



LIFE E-VIA

“Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction”

LIFE18 ENV/IT/000201

Deliverable	Technical Report Actions B3
Content	Review on electric vehicles and their noise emission
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1 Foreword

Action B3, leaded by FIRENZE, is of paramount importance because it refers to the interventions' implementation in the pilot area of the LIFE E-VIA project (Sub-Action B3.1) and it allows the subsequent fulfilment of Actions B4, B5, B6 and following ones.

Firenze, as many medium-large Italian cities, suffers noise pollution and aims at curbing this phenomenon as a whole, particularly focusing on transportation-related impacts. Firenze was the first Italian city to install a charging station for EVs and motorcycles, the first to make available licenses for taxi drivers who work with EV only and the first to have activated the car sharing of electric vans.

Firenze approved policies in this frame specifically regarding:

- The introduction of the tramway lines
Now two lines are running and an additional one will be constructed in the next years.
- Incentives for EVs
There are currently about 600 EVs in circulation and the number of charging stations is about 200. Incentives are given for purchasing EV and about 100 EV have been made available for the municipality staff. Firenze participated to the Ele.C.Tra project (July 2013 - December 2015) that encouraged the use of EVs, especially mopeds, to reduce pollution and improve life quality.

In the European scenario, the EV increase is leading to a decrease in traditional traffic (and thus to a noise reduction). At the same time, the increasing in the number of EVs without introducing different mobility systems, permit to their speed to remain low.

If, on the other hand, part of the mobility is absorbed by public transport at the same time, the total number of vehicles in circulation will decrease and thus EV can increase their speed. If many of these vehicles are electric, tyre/road noise becomes significant with respect to propulsion one. Consequently, it is essential to optimize pavements and tyres to obtain an important noise reduction (5 dB) at receivers living roadside.

The pilot road studied and selected is the 800 m long Paisiello street in Florence. In particular, 2 road sections, each 150 m long, have been identified. Track 1 is the REFERENCE surface, (CPX<90 dB(A) at 50 kph), while Track 2 is the OPTIMISED surface (CPX<87 dB(A) at 50 kph).

In Action B3.1 Firenze will adopt the final tracks design and the support in the pursuit of track construction as developed in Action B1. Moreover, it will manage construction and monitoring-related procedures.

Overall, Firenze municipality aims at using products and services officially recognised with eco-labelling schemes. To this end, it is worth noting that Firenze will focus on a labelling Strategy for Evaluating the Performance of low-noise, EV-oriented Wearing Courses. This fact is linked to action C2 (LCA and LCC) and in more detail to the environmental analysis. Firenze is the only public body involved in the permits and authorizations needed, for timely and effective implementation.

2 Localization of the intervention area

The area object of interventions is located in the central-west area of the city of Firenze (Figure 1). Paisiello street is a populated and busy street close to the city centre (Figure 2).

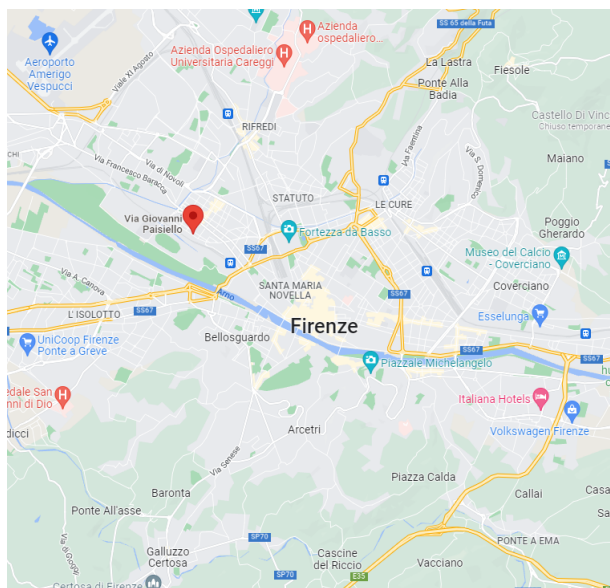


Figure 1: Localization of the intervention area - source Google maps 2022

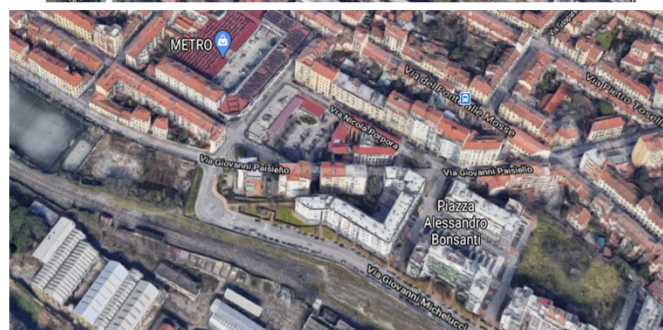
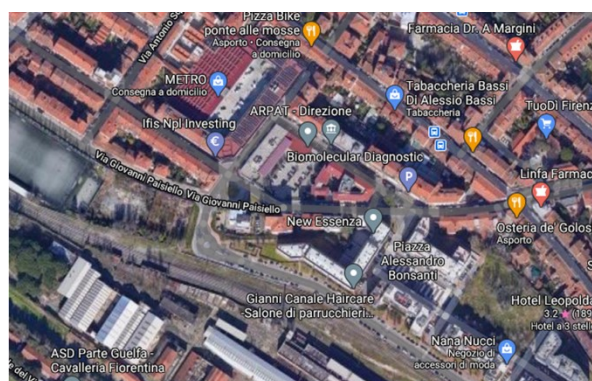


Figure 2: Paisiello street - source Google maps 2022

3 Description of the roadway and critical points

In the pilot area of the project, Via Paisiello is a one-way, one-lane road with parking spaces on both sides. The width of the entire track is 10.0 m while the width of the lane, i.e. the asphalted section of the intervention, is about 3.75 m for a total surface of about 560 square metres of traditional asphalt and 560 square metres of low-noise project asphalt. The intervention was carried out by the company AVR S.p.A., a road service company, entrusted with the Global Service contract for road maintenance in the municipality of Florence. The intervention was included in the authority's planning for road maintenance for the year 2021.

The design mix prepared by the University of Reggio Calabria was previously supplied to the company Endiasfaldi, a producer of bituminous conglomerates, which carried out tests and then produced the required mix. The work was then carried out between 12 and 16 July 2021 by the AVR company, which laid 150 linear metres of traditional asphalt and 150 linear metres of project asphalt.

Subsequently, on 16 July 2021, Laboratorio Sigma srl carried out core drilling tests to verify the correspondence between the laid asphalt (grain size, bitumen percentage, porosity, etc.) and the planned asphalt, obtaining excellent results.

4 Description of the project works

The construction related procedures have been structured and timely planned according to the following:

- Preparation of technical documents: September 2020
- New mixture definition (technical minimum requirements actions B1 e B2). Included as specification in the tender documents: December 2020
- Tender and award notice published: March 2021
- Winner legal documents received: June 2021
- Implementation: mid July 2021

The resurfacing work began on Monday 12 July and ended on Friday 16 July.

The works have been carried out in two phases with narrowing of the track between Rinuccini street and Lagorio street: in the first phase the right-hand side track has been affected, in the second phase the works moved to the left-hand side track with closure of the side roads (Rinuccini street, Ponchielli street, Squarcialupi street. Alternative route for vehicles heading for Mercadante street and the closed areas of Rinuccini street, Ponchielli street and Squarcialupi street from Paisiello, Vivaldi and Mercadante streets.

Stages of intervention

STEP 1 - Building site signage installation

Management of interference derived from road users, by affixing appropriate site signs and diversion of road flows on alternative roads.

STEP 2 - Milling the existing road pavement

Milling of the asphalt surface for a thickness of 4 cm of the entire road section and a portion of the adjacent roadway in order to carry out a deep and homogeneous rehabilitation of the pavement.

The removal of the material with the consequent realization of a new road package allows a more durable intervention over time, with a considerable reduction of the disruptions that could affect the safety of road users and a reduction in noise caused by the transit of vehicles.

STEP 3 – Re-location of manhole covers and grates.

Restoring the regularity of the road surface, by means of localised interventions that involve putting the manhole covers and grids flush with the paving, allows vehicles to pass through correctly and a considerable reduction in road noise caused by the passage of the wheels.

STEP 4 - Laying the wear layer

Laying of:

- A traditional asphalt for a thickness of 4 cm (150 m length)
- The new DENSE GRADED type wear layer for a thickness of 4 cm (150 m length).

The DENSE GRADED type is a mix of closed bituminous conglomerate with granulometric characteristics such as to reduce the noise emissions generated by the wheel-floor contact compared to traditional wear layers. The reduction in rolling noise is exclusively due to the special grain size range, which makes it possible to obtain wearing surfaces with texture characteristics such as to reduce the noise produced by the resonance phenomena generated by the wheel-floor contact.

STEP 5 -Horizontal road signs

Renovation of road markings, including longitudinal and transverse stop crossings, lane markings, pedestrian crossings.

Work in progress....



Post operam



5 Feasibility of the intervention and specialist reports

The intervention is feasible, according to the technical report of the Mobility Department of the municipality of Florence of 4652/2021 (annex 1)

- Accessibility area: Accessible
- City Planning Compliance: Compliant
- Landscape environmental compliance: Compliant
- Availability area: Available - The roads are all municipal property.

Concerning specialist relations;

- Geological, geotechnical, hydrological, hydraulic, seismic relations;

Considering the nature of the intervention, it is not necessary to draw up a special survey.

- Technical and specialist reports;

Due to the nature and type of intervention, no specialist technical reports are required.

- Preliminary calculations of the structures;

Considering the nature of the intervention, structural and plant engineering calculations are not necessary.

6 Accessibility and usability of roads serving existing activities and residences

During the execution of the work, the accessibility and usability of the roads connected to them must be guaranteed by emergency and surveillance vehicles, as well as by public utility services.

It may be envisaged the establishment of an alternating one-way system regulated by traffic lights and/or by workers with signal flags to guarantee, where necessary, access to frontagers. To this end, the operational phases are briefly described in order to guarantee the correct execution of the works without jeopardizing road safety and access to lands.

- request for special ordinances to the Municipal Police Command;
- request to the managing bodies of the other sub-services (Enel, Telecom, aqueduct, sewerage, methane pipeline) to identify the sub-services along the roads involved;
- installation of signage in compliance with the provisions of the New Highway Code and the Ministerial Decree of July 10, 2002 "Technical specifications for signage schemes, differentiated by road category, to be adopted for temporary signage" (D.M. 10 luglio 2002 "Disciplinare Tecnico relativo agli schemi segnaletici, differenziati per categoria di strada, da adottare per il segnalamento temporaneo").
- scrupulous compliance with the indications and/or prescriptions contained in the Safety Plan, attached to this project.

7 Work progress and safety instructions

The works in this project are of considerable importance both from the point of view of the road network and for the circulation inside the town centre. The main risks of the works in question derive from the promiscuity of road users with the labourers involved in the works.

The nature of the work required the mobility of the worksites, which have, therefore, been prepared on the various sites as the work progresses.

In order to limit interferences, construction sites have been suitably and preventively signposted, providing alternative routes both to road users and to front driveways.

The planning of alternative routes have been agreed in advance with the Municipal Police and the Mobility, Viability and, Networks Department of the municipality of Firenze.

Considering the length of the stretch of road affected by the works, the construction site has been set up in two stages.

This choice was aimed at reducing interferences with road users since, by dividing the site into three phases, it is possible to carry out the works of scarifying and restoring the road surface during the working day, reopening the road network at night.

There are no excavations that may interfere with the sub-services, however the contractor, before starting the milling and scarifying works, identified possible interferences and agreed with the Director of Works and the Safety Coordinator in the Execution phase on the methods of intervention.

8 Economic framework

The total amount of the works, including security charges, is € 26.218,15 and derives from the economic framework attached to this project (Annex 2).



Annexes:

- 1) DD 4652/2021 (formal work assignment)
- 2) LIBRETTO DELLE MISURE (economic framework)