BOX JACKING EXPLANATION

- •It is the process in which a pre-cast R.C.C box or a rigid box is pushed into the soil withthe help of hydraulic jacks
- •It is non-intrusive method beneath the existing surface.
- •It is more often used when a subway or a aqueduct or a underground structure is to be constructed.
- •It enables the traffic flow without disruption.

METHODS OF BOX JACKING

Box Jacking

- Non –intrusive method beneath existing surface infrastructure
- Frequently used where an existing road or rail tracks is an embankment and spaceexists for the structure to be cast at the side
- Enables traffic flows to be maintained disruption

Procedure

- It involves the advancement of a site-cast rectangular or other shaped box using highcapacity hydraulic jacks.
- An open ended reinforced concrete box is cast on a jacking base.
- A purpose designed tunneling shield is provided at its leading end and thrust jacks are provided at its rear end reacting against a

jacking slab

- The box is then jacked carefully through the ground
- Excavation and jacking take place in small increments of advance.
- Measure are taken to ensure stability of the tunnel face and to prevent the ground from being dragged forward by the advancing box
- When the box has reached its final position the shield and jacking equipment areremoved.

R.C.C box jacking

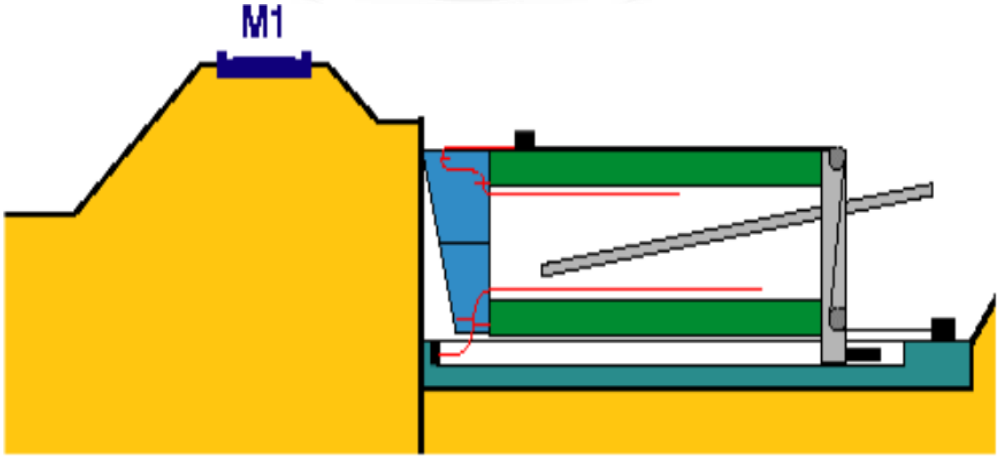
- Is adopted where it is not possible to constructed in situ R.C.C boxes
- These boxes are used for canal siphon, road under bridge and culvert for conveyingwater/service pipes
- The box is provided with a shield in front in front called “Front shield”

Which pierces through the soil by cutting

R.C.C BOX JACKING

- •First the box section is designed and cast at the site or can be transported to the site according to the requirement.
- •The foundation boxes are jacked into the ground designed to carry the dead and the live loads.
- •Then the high capacity jacks are placed at the back and it pushes the box into the ground.
- •A purpose designed tunneling shield is provided in the front end.
- •Then the box is jacked carefully through the earth.
- •Excavation and jacking are done in small increments in advance.
- •Measures should be taken to prevent the soil being dragged towards the box.

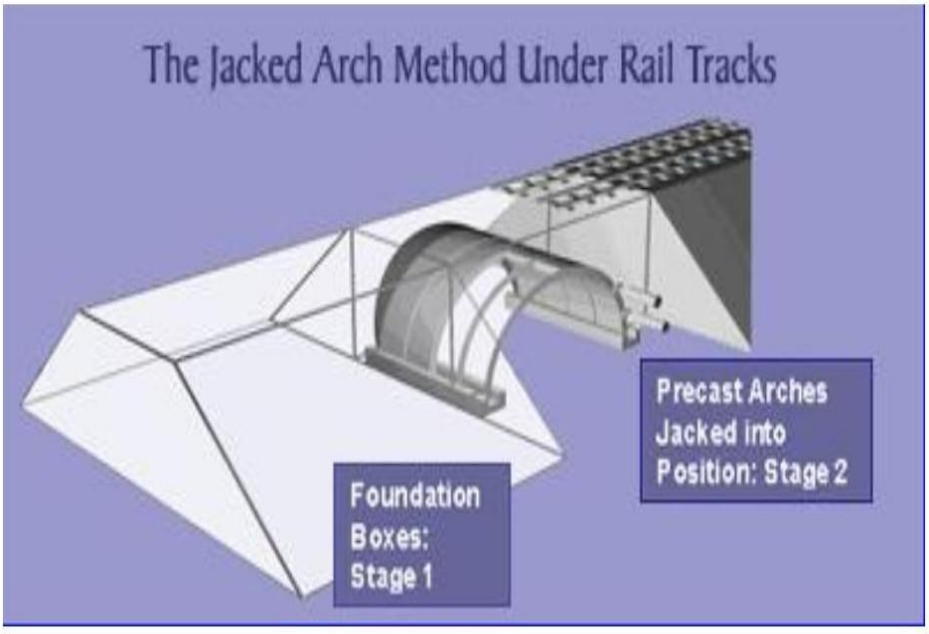
R.C.C BOX JACKING



Throustboring method

- Is a process of simultaneously jacking pipe through the earth while removing the soil inside the encasement by means of a rotating auger.
- In unstable soil conditions, the end of the auger is kept retracted back inside theencasement so as not to cause voids.
- In stable conditions, the auger can be successfully extended beyond the end of the encasement.

ARCHED JACKING



THRUST BORING METHOD

- •It is a process of simultaneously jacking the pipe through the earth while removing the earth inside the box by means of a rotating auger.
- •Unstable conditions- the end of auger is kept retracted inside the encasement so as not tocause voids.
- •Stable conditions- the auger can be successfully extended beyond the encasement.
- •This can be successfully used in any kind of soil conditions.

PROBLEMS ENCOUNTERED IN JACKING

- •Settlement of the above ground.
- •Seepage of ground water.
- •Caving in of soil etc.

FREEZING OF GROUN

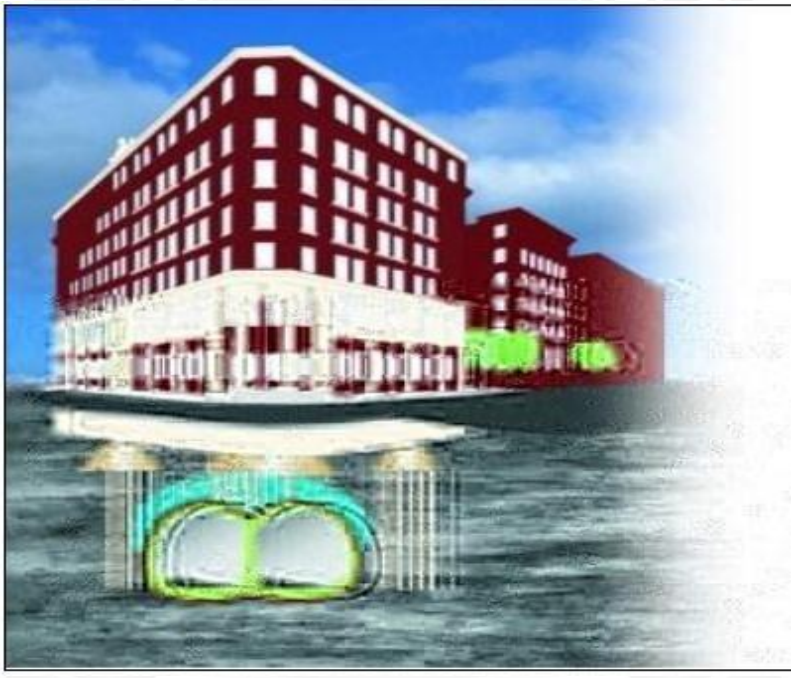
- •This method is used when we encounter the problem of ground water seepage and settlement of ground.
- •In this method a brine solution is continuously passed through the pipes fixed in the soil.
- •The temperature of the brine would be -30°c.
- •So when this brine solution is circulated through these pipes it freezes the ground and the ground behaves like an ice block.
- •The spacing of the freezing pipes will vary according to the type of soil, its permeability and other factors.
- •Generally it is kept at a spacing of 1.2 m

PROBLEMS IN FREEZING

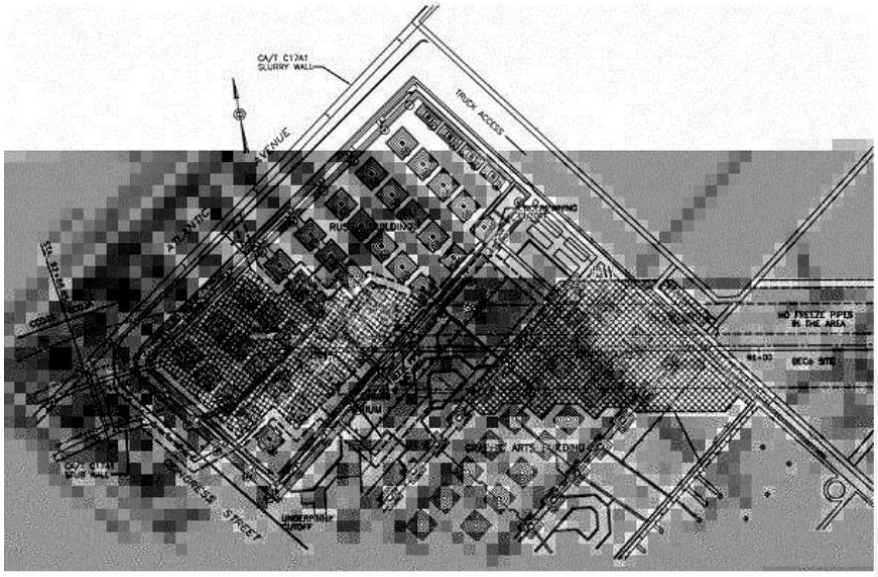
- •The main problem in the freezing method is the UPHEAVING of the above ground.
- •To avoid the upheavement problem we should be careful in the ground freezing processand the temperature of the brine solution.

CASE STUDY - SOUTHERN BOSTON PIERS TRANSIT WAY

- •The carriageway has to go beneath – a Russian building,100 year old
- •2m thick soil was frozen.
- •Under pinning was also done using mini piles.



PLAN OF THE RUSSIAN BUILDING



ADVANTAGES

- •Timely completion of project.
- •No disruption of traffic.
- •No need to divert the traffic.

DISADVANTAGES

- •Cost of project increases.
- •Skilled personnel required.
- •Safety precautions to be done properly.

PIPE JACKING

ABOUT THE TECHNIQUE

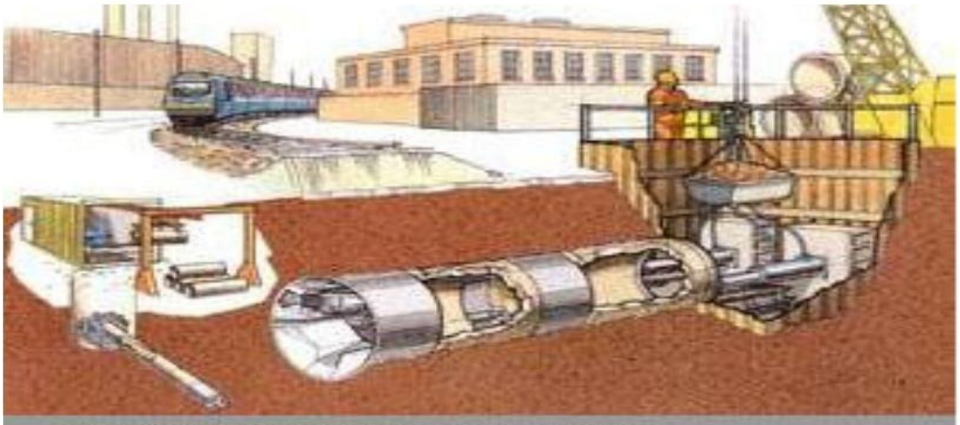
- •It is generally referred as “Micro tunneling”
- •Pipes are pushed through the ground behind the shield using powerful jacks.
- •Simultaneously excavation takes place within the shield.
- •This process is continued until the pipeline is completed.
- •The method provides a flexible, structural, watertight, finished pipeline as the tunnel isexcavated.
- •No theoretical limit to the length of individual pipelines.
- •Pipes range from 150mm to 3000mm diameter can be installed in straight line or incurvature.
- •Thrust wall is provided for the reaction of the jacks.
- •In case of poor soil, the thrust wall may punch inside the soil.
- •Then piles or ground anchoring methods can be used.

PROCEDURE

- •The thrust pit and the reception pit are excavated at the required places.
- •Then the thrust wall is set up in the thrust pit according to the requirement.
- •In case of mechanized excavations, a very large pit is required.

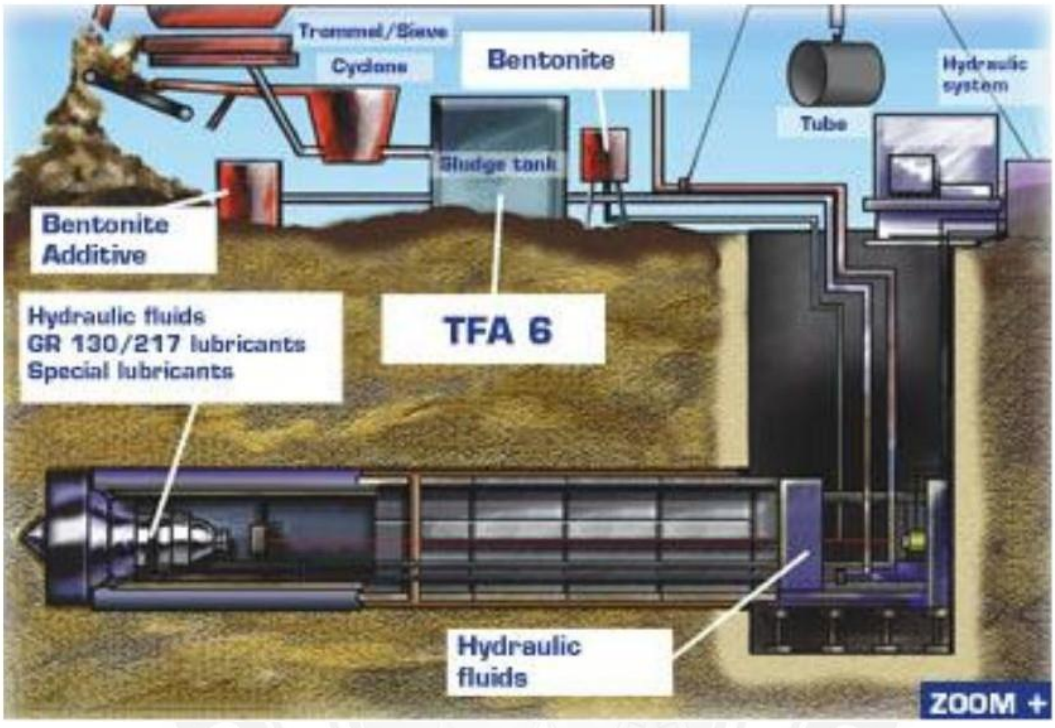
- •But in case of manual excavation, a small pit is enough.
- •Thrust ring is provided to ensure the even distribution of stress along the circumference of the pipe.
- •The number of jacks vary upon the frictional resistance of the soil, strength of pipes etc.,
- •The size of the reception pit is to be big enough to receive the jacking shield.
- •To maintain the accuracy of alignment a steer able shield is used during the pipe jacking.
- •In case of small and short distance excavations, ordinary survey method is sufficient.
- •But in case of long excavations, remote sensing and other techniques can be used.

GENERAL ARRANGEMENTS

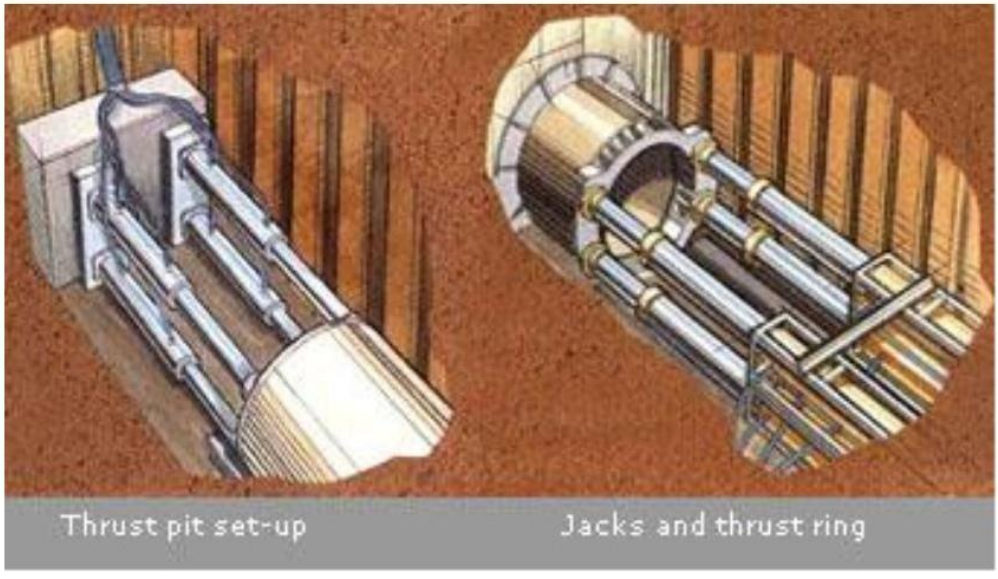


General arrangements of pipe jacking and microtunelling systems

PIPE JACKING SETUP

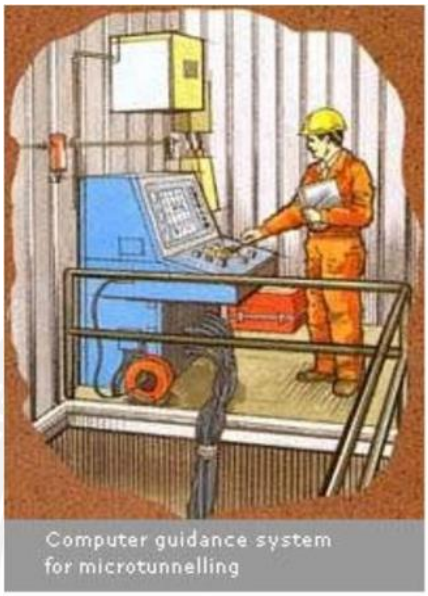


THRUST SETUP



COMPUTER GUIDANCE SYSTEM

- •The computer system enables us to control the work remotely.



Computer guidance system for microtunnelling

ADVANTAGES

- •It avoids the excavation of trenches. So it is also called as “Trench less Technique”.
- •There won’t be any leak problems in the future.
- •Timely finish of projects.

DISADVANTAGES

- •Very costly method.
- •Skilled personnel is required.