

# JUST FOR U.S.\*

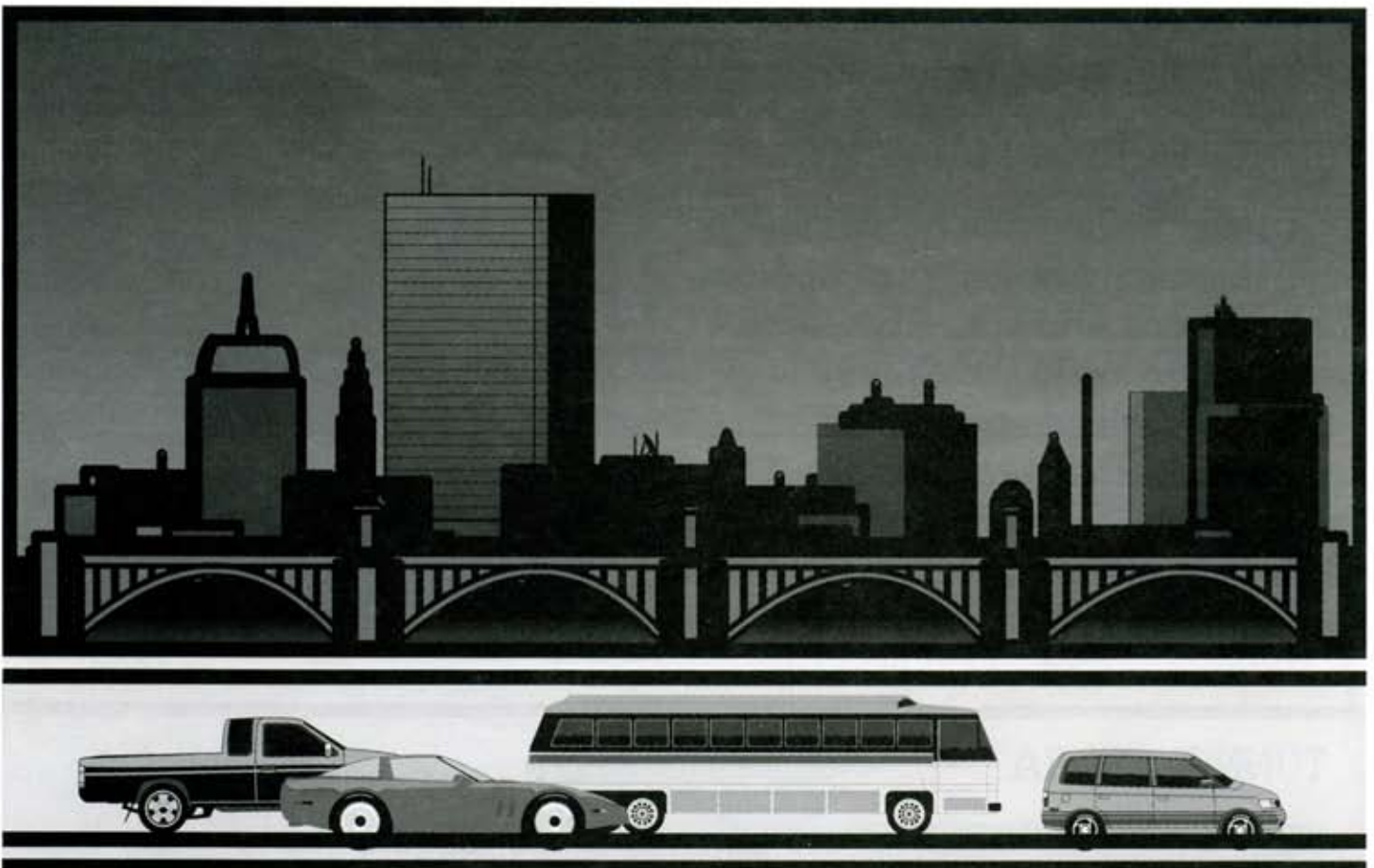
GRADES 4 - 5

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## THE BIG DIG



There are traffic problems in cities all around the United States, including Atlanta. In Boston, Massachusetts, city planners have come up with a new solution. Build tunnels under the city. This is no simple task. They need to build tunnels under water, under roads, even under train tracks. They call this project **THE BIG DIG!**

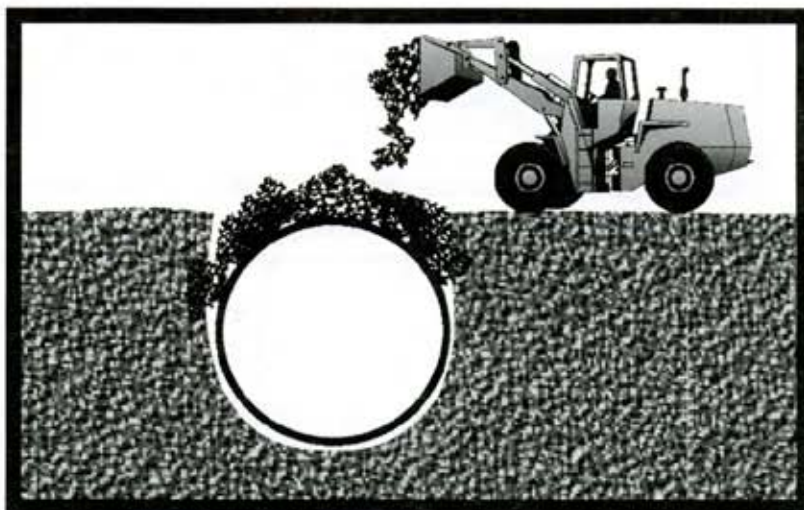
## HERE IS THE CHALLENGE OF THE BIG DIG.

Workers must build tunnels under Boston without shutting down the city. This is not easy! They must dig without destroying the roads, subways and railroads already there. For this reason, builders cannot use the most common tunneling techniques. Instead they must use more difficult methods.

## TWO COMMON WAYS TO BUILD TUNNELS

### CUT AND COVER

This method is the simplest. Cut out a big ditch. Place pre-made tunnel pieces in the ditch. Connect the pieces. Then cover them with soil. The tunnel is complete! "Cut and Cover" is a common way to build subway tunnels.



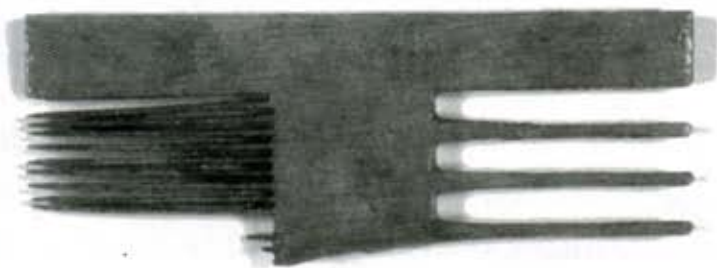
### TUNNEL BORING MACHINES

Tunnel Boring Machines (TBMs) have large blades that turn and cut through rock and soil. This TBM was used to build the Chunnel between England and France. It has a shield that prevents the ground from collapsing on builders while they work. This TBM is 28 feet across!



©Eurotunnel

### TUNNEL TRIVIA

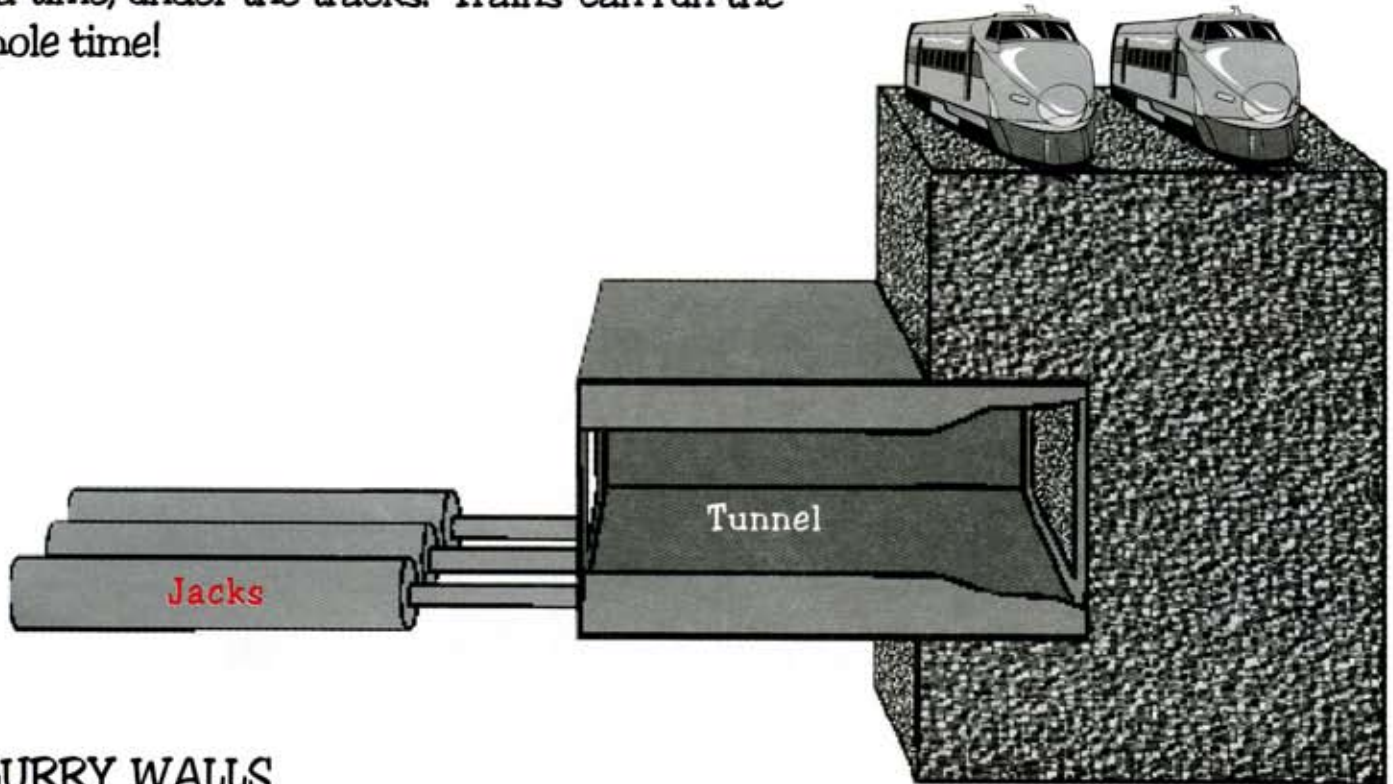


At some construction sites before digging starts, archeologists (AR-KEY-OL-OH-JISTS) inspect the area to save buried objects. This lice comb from the 1600's was found at the **BIG DIG**.

## TWO SPECIAL METHODS USED IN THE BIG DIG

### TUNNEL JACKING

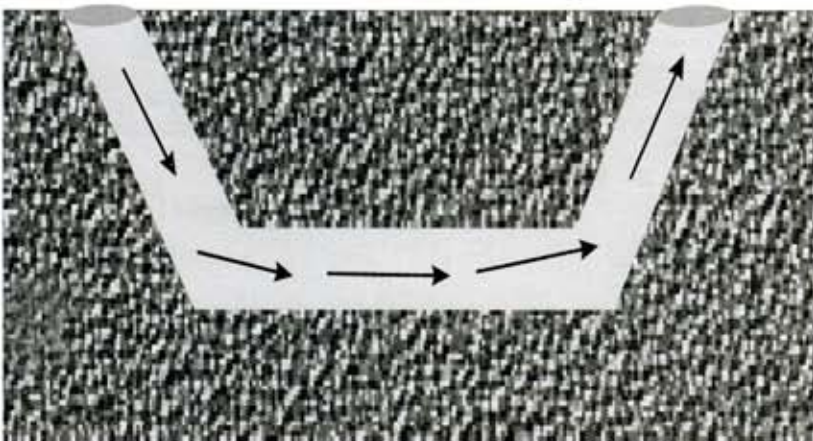
Tunnel jacking is needed to push tunnel sections under railroad tracks. Each section is built in a pit near the tracks. Then jacks push the section, 3 feet at a time, under the tracks. Trains can run the whole time!



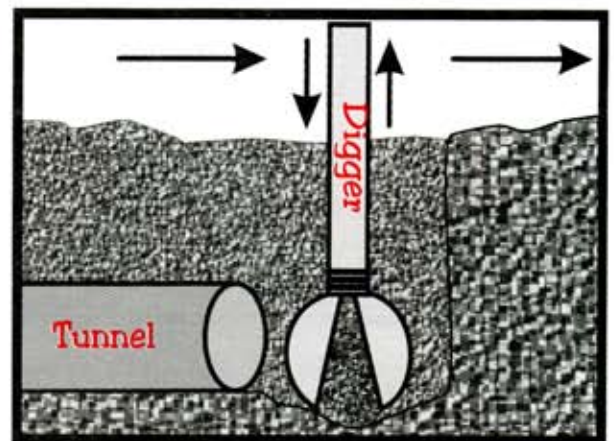
### SLURRY WALLS

Slurry walls are needed to build deep tunnels in narrow spaces. Diggers make a deep hole that is only 10 feet wide. Slurry, a mixture of clay and water, is pumped in so the walls of the hole do not collapse. The walls are reinforced with steel. The slurry is pumped out and 10 feet of tunnel are built. Another 10 feet are dug and more slurry is put in. More tunnel is built.

Most tunnel walls are dug like this.



Slurry walls are dug like this.



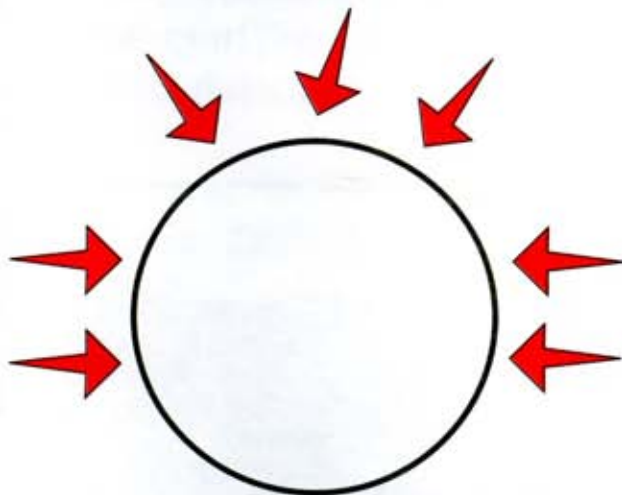
The first tunnel finished in the Big Dig doesn't go under the city. It goes under Boston Harbor. Workers used the "sunken tube" method. A big ditch was dug in the ground under the water with dredging machines. Tunnel tubes with caps on the ends were pre-made on land and floated over on barges. The tubes were placed under water in the ditch. The caps kept water out. Divers attached the tubes together. The caps were then removed and the tubes were covered with soil.



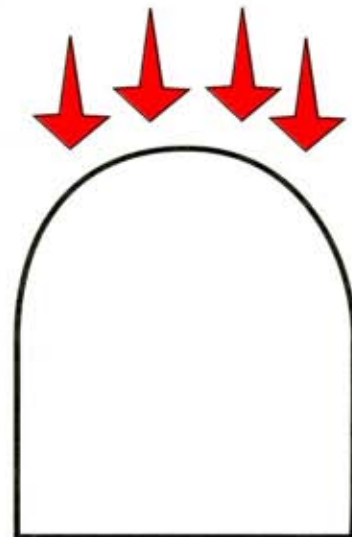
These tubes floated over from Maryland! Find Massachusetts and Maryland on a map to see how far that is!

*Tunnel tubes with caps*

The shape of this tunnel is round. This is the best shape for soft soil because the tunnel is squeezed on the top and sides by the soil.



An arched shape is better in firm soil and rock. Pressure comes mainly from above.



A lot of planning has to be done to build a strong safe tunnel. Think about that next time you go through one!

# JUST NEWS



## PROJECT UPDATE

THE BIG DIG PROJECT in its final stages of construction remains the largest and most complex highway and tunnel project in the nation's history. To follow the progress of THE BIG DIG PROJECT and to see great pictures go to the Massachusetts Turnpike Authority web site, [www.masspike.com/bigdig/updates/index.html](http://www.masspike.com/bigdig/updates/index.html).



# TUNNEL FUN

Subways are one of the most common places to go through tunnels. In Sillytown, subway lines are not straight. Michael needs your help. Write in the red boxes which subway line he should take to...

Ride a ferris wheel

Visit his friend



- 1
- 2
- 3
- 4
- 5
- 6

Go swimming

Learn math

See the doctor

Play in the park

