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 with the 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 space exists 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 high capacity 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.
- Measures 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 are removed.

**R.C.C box jacking**

- Is adopted where it is not possible to construct in situ R.C.C boxes
- These boxes are used for canal siphon, road under bridge and culvert for conveying water/service pipes
- The box is provided with a shield 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 the encasement so as not to cause voids.
- In stable conditions, the auger can be successfully extended beyond the end of the encasement.
ARCHED JACKING

- 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 to cause voids.
- Stable conditions - the auger can be successfully extended beyond the encasement.
- This can be successfully used in any kind of soil conditions.

THRUST BORING METHOD
PROBLEMS ENCOUNTERED IN JACKING

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

FREEZING OF GROUND

- 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 -30ºc.
- 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 process and 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 is excavated.
- No theoretical limit to the length of individual pipelines.
- Pipes range from 150mm to 3000mm diameter can be installed in straight line or incuration.
- 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 steerable 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
PIPE JACKING SETUP

THRUST SETUP
COMPUTER GUIDANCE SYSTEM

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

ADVANTAGES

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

DISADVANTAGES

- Very costly method.
- Skilled personnel is required.