

LIFE15 ENV/IT/000586

LIFE MONZA Methodologies fOr Noise low emission Zones introduction And management

Technical Report on Pilot area actions implementation

Deliverable	Interventions detail design (containing technical specifications and terms of contract to be used for the tender)
Action/Sub-action	B.1
Authors	Monza and Vie en.ro.se Ingegneria
Status - date	
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	COMUNE MONZ	
Provincia di	Monza e Brianza	
Project for the realization in the stree	n of low-noise road pay et 'Viale Libertà'	vement
EXECU	JTION PLAN	
List of a	documents	
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LIST OF DOCUMENTS

Reports	
A_00	List of documents
A_01	Technical and specialist report
A_02	Bill of quantities (version in Italian language)
A_03	Price list (version in Italian language)
A_04	Safety costs (version in Italian language)
A_05	Economic framework (version in Italian language)
A_06	Safety and Coordination Plan (version in Italian language)
A_07	GANTT chart
A_08	Maintenance plan
A_09	Technical Booklet of the Work
A_10	Special tender specifications
Drawings	
P_01	Elaborated project - Current Status
P_02	Elaborated project - Improved Status
P_03	Elaborated project – Overlapping Status
P_04	Elaborated project – Road sections

	COMUNE MONZ							
Provincia di	Monza e Brianza							
Project for the realization of low-noise road pavement in the street 'Viale Libertà'								
EXECU	JTION PLAN							
Technical an	d specialist report							
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CONTENTS

1-	Foreword	. 2
2-	Localization of the intervention area	. 3
3-	Description of the roadway and critical points	. 4
4-	Description of the project works	. 9
5-	Feasibility of the intervention and specialist reports	10
6-	Chronoprogram of the implementation phases	11
7-	Accessibility and usability of roads serving existing activities and residences	11
8-	Work progress and safety instructions	11
9-	Economic framework	12



1- Foreword

The main objective of the project is to develop a methodology, easily replicable in other contexts, for the introduction and management of the Low Noise Emission Zone. The latter is an urban area subject to traffic restrictions, whose impacts and benefits regarding noise pollution will be tested in the pilot area of the Libertà district of Monza.

- Project LIFE MONZA - LIFE15 ENV/IT/000586

Methodologies fOr Noise low emission Zones introduction And management Project Partners

- Coordinating Beneficiary: ISPRA National Institute for Environmental Protection and Research

- Associated Beneficiaries: MUNICIPALITY OF MONZA, UNIVERSITY of FLORENCE, Vie en.ro.se. Ingegneria Srl

Project duration 01/09/2016 - 30/06/2020 Pilot Area of the project: Municipality of Monza, Libertà District

Action A1: Operational context for Low Noise Emission Zones (LEZ) detection and management Sub-action A1.5: Operational context: interventions and expected effects on air quality, noise and health

In this phase of intervention, the design concerns the construction of low-noise flooring. Low-noise paving is the main tool for the reduction of traffic noise on a large scale by means of interventions at source and there are now several technologies available that differ in composition, materials used and field of use.

The type of flooring designed for this project is specified in the following paragraphs.



2- Localization of the intervention area

The intervention concerns a section of the municipal road 'Viale Libertà' and precisely the section that starts to the west from the roundabout with the road axes Via Bosisio / Via Albert Einstein and ends to the east with the roundabout with the road axes Via Carlo Emilio Gadda / Via Santa Anastasia.

The road is classified in the P.G.T.U. of the municipality of Monza, according to the Ministerial Decree of 05/11/2001, in the Category 'DE' - Urban Roads Inter district, and the section subject to intervention has a length of about 1 km.



Figura 1 - Photogrammetric extract of the intervention area



3- Description of the roadway and critical points

The type of road is described below, dividing the entire intervention section into three sub-sections classifiable for similar features:

Section A - from roundabout 'Via Bosisio' / 'Via Albert Einstein' to roundabout with 'Via Correggio'

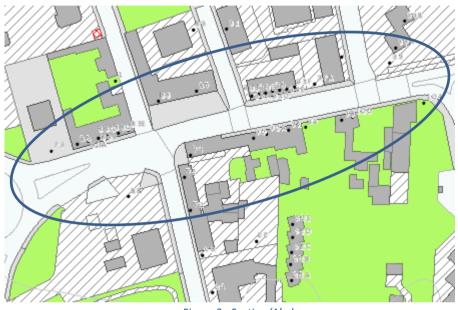


Figure 2 - Section 'A' plan

Road section about 225 m long and 12 m wide, 2 lanes (one in each direction of travel) separated by concrete traffic divider. Sidewalks on both sides. Flush pedestrian crossings.



Figure 3 – Photo section 'A' - west direction

Figure 4 – Photo section 'A' - east direction





Section B - from roundabout with 'Via Correggio' to intersection with 'Viale Giacomo Tosi'

Figure 5 – Section 'B' plan

Road section about 260 m long and about 12 m wide, 2 lanes (one in each direction of travel) separated, only in the first section of about 130 m, by a concrete divider. Sidewalks on both sides.

The pedestrian crossings are currently flush, and a new protected pedestrian crossing is being built at house number 119.



Figure 6 – Photo section 'B' - west direction



Figure 7 – Photo section 'B' - east direction



<u>Section C</u> - from intersection with 'Viale Giacomo Tosi' to roundabout with the road axes 'Via Carlo Emilio Gadda' / 'Via Santa Anastasia'.



Road section about 530 m long and about 12 m wide, 2 lanes (one in each direction of travel) separated

only in the last section of about 100 m by a concrete traffic divider equipped with guardrail. Sidewalks on both sides.

This section has widening and narrowing of the lanes in correspondence of the turning points of 'Via Tolomeo' and 'Via Tosi' and the widening of the lane, intended for the bus stop at the high school 'Istituto Tecnico Statale Commerciale and per Geometri "Achille Mapelli"'.

The pedestrian crossings are flush with each other and a new protected pedestrian crossing is being built in correspondence with the civic centre. At the widening of the lane for bus stops, the width of the road is about 23 m.



Figure 9 – Photo section 'C' - west direction

Figure 10 – Photo section 'B' - east direction



The road axis concerned by this project presents phenomena of wear and tear on the road surface caused by normal traffic and the continuous increase in traffic, which accelerates the process of deterioration of the pavement.

There are slight alterations to the regularity of the road surface in both transverse and longitudinal directions. These alterations can significantly affect the noise produced by the passage of cars and also the regularity of vehicle movement.

The following project is aimed at carrying out road rehabilitation work on the road surface by rebuilding the wearing course with low-noise bituminous conglomerates.

In order to achieve a complete, long-term road package, it is necessary to ensure that the base and connection layers are not damaged in such a way as to impair the surface course.

Below are some of the road pavement defects that were assessed on-site during the inspection; - presence of localised hollows in the manhole coverings with concomitant cracks at the edges.



Figure 11 – Depression at the grids

- presence at times of patches of bitumen, carried out in posthumous times to the laying of the wearing surface, for works connected to the sub-services.



Figure 12 – Longitudinal patch at sub-services



- sporadic joint cracks at the joint of the patches.



Figure 13 – Joint cracks at patches

- presence of deformation of the superstructure caused by wear and tear and wheel loads in correspondence with the trajectories of the vehicles, known as 'deterioration', is a phenomenon of fatigue cracking of the asphalt and crocodile-skin cracks.



Figure 14 – Crocodile-skin cracks in the wheel transit



4- Description of the project works

A list of the steps of intervention follows. They are necessary, as verified in March 2017, in order to carry out proper noise remediation and consequently improve the safety of cycles, motorcycles and vehicles on the road section concerned.

The intervention area is limited to 'Viale Libertà' roadway, with the inclusion of small sections at the junctions with the secondary roadway. The rehabilitation of these areas makes it possible to significantly reduce the contribution generated by tyres with asphalt when stopping and entering the main roadway.

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. Milling of the asphalt pavement for a further 4 cm thick in the portions of damaged road section in order to carry out a deep and homogeneous restoration of the pavement (main axis 'Viale Libertà').

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 Binder connection layer

Laying a traditional hot Binder connection layer for a thickness of 4 cm in the portions of road section deteriorated (main axis 'Viale Libertà').

The Binder connecting layer is used between the base course and the wearing one and is used to create the intermediate part of the road pavement. Its use makes it possible to transfer the vertical loads generated on the surface layer of the pavement to the base layer below and avoid permanent deformation of the pavement itself.

STEP 5 - Laying the wear layer

Laying the traditional DENSE GRADED type wear layer for a thickness of 4 cm on the entire stretch of road and on the adjacent portions of the road.



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.

The bituminous conglomerates used for the formation of dense graded-type optimised weave wear pavements are packed with modified bitumens, i.e. semi-solid bitumens containing elastomeric and/or plastomeric polymers that modify their chemical structure and physical and mechanical characteristics.

STEP 6 -Horizontal road signs

Renovation of road markings, including longitudinal and transverse stop crossings, lane markings, pedestrian crossings, buses' rest areas.

The restoration of coils for the detection of vehicles at the intersection of 'Viale Libertà' and 'Via Bertacchi' is scheduled. The characteristics are specified in the special tender specifications and in the bill of quantities. Their restoration will have to be agreed with the management of the work and with the Mobility, Viability and, Networks Department of the municipality of Monza.

The works described in Phases 1, 2, 3, 4 and 5 will be carried out in sequence for every single section of the entire lot of 'Viale Libertà' ('A' section, 'B' section, 'C' section), whereas the works in Phase 6 (rebuilding of the signage), must be carried out last for the entire section of the works, subject to the temporary lack of road markings.

For the above-mentioned works, the indications and/or prescriptions, given in the 'Security plan and coordination' attached to this project, must be scrupulously observed.

5- Feasibility of the intervention and specialist reports

The intervention is feasible, according to the technical report of the Mobility, Viability and, Networks Department of the municipality of Monza of 30/01/2017 n.53;

- 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- Chronoprogram of the implementation phases

In accordance with the Municipal Administration's requirements regarding the period of commencement and maximum period for completion of the works, the completion time can be estimated at 35 days. Considering the need to carry out the works in a defined time, it will be the responsibility of the contractor to define a detailed schedule with the Municipal Administration, based on what is specified in the project drawings, defining times and working methods.

The contractor shall ensure that the works are also carried out at night and during August without further charge to the Municipal Administration except for the second week of August; the contractor is also obliged to suspend the works in September for the entire week involved in the F1 car race;

7- 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 such as school buses, urban services, etc...

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.

8- 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 requires the mobility of the worksites, which will, therefore, have to be prepared on the various sites as the work progresses.

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

The planning of alternative routes must be agreed in advance with the Municipal Police and the Mobility, Viability and, Networks Department of the municipality of Monza.

Considering the length of the stretch of road affected by the works, the construction site will be set up in three stages.



This choice is 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, must identify possible interferences and agree with the Director of Works and the Safety Coordinator in the Execution phase on the methods of intervention.

For all safety regulations and procedures, the Safety Plan attached to this project must be scrupulously observed.

The safety and coordination plan, which is an integral part of the executive project, may be subject to integration and/or updates, even substantial, by the Safety Coordinator in the Execution phase, also in relation to the evolution of the works and any changes made. This has to be made in agreement with the Director of Works, the Sole Responsible for the Proceedings and the offices of the Mobility, Viability and, Networks Department of the Municipality of Monza.

9- Economic framework

The total amount of the works, including security charges, is € 338,698.53 and derives from the economic framework attached to this project.

Monza, January 2018

Provincia di	COMUNE MONZ	
Project for the realization in the stree	n of low-noise road par et 'Viale Libertà'	vement
EXECU	JTION PLAN	
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ACTIVITY	day					week	1						week	2				week 3								week		
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	ļ
Phase 3		-1	1	2	3	4	5			8	9	10	11	12			15	16	17	18	19			22	23	24	25	ŀ
(Section 'A')																								-		++		
SF1: Construction site signage	1																											
SF2: Flooring Milling	4																							A1	A2	B1	B2	
SF3: Flush manhole covers and grates	4																							A1	A2	B1	B2	
SF4: Binder laying	4																							A1	A2	B1	B2	
SF5: New paving	4																							A1	A2	B1	B2	
Phase 2 (Section 'B')																	_				•							
SF1: Construction site signage	1																											ĺ
SF2: Flooring Milling	5																A1	B1	B2	C1	C2							ĺ
SF3: Flush manhole covers and grates	5																A1	B1	B2	C1	C2							ĺ
SF4: Binder laying	5																A1	B1	B2	C1	C2							ĺ
SF5: New paving	5																A1	B1	B2	C1	C2							ĺ
Phase 1 (Section 'C')			_				•																					
SF1: Construction site signage	2	*																										
SF2: Flooring Milling	5		A1	A2	B1	B2	C1																					ĺ
SF3: Flush manhole covers and grates	5		A1	A2	B1	B2	C1																					ĺ
SF4: Binder laying	5		A1	A2	B1	B2	C1																					
SF5: New paving	5		A1	A2	B2	B2	C1																					
SF1: Construction site signage										_				-														
SF2: Flooring Milling	5									C2	С3	D1	D2	D3														
SF3: Flush manhole covers and grates	5									C2	С3	D1	D2	D3														
SF4: Binder laying	5									C2	С3	D1	D2	D3														
SF5: New paving	5									C2	С3	D1	D2	D3														
Phase 4 (Section 'A', Section 'B', Section 'C')																												
SF1: Construction site signage	1																											
SF6: Horizontal and vertical signage	6																											
SF7: Yard disassembly Signage removal	3																											

* Before the start of the work, the contractor must install the signage as specified in the Safety and Coordination Plan -PSC- and in agreement with the Safety Coordinator in the Execution phase, the works management, municipal offices, transport and road network.

PHASE 1 - Section 'C' is divided into 10 days, of which East in 4 days (A1 North/West, A2 South/West, B1 North/East, B2 South/East), West in 6 days (C1 North/West, C2 South/West, D1 North/East, D2 South/East), carrying out consequential work, thus avoiding interference and completing the section by the end of the day.

PHASE 2 - The section is divided into: Realization of the roundabout (A1), North section in 2 days (B1, B2), South section in 2 days (B1, B2) carrying out the consequent works, avoiding interferences and completing the section by the end of the day. PHASE 3 - The North section is divided into 2 days (A1, A2) and the South section into 2 days (B1, B2), thus avoiding interferences and completing the section by the end of the day.

PHASE 4 - Road signage

** At the end of the work, the contractor must remove all the temporary signs installed.



tion phase, the works management, municipal offices, rth/East, D2 South/East), carrying out consequential ences and completing the section by the end of the day.



MAINTENANCE PLAN



CONTENTS

1.	NORMATIVE REFERENCES:	2
2.	MAINTENANCE MANUAL	3
2.1	1 – Ordinary Maintenance:	3
2.2	2. – Extraordinary Maintenance:	3
3.	MAINTAINANCE PLAN	4
3.1	1 – Ordinary Maintenance:	4
3.2	2 – Extraordinary Maintenance:	4



In accordance with art. 40 of Presidential Decree 554/99, the following maintenance plan is drawn up for the Executive Plan for ordinary and extraordinary maintenance work on roads and road signs in the project, based on the type of work and the checks required.

1. NORMATIVE REFERENCES:

Art. 40. Maintenance plan of the work

1. The maintenance plan is the complementary document to the executive project which foresees, plans and programme, taking into account the executive project drawings actually carried out, the maintenance activity of the intervention in order to maintain its functionality, quality characteristics, efficiency and economic value over time.

2. The maintenance plan assumes a differentiated content in relation to the importance and specificity of the intervention, and consists of the following operational documents:

(a) the user manual;

(b) the maintenance manual;

(c) the maintenance programme;

3. The user manual refers to the use of the most important parts of the asset, and in particular the technological systems. The manual contains all the information necessary to enable the user to know how to use the good, as well as all the elements necessary to limit as much as possible the damage resulting from improper use, to allow to carry out all the operations suitable for its preservation that do not require specialist knowledge and to promptly recognize anomalous deterioration phenomena in order to solicit specialist interventions.

4. The user manual contains the following information:

(a) the location in the intervention of the parts mentioned;

b) the graphic representation;

c) description;

(c) the description;

(d) the correct use.

5. The maintenance manual refers to the maintenance of the most important parts of the good and in particular of the technological systems. It provides, in relation to the various technological units, the characteristics of the materials or components, the information necessary for proper maintenance and for the use of service or assistance centres.

6. The maintenance manual shall contain the following information

(a) the location of the parts mentioned;

(b) the graphic representation;

(c) a description of the resources required for maintenance work;

(d) the minimum level of performance;

(e) the anomalies that can be found;

f) maintenance that can be performed directly by the user;

g) maintenance to be carried out by specialised personnel.

7. The maintenance programme provides for a system of checks and interventions to be carried out, at intervals of time or otherwise fixed, in order to ensure the correct management of the asset and its parts over the years. Omississ.....

MAINTENANCE PLAN



2. MAINTENANCE MANUAL

Maintenance works related to this work are all those works that do not intervene on the road structure but guarantee the maintenance of the works and their correct use in safety.

2.1 – Ordinary Maintenance:

Check Plan

Parts of the work subject to check	Check type
Wear and tear of pavement	Control of wear and tear and microlesions in the pavement
Sewers and white sewer	Checking the normal exhaust and wear of the elements
Horizontal Signage	Checking the condition of the painting.

Maintenance Plan

Parts of the work subject to check	Check type
Wear and tear of pavement	Local restoration in deteriorated or loose areas.
Horizontal Signage	Checking the condition of the painting.

2.2. – Extraordinary Maintenance:

Parts of the work subject to check	Check type
Wear and tear of pavement	Renovation of the wearing course and, if necessary, of the road structure.
Sewers and white sewer	Restoration and integration of open-close elements. Anti-corrosion treatment of visible metal parts. Replacement of worn elements and/or degraded joints.
Horizontal Signage	Rinnovo verniciatura segnaletica orizzontale



MAINTENANCE PLAN

3. MAINTAINANCE PLAN

To correctly manage the structure, maintenance operations must follow deadlines and time schedules. The controls must be carried out by periodic inspections of the structures aimed at verifying the stability of the work and the functioning of all its parts, and a control plan must be provided which will update the current programme provided for in the design phase.

The following tables indicate the timing foreseen for maintenance and controls.

3.1 – Ordinary Maintenance:

Check Plan

Parts of the work subject to check	Frequency of checks
Wear and tear of pavement	quarterly
Sewers and white sewer	quarterly
Horizontal Signage	biannual

Maintenance Plan

Parts of the work subject to maintenance	Frequency of checks
Wear and tear of pavement	if necessary
Sewers and white sewer	annual
Horizontal Signage	if necessary

3.2 – Extraordinary Maintenance:

Parts of the work subject to maintenance	Frequency of checks
Wear and tear of pavement	quinquennial
Sewers and white sewer	decennial
Horizontal Signage	quinquennial

Monza, 22/01/2018

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CONTENTS

1-	Introduction
2-	Structure of the Technical Booklet of the Work 2
3-	Persons interested in the use of the Technical Booklet of the Work 2
4-	Summary description of the work and identification of interested persons (Sheet I)
5-	Preventive and protective measures supplied and auxiliaries (Sheet II-1)
6-	Adaptation of the preventive and protective measures supplied and auxiliaries (Sheet II-2)
7-	Information on preventive and protective measures (Sheet II-3)
8-	List and location of the technical papers related to the work in its context (Sheet III-1) 10
9-	List and location of the technical drawings related to the architectural and static structure of the work (Sheet III-2) 11
10-	List and location of the technical drawings related to the installations of the work (Table III-3) 11
LIST O	F ATTACHMENTS 12
SUMM	ARY FRAMEWORK FOR TRANSMISSION OBLIGATIONS 13



1- Introduction

The Safety Coordinator in the Design phase, according to Art. 91 paragraph 1 letter b of Legislative Decree 81 of 09/04/2008 (Art. 91 comma 1 lettera b del D.Lgs. 81 del 09/04/2008), has the obligation to prepare a file in compliance with the contents of Annex XVI to the abovementioned Legislative Decree and containing all information useful for the prevention and protection to which workers are exposed.

This file must be updated by the Safety Coordinator in the Execution phase, following the work.

2- Structure of the Technical Booklet of the Work

in addition to this premise, the Technical Booklet of the Work is constituted by the sheets listed below:

- TABLE I: Summary description of the work and identification of interested persons

- TABLE II-1: Preventive and protective measures supplied and auxiliaries

- TABLE II-2: Adaptation of the preventive and protective measures supplied and auxiliaries

- TABLE II-3: Information on the preventive and protective measures supplied with the work and necessary to plan the implementation in safe conditions and how to use and control its efficiency

- TABLE III-1: List and location of the technical papers related to the work in its context

- TABLE III-2: List and location of the technical drawings related to the architectural and static structure of the work

- TABLE III-3: List and location of the technical drawings related to the installations of the work.

3- Persons interested in the use of the Technical Booklet of the Work

The manager of the work is the most involved person in the use of the Technical Booklet. The manager will carry out maintenance operations according to any periodicity identified in the booklet and must inform the companies in charge of interventions, procedures or choices made during the design phase to reduce risks. Finally, if the work is sold, the owner must also deliver the Technical Booklet of the Work. To sum up, the parties interested in using the booklet are:

1. Manager of the work (Administrator, owner, etc.);

2. Companies appointed for the ordinary and extraordinary maintenance of the work.



4- Summary description of the work and identification of interested persons (Sheet I)

Summary description of the work

The intervention concerns a section of the municipal road 'Viale Libertà' and precisely the section that starts to the west from the roundabout with the road axes Via Bosisio / Via Albert Einstein and ends to the east with the roundabout with the road axes Via Carlo Emilio Gadda / Via Santa Anastasia.

The road is classified in the Urban Traffic Master Plan (called PGTU) of the municipality of Monza, according to the Ministerial Decree of 5/11/2001, in the Category DE - Urban Roads Inter district. The section subject to intervention has a length of about 1 km.

The project works concern the construction of new low-noise paving after scarifying the old road superstructure.

Duration of the work	
Start of work: to be defined in the invitation	End of work: to be defined in the invitation to tender.
to tender	Estimated in 40 days from the start of the work

Construction site address		
street/square: Viale Libertà		
Location: Monza	City: Monza	Provinces: 'Monza' and 'Brianza'

Client	
	Municipality of Monza
	address: Piazza Trento e Trieste 1
	CAP: 20900
	City: MONZA (MB)
	Phone number / Fax: 039/23721
	In the person of:
	Eng. Carlo Nicola Casati - (Client)
	Luciano Lanzani (surveyor, Sole Responsible for the Proceedings)
	Director of Mobility, Viability and, Networks Department
	Via Guarenti 2
	20900
	MONZA (MB)
	Phone number / Fax: 039/2832836 039/2832845
	VAT number: 02030880153
	Fiscal Code: 02030880153

Work Manager	
	Not appointed



JE Gianfrancesco Colucci
Designer
via Poggio alla guardia, 39/A – 51018 Pieve e Nievole (PT)
e-mail: gianfranco.colucci@live.it
Eng. Sergio Luzzi
Designer – Technical director
Vie en.ro.se. Ingegneria S.r.l Via Stradivari, 19 - 50127 Florence e-mail: sergio.luzzi@vienrose.it
Arch. Lucia Busa
Designer – Technical director
Vie en.ro.se. Ingegneria S.r.l Via Stradivari, 19 - 50127 Florence e-mail: lucia.busa@vienrose.it

Safety Coordinator in the Design phase (CSP)	
	Arch. Stefano Baldini
	via Giacomo Puccini, 123 – Calenzano (FI)
	e-mail: stefano.baldini@virgilio.it

Safety Coordinator in the Execution phase (CSE)	
	to be determined



5- Preventive and protective measures supplied and auxiliaries (Sheet II-1)

P. 01 Poad flooring	Type of work:	Subject of maintenance:	Table code:
	ordinary maintenance	Road flooring	P_01

Type of intervention	Identified risks
Control, maintenance and restoration of the	Accident - Impacts - Abrasions - Dust inhalation -
functionality of deteriorated parts	Contusions

Information for contractors and self-employed workers on the technical characteristics of the planned work and the workplace:

The working company must make its employees wear the necessary PPE, required by law. Before carrying out the work, the contractor must make contact with the local technician for the positioning of the relevant site signs according to the Safety and Coordination Plan.

Critical points:	Preventive and protective measures supplied with the work:	Auxiliary preventive and protective measures:	
Access to the workplace	Not included	Not included	
		Positioning of: -road signs;	
Workplace safety	Not included	-barriers; -signal boxes;	
		-workers with signal flags and traffic light systems for traffic regulation	
Procurement and material handling	Not included	Road cleaning	
Equipment procurement and handling	Not included	The unloading and handling of the material must take place under the direct supervision of the person in charge and with the aid of appropriate signs and workers with signal flags.	
Occupational hygiene Not included		Possibility of using the toilets in agreement with public premises.	
Interference protection of third parties Not included		Presence of a trained worker checking access to the site by unauthorized personnel.	



Table code:	Subject of maintenance:	Type of work:
G_01	Grids and manholes	ordinary maintenance
	•	

Type of intervention	Identified risks
Control, maintenance and restoration of the	Accident - Impacts - Abrasions - Dust inhalation -
functionality of deteriorated parts	Contusions

Information for contractors and self-employed workers on the technical characteristics of the planned work and the workplace:

The working company must make its employees wear the necessary PPE, required by law. Before carrying out the work, the contractor must make contact with the local technician for the positioning of the relevant site signs according to the Safety and Coordination Plan.

Critical points:	Preventive and protective measures supplied with the work:	Auxiliary preventive and protective measures:
Access to the workplace	Not included	Not included
Workplace safety	Not included	Positioning of: -road signs; -barriers; -signal boxes; -workers with signal flags and traffic light systems for traffic regulation
Procurement and material handling	Not included	Road cleaning
Equipment procurement and Not included handling		The unloading and handling of the material must take place under the direct supervision of the person in charge and with the aid of appropriate signs and workers with signal flags.
Occupational hygiene	Not included	Possibility of using the toilets in agreement with public premises.
Interference protection of third parties	Not included	Presence of a trained worker checking access to the site by unauthorized personnel.



Table code:	Subject of maintenance:	Type of work:	
S_01	Horizontal signage	ordinary maintenance	

Type of intervention	Identified risks
Control, maintenance and restoration of the	Accident - Impacts - Abrasions - Dust inhalation -
functionality of deteriorated parts	Contusions

Information for contractors and self-employed workers on the technical characteristics of the planned work and the workplace:

The working company must make its employees wear the necessary PPE, required by law. Before carrying out the work, the contractor must make contact with the local technician for the positioning of the relevant site signs according to the Safety and Coordination Plan.

Critical points:	Preventive and protective measures supplied with the work:	Auxiliary preventive and protective measures:
Access to the workplace	Not included	Not included
		Positioning of:
		-road signs;
Workplace safety	Not included	-barriers;
Workplace safety	Not included	-signal boxes;
		-workers with signal flags and traffic light systems for traffic regulation
Procurement and material handling	Not included	Road cleaning
quipment procurement and Not included handling		The unloading and handling of the material must take place under the direct supervision of the person in charge and with the aid of appropriate signs and workers with signal flags.
Occupational hygiene	Not included	Possibility of using the toilets in agreement with public premises.
Interference protection of third parties	Not included	Presence of a trained worker checking access to the site by unauthorized personnel.



6- Adaptation of the preventive and protective measures supplied and auxiliaries (Sheet II-2)

Table code:	Subject of maintenance:	Type of work:
Type of intervent	ion	Identified risks

Information for contractors and self-employed workers on the technical characteristics of the planned work and the workplace:

Critical points:	Preventive and protective measures supplied with the work:	Auxiliary preventive and protective measures:
Access to the workplace		
Workplace safety		
Procurement and material handling		
Equipment procurement and handling		
Occupational hygiene		
Interference protection of third parties		



7- Information on preventive and protective measures (Sheet II-3)

Preventive and protective measures, supplied with the work, necessary to plan the realization in safe conditions. In addition, methods of use and control of the measures' efficiency are listed.

Maintenance work to be carried out	Frequency of interventions	Information needed to plan a safe realization	Provided preventive and protective measures	Checks and controls to be carried out	Frequency of checks	Safe use
Restoration	5 years		See Table P_01 Road flooring	Visual check of the state of wear	When needed	
Cleaning	10 years		See Table G_01 Grids and manholes	Visual check of obstructions	When needed	
Renovation	15 years		See Table S_01 Horizontal signage	Visualization of the state of wear	When needed	



8- List and location of the technical papers related to the work in its context (Sheet III-1)

Technical sheets:

Realization of low-noise paving in 'Viale Libertà'

List and location of the technical papers related to the work in its context	Name and address of the persons who prepared the technical sheets	Dates	Placement of technical sheets	Note
 Technical and specialist report Bill of quantities Price list Security costs Economic framework Safety and Coordination Plan GANTT Chart Maintenance Plan Technical Booklet of the Work Special tender specifications Project report 	JE Gianfrancesco Colucci Designer via Poggio alla guardia, 39/A 51018 Pieve e Nievole (PT) e-mail: gianfranco.colucci@live.it Eng. Sergio Luzzi Designer – Technical director Vie en.ro.se. Ingegneria S.r.l Via Stradivari, 19 - 50127 Florence e-mail: sergio.luzzi@vienrose.it Arch. Lucia Busa Designer – Technical director Vie en.ro.se. Ingegneria S.r.l Via Stradivari, 19 - 50127 Florence e-mail: lucia.busa@vienrose.it-	May 2017 Review. July 2017 Review. January 2018	Municipality of Monza Vie en.ro.se. Ingegneria S.r.l. www.vienrose.it vienrose@vienrose.it Tel. 0554379140 Fax 055416835 registered office: Via Stradivari, 19 - 50127 Florence - n. iscrizione RI C.C.I.A.A. Firenze: 05806850482	



9- List and location of the technical drawings related to the architectural and static structure of the work (Sheet III-2)

Technical sheets:			

List and location of the technical papers related to the work in its context	Name and address of the persons who prepared the technical sheets	Dates	Placement of technical sheets	Note

10- List and location of the technical drawings related to the installations of the work (Table III-3)

Technical sheets:								
List and location of the technical papers related to the work in its context	Name and address of the persons who prepared the technical sheets	Dates	Placement of technical sheets	Note				



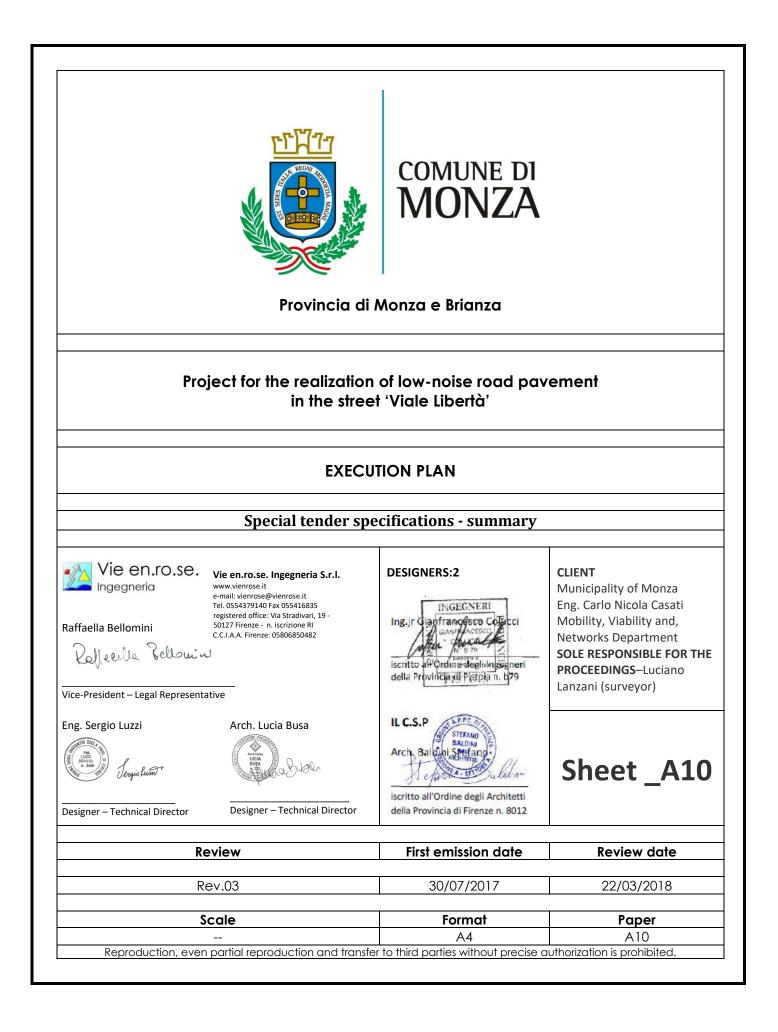
Technical Booklet of the Work

LIST OF ATTACHMENTS									
drawings									
project drawings and technical documentation as build									
executive/constructive technical details									
photo documentation;									
documentation of protective devices in operation									



Technical Booklet of the Work

	UMMARY FRAMEWORK FOR TRANSMISSION OBLIGATIONS
Thi	document consists of 13 pages.
1	The Safety Coordinator in the Design Phase transmits the present Technical Booklet of the Work to the Municipality of Monza for its consideration.
	Date: May 2017 Safety Coordinator in the Design Phase's Signature STEFANO BALDINI 8012 ARCHITETTO ARCHITETTO ARCHITETTO ARCHITETTO ARCHITETTO ARCHITETTO ARCHITETTO ARCHITETTO
2	The client, after taking into consideration the Technical Booklet of the Work, sends it to the Safety Coordinator in the Execution phase in order to modify it in the course of the work.
	Date Client's Signature
3	The Safety Coordinator in the Execution phase, after having modified the Technical Booklet of the Work during the execution, sends it to the Client for consideration in any subsequent work.
	Date Safety Coordinator in the Execution Phase's Signature
4	The Client signs the document for receiving.
	Date Client's Signature



In the following sections, a detailed description of technical characteristics and specifications required in the tender documents for the asphalt is provided.

Asphalt wearing course

Surface layer of bituminous conglomerate are characterized by a rather consistent lithic skeleton, with a minimum compressed thickness of 4 cm. The wear layer is made up of sand and rubble mixed with a quantity of bitumen suitably determined by laboratory tests.

The thickness of the layer is calculated at the design stage as a function of the assumed operating traffic.

The execution of the wearing course will follow in the short term the execution of the connecting layer, i.e. it will follow immediately the execution of the recovery coat when necessary.

Optimised surface courses made from dense graded asphalt mixes

The dense graded type of optimised surface course is a closed type of asphalt mix with particle size characteristics that reduce the noise emissions generated by the wheel-asphalt contact compared to traditional types of surface course. The reduction in rolling noise is due exclusively to the particular particle size assortment, which makes it possible to obtain surface courses with weaving characteristics such as to reduce the noise produced by resonance phenomena generated on the wheel-asphalt contact. For this reason, we are referring to dense graded types of optimised weaving.

Qualification of materials

Aggregates

The stone aggregates used for the first time are composed of all the coarse aggregates, fine aggregates and fillers that can come from the fine fraction or additives: these aggregates are the solid phase of the wear coverings with optimized texture such as dense graded. The aggregates used must be qualified in accordance with Directive 89/106/EEC on construction products. Each supply must be accompanied by the CE marking attesting the conformity to appendix "AZ" of the European harmonised standard UN EN 13043 (standard now revoked but maintained as a reference in the Tuscany region - Italy).

Coarse aggregate

Designation given to larger aggregates with Diameter (D) less than or equal to 45 mm and d greater than or equal to 2 mm, where D indicates the size of the upper sieve and that of the lower sieve. The designation of the coarse aggregate must be made by means of the dimensions of the sieves belonging to the base group combined with the sieves of group 2 of UNI EN 13043.

It must consist of elements obtained by crushing stone rocks and natural elements with sharp edges. For the mixture of coarse aggregate, the smoothness value (PSV) must be measured for each origin or petrographic nature of the material used: the PSV value measured on the minimum size passing through the 10 mm sieve and retained at the 7.2 mm bar sieve must be \geq 50. Fine aggregate

The designation given to smaller aggregates with a D less than or equal to 2 mm and containing particles which are mostly retained on a 0,063 mm sieve.

The designation of the fine aggregate must be made according to UNI EN 13043. For reasons of congruence with the fine sizes currently produced in Italy, the use of single fraction aggregates with a maximum size of D = 4 mm as fine aggregates is also permitted. It must consist of natural and crushing elements.

The retention at the 2 mm sieve must not exceed 10% if the fine aggregates come from rocks with a PSV value ≤ 50 .

The filler is the fraction passing for the most part through the sieve 0.063 mm and comes from the fine fraction of the aggregates: it can also consist of rock dust, preferably limestone, cement, hydrated lime, hydraulic lime, asphalt dust, fly ash.

Binder

The bituminous conglomerates used for the formation of wear coverings with optimized dense graded texture are packaged with modified bitumen, that is, with semi-solid bitumen containing elastomeric and/or plastomeric polymers that modify their chemical structure and physical and mechanical characteristics.

The modified bitumen Hard type must be used to make conglomerates with optimized dense graded texture. The filler - bitumen ratio must be between 1.1 and 1.7.

The bitumen binders used must be qualified in accordance with Directive 89/106/EEC on construction products. Each supply must be accompanied by the CE marking attesting conformity to appendix ZA of the harmonized European reference standards: UNI EN 12591 for pure bitumen for road applications, UNI EN 14023 for modified bitumen, UNI EN 13808 for bitumen emulsions.

Additives

To improve the performance of bituminous conglomerates, natural or artificial products called additives are added to the aggregates or bitumen.

Adhesion activators

Adhesion activators are surfactant additives that promote bitumen-aggregate adhesion, used to improve the water durability of bituminous mixtures. Their dosage must be specified in the study of the mixture and may vary depending on the conditions of use, the nature of the aggregates and the characteristics of the product. The adhesion activator chosen must have chemical characteristics stable over time even if subjected to a high temperature (180 $^{\circ}$ C) for long periods (15 days).

To introduce the surfactant substances into the bitumen, suitable equipment must be used, in order to guarantee the exact dosage and their perfect dispersion in the bituminous binder.

The presence and the dosage of the adhesion activators in the bitumen are checked by means of the chromatographic separation test on a thin layer.

Mixtures

Composition of the mixtures

The mixture of the first-use aggregates to be used for the dense graded type of optimised surface course must have a specific particle size composition.

The dense graded wear layers with optimised texture shall have a minimum thickness of 30 mm. The quantity of bitumen actually used must be determined by studying the mixture with the volumetric method on thickened samples with a rotary press according to UNI EN 12697-31. Acceptance of mixtures

Before the start of work, the Company is required to submit to the Works Management the project study of the mixture it intends to adopt, in original and signed by the Company's supervisor.

It must be accompanied by a complete documentation of the studies carried out and contain the results of the acceptance and suitability tests of the design mixture and of all the elements that compose it (aggregates, binders, additives). During the works, the Company must strictly adhere to the accepted project formulation, carrying out production and implementation controls according to the Quality System adopted by it.

Tolerances on results

Deviations from the individual percentages of the coarse aggregate, fine aggregate and the UNI 0.063 mm sieve feedthrough may be allowed in the particle size curve provided they are compatible with limits: limits in any case not greater than the individual percentages of the aggregate content:

- for the feed-through greater than or equal to 0.063 mm: \pm 3%;

- for the 0.063 mm sieve feed-through: $\pm 1.5\%$.

If it is found that the particle size curve has left the limits, both upper and lower, of the prescribed melt, the difference between the percentage prescribed by the specifications and the percentage found on the sample, expressed to two decimal places, is determined. All the percentage differences corresponding to the various sieves where the curve has come out of the melt are added up. The total shall be multiplied by a coefficient of 1,5 and the deduction shall be made in percentage points, to two decimal places, to be applied to the unit price. This deduction shall be permitted only if the total of the percentage difference found on the individual sieves is less than 20 percentage points. Beyond this limit, the work will be considered unsuitable and therefore untested.

A deviation of $\pm 0.25\%$ is tolerated for the percentage of bitumen. The above values must be respected both by the mixes taken from the pavement and by the carrots taken from the site, taking into account for the latter the theoretical quantity of the anchor bitumen.

In the following sections, a detailed description of specifications required in the tender documents for execution of works is provided.

Mixture packaging

The conglomerate must be packaged in fixed automated plants of suitable characteristics, which are always kept fully functional in all their parts. In order to guarantee perfect drying and uniform heating of the mixture, as well as perfect screening to ensure a suitable reclassification of the individual classes of aggregates, the production of each plant must not be pushed beyond its potential.

Continuous systems (such as drum-mixers) can also be used, provided that the dosage of the components of the mixture is carried out by weight, using suitable equipment whose efficiency must be constantly checked.

In any case, the plant must guarantee uniformity of production and be able to produce the mixture corresponding to that indicated in the study presented for acceptance: each plant must, then, ensure the heating of the bitumen at the required temperature and uniform viscosity until the time of mixing in addition to the perfect dosage of both the bitumen and the additive.

In order to avoid that clayey substances and water stagnation could compromise the cleaning of the aggregates, the area destined to the storage of the aggregates must be preventively and conveniently arranged; moreover, the heaps of the different classes must be clearly separated from each other and the filling operation in the pre-dispensers must be carried out with the utmost care.

The mixing time must be established according to the characteristics of the system, to such an extent as to allow a complete and uniform coating of the aggregates with the binder.

The moisture content of the aggregates at the dryer outlet must not exceed 0.25% by weight.

The temperature of the aggregates at mixing must be between 170° C and 190° C and the temperature of the binder must be between 160° C and 180° C.

The dryers, boilers and hoppers of the plants must be equipped with fully functional fixed thermometers and periodically calibrated to allow verification of the above temperatures.

Preparation of paving surfaces

Before starting the paving of the dense graded type of optimised surface course, it is necessary to check that the transverse slopes of the laying surface (always > 2.5%) are respected, otherwise it must be reshaped; in addition, the conditions of longitudinal regularity and the presence of traces must be checked.

The preparation of the paving surface must be carried out before the wear layer is created in order to ensure adequate adhesion to the interface by applying bituminous emulsions with specific characteristics in appropriate doses. This type of processing, called "coat of attack", consists in the application of a bituminous emulsion with medium or rapid breakage (depending on the conditions of use) above a surface of bituminous conglomerate before the creation of a new layer, with the aim of avoiding possible relative slippage by increasing the adhesion at the interface between the two layers.

The dosage of the material to be used, as well as its characteristics, vary depending on whether the application concerns the construction of a new superstructure or a maintenance operation: in the case of new constructions, a cationic bituminous emulsion (60 % or 65 % binder) will be used, dosed so that the residual bitumen is equal to 0.30 kg/m². If the new layer is to be laid on top of an existing pavement, it is recommended to use a modified bituminous emulsion, dosed so that the residual bitumen is equal to 0.35 kg/m².

Before applying the primer coat, the Company must remove all impurities and seal any porous and/or fissured areas using a bituminous sealing mortar.

If the bituminous conglomerate is to be laid on a previously milled pavement, the use of more diluted cationic and modified bituminous emulsions (up to a maximum of 55% of residual bitumen) is permitted, provided that the quality indicators (evaluated on the residual bitumen) and the required performance respect the same values for each type of emulsion.

Before the start of the works, for the purpose of accepting the binder by means of attack hands, the Company is required to prepare the qualification of the product by means of certification attesting to the indicated requirements.

The bitumen-based binder used for the attachment hands must be qualified in accordance with Directive 89/106/EEC on construction products. Each supply must be accompanied by the CE marking attesting to the conformity to the hanger.

Laying of the mixtures

The bituminous conglomerates will be laid by means of vibratory finishing machines in perfect condition and equipped with automatic self-levelling; in any case, the vibratory finishing machines must leave a perfectly shaped finished layer, free from crumbling, cracking and defects due to the segregation of the larger lithoid elements. The advance speed of the pavers must not exceed 3-4 m/min with continuous feeding of the mix.

The thickness of the layer must be laid for its entire height in a single pass, limiting pavement interruptions as much as possible and avoiding manual interventions to correct anomalies.

During the paving phase, great care must be taken in the formation of the longitudinal joints, preferably obtained by the timely placing of a strip side by side with the previous one using two pavers; if this is not possible, the edge of the strip already created must be coated with cationic bituminous emulsion to ensure the welding of the next strip. If the edge is damaged or rounded, it must be cut vertically with suitable equipment.

The transverse joints resulting from daily interruptions must always be made after cutting and removing the zeroing end part. The overlapping of the longitudinal joints between the various layers must be programmed and carried out in such a way that they are staggered between them by at least 20 cm and never fall in correspondence of the two strips of the lane normally affected by the wheels of heavy vehicles.

The mix must be transported from the packaging plant to the paving site using means of transport of adequate capacity, efficient and fast and in any case always equipped with a tarpaulin cover to prevent excessive surface cooling and the formation of crusts; moreover, the temperature of the mix at the time of paving, controlled immediately behind the paver, must not be less than 140 $^{\circ}$ C at all times.

If the general weather conditions may affect the perfect success of the work, the paving must be suspended: any compromised layers must be removed immediately and then rebuilt at the expense of the Company.

The compaction of the mixes must begin as soon as the paver has been paved and must be carried out without interruption.

Thickening should preferably be carried out with rubber rollers, but a tandem roller with metal wheels with a maximum weight of 15 t can also be used.

At the end of compaction, the percentage of voids in the mixture must not be more than 2% higher than the design percentage. Compaction must be carried out with the most suitable method to obtain uniform thickening at every point and avoid cracks and slippages in the layer just laid. When compaction is complete, the surface of the layers must be free of irregularities and undulations so that a straight rod 4 m long placed in any direction on the finished surface of each layer adheres evenly to it; a maximum deviation of 5 mm can be tolerated.

The bituminous mixture of the wearing course will be applied to the finished surface of the underlying layer after the Works Management has ascertained that the latter meets the height and shape requirements.

Controls

The quality control of dense graded asphalt pavements and their installation must be carried out by means of laboratory tests on the constituent materials, the mixture, the carrots extracted from the pavement and on site.

Control of supplies

In addition to the initial checks, necessary for acceptance, even during the work, to assess that there are no changes in the quality of materials, must be carried out laboratory tests on samples taken in contradiction with the Works Management. The quality control of mixed granules for first use must be carried out by laboratory tests on samples taken in the plant before mixing. The quality control of the bitumen must be carried out on samples taken directly from the tank at the plant.

Checking the mixtures taken at the time of paving

The bulk asphalt mix is removed in a contradictory manner at the time of paving. The following checks will be carried out on the samples taken from the paver at a trusted laboratory of the Administration:

- the percentage of bitumen (UNI EN 12697-1/39);

- the particle size of the aggregates (UNI EN 12697-2).

In addition, the suitability characteristics of the mixture will be checked by means of the rotary press. The samples packaged with the Giratoria Press equipment must be subjected to indirect tensile strength tests at 25 °C (UNI EN 12697-23) and water sensitivity tests at 25 °C (UNI EN 12697-12).

Performance checks on the finished layer

After the paving, the Works Management will pick up, in contradiction with the Company, carrots for the control of the characteristics of the conglomerate in place and the verification of the thicknesses. The carrots will be determined by:

- the thickness of the layer (average of four measures in each carrot);

- the density;

- the percentage of residual voids.

The thickness of the layer will be determined, for each homogeneous stretch of paving, by averaging the measurements (four for each carrot) taken on the carrots extracted from the pavement, discarding the values with an excess thickness, compared to that of the project, of more than 5%. The average thickness of the layer must not be less than that provided for in the project.

The percentage of voids in the mixture on site, in 95% of the samples, must not be greater than 2% compared to the project.

Surface characteristics

Tests must be carried out on finished floors to check the adhesion and macro-texture values of the surface of the wear layer. The adhesion measurements (resistance to sliding friction) carried out with the Skid Tester according to UNI EN 13036-4 must provide BPN (British Pendulum Number) values ≥ 65 . The surface texture, measured with the height of sand (HS), determined according to the method described in UNI EN 13036-1, must be ≥ 0.5 mm.

Alternatively, for the measurement of adhesion and macro-weaving, high-performance tests may be carried out using one of the equipment that participated in the AIPCR harmonisation experiment (1992). For the calculation of the parameter HS (MTD) from tests performed with a laser profilometer, the data processing must be performed according to the procedure provided for in UNI EN ISO 13473-1.

The adhesion values obtained with such equipment will be brought back to BPN values using the IFI calculation report (AIPCR 1992), previously accepted by the Working Management. Adhesion and macro-weaving measurements must be carried out in a period between 60 and 180 days from opening to traffic. The sections to be measured, with lengths of at least 200 m, may be located at points where, the weaving and/or roughness is not sufficient or doubtful; in any case, the adherence must be checked throughout the entire extension of the intervention.

For the evaluation of the characteristics of adhesion and surface texture, reference will be made to the average values, obtained from the point measurements (pitch 10 m) or from the values already averaged every 50 m, relative to each homogeneous section in which it is possible to divide the measured section; homogeneous sections are those sections of pavement, in which at least 12 values of the indicator fall, statistically distributed according to a "normal" distribution; the values thus obtained must be in accordance with the above prescriptions.

The homogeneous sections will be identified with a statistical procedure.

The measurements of adhesion and texture must be carried out with a "measurement step" of 10 m and the measured values may, if necessary, be averaged every 50 m to filter out occasional and localized inhomogeneity of the surfaces.

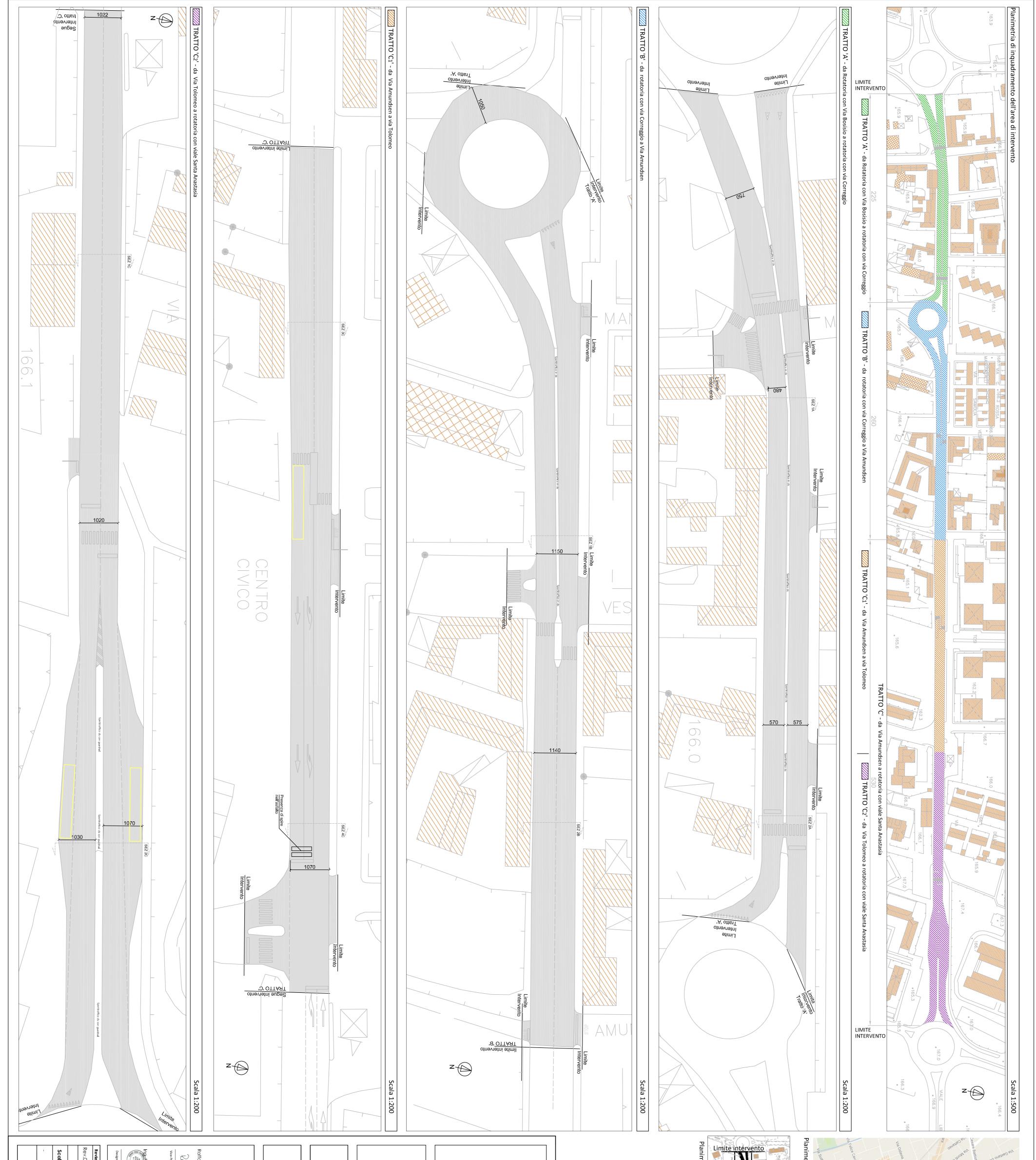
In order to check the capacity of the wear layer to reduce the generation of rolling noise on the longitudinal profile acquired by using a laser profile meter in a period of time between the 15th and the 45th day from opening to traffic, the weaving spectrum should be determined according to the procedure provided by ISO/CD 13473-4. From the mixture taken at the time of paving, three samples will be packaged with a rotary press, with a number of rotations equal to 100. On the upper face of the samples thus prepared and cut with a thickness equal to that of the project, the sound absorption capacity will be checked by means of an impedance tube according to the procedure defined in UNI EN ISO 10534-2.

Regularity

The I.R.I. (International Roughness Index), calculated (as defined by the World Bank in 1986 - The International Road Roughness Experiment) from the longitudinal profile of the pavement, must be less than 1.8 mm/m in the case of intervention with a layer of surface spread over the entire carriageway.

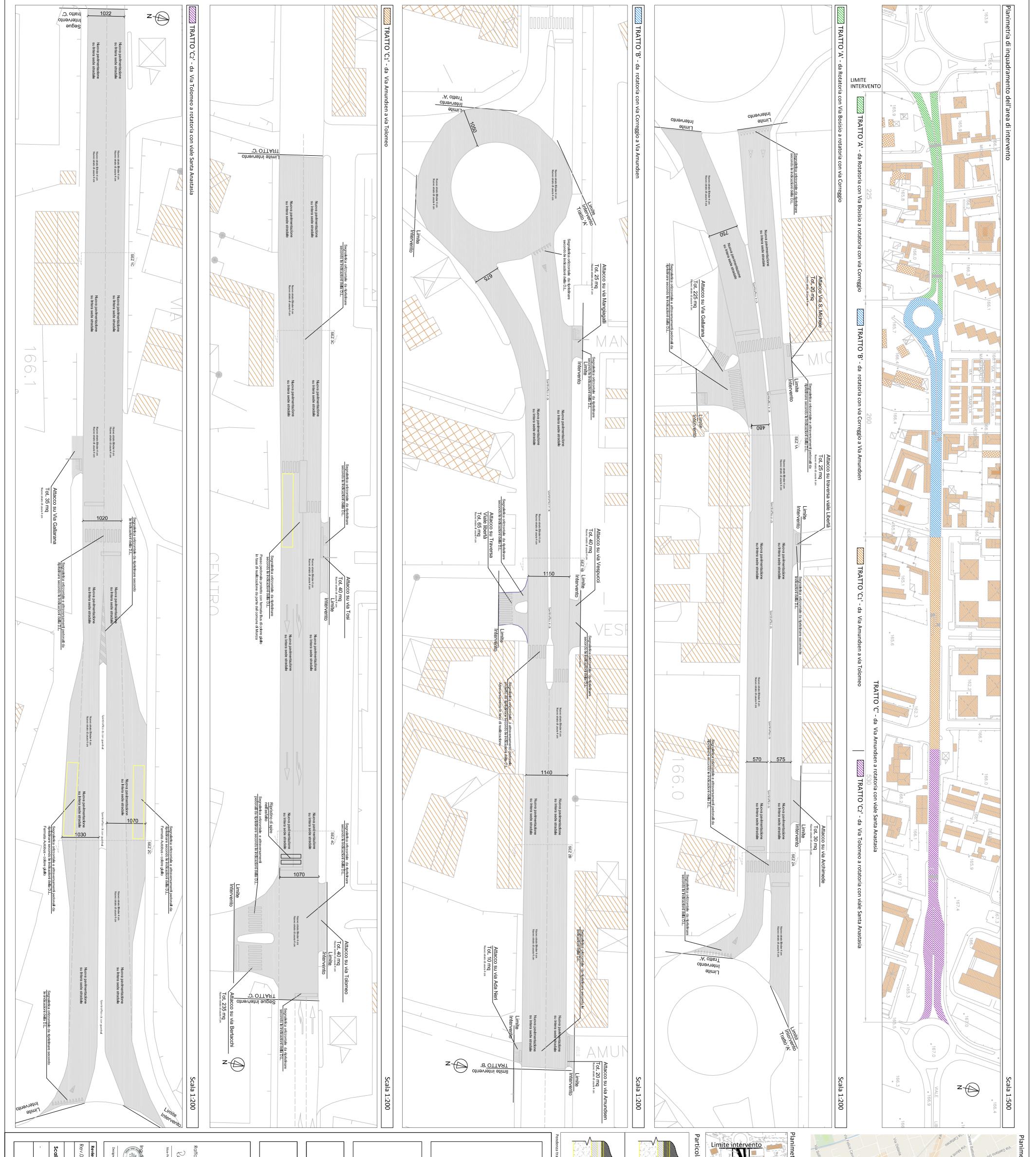
The longitudinal profile measurements will cover the entire length of the intervention and must be carried out in a period of time between the 15th and 180th day from opening to traffic, using a laser profile meter, and must be carried out with a "measurement pitch" of 10 cm.

The values of the IRI index will be calculated with a "step" of 100 m from the measured longitudinal profile. For the evaluation of the surface regularity characteristic, in the case of use of the IRI index, reference will be made to the average values, obtained from the point values (step 100 m), relative to each homogeneous section in which it is possible to divide the measured section; the IRI values thus obtained must be in accordance with the above prescriptions. The homogeneous sections will be identified by a calculation programme linked to the programme for returning regularity data.

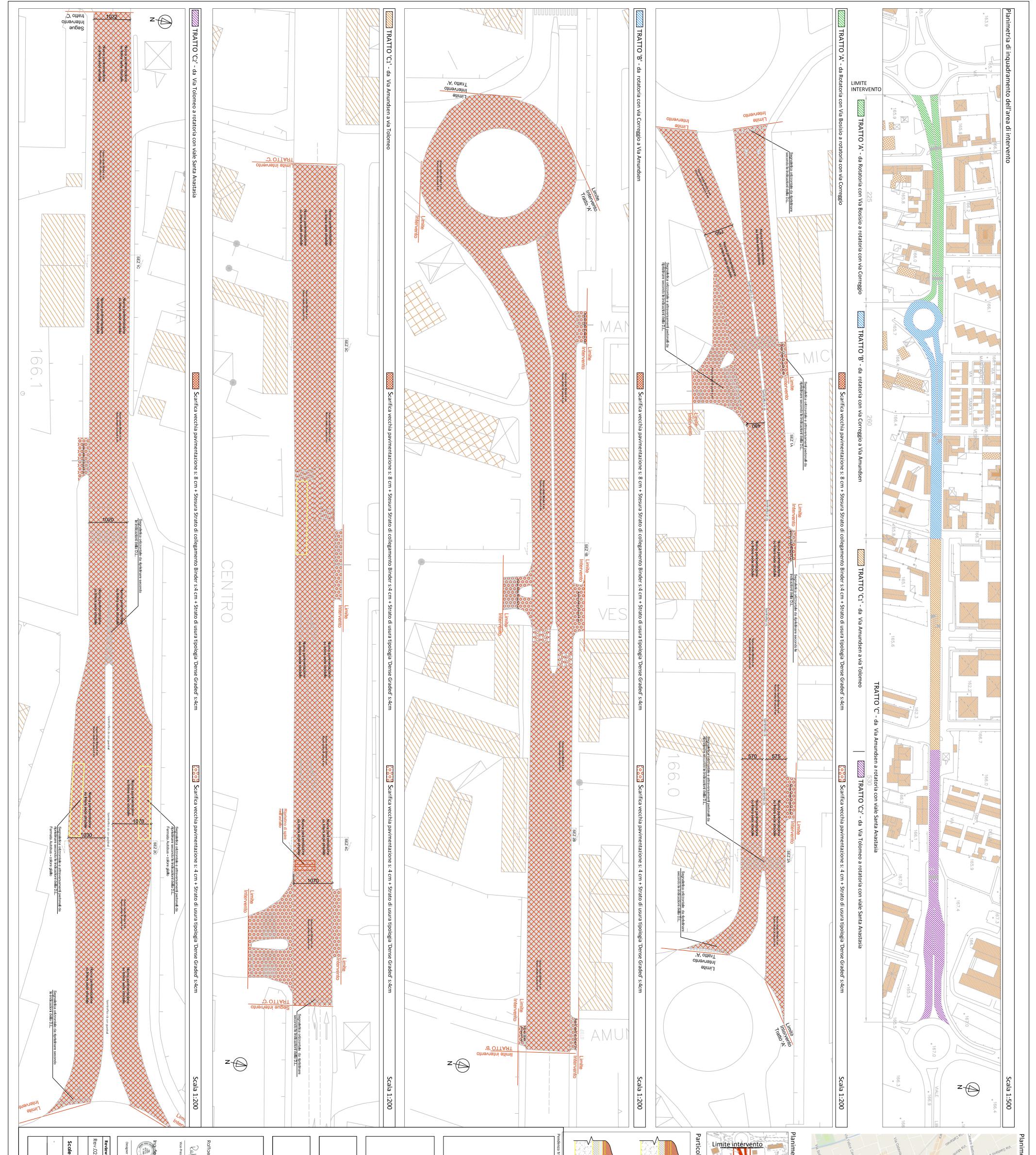


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