

## DETAILS OF INTERESTING CLAIM

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

No: DOIC28 (CAR)

### Type of Insurance:

CAR

### Description of damaged item:

Two buildings destroyed resulting from the ground collapse during the tunnel boring

### Cause of Loss:

(1) Faulty operation

### Claim Cost

3 € Mio

### Description of Incident and Loss Prevention Measures initiated:

Tunnel at a depth of around 25 m. In this area, the buildings and stores are described as historic to some extent. A few days earlier, a minor incident forced the shield tunnel boring machine (SM) to halt to fill a cavity of around 15 m<sup>3</sup> due to over excavation. At restart, water ingress on front of excavated tunnel, subsequent water inflow in the SM. A fatal injury resulted when a third party fell into the crater, roughly 8 m x 8 m x 6 m depth, resulting from the ground collapse. Two buildings totally destroyed, and major structural damage encountered in two other buildings and to other third parties properties already affected by the previous incident. Relocation of tenants for about one year until the buildings were rebuilt; other tenants in hotels for months.

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

Investigations on the causes are still incomplete, but technical and procedural questions of general importance have been asked and discussed with experts. Some of the preliminary findings:

- Not all reasonable safety measures may have been adopted in line with the situation, more soil improvement or additional soil investigations should have been performed
- Bearing in mind the high level of exposure for the buildings, the presence of wells should have led to prevention measures for possible instabilities
- SM passing changed the ground conditions by increasing the alteration degree, water ingress under pressure and the occurrence of significant over excavation.
- Worsening ground conditions means a significant divergence from what was foreseen in the project.
- Alarm established for overexcavation, comparing the weight of the theoretical volume to be excavated and the actually extracted excavated weight should have been established.
- Soil indications such as water ingress, ground settlement, change of pressure at cutter wheel deserve interpretation, the question of being under pressure to continue versus security/safety considerations has been raised.
- Vulnerability of these buildings indicated in the survey as low risk, must be revised taking into account the soil conditions

- Questions arose whether halting the SM was a wise decision (fourth incident). Was the option to continue boring an alternative?

The government intervened after the fatality, interrupting the works and investigating responsibilities. The amount of the material damage is negligible but for the TPL (still pending) is expected to be approximately EU 3 m.

## **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