SIKA AT WORK

Rail fixing system rehabilitation of Athens TRAM line, Urban Rail Transport SA (ΣΤΑ.ΣΥ. ΑΕ), N. Faliro, Attica region, Greece

EMBEDDED RAIL SYSTEM: Icosit® KC 330 Primer,
Icosit® KC 340/45

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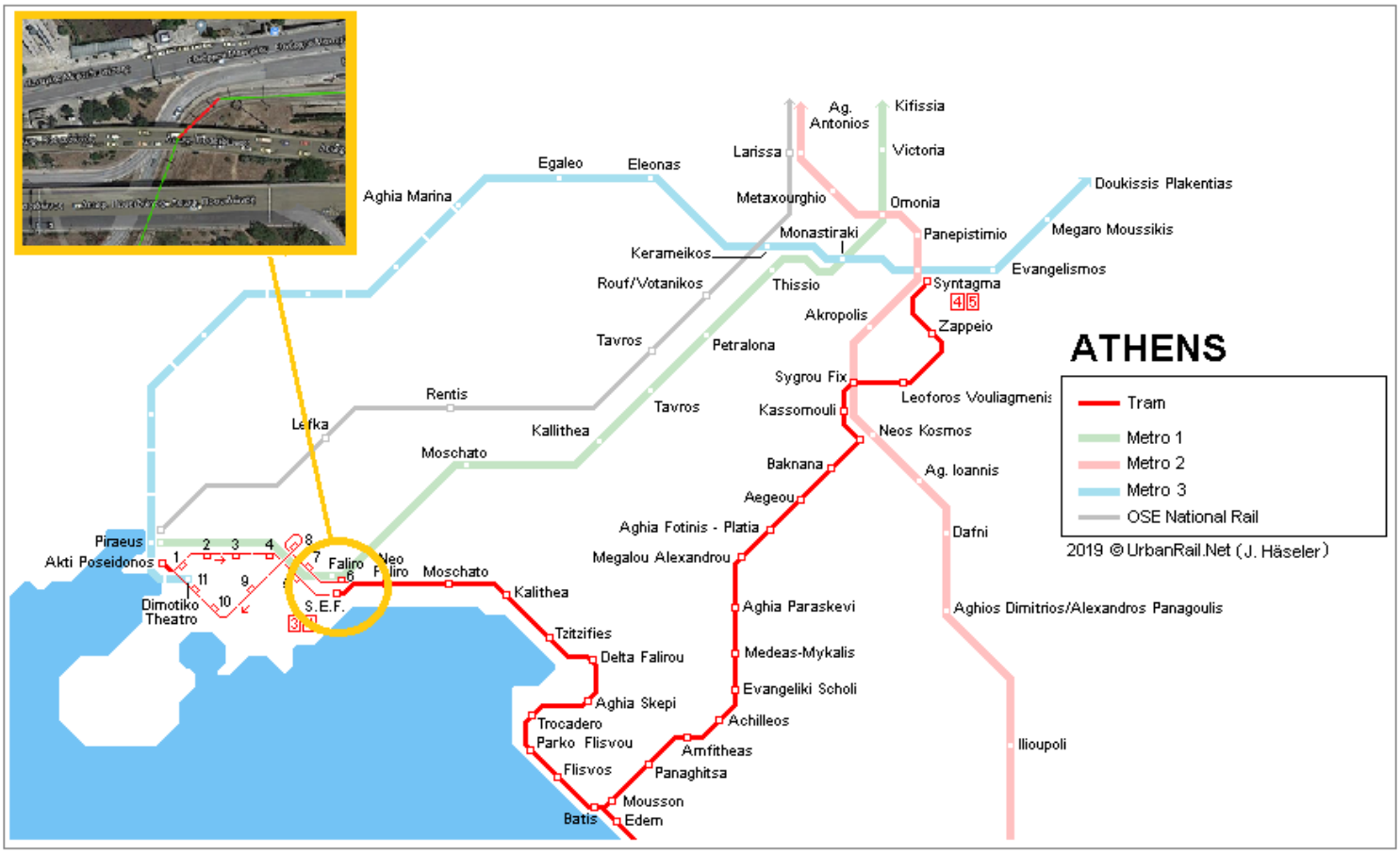
RAIL FIXING SYSTEM REHABILITATION – ATHENS TRAM LINE (URBAN RAIL TRANSPORT)

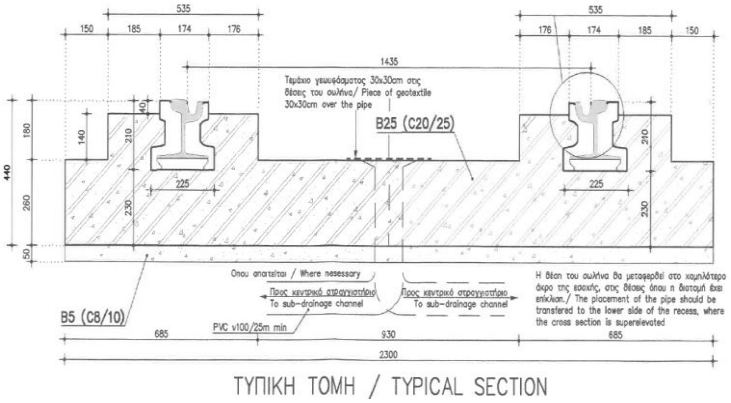


PROJECT DESCRIPTION

Moden Athens TRAM line system launched in 2004, a few weeks prior to the Athens 2004 Olympic Games, connecting Athens historical city centre (Syntagma square as starting point) with Attica region southern suburbs.

The tramway's network has 48 stops in total, three of which (namely ''SYNTAGMA, SEF & ASKLIPIIO VOULAS'') are terminal stops, while a new section from Neo Faliro to Piraeus (cyclical route) is planned to open during 2021.

The rail fixing system, which had been selected for most of the project, involved rail embedment into a specially preformed and prefabricated (jaqueted) elastomeric compound. The system had been installed along with the rails at the exact alignment, defined by the design, followed by post-concreting.



Post-concreting installation method, without using precast concrete slabs where the rails are embedded in, in combination with application issues can cause significant damage to concrete, such as concrete peeling or flaking, reinforcement corrosion and eventually water ingress in the embedding system.

In addition, where the rail alignment invloves sharp turns, significant damage occur on rails, resulting in need for their retreading/ restoration or even replacement.

Similar rail damage was located along 35-meter length of the 1 rail of the track, closely to SEF station, which was decided to be refurbished during TRAM line's shutdown due to Faliro Bay renovation works.

Therefore, Sika Hellas technical proposal was requested regarding the Embedded Rail System (ERS).

SIKA PROPOSAL

As far as the rail fastening system is concerned, Embedded Rail System (ERS) using a 2-component, polyurethane based grout, **Icosit® KC 340/45,** was proposed. **Icosit® KC 340/45** is a hard/ elastic, flexible, load bearing product, suitable for embedded rail designs.

Advantages of **Icosit® 340/45**:

- Vibration and structure borne sound reduction
- Control of stray currents, electrical resistance (no stray current bridges)
- Hard, elastic product (Shore A hardness: 55)
- Elongation at break, ~120%
- Rapid curing and fast return for operation

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Advantages of **Icosit® Embedded Rail System**:

- Uniform and monolithic behavior of the rail fixing system
- Uniform distribution of the loads to the foundation
- Full system bonding without inter-surfaces (elimination of risk) between products of different properties
- Watertight structure due to full bonding
- Vibration and structure borne sound reduction
- Long durability with larger intervals for maintenance
- Extensive documentation & references
- Reference projects from the 1970s

SIKA SOLUTION

The following application steps were required prior to the application of the **Icosit® ERS**:

- Removal of the existing embedded rail fixing system as well as of the damaged rail
- Restoration of rail box geometry
- Installation and alignment of the new rail

After products' curing, used for the rail box restoration and prior to the installation of the new rail, **Icosit® KC 330 Primer**, 1-component, polyurethane based primer was applied on both concrete and rail.

Moreover, as **Icosit® KC 330 Primer** curing time passed by and the new rail was installed, **Icosit® KC 340/45** was applied in 2 phases by gravity casting.

During the 1st phase, **Icosit® KC 340/45** was applied gravitationally and unilaterally at layer height/ thickness ~80mm from channel's bottom, in order the rail foot to be fastened. One-side casting is required in order to avoid air entrapment under the rail foot. Finally, the use of a constantly full hopper is recommended, so that the product can flow due to its weight.

The 2nd application phase starts ~12h after the 1st phase end and the product is applied on both sides of the rail, in order the full rail embedment up to the required height.

Icosit® KC 340/45 is touch-dry after ~2h and it is trafficable and open for operation ~24-48h after application depending on the prevailing conditions, which is essential on railway projects.

QUALITY CONTROL

Quality control was carried out during application and curing of **Icosit® KC 340/45**, which included visual inspection and Shore A hardness testing, using suitable equipment.

Visual inspection:

Product samples were taken after mixing, in order the curing time to be evaluated on site in correlation to their mixing and hardening.

Hardness testing (Shore A):

Suitable equipment (durometer) was used for Shore A hardness evaluation and testing, according to ISO 48-4:2018 standard.

Shore A hardness testing took place 5 days after the application on samples taken on-site and cured in lab conditions as well as on the actual applied system in the jobsite, which showed similar results/ performance between them and according to Product's Data Sheet.

Our most recent General Sales Terms shall apply. Please consult the most recent Product Data Sheets prior to any use and processing.

Sika Hellas ABEE
Πρωτομαγιάς 15
145 68, Κρυονέρι
Ελλάδα

Επικοινωνία
Τηλ.: +30 210 8160600
Fax: +30 210 8160606
www.sika.gr /sika@gr.sika.com

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