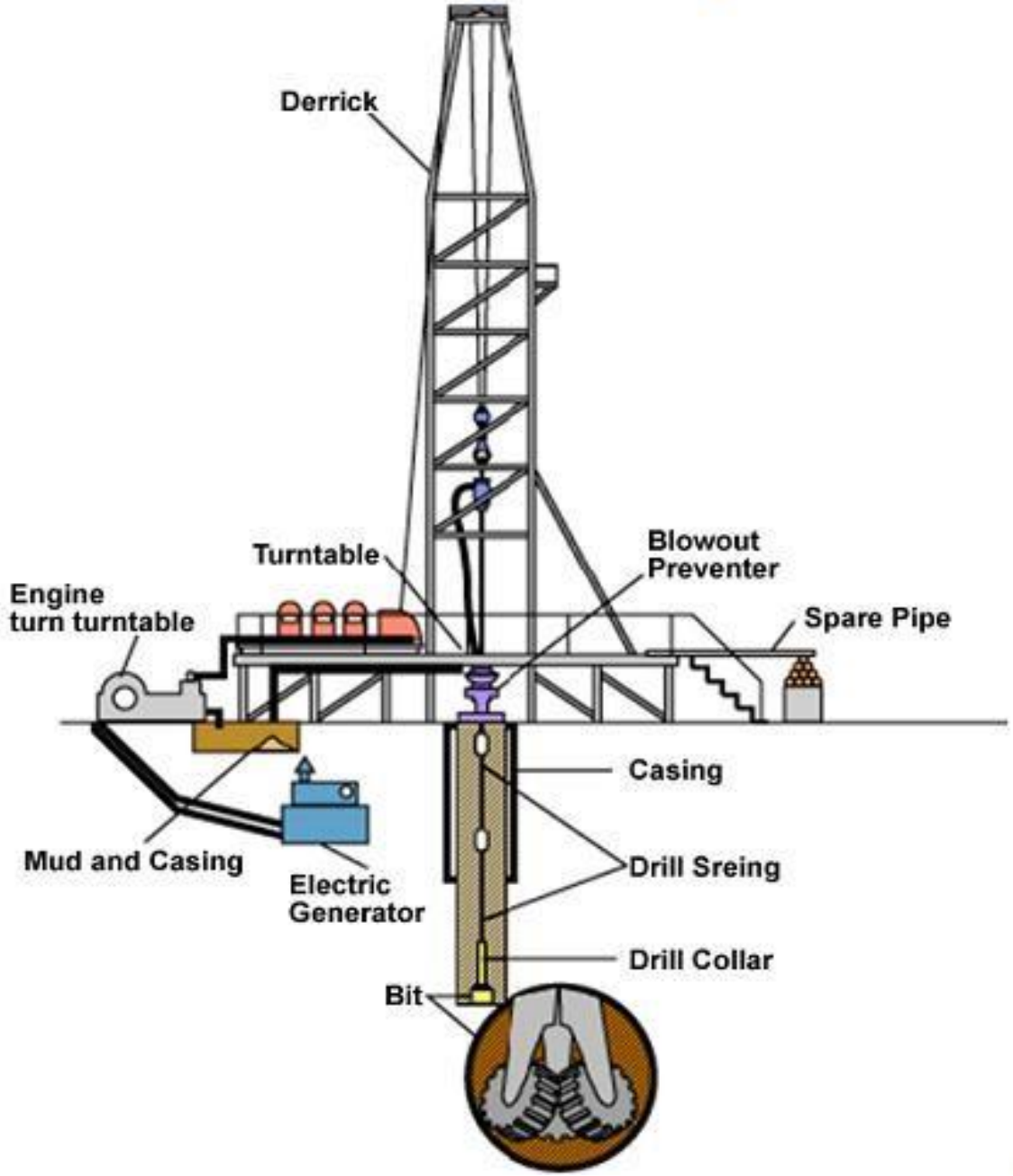
sequence of operations is as follows when a land well is drilled:

1. **Prepare location before rig arrives.**
2. **Dig cellar**
3. **Install conductor pipe**
4. **Prepare support pad for rig, camp, etc**
5. **Build roads, fencing, dig pits**

6- Sometimes drill water well.

7- Move rig on to location, rig up and prepare to start drilling.

Rotary Drilling



Rotary Drilling Process

- Rotary table rotates the drill string
- Downward force applied to the bit
- Cuttings are lifted to the surface by circulating a fluid down the drill string

☛ **Main Component Parts of a Rotary Rig are:**

1.Power System

2. Hoisting System

3. Fluid Circulating System

4. Rotary System

5. Well Control System

6. Well Monitoring System

2- Marine Drilling Rigs (*Offshore)*

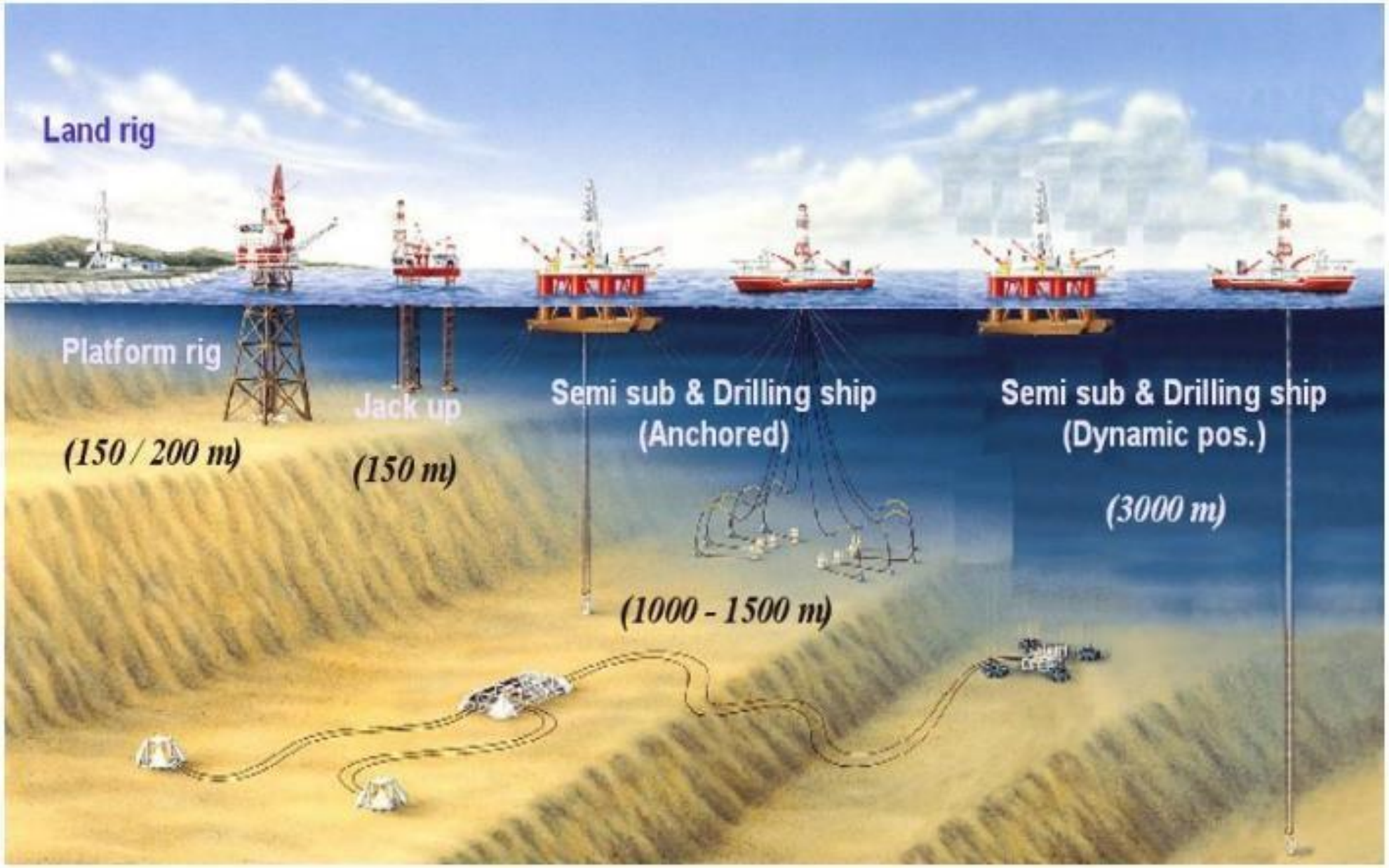
Two main types:

1. ***floating***
2. ***bottom-supported unit***

Floating unit include: semisubmersible (bottle-type, column stabilized), barge rig and drill ship.

Bottom-supported unit include: submersible (posted barges, bottle-type submersibles, arctic submersibles), jackups and platforms.

Marine (offshore) Rig



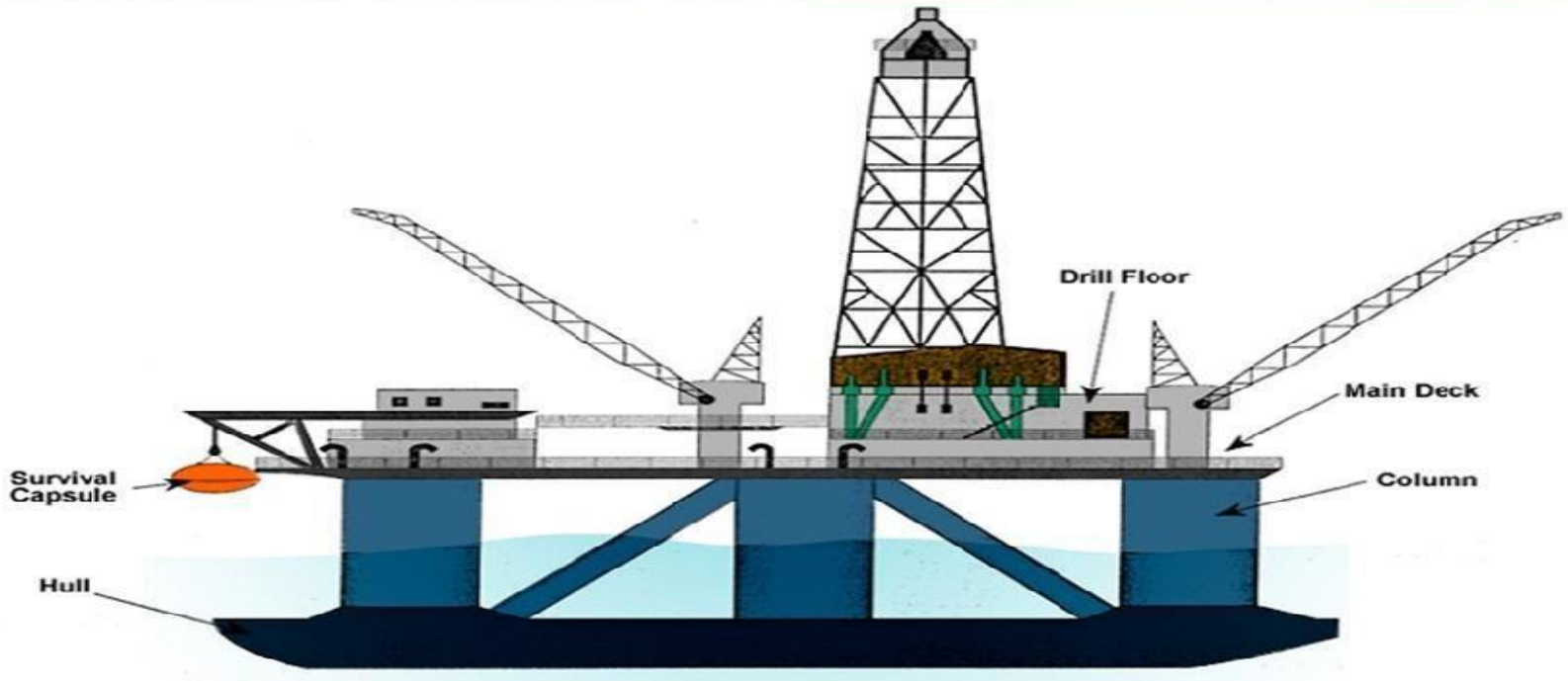
Floating Rig

SEMI - SUBMERSIBLE

- This floating drilling unit has columns when flooded with seawater, cause the structure submerge to a predetermined depth.
- Although it is moved by wave action, it sits low with a large part of its structure under water combined with eight huge mooring anchors, make it a very stable installation.
- This type of rig drills a hole in the seabed then it moves to the next location.
- With advancing technology some semi submersibles can drill in water depths over five thousand feet.

Floating rig

Semi Submersible Rig



Drill ship

- As the name suggests this is a ship shaped drilling vessel.
- Unlike the semi-submersible and the Jack up, it does not require tugboats to tow it to location.
- Although they are not as stable as semi submersibles they also drill in very deep waters

DRILLING BARGE

It is found in swamps, ponds and shallow waters and reaches a depth of 20 or 30 meters.

Bottom supported Rig

- This is a mobile drilling rig, different from the semi-submersible. Instead of floating over its drilling location the Jackup has long leg structures, which it lowers to and into the seabed raising the rig out of the water.
- The obvious limitation with this type of installation is the depth of water it can operate in.
- The maximum being five hundred feet.

Platforms

❖ This immobile structure can be built from concrete or steel and rests on the seabed.

❖ When oil or gas is located a platform may be constructed to drill further wells at that site and also to produce the hydrocarbon.

Steel Jacket platform

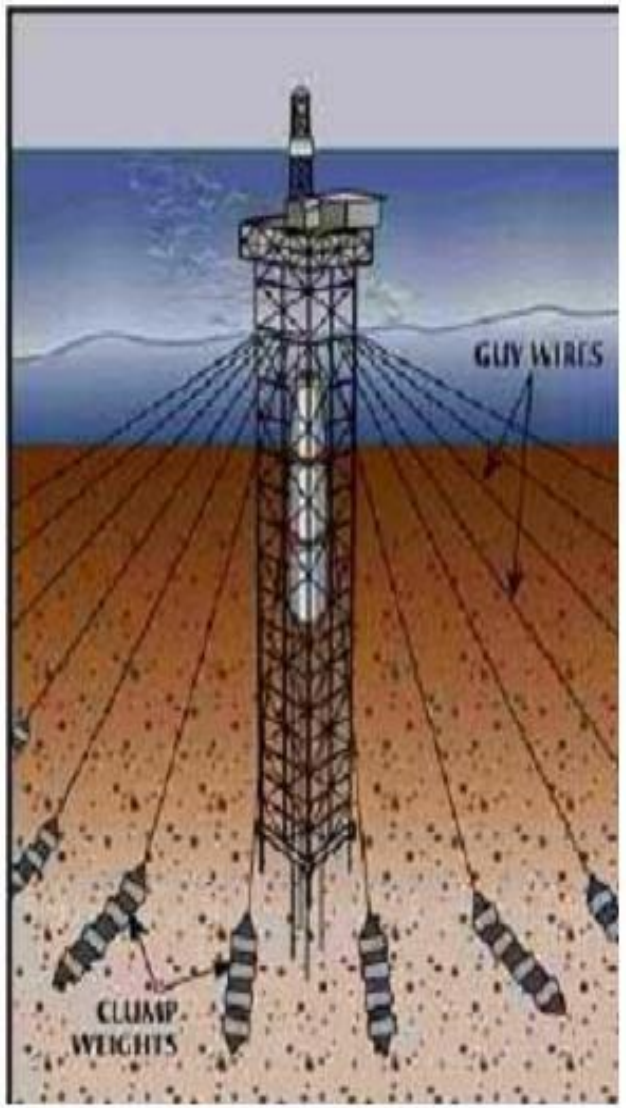
- Most common type of platform.
- Consist of the jacket, a tall vertical section made of tubular steel members.
- Supported by piles driven into the seabed.
- Additional sections on top of the jacket provide space for drilling rig, crew quarters, and other equipment's.

Concrete Gravity

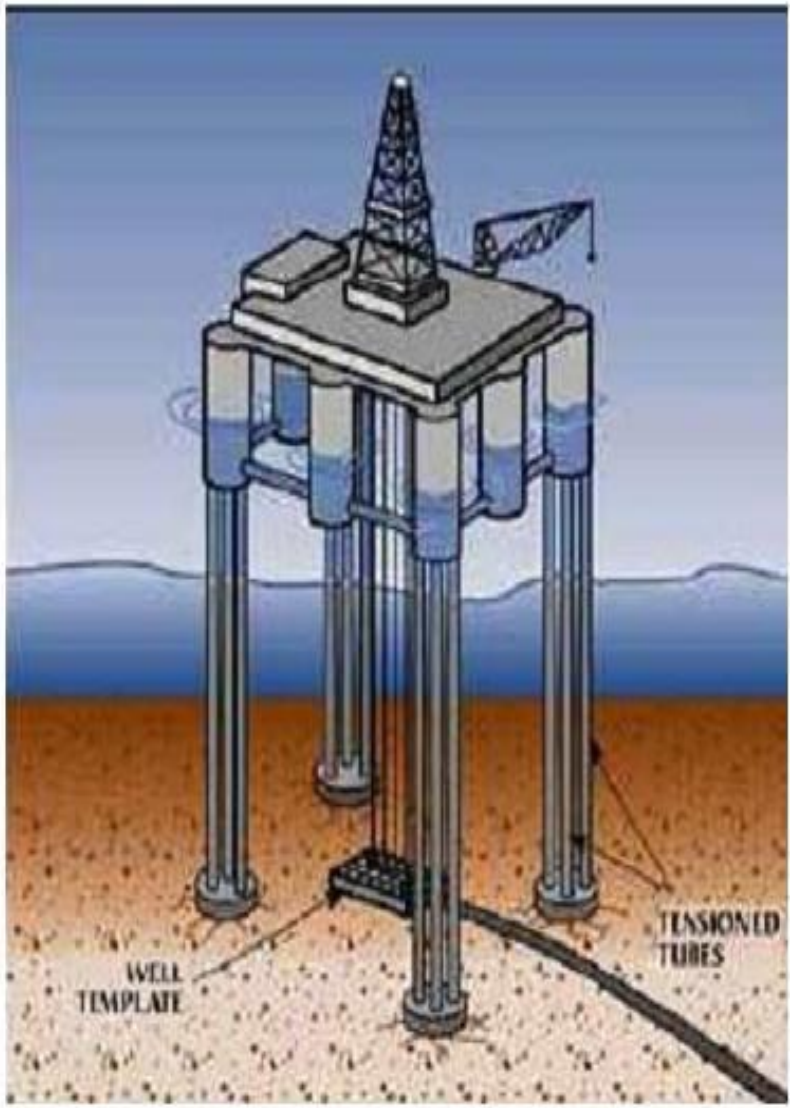
- Build from steel reinforced concrete.
- Tall caissons, or column are the dominant feature of this platform.
- Sometime, special concrete cylinder are fixed at the base of the caissons on the sea floor to store crude oil.

Compliant platform

- Using rigid platform in water much over 1000 feet depth is not practical – very much expensive to build.
- In deep water, most companies use compliant platform, which contain fewer steel parts and are lighter than rigid steel-jacket
- Guyed-tower platform and tension-leg platform.



Guyed tower platform



Tension Leg Platform (TLP)