Underground solutions for city infrastructure; a general discussion.

Topics

+ **Uses**
+ **Benefits**
+ **Innovations**
+ **Infrastructure Choices**

Prepared by the Benefits of Going Underground Committee of the Underground Construction Association a Division of the Society of Mining Engineers.
USES

Examples of surface infrastructure that can go underground.
Rapid transit delivering:
Rider Comfort
Reliable Commutes
Year-round Operability

New Urban Infrastructure

Subway and Railroad Tunnels
TRAFFIC ROUTES PROVIDING:
Reduced neighborhood impact
Controlled service conditions
More efficient traffic flow

NEW URBAN INFRASTRUCTURE
Road Tunnels
PORTLAND OREGON

A new tunnel network keeps waterways clean.

NEW URBAN INFRASTRUCTURE

Sewer Tunnels
WASHINGTON DC

Tunnels will control overflows and flooding.
Tunnels are resilient structures for hosting critical service networks for water, wastewater, gas, power communications, etc.

Utility Tunnels

“Future generations of New Yorkers will have the clean and reliable supply of drinking water essential for our growing city.”

- Mayor Michael R. Bloomberg
Many types of facilities can be housed underground.
BENEFITS
Tunnels provide safe and efficient alignments under natural barriers and constructed areas. Improving transit and network connections.

Connecting Communities
BENEFITS

Tunnels reduce city congestion and improve
the urban environment for pedestrians and
bikers.

Providing drivers with shorter, faster travel
options. Improved circulation and added
capacity.

NEW URBAN INFRASTRUCTURE

Relieving street-
level gridlock
Underground mass transit offers city travelers efficient commutes and inter-modal transfer.

Predictable transit times in a congested footprint. Cities with subways want more subway.
Revisiting the City

NEW URBAN INFRASTRUCTURE

Replacing aging infrastructure with an underground alternative can return surface space to the citizens.

Preserving the integrity of heritage structures.
Tunnels maintain green space and limit land takes.

Subsurface sites offer sustainable, energy efficiency models.
Surface construction disrupts city business, damages adjoining structures and pollutes.

Tunnel work minimizes neighborhood impacts.

Maximum Tunneling = Minimum Disturbance
Siting new infrastructure underground offers urban planners opportunities for high density development.

Delivering sustainable solutions that reduce sprawl and generate new residential and business revenue.
INNOVATIONS
Ground support systems reliably stabilize a wide range of adverse construction conditions.

Innovations

Ground Stabilization Methods

Sprayed Concrete

Pre-Cast Segmental Liners
Tunnel Boring Machines (TBM’s) and one-pass liners deliver dry tunnel subject to high external water pressures.

A tunnel is no longer a structure that “leaks.”
TBM advance rates over one mile per month have been achieved under favorable ground conditions.

TBM technology is proven over a wide range of ground conditions and excavated diameters.
Examples of Large Diameter TBM Projects

- Elbe River 4th Road Tunnel
- Oahe Dam Tunnel / South Dakota
- Niagra Pressure Tunnel Canada
- Tunnel & Reservoir Plan / Chicago
- Sparvo Road Tunnel, Italy
Increments in Maximum TBM Diameter

TBM advance rates over one mile per month have been achieved under favorable ground conditions.

TBM technology is proven over a wide range of ground conditions and excavated diameters.

Built in 1904 / Still in regular service

Built in 1945 / To be replaced by a tunnel
Improved Contract Practices

New tunnel contract guidelines facilitate better management of underground risks; increasing confidence in the procurement process and construction outcome.

“A Code of Practice for Risk Management of Tunnel Works.”

“Geotechnical Baseline Reports for Construction.”
American Society of Civil Engineers, 2007

Society of Mining Engineers, 2008
INFRASTRUCTURE CHOICES
The Community’s Choice

For Users:  
More efficient, comfortable commutes.

For Residents:  
Space returned to civic use.
The Operator’s Choice

Well-controlled operating environment.

Reliable, cost-competitive solutions to many contemporary urban infrastructure problems.
The Builder’s Choice

Methods are robust and outcomes predictable.

The number and size of tunnel contracts let in the US is increasing.

More contractors compete for more work.
Underground alignments improve infrastructure operation and create more livable cityscapes.

**Underground: A Win:Win Solution**

Without a tunnel

With a tunnel
CITIES ARE RUNNING OUT OF SPACE
Time to Go Underground
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UCA represents the underground construction industry; Owners, Contractors, Designers, Manufacturers, Suppliers, and others with an interest in underground construction.

UCA serves its members by advocating the responsible and cost-effective use of underground structures to improve the value and sustainability of public space.