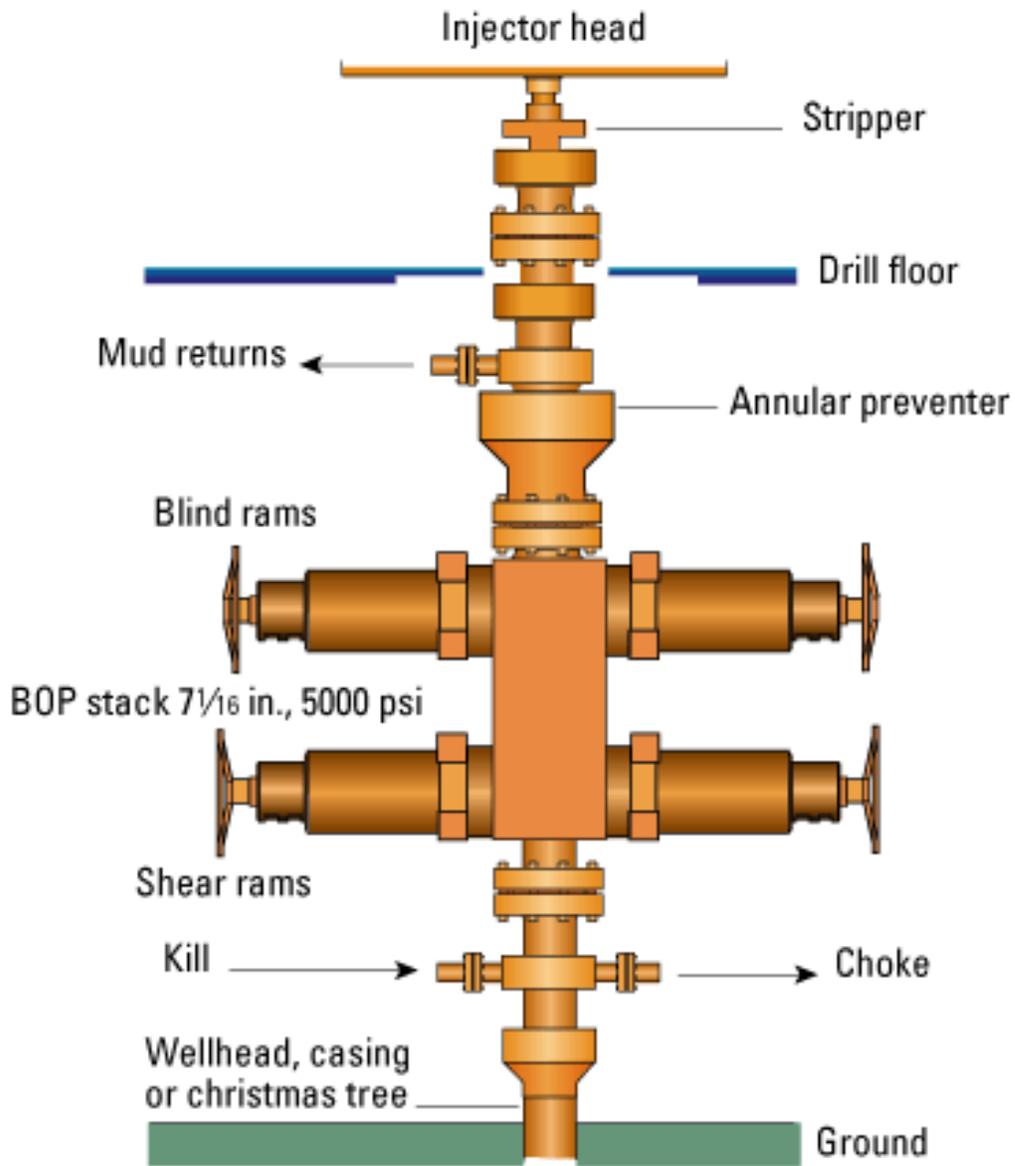


# Blowout Preventers:



Blowout Preventer

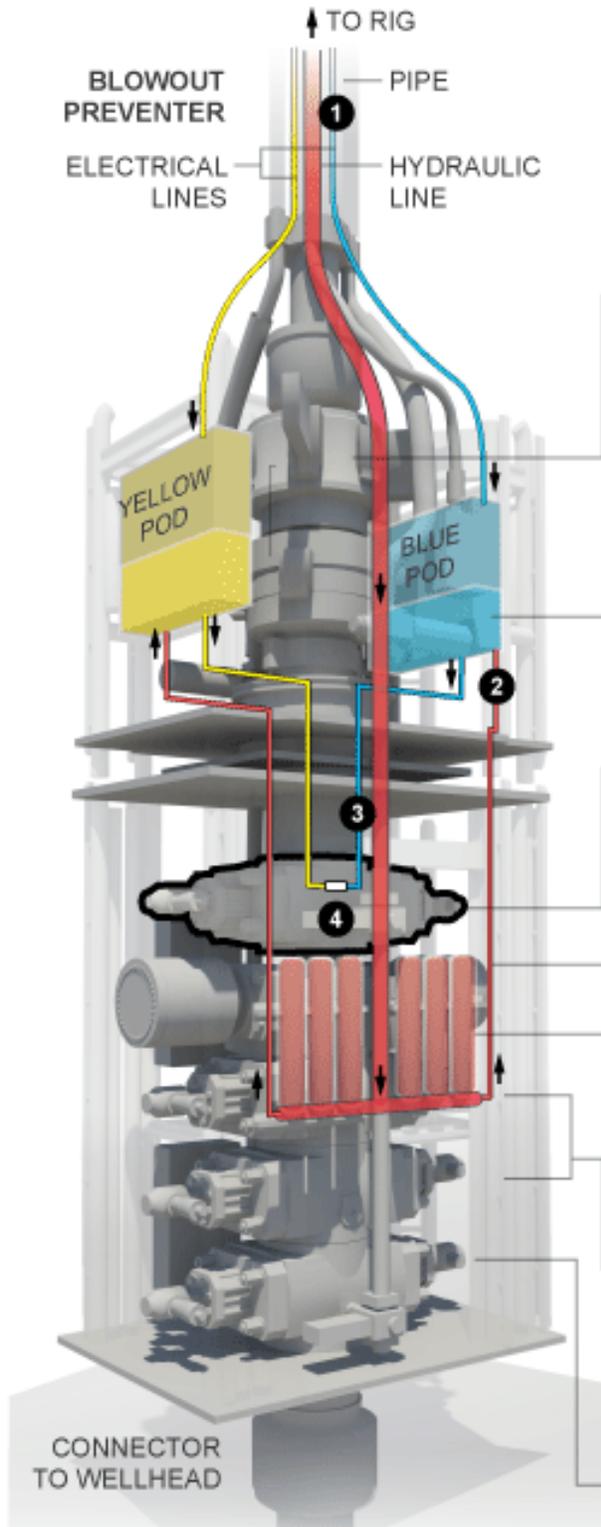
DEEPWATER HORIZON RIG

PIPE

**BLOWOUT PREVENTER**  
SEAFLOOR  
5,067 FT.

PIPE

OIL AND GAS RESERVOIR  
18,360 FT.



*The blowout preventer is 54 feet tall.*

- ANNULAR PREVENTERS**  
Can create a seal around the drill pipe or seal off an open wellbore when there is no pipe.
- CONTROL PODS**  
Receive electrical signals from the rig and direct the movement of hydraulic fluid. Upper portion has electrical parts; the lower portion has hydraulic valves. Only one pod is activated at a time.
- BLIND SHEAR RAM**  
Cuts the drill pipe and completely seals the well.
- CASING SHEAR RAM**  
Cuts drill pipe or casing in an emergency when the rig needs to disconnect from the well quickly.
- ACCUMULATORS**  
Store fluid sent from the rig. During an emergency, pressurized fluid from these canisters can provide force to power the blind shear ram.
- PIPE RAMS**  
Seal off the space between the outside of the drill pipe and the well bore and keep the pipe centered.
- TEST RAM**  
Used to test the rams above it.

## WHAT SHOULD HAPPEN IN AN EMERGENCY

---

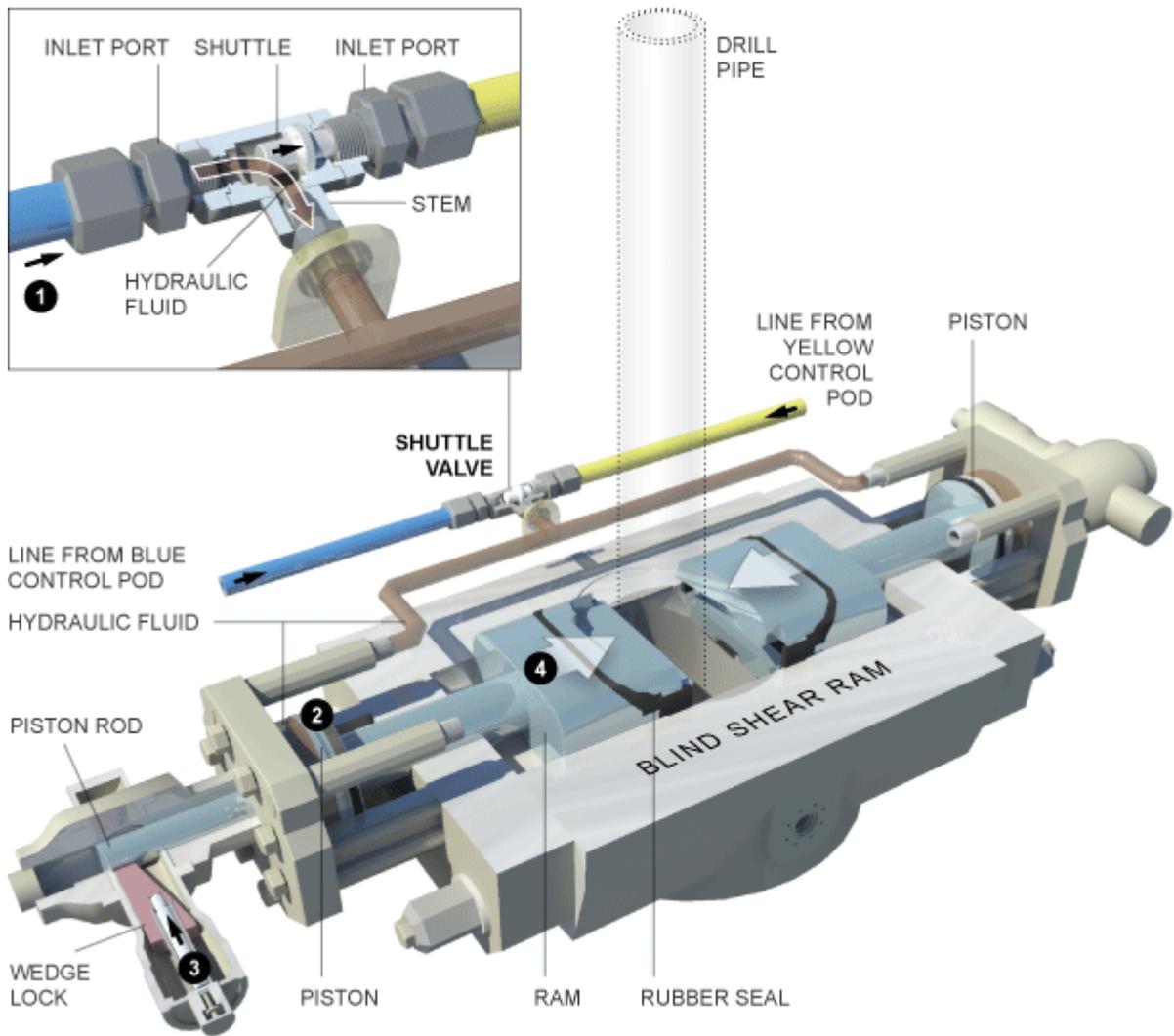
- ① In a blowout, a rig worker presses an emergency button. A signal is sent from the rig down an electrical line to one of the control pods.
- ② The control pod directs hydraulic fluid from the rig and from a bank of pressurized canisters, called accumulators ...
- ③ ... through a valve, called a shuttle valve, and into the blind shear ram. Some blowout preventers have a separate emergency system with its own shuttle valve.
- ④ The blind shear ram cuts through the drill pipe and seals the well, preventing oil from gushing out.

### **Inside the Blind Shear Ram**

Of all the components on the blowout preventer, only the blind shear ram was designed to shut down the well in a blowout like the one that took place on the Deepwater Horizon oil rig on April 20. It is the only device that is supposed to cut through the thick drill pipe and seal off the hole.

Unlike many other parts of the Deepwater Horizon's blowout preventer, the blind shear ram has no backup. The breakdown of any part of the ram can lead to disaster. One of the most critical components of the blind shear ram is the shuttle valve, the only point for the hydraulic fluid to enter the ram.

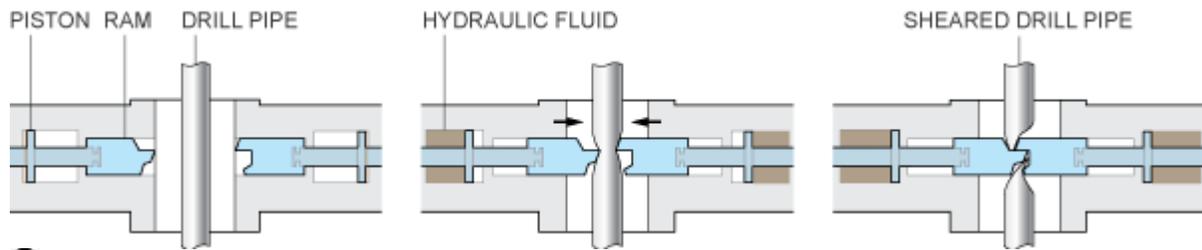
A risk analysis commissioned by the manufacturer of the blowout preventer identified this valve as one of the weakest links. As the fluid flows through the system, it has two possible pathways until it reaches the valve. So if the valve fails, the well will not be sealed.



## HOW IT WORKS

- ❶ Fluid enters the shuttle valve from one of two inlet ports and pushes a metal “shuttle” to one side and flows down the stem of the T-shaped valve.
- ❷ The fluid flows behind pistons, which drive the ram to shear the drill pipe.
- ❸ Wedge locks slide in to prevent the pistons from moving back.
- ❹ Rubber seals on the ram close off the well. Oil pushing up from the well adds pressure below and behind the ram, helping to keep the ram closed.

## HOW THE RAM CUTS THE DRILL PIPE



- ❶ Pistons push the ram toward the pipe.
- ❷ Offset blades on the ram cut the pipe.
- ❸ The pipe breaks and collapses.