

DETAILS OF INTERESTING CLAIM

(From Tunnel Boring Machine (TBM) applications in soft ground conditions - IMIA Paper WGP18 (01)E)

No: DOIC27 (CAR)

Type of Insurance:

CAR

Description of damaged item:

The distortion of wastewater transfer tunnels

Cause of Loss:

(9) Other external causes

Claim Cost

65 € Mio

Description of Incident and Loss Prevention Measures initiated:

Close to a vertical shaft, distortion was encountered for approx. 15 m of recently completed tunnel, causing seepage of silt and water. Further investigation showed that apart from this distortion, approx. 100 m of the tunnel was still intact but had dropped into the void created by the underlying bed of fine sand that poured into the tunnel due to high groundwater pressure during lining failure. As a consequence, the shield machine was trapped.

Management and all parties involved reacted immediately and tried to stabilise the situation:

- tunnel area stabilised by 2 bar compressed air, followed later by filling the section with water to stop further pouring of sand into the tunnel.
- checking the already completed 8 km of tunnel; no evidence of distortion
- checking the surroundings; no residential properties affected by the subsidence
- works stopped
- parallel investigation started to evaluate possible methods to stabilise the ground and further procedures. Ground freezing selected among several alternatives.

Additional works carried out after immediate measures were in place:

- 3 stage advance (crown, bench, invert) in frozen ground in one metre steps lining by shotcrete with additional insulation
- layer between frozen ground and lining.
- heating of mixture aggregates to 40°C.
- secondary lining applied in 20 m steps and featuring original inner diameter.
- Shield machine used on the second contract phase has, after finishing his works, been relocated, in a new additional shaft and will work backwards to gain access to the trapped shield machine.

Situation - The wastewater plant is in operation at 50% capacity only. Full commissioning delayed The amount for the material damage only (still pending), is expected to be approx. EU 65 m.

Outline the interesting or unusual aspects of this claim or problems experienced during settlement:

Out of these two cases we have extracted almost all the issues of concern regarding

the difficulties to insure tunnels in soft soil conditions:

- An incident can occur despite sound and professional preliminary studies, careful analysis and above average documentation. Geological factors especially in soft ground pose certain unpredictability.
- A tunnel is always part of a system and might be the bottle neck, therefore the DSU exposure increases, even if in those cases the cover was not granted. Nevertheless a substantial delay caused a considerable financial loss to the principal.
- In general, underground events and even more so, those involving SM demand professional management and pre-determined procedures.

CODES

1. Type of Insurance

M - Machinery Breakdown

BE - Boiler Explosion

LP (M) M - Loss of Profits

ALOP (DSU) - Advance Loss of Profits

EAR - Erection All Risks

CAR - Contractors All Risks (Civil)

G - Guarantee

EE - Electronic Equipment

O - Other Classes

2. Cause of Loss

(1) Faulty operation

(2) Faulty material or workmanship

(3) Faulty design

(4) Other internal causes

(5) Fire

(6) Explosion

(7) Storm

(8) Earthquake

(9) Other external causes

(10) Other causes or unknown