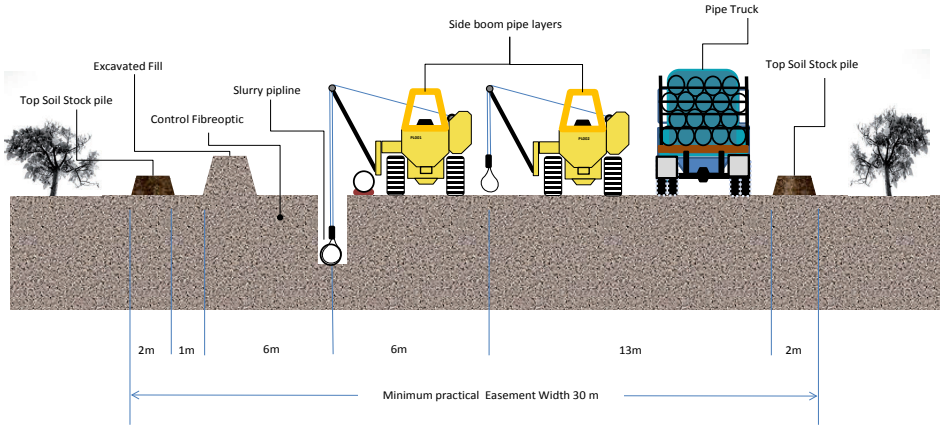
PIPELINE INSTALLATION (cont'd)

CLEAR, GRUB AND GRADE

The easement development crew works well in advance of the pipe laying crews

- The establishment of the ROW which best facilitates the installation of the pipeline is critical
- In order to minimise disturbance, follow the natural contours and only remove topsoil from the trench line.
- Topsoil will be placed in a separate windrow for use during rehabilitation. The total working width will be limited to a cleared easement of 25 metres wide with a further 5 metres being available to stockpile cleared vegetation.



- This crew is firstly responsible for clearing trees, shrubs and undergrowth within the easement corridor.
- The trees and shrubs are stockpiled along the easement, timber is staked for collection while shrubs, smaller timber and undergrowth are shredded for use in rehabilitation or properly disposed of in agricultural areas.
- Topsoil is removed to a predetermined depth and stockpiled along the easement for use in rehabilitation.

PIPELINE INSTALLATION (cont'd)

GRADE AND LEVEL

A crew works its way along the easement using earthmoving equipment, firstly to grade and level the right of way, then developing the leveled working platform for the trenching and pipe laying crews. This crew also installs erosion and runoff containment structure along the pipe route.

GRADE AND PREPARE

- Remove topsoil over the trench centre line width;
- Expose and mark buried services and utilities;
- Erect warning signs in required locations

EQUIPMENT

- Graders - 2
- Dozer - 2
- Excavator 22 tonne - 1
- Service truck - 1
- 4x4 Vehicle - 1

LABOUR

- Supervisor - 1
- Plant Operator - 5
- Labourer - 2

PIPELINE INSTALLATION (cont'd)

BRIDGING, CULVERTS AND UNDERGROUND BORES.

On most pipelines there are areas where the terrain requires structures to traverse gullies, creeks, wetlands or rivers, where the profiling of the easement is past the requirement of a simple grade and level and where trenching through the obstruction is not practical.

CULVERTS

Culverts are to be installed in water courses where the flow and dimensions of the water course allow. This is general achieved by using Armco or pre-cast concrete pipes and profiles that are laid at the bed level of the water course and backfilled with a compacted aggregate or selected engineered fill. In some cases this is all that is required, but where water flow has an erosive nature, the use of stabilising systems such as riprap, rock armour or stabilising blankets, can be used on the exposed levies.

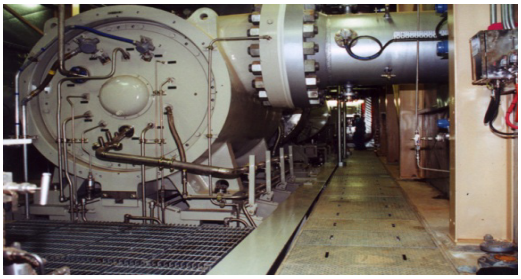
UNDERGROUND BORING AND SUBMARINE

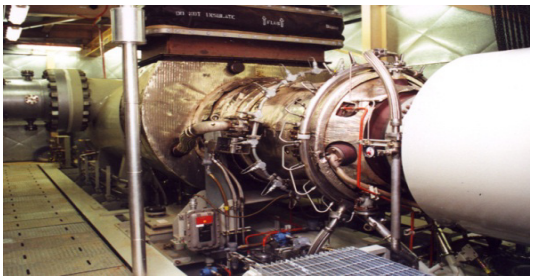
Where rivers and heavily trafficked roads need to be traversed, the usual method is by horizontal boring, where the pipe is driven under the river, water or road without the need to disturb the system or ground conditions

In some cases for water crossings where this is not practical, a submarine pipeline can be installed by welding the pre weighted pipeline and towing it to the crossing location and submerging the pipeline on the river bed. The pipe can be buried below the river or ocean floor if required and this can be achieved using a sub-sea grading blade and back fill grader towed by a barge or using water jets under the pipe to sink the pipe in the loose sedimentary bed.

Concrete weight coating is coating developed to provide negative buoyancy and mechanical protection in river crossings and offshore pipelines. The standard density for any concrete coatings is 2.3, although denser material can be applied using iron ore aggregates. Thickness typically ranges from 25mm up to 100mm.

10MW MARS SOLAR TURBINE GAS COMPRESSOR STATION INSTALLATION ESTIMATE

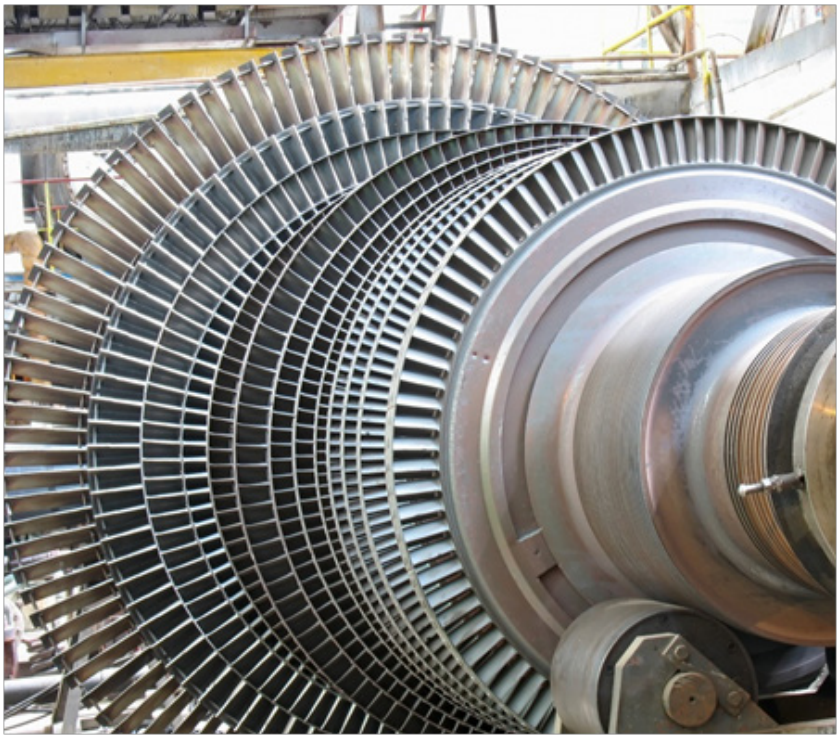




This installation is for an in-line gas compressor station utilised for land based gas transmission system where intermittent stations are positioned along the pipe route to build up pressure gas in the pipeline supported by line looping for the additional holding capacity.

Plant area	Man-hours
Control equipment	265.70
Cabling yard	2997.07
Light external walkway and stairs	49.95
Substation earthbar assembly	9.96
Additional earthing	220.50
Workshop earthing	185.24
Enclosure	25.70
Pipework (install)	4629.78
Instruments	1099.75
Install valves and in-line instruments	631.00
Install pipe penetrations	104.80
Concrete	3833.75
Civil works	1594.00
Install pipe supports	566.90
Install sand bag supports	212.40
Site mechanical installation	2141.00
On site structural installation	510.00
Site establishment	1170.00
On site buildings	457.25
Total installation hours	**20704.75**

SKID MOUNTED STEAM TURBINE MECHANICAL INSTALLATION



Installation hours for a 5 to 8mW modular skid mounted steam turbine.

Turbine installation hours were quoted as 6000 to 7000 hours for alignments, levelling and lifts alone in past times where the equipment required a large degree of alignment works for low pressure and high pressure fitment of on skid components.

This estimated installation time assumes the units are self-contained and fully skid mounted, the units are sealed and ready for pipe system hookup and attachment of driven units.

Mechanical installation time between 2800 and 3300 Man-hours inclusive of vendor representatives.

Always refer to the suppliers' recommendations and installation data when estimating a steam turbine installation; equipment supplied in component parts will require far more time to install.

Allow additional time for the installation of the driven units (generators, compressors etc.), piping systems, electrical hookup and wet commissioning. The installation of the finished insulated pipe systems will generally require more Man-hours than the mechanical installation of this unit.

The bulk of the Man-hours attributed to the installation of a steam turbine system is the piping and associated driven equipment; the mechanical installation of a skid mounted unit is explained below. Times may appear long for some tasks but this is due to the fine tolerances required.