

Review of construction practices for E-roads

RESULTS
AREA

A review of E-road trials undertaken in FABRIC and possible construction procedures, materials and specifications for future implementation

Objectives /methodology

This study presents work undertaken in FABRIC and methodology consists of the following tasks:

- Review of global E-road case studies
- FABRIC E-road test sites
- E-road construction methods
- E-road materials and specifications
- Additional guidance for E-road construction
- Logistics
- Comparison with traditional road construction practices

Review of E-road construction practices

This study reviewed four possible E-road construction methods that could be suitable for major motorways and highways which are based on existing E-road WPT systems. These include:

- Trench-based construction (sub-surface layer or surface-flush);
- Micro-trench based excavation (sub-surface only);
- Full lane-width construction (sub-surface layer or surface-flush);
- Pre-fabricated full lane-width construction (sub-surface layer or surface-flush).

It is important to also note that the construction methodologies presented in this study are based on specific WPT systems and are therefore not considered suitable for general E-road construction.

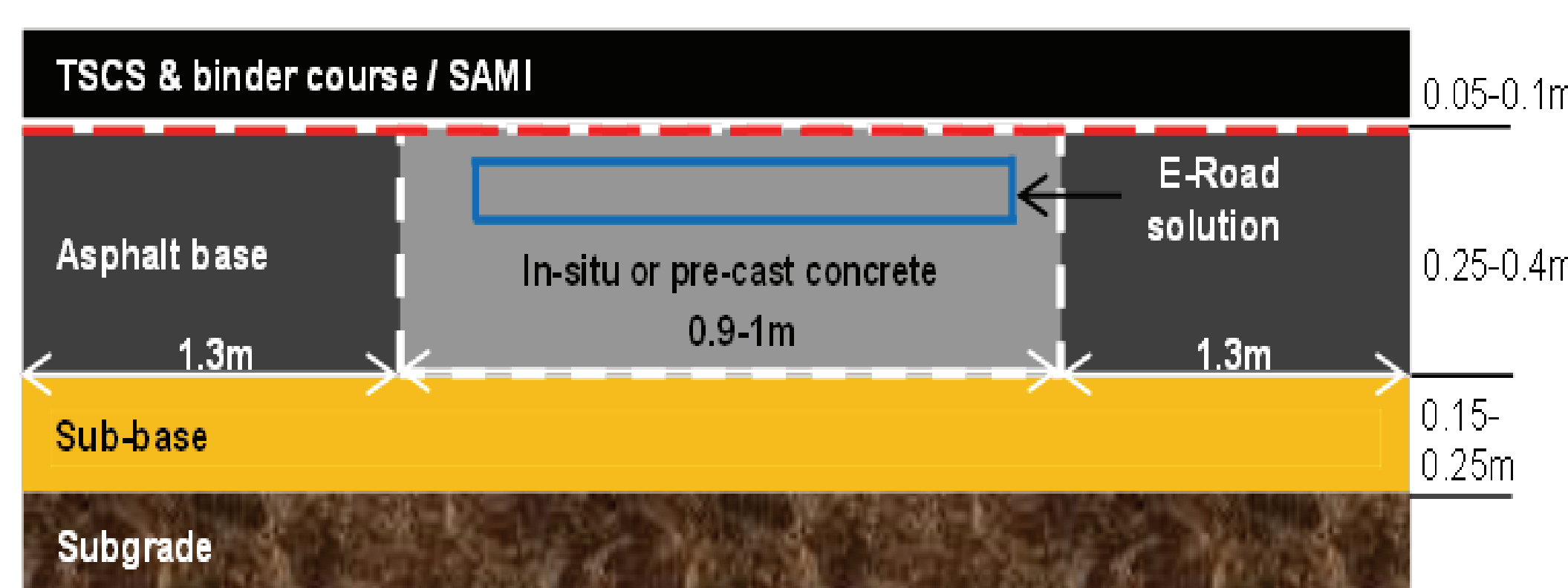
Analysis of E-road materials

Theoretical analysis of the structural performance of E-roads included laboratory testing of road materials containing concrete sections (representing DWPT systems) and finite element analysis (FEA) of the effects of the DWPT on the structural performance.

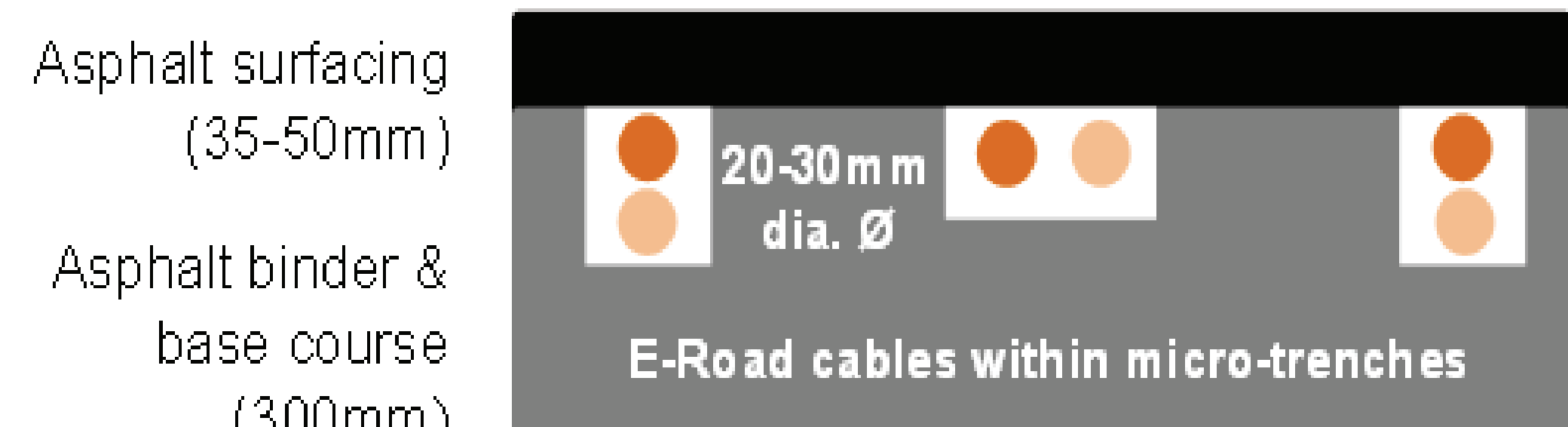
Main outcomes

- Based on previous case studies of DWPT systems four different types of E-road construction types have been identified: (i) Trench-based construction, (ii) Micro-trench based excavation, (iii) Full lane-width construction, (iv) Pre-fabricated full lane-width construction.
- The potential benefits of the trench-based and micro-trench based construction options include shorter installation periods (when compared with full lane width construction), lower volume of waste material excavated, and ease of access to the E-road systems for maintenance. However, concerns exist around the potential maintenance requirements for longitudinal joints in the road surfacing as a result of reflective cracking from the presence of E-road systems in the pavement.
 - Note: the main factors that are likely to influence roads authorities in selecting the appropriate E-road construction type include the safety implications to road users and construction workers (during the installation, maintenance and operation of the E-roads).
- Results from the theoretical studies suggested that there were no significant concerns with load capacity of the E-roads, although dynamic loading testing showed greater rates of deterioration with the appearance of voids at the interface between the system and the surrounding pavement material.
 - FEA results showed that this could be mitigated using various techniques to improve the structural performance of E-roads. For instance, ensuring that full bonding occurs at the interface during construction is essential to the structural performance of E-roads, particularly from the effects of sudden vehicle braking and accelerations.
 - FEA showed that utilization of joint materials such as stress absorbing membranes reduced the level of stress over the E-road system and therefore improved the structural performance of the E-road.

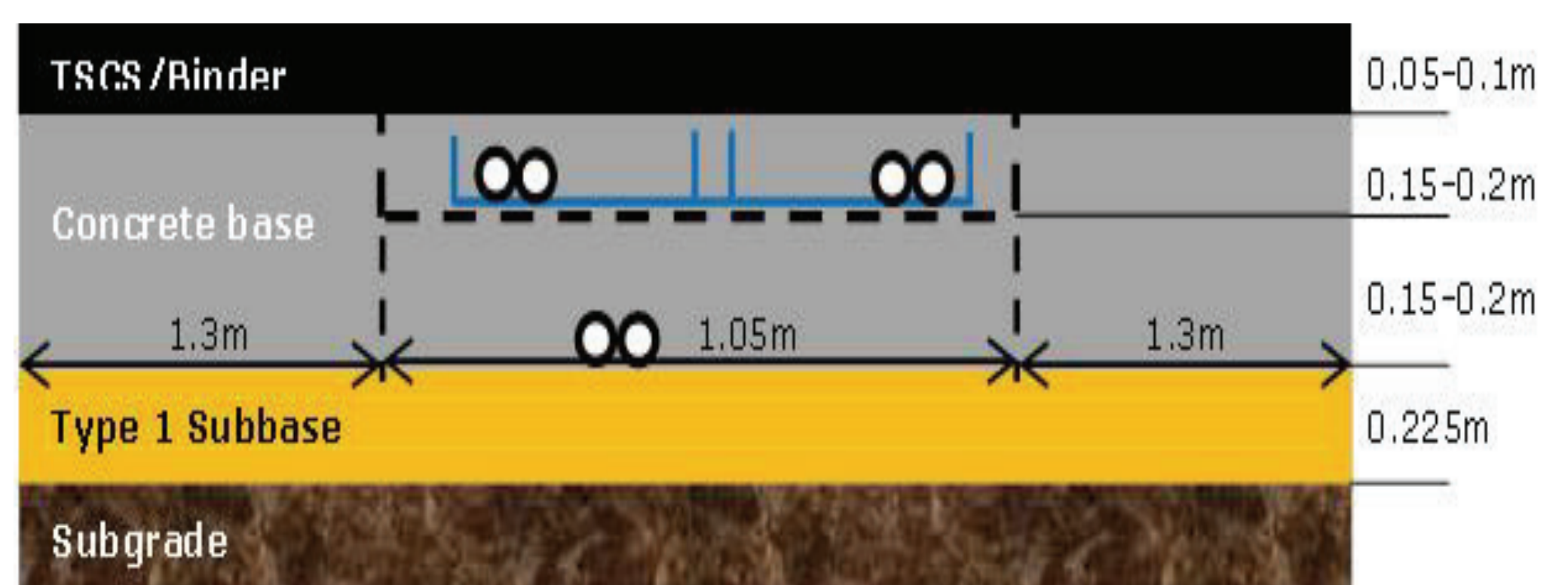
Partners involved



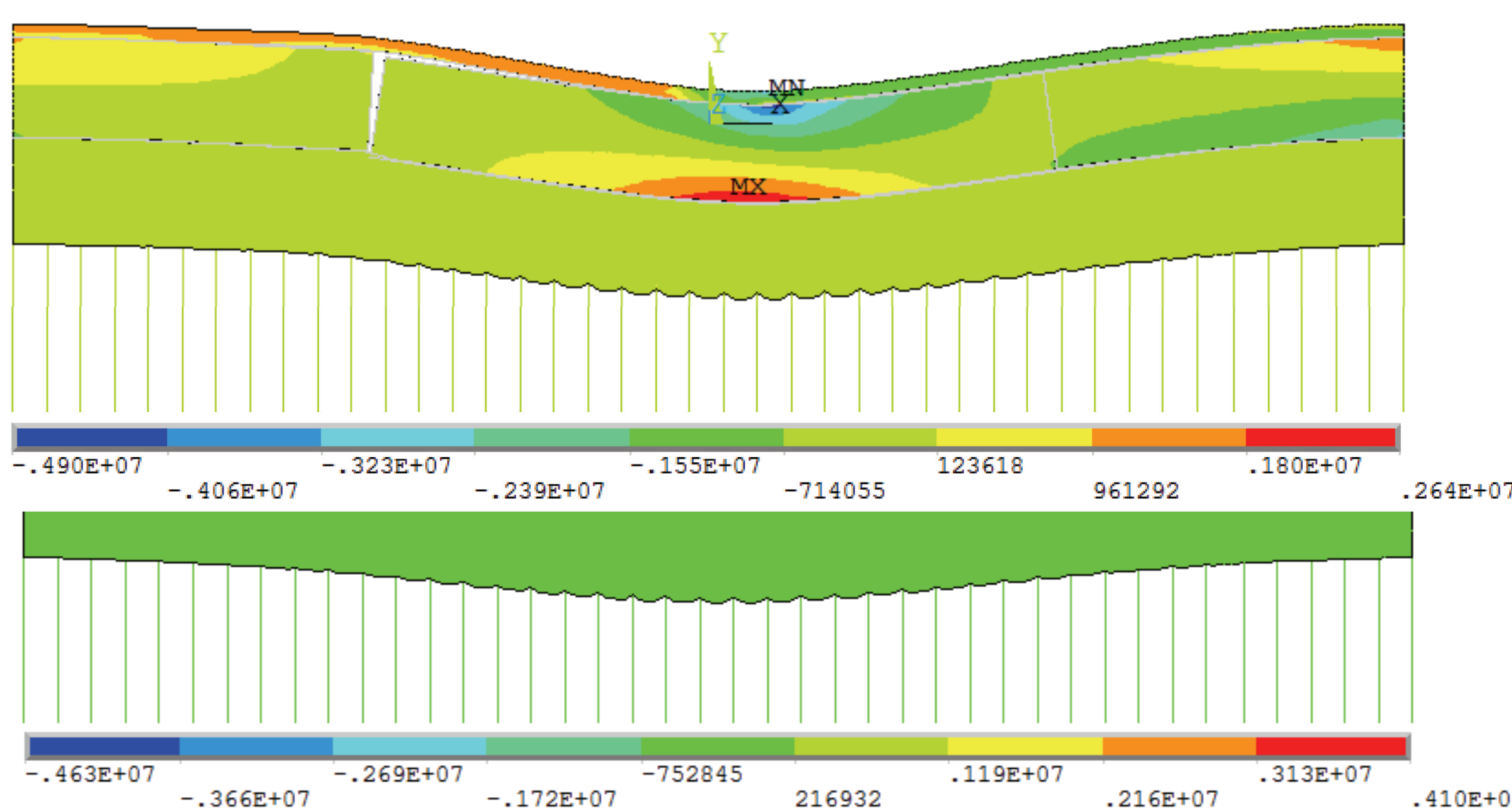
Trench-based construction of E-road solution



Micro-trench based construction of E-road solution



Full lane width construction (in-situ built or prefabricated) of E-road solution



Finite Element Analysis of E-road solution

Final Event & Demonstration | 21-22 June 2018 Italy

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Project facts

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