Buried Infrastructure Asset Management – Dealing with System Interdependencies

Streets for the 21st Century

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Surface urban transport infrastructures – roads, cycle ways, pedestrian areas, tramways – are vital to a city’s function.

Since the utility services infrastructure that supports city living is typically buried beneath the surface transport infrastructure ...

... streetworks to install, replace, repair or maintain the utility infrastructure comes into conflict with the city’s movements.

In particular, using traditional (i.e. open cut) techniques disrupts, and often significantly damages, the transport infrastructure ...

... and the ground on which it bears

... and the ground in which the utility infrastructure is buried

... if the ground properties change, or the ground moves, the adjacent / overlying infrastructure responds accordingly.
Physical Interdependencies

A leaking water pipe can erode and weaken the soil
...leading to road failure

May 2016 – Florence (Italy)
Open Trench – The basics haven’t changed
Open Trench

... but they are getting narrower
Soil A

Soil B

Granular Blanket surrounding the pipe to prevent point loads.

Road structure made up of granular base course with overlaying grades of tarmac.

Compaction layers

1 – 4 m deep

0.5-2m wide.

The width of a trench has to be relative to the size of pipe as well as the installation working room.
Impact of Trenching

- Lateral stress relieve...
- Ground movement... especially when subject to different weather (drying/wetting)
- Softening/weakening of the ground

⇒ Poor support for buried and surface infrastructure
⇒ Differential settlement resulting in failure of existing, long, linear infrastructures
Impact of Trenching

• Increased water ingress
• Reduction of support of road infrastructure
• Reduction of road life (long-term damage)

➤ Pristine road/subbase system: ~15-20 years
➤ Well reinstated road: ~8 years
➤ Poorly reinstated road: ~6 years
Trenchless Installation

It is often very important to understand the type of ground the trenchless technology is passing through to get an accurate survey.

The field of interference caused by trenchless technology is much less than traditional methods making detection harder.
Trenchless Technology

Pipe jacking

Monitoring ground movements
Pipe Splitting

Monitoring ground movements

Field Data (Sec 2 J1, nominal 210 degree blade angle)

Input Parameters
- \( d = 155 \text{ mm} \)
- \( D = 230 \text{ mm} \)
- \( Z = 0.814 \text{ m} \)
- \( \alpha = 218.5 \text{ mm} \)
- \( b = 115.0 \text{ mm} \)
- \( K = 13.8 \)
Summary

• Surface Infrastructure, Subsurface Infrastructure and the Ground exist in symbiosis
• Open trenching impacts the life of the road
• Trenchless technologies have less impact

➡ Vital to view it as a holistic system
Thank You

Any Questions?

More information can be found at
www.mappingtheunderworld.ac.uk
www.assessingtheunderworld.org