

DETAIL DESIGN

Feature graphic by 600 Series Design with input from David Lewis and Perry Pise, Engineering Managers for onshore-offshore pipeline

Laying Offshore Pipe

Surveying the sea floor

Engineers survey the sea floor—using tools such as echo sounders, side scan sonar, and sub-bottom profiler—to optimize the pipeline route. Obstacles such as ammunition dumps, shipwrecks, and other pipelines must be avoided.



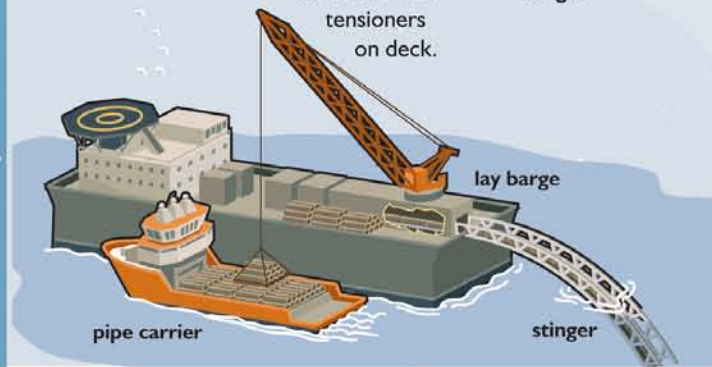
survey vessel

Laying pipe onto the sea floor with a barge

Sections of steel pipe are welded together on the deck of a barge, which travels over the planned route.

To prevent buckling and control the rate of descent, the pipe is supported by numerous rollers and held back with tensioners on deck.

The pipeline is lowered onto the sea floor from an extended structural arm, called a "stinger."



lay barge

above surface
below surface

platform

lay barge

new pipelines

existing pipelines

wellhead

hub

jumper

ROV

hub of pipeline

manifold valve

At the wellhead

Oil or gas fields are developed along the same principles as a residential community. Wells are drilled after geologists identify the potential of a field. Newly-drilled wells are capped at the seabed and a subsea "Christmas tree" is installed, housing the main shut-off valve.

Subsea hookup

The end of the pipeline laid by the barge is hooked up—either to the platform or to the manifold valve—with a short, flexible spool called a "jumper." Divers can make this connection in shallow waters, while robotic remotely operated vehicles (ROVs) are used at greater depths.

Laying Onshore-Offshore Pipelines for Oil or Gas

Large engineering and construction projects pose myriad challenges involving logistics, equipment, legal and regulatory issues, personnel, and safety. It's even more complex for onshore-offshore pipeline engineers, who must be masters of two worlds – one on land, and the other below the sea.

Onshore pipelines often must be laid along a serpentine route that is predetermined by the lay of the land, existing rights-of-way, and human habitation. Where long stretches of gently sloping open land do not

exist, pipelines must be bridged over, snaked around, or tunneled through the earth's surface.

Laying pipe offshore presents the opposite problem: difficult topography and deep water add huge amounts of cost and complexity to a project. Moreover, the very nature of ocean waves and currents creates a constantly shifting landscape under the surface and incredible forces on the pipeline, so extensive planning must be done to discover the straightest, shortest, and structurally firmest route between shore and the platform or wellhead.

Laying Onshore Pipe

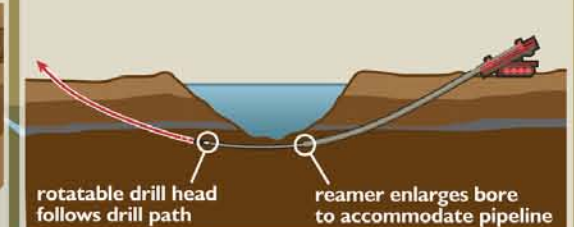
Trench cutting

Onshore pipe is laid in narrow trenches to a depth of at least 1.09 yards (one meter), depending on terrain and safety requirements.



Crossings

When the pipe route must cross a developed area or existing infrastructure, short tunnels may be drilled to minimize the impact above. Auger boring and horizontal directional drilling (shown below) are common methods.



Existing right-of-way

Onshore terminal

Planning the onshore route

An onshore pipeline is never planned as a straight line between the shore and the terminal. Engineers consider environmental conditions, community needs, local ordinances, and safety concerns before plotting an optimized route.



At the onshore terminal

The oil or gas is treated at the onshore refinery or processing plant. Impurities are separated, and multiple products are derived from oil through refining. Sales-quality gas or petroleum products are distributed from here to end customers.