



SIKA AT WORK

Ionia Motorway

CONCRETE PRODUCTION: Sika® Plastiment®, Sika® ViscoCrete®, Sika® ViscoFlow®,
Sika® Sigunit®, SikaTard®, Sika® Separol®, Sika® Antisol®,
SikaFiber® PP 540/52

ANCHORING: Sikadur®, Sika® AnchorFix®

ELASTIC SEALING: Sikaflex®

WATERPROOFING: Sika® Waterbars®, Sikadur® Combiflex®, SikaSwell®

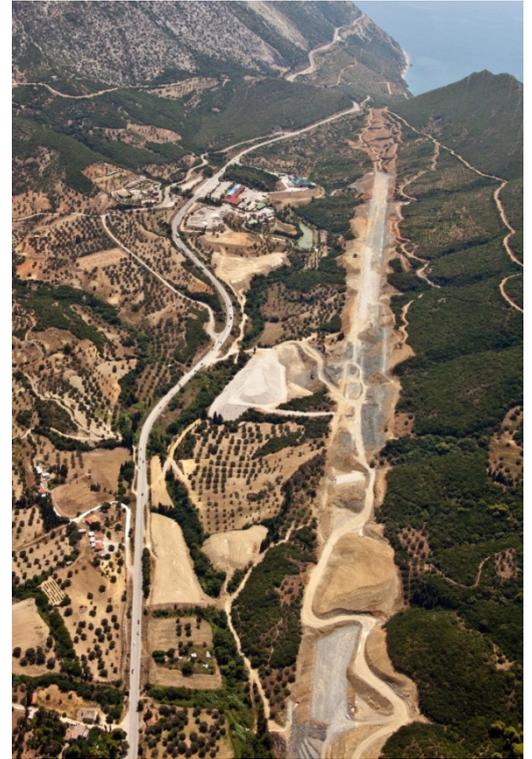
REPAIR: Sika® MonoTop, SikaGrout®

DECK BRIDGE WATERPROOFING: Sika BituSeal® T-130 SG BHR, Sikaplan® WP

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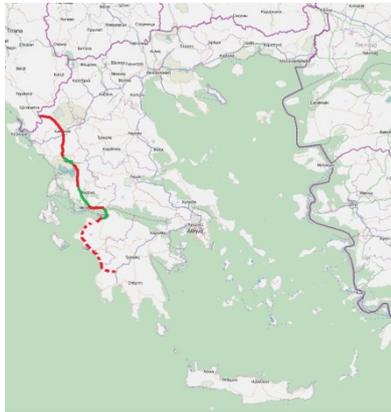


IONIA MOTORWAY



PROJECT DESCRIPTION

Ionia Motorway Motorway A5, A5) is an under construction motorway, in most of its length, in Greece with a 196km total length. It starts from Patras, near Rio, Achaia, will pass through Mesolongi, Agrinio, Amfilochia, Arta and will end at Ioannina where it will be connected with Egnatia Motorway. It forms part of the European Motorway 55 (E55) from Antirio up to the flyover of Amvrakia (junction with highway 52 or A52), while from there up to its connection with the Egnatia Motorway in Pedini node will actually form the European road 951 (E951). The main contractor is Nea Odos, which has undertaken also a section of the A1.



The districts that it passes through are: Aitoloakarnania, Arta, Preveza, and Ioannina. Its completion, which is scheduled to take place in March 2017, is expected to give a major boost to the region's development, which is considered, according to the EU data, one of the poorest in Europe.

When the project is completed, it will include:

- 196 km of motorway, with 2 lanes per direction, an emergency line and New Jersey partitions
- 19 flyovers
- 133 upper and underpasses
- 4 twin tunnels
- 24 bridges
- 4 main and 5 side tollbooths
- 5 emergency stations (4 in both directions)

The project's progress at the beginning of October 2016 was 85%.

PROJECT DEMANDS

The project is separated in the following sections:

1. Antirio – South end of Agrinio bypass, 42.9km length
 - ✓ 4 flyovers of modern geometry
 - ✓ 3 twin tunnels with a total length 4,400m (Makyeia tunnel 600m, Klokova tunnel 2,900m, Kalydona tunnel 900m) and other underground parts (cut and cover) with a total length of 700m
 - ✓ 41 bridges over 20m, total length 2,800m
 - ✓ 27 local area interchanges
2. Agrinio bypass – Arta bypass, 53 km length
 - ✓ 3 flyovers of modern geometry
 - ✓ 9 bridges over 20m, total length 1,100m
 - ✓ 37 local area interchanges
3. North End of Arta detour – Egnatia Motorway, 50 km length
 - ✓ 6 flyovers of modern geometry
 - ✓ 1 tunnel (Ampelia), 950m length
 - ✓ 17 bridges over 20m, total length 4,760m
 - ✓ 36 local area interchanges

Each part of the project featured its own specific requirements, due to the morphological characteristics of the area. Exceptional case was the Klokova tunnel. The Klokova (Paliouvouna) is the mountain that the driver sees immediately after Antirio. Today the existing road is literally hanging on the mountain and in most cases the passage of the mountain is in the form of "caravans", because if a truck is ahead, the car drivers are required to stay in the course of the road, because it is so narrow that no overtaking is possible.

The opening (drilling) was performed from both directions of the tunnel, in order to achieve rapid completion. On June 28, 2016, just 13 months after the drilling began, the tunnel was completely opened, breaking a huge record for Greece.



SIKA SOLUTION

In this project, Sika supplied a wide range of materials, but besides that, it formed a strong partner with continuous on-site presence, already from the design phase. In particular, we can distinguish the following major steps:

CONCRETE & SHOTCRETE PRODUCTION

- **Shotcrete for tunnel lining:** For all shotcrete mix designs, the basic requirements was the maintenance of early and final strengths on a high level, the reduced rebound, easiness in pumping and workability maintenance for a prolonged period – up to 3 hours! For all these demands, Sika supplied special superplasticizing admixtures / high range water reducers **Sika® ViscoCrete®** and **Sika® ViscoFlow®**, some of which were designed especially for the project demands at Sika Hellas' fully equipped Concrete Lab, with tests performed on aggregates and cements used on site.



Depending on the project's specification, there was a demand for use of alkali-free accelerators, while in some shotcrete mixes the synthetic macro-fibers **SikaFiber® PP 540/52**, were incorporated, due the major advantages / characteristics that distinguish them:



- Higher stress absorption
- Increased ability for plastic deformation of the shotcrete (increased safety)
- Much lesser dosage (2-4 kg/m³) in comparison with steel fibers, resulting in lower labor costs, faster mixing, ease of inventory management
- Uniform distribution in shotcrete's mass
- Problem management regarding pumpability
- Non corrosive
- Reduced equipment wear



- Increased personal safety
- Faster completion of the project, as grid placement work is not required
- Lower project costs due to reduced material and labor costs

At points with a low shotcrete thickness (<15cm), the FNARC energy absorption requirement was >550joule. This was achieved with 2 kg/m³ of **SikaFiber® PP 540/52** fibers.

At points with a shotcrete thickness 25-35cm, the FNARC energy absorption requirement was >800joule. This was achieved with 4 kg/m³ of **SikaFiber® PP 540/52** fibers.



- Unreinforced Tunnel Lining of Kalydona Tunnel: Sika formed the absolute contractor's partner in the design of the tunnel's unreinforced tunnel. A major assistant in this enthusiastic project was – once again – Sika Hellas' Concrete Laboratory, in which the whole study of the unreinforced tunnel lining was performed, using a specialized simulation program for the emitted hydration heat. The close collaboration between the two parts, led ultimately to the optimal choice for the mix design, based on the specific conditions prevailing on site and the raw materials that were to be used.
- Use of Sika Watertight® Concrete: All water reservoirs were constructed using Sika® Watertight Concrete Technology, combining 3rd generation superplasticizers and the special waterproofing admixture **Sika®-1+**.
- Concreting at Evinos & Tsagkaropoulou bridges: During the construction of these two bridges, there was a demand for high early strength development (>35MPa) 2 days after casting, due to the scheduled prestressing that had to take place.



BRIDGE DECK WATERPROOFING

For the deck waterproofing of the numerous bridges in the Ionia Motorway, the specially developed bituminous felt **Sika Bituseal® T-130 SG BHR** was used, a product that features special certifications regarding its use for road and rail bridge deck waterproofing according to EN 14695 and the synthetic membrane **Sikaplan® WP-1150 15HL**.



WATERPROOFING, REPAIRS, BASE PLATES, JOINT SEALING

Sika supplied in the project a major range of products for all requirements and needs encountered during the construction phase, including cementitious based repair mortars, joint sealants, rigid resin adhesives and anchoring products.

Also, the waterproofing of technical project sections was performed using the bituminous felt **Sika Bituseal® T225 PF**.



SIKA PRODUCTS IN VOLUMES:

- Concrete & Shotcrete production:

Superplasticizers: **Sika® ViscoCrete®** & **Sika® ViscoFlow®**: 1367 tns

Retarder: **Sika® Plastiment®**: 67 tns

Cement Hydration Stabilizer: **SikaTard®-930**: 40 tns

Synthetic Fibers: **SikaFibers®** & **SikaFiber® PP-540/52**: 16 tns

Shotcrete Accelerators: **Sika® Sigunit®**: 1257 tns

Curing compound: **Sika® Antisol®**: 71 tns

Concrete Waterproofing Admixture: **Sika®-1+**: 3 tns

- Joint waterproofing:

Waterbars: **Sika® Waterbar®**: 14,5 km

- Bridge Deck Waterproofing:

Bituminous membrane: **Sika® BituSeal T – 130 SG BHR**: 10,530 m²

Synthetic membrane: **Sikaplan® WP-1150 15 HL**: 2,940 m²

- Elastic joint sealing:

Polyurethane sealants: **Sikaflex®**: 26 km of joints

PROJECT PARTICIPANTS:

Project Owner: **Greek Public Sector**

Construction: **Nea Odos S.A.**

Contractor: **TERNA A.E.**





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Please consult the most recent Product Data Sheets prior to any use and processing.

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