It can be concluded that the Zalau power plant ash can be used in mortar compositions 5 wt% replacement of cement by ash brings both economical and qualitative benefits.

Protection measures against geological failures, during the construction of Thessaloniki - Kavala Section of Egnatia Highway in N. Greece

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The present paper refers to the major part of the Egnatia highway, about 100 km long, which connects Thessaloniki and Kavala cities in North Greece. Actually, it is divided in three parts: i) Nymphopetra-Asprovalta, about 40 km long, ii) Asprovalta-Strymonas, about 20 km long and iii) Strymonas-St. Andreas, about 40 km long. The highway has already been constructed. Driving from the west to the east, the highway, at the beginning of Nymphopetra-Strymonas part, passes nearby Volvi lake, at the foot of Vertiscos Mountains. Easterly, it passes through Kerdillia Mountains, Strymona's river and it leads to Pangeo's mountain, ending through Symbol Mountains. The highway also passes through five tunnels; i) Vrasna tunnel, which is located at Nymphopetra – Asprovalta's part, ii) Asprovalta's tunnels, which are three tunnels locating at Asprovalta – Strymona's part and iii) Symbol tunnel, which is located at the last Strymonas – st. Andrea's part. The paper describes the support measures against geological failures during the construction of the highway. For this purpose, the mechanisms of sliding and rock falling procedures were studied. As far as slopes concern, the orientation of the discontinuities and the poor quality of the rock mass, that creates cyclic sliding, were responsible for the instabilities. Rainfall also helps landslides to be occurred. During the tunnelling excavation, the sliding along a plane, the décollement from the roof and the fall of wedges were the common failure causes.

Historical faulting in Aghios Konstantinos area (central Greece), based on archaeological indications

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Aghios Konstantinos lies on the foothills of the Atalanti fault system scarps. The area is located in central Greece and the fault system is the primary morphology-controlling agent. It defines the west shoreline of northern Euboea gulf and is associated with several historical earthquakes.

Morphologically this zone forms steep high bedrock scarps, on the foot of which extensive colluvial deposits are observed. Several minor fault scarps have been mapped and they were classified in three classes: a) bedrock fault scarps with visible fault plane, b) soft-sediment scarps with visible fault plane and c) soft-sediment scarps with no visible fault plane. The minor scarps are generally aligned in en échelon pattern, following the general WNW – ESE trend of the major fault zones, while their general dip direction is towards the NNE. Fault analysis shows that there is extensive tilting of hangingwall blocks, as well as of the minor faults themselves. Faults tend to "lock" with each other forming a complex pattern that is inherited to the overlying Upper Miocene-Pleistocene and Holocene sedimentary cover.

A small settlement was found at "Karvouna" site, west of Aghios Konstantinos, during the works performed for the construction of a new segment of E75 highway. This settlement comprises of low-lying houses, storage rooms and a small temple. A larger and more important temple was discovered in another location nearby. According to archaeological evidence, the settlement was active in classical and Hellenistic times, and sporadically afterwards. It was a rural settlement and numerous finds indicate at least three successive layers of buildings with stone foundations criss-crossing one another with no particular pattern.

The foundations of the buildings and the surrounding environs show many signs of episodic deformation, either direct or indirect. The most obvious cases are:

A surface rupture cutting through at least two foundations. It has a heave of up to 3 cm and a slight normal displacement.

Several basal walls and foundations have been found tilted and deformed. Tilting is as high as 30^o off vertical.

A small temple that is located just outside the settlement shows signs of sudden destruction: roof tiles are being found in and around the temple. They are roughly retaining the space that they had on the roof, which is an indication that the wooden roof collapsed. Also, one of the entrance pillars seems displaced both vertically as well as left-laterally. This displacement vector is compatible with the general fault displacement vector in the area.

An artificial cross-section at the stream that bisects the settlement shows an exposure of a normal fault system that deforms a series of paleoseoils and runs through the settlement, parallel to the main fault. Paleoseismological analysis of the cross-section shows that this fault system was not active in historical times, although the southwesternmost strand of the system roughly coincides with the surface rupture.

The position of the settlement on a rather steep slope, as well as the nature of finds, indicate a severe topographical amplification of the effects. Nevertheless, we believe that the primary deformational cause was faulting, evidence of which has been found in the cross-section that was consequently amplified by gravitational effects.

Urban paleoseismology: case studies from Thessaloniki, Greece

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Faults in urban areas pose a real danger for buildings and infrastructures, not only in the case of an earthquake, but also in such cases as differential sediment compaction, water overpumping, etc. Their importance is often underestimated with sometimes severe consequences.

Detection of faults is not easy in urban environments, as usually outcrops have been covered by built structures, prohibiting direct observations. Geophysical surveys are rare, but even in those cases the exact location of a surface-intercepting fault is not clear.

One of the most promising methods for acquiring quantitative information about faults in urban areas is paleoseismological investigation. It consists of an integrated set of methodologies that can provide hands-on data for displacement, timing, etc. In this paper we present two cases of paleoseismological applications in the metropolitan area of Thessaloniki. Two faults, one evident and one unknown, have been studied in Peraia and Kalamaria respectively.

<u>Peraia fault</u>: This fault defines the contact between the footwall Pliocene sandstone-marl series and the hangingwall loose Holocene deposits. It is a fault that coincides with the well known Anthemountas fault zone, a roughly E-W trending normal fault zone that is associated with several historical earthquakes. Its exact location through Peraia town was not known in much detail due to the lack of outcrops. Nevertheless, it forms a well defined scarp that divides the town into an upper (Ano) and lower (Kato) part. In 2005 and 2006 a set of surface ruptures along this fault caused significant damage on buildings and roads. Paleoseismological investigation with two trenches along the fault showed that faulting was not random, as a large displacement was detected, with successive steps of cumulative faulting. Borehole data confirmed that the total displacement was indeed large (35 m). Trenching showed that the fault has been continuously active during the Quaternary, with all