Annex to the Order of the Minister of
Transport and Infrastructure
No ..... / .....
and Order of the Minister of Development,
Public Works and Administration
No ..... / .....

MINISTRY OF TRANSPORT AND INFRASTRUCTURE

No ...../.....

MINISTRY OF DEVELOPMENT, PUBLIC WORKS AND ADMINISTRATION

No ...../.....

ORDER

approving the technical regulation "Standard for hot recycling of asphalt mixtures in fixed, semi-mobile, and mobile mixing plants" - Code DD 509-2024

In accordance with the provisions of Article 10(2) of Law No 10/1995 on quality in construction, republished, as amended, and Article 57(h) of Government Order No 43/1997 on the rules governing roads, republished, as amended,

By virtue of the provisions of Article 9(4) of Government Decision No 370/2021 on the organisation and functioning of the Ministry of Transport and Infrastructure, as subsequently amended and supplemented and Article 12(6) of Government Decision No 477/2020 on the organisation and functioning of the Ministry of Development, Public Works and Administration, as subsequently amended and supplemented,

the Minister of Transport and Infrastructure and the Minister of Development, Public Works and Administration, issue the following:

ORDER

Article 1. - The technical regulation "Standard for hot recycling of asphalt mixtures in fixed, semi-mobile, and mobile mixing plants" - Code DD 509-2024, set out in the Annex which forms an integral part of this Order, is hereby approved.

Article 2. - As of the date of entry into force of this Order, the Order of the Minister of Transport, Construction and Tourism No 906/2004 for the approval of the technical regulation "Standard for hot recycling of asphalt mixtures in fixed plants - revision" DD 509-89, code DD 509-2003, published in the Official Journal of Romania, Part I, No 659 bis of 22 July 2004, is repealed.

Article 3. - This Order shall be published in the Official Gazette of Romania, Part I, and shall enter into force on the date of its publication.

Standard for hot recycling of asphalt mixtures in fixed, semi-mobile, and mobile mixing plants -

Code DD 509-2024

CHAPTER I

General principles

SECTION 1

Purpose and scope

Article 1. – This standard concerns the quality conditions for the hot recycling, in fixed, semi-mobile and mobile preparation plants, of asphalt mixtures reclaimed from bituminous road beds.

Article 2. - The recycled asphalt mixture covered by this standard is prepared with reclaimed asphalt from the milling and/or stripping of bituminous road surfaces. Reclaimed asphalt must comply with the provisions of SR EN 13108-8.

Article 3. - Hot recycling in fixed, semi-mobile and mobile preparation plants consists, in principle, in the preparation of asphalt mixes from reclaimed asphalt and input materials (natural aggregates, filler, bitumen, regenerating agents and additives) in installations for the manufacture of asphalt mixes intended for this purpose, in accordance with Article 7.

Article 4. – Hot recycled asphalt mixture in fixed, semi-mobile and mobile preparation installations, in accordance with this regulation, can be used for:

a) the construction of the connection layer, on public roads of the technical class III-V and streets of the technical category II-IV, under the conditions of Article 11;

b) the execution of the base layer, on public roads of the technical class III-V and streets of the technical category II-IV, under the conditions of Article 11;

c) execution of maintenance and repair work on bituminous road clothing in accordance with Standard AND 554.

SECTION 2

General prescriptions

Article 5. – In the road technique in our country, the recycling of asphalt mixtures can be carried out using the following technologies:

a) cold recycling in situ according to Standard AND 532;

b) hot recycling, in fixed, semi-mobile and mobile preparation installations, in accordance with this regulation;

c) other technically approved recycling processes.

Article 6. – The main source of hot recycled asphalt mixtures in fixed, semi-mobile and mobile preparation plants is asphalt reclaimed by milling and/or stripping from asphalt coverings and/or asphalt layers of existing road structures, as follows:

a) layers of asphalt mixtures exhibiting deterioration such as cracks and multiple fissures in different directions, block cracking, rutting, heaving, slumps, local settlements, etc.,

b) asphalt mix layers on the asphalt path of bridges in the case of bridge rehabilitation or waterproofing,

c) layers of asphalt mixtures on road sections that require elevation to locally correct the longitudinal

profile or to remove them from the effects of flooding,

d) layers of asphalt mixtures from road sections with a low load-bearing capacity, for the purpose of reinforcing the road structure, on the basis of technical and economic studies,

e) layers of asphalt mixtures on roads or streets where underground building installation works are to be carried out,

f) layers of asphalt mixtures on street networks requiring increased load-bearing capacity through the addition of new layers, but the elevation of the curb does not allow,

g) layers of asphalt mixtures from decommissioned road bypasses or from service roads at engineering structures.

NOTES: (1) The sources of recovery indicated in Art. 6 are not limitative, with the exception of cold recycled mixtures which cannot be used and are not subject to this standard.

(2) It is recommended, for economic and environmental reasons, that asphalt mixtures resulting from the milling or stripping of road surfaces should be reused in accordance with the provisions of this standard in all cases where they are not recycled in situ or find no other means of recovery.

Article 7. - Hot recycling technology in fixed, semi-mobile and mobile preparation plants, as described in Chapter 3, Section 2, includes the following main operations:

a) organization of production bases by arranging storage areas for the reclaimed mixture and equipping them with the necessary equipment for sorting and dosing it, supplying the plant, and possibly crushing it (in the case of milled mixture),

b) recovering of asphalt mixture from asphalt surfaces and/or asphalt layers of existing road structures by milling and/or stripping,

c) transport of the reclaimed asphalt mixture to the organized production bases and its storage,

d) crushing and sorting the reclaimed asphalt mixture;

e) determination of the average composition of the reclaimed asphalt mixture;

f) preparation of dosage for recycled asphalt mixture;

g) preparation of recycled asphaltic mix/recycling itself.

SECTION 3

Terminology and definitions

Article 8. - The notations of recycled asphalt mixtures are given in Table 1, in accordance with Standard AND 605.

Article 9. - For the application of this regulation, the terms and definitions of the current standards and technical regulations specified in Article 10 shall be used, primarily including:

- *Adhesion* - property characterising the ability of two materials to adhere to each other and a characteristic of bituminous binders expressed by the resistance that they resist to detachment the bitumen film from the granules of the natural aggregates under the action of the interfacial stresses of the binder-aggregate system in the presence of water.

- *Natural input aggregates* - aggregates of a certain granularity/sort class or a combination of several granularity/sorting classes, required to be added both for the classification in the granularity requirements (granularity curve, i.e. maximum aggregate size) imposed by the laboratory study, and to ensure the quality requirements imposed on the aggregate mixture (resistance to freezing - thawing, resistance to wear, adhesion, etc.).

- *Milling* - a mechanised operation of breaking and shredding a layer or group of layers located on the upper part of the road structure, as part of rehabilitation/reinforcement/maintenance works on public roads.

- *Mixture/Reclaimed asphalt* - asphalt mixture subject to recycling, derived from the milling and/or pickling of road bituminous layers.

- *Recycled asphalt mixture* - mixture obtained by homogenisation of the mineral skeleton (consisting of milling material with or without the addition of aggregates), filler, bitumen, regenerative agents and additives, if applicable.

- *Bitumen regenerative agent* - is a component material that is added in small quantities must have the ability, in terms of thermomechanical characteristics, to rejuvenate/reactivate the aged bitumen from Reclaimed Asphalt Pavement (RAP) and, finally, to offer a final product with properties similar to those of a fresh bitumen in the milled asphalt mixture, in order to improve the characteristics to permanent deformation of the final asphalt mixtures.

- *EC marking* - marking attesting the conformity of a construction product with the declared performance in relation to the essential characteristics, confirmed by a harmonised standard or by the European Technical Assessment.

SECTION 4

Regulatory references

Article 10. 1. The provisions of the following reference documents shall apply to the use of this normative act, but shall not be limited to them:

SR 4032-1	Road works. Terminology.
SR EN 933-1	Tests for geometrical properties of aggregates. Part 1: Determination of particle size distribution. Sieving method.
SR EN 933-2	Tests for geometrical properties of aggregates. Part 2: Determination of particle size distribution. Test sieves, nominal size of apertures
SR EN 933-3	Tests for geometrical properties of aggregates. Part 3: Determination of particle shape - Flakiness index
SR EN 933-4	Tests for geometrical properties of aggregates. Part 4: Determination of particle shape. Shape index.
SR EN 933-5	Tests for geometrical properties of aggregates. Part 5: Determination of percentage of crushed or broken surfaces in coarse aggregate particles.
SR EN 933-8	Tests for geometrical properties of aggregates. Part 8: Assessment of fine parts. Sand equivalent test.
SR EN 933-9	Tests for geometrical properties of aggregates. Part 9 - Assessment of fine parts. Methylene blue test.
SR EN 933-10	Tests for geometrical properties of aggregates. Part 10: Assessment of fines. Determination of the filler gradation (air stream sieving).
SR EN 1097-1	Tests for mechanical and physical properties of aggregates. Part 1: Determination of the resistance to wear (micro-Deval).
SR EN 1097-2	Tests for mechanical and physical properties of aggregates. Part 2: Methods for the determination of resistance to fragmentation.

SR EN 1097-5	Tests for mechanical and physical properties of aggregates. Part 5: Determination of the water content by drying in a ventilated oven.
SR EN 1097-6	Tests for mechanical and physical properties of aggregates. Part 6: Determination of particle density and water absorption
SR EN 1367-1	Tests for thermal and weathering properties of aggregates. Part 1: Determination of resistance to freezing and thawing.
SR EN 1367-2	Tests for thermal and weathering properties of aggregates. Part 2: Magnesium sulphate test.
SR EN 13043	Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.
SR EN 1744-1	Tests for determining the chemical properties of aggregates. Part 1: Chemical analysis.
SR 61	Bitumen. Test of ductility.
SR EN 1426	Bitumen and bituminous binders. Determination of needle penetration.
SR EN 1427	Bitumen and bituminous binders. Determination of the softening point. Ring and ball (IB) method.
SR EN 1428	Bitumen and bituminous binders. Determination of water content in bituminous emulsions. Azeotropic distillation method.
SR EN 1429	Bitumen and bituminous binders. Determination of residue on sieving of bituminous emulsions, and determination of storage stability by sieving.
SR 10969	Road works. Determination of adhesiveness of road bitumens and cationic bituminous emulsions against natural aggregates using spectrophotometry.
SR EN 12591	Bitumens and bituminous binders. Specifications for paving grade bitumens.
SR EN 12607-1	Bitumen and bituminous binders. Determination of the resistance to hardening under influence of heat and air. Part 1: RTFOT method.
SR EN 13808	Bitumen and bituminous binders. Framework for specifying cationic bituminous emulsions.
SR EN 14023	Bitumen and bituminous binders. Specification framework for polymer modified bitumens.
SR EN 12697-1	Bituminous mixtures. Test methods. Part 1: Soluble binder content.
SR EN 12697-2	Bituminous mixtures. Test methods. Part 2: Determination of particle size distribution.
SR EN 12697-6	Bituminous mixtures. Test methods. Part 6: Determination of the apparent density of asphalt samples.
SR EN 12697-8	Bituminous mixtures. Test methods. Part 8: Determination of void characteristics of bituminous specimens.
SR EN 12697-11	Bituminous mixtures. Test methods Part 11: Determination of the affinity between aggregate and bitumen.
SR EN 12697-12	Bituminous mixtures. Test methods. Part 12: Determination of the water sensitivity of bituminous specimens.
SR EN 12697-13	Bituminous mixtures. Test methods. Part 13: Temperature measurement.
SR EN 12697-23	Bituminous mixtures. Test methods. Part 23: Determination of the indirect tensile strength of bituminous specimens.
SR EN 12697-24	Bituminous mixtures. Test methods. Part 24: Resistance to fatigue.

SR EN 12697-25	Bituminous mixtures. Test methods. Part 25: Cyclic compression test.
SR EN 12697-26	Bituminous mixtures. Test methods. Part 26: Stiffness.
SR EN 12697-27	Bituminous mixtures. Test methods. Part 27: Sampling.
SR EN 12697-28	Bituminous mixtures. Test methods. Part 28: Sample preparation for determining composition and moisture content.
SR EN 12697-29	Bituminous mixtures. Test methods. Part 29: Determination of the dimensions of a bituminous specimen.
SR EN 12697-30	Bituminous mixtures. Test methods. Part 30: Specimen preparation by impact compactor.
SR EN 12697-31	Bituminous mixtures. Test methods. Part 31: Specimen preparation by gyratory compactor.
SR EN 12697-34	Bituminous mixtures. Test methods. Part 34: Marshall test.
SR EN 12697-35	Bituminous mixtures. Test methods. Part 35: Laboratory mixture.
SR EN 12697-36	Bituminous mixtures. Test methods. Part 36: Determination of asphalt pavement thickness.
SR EN 12697-42	Bituminous mixtures. Test methods. Part 42: Quantity of foreign materials in reclaimed asphalt.
SR EN 13108-1	Bituminous mixtures. Material specifications. Part 1: Asphalt concrete.
SR EN 13108-8	Bituminous mixtures. Material specifications. Part 8: reclaimed asphalt
SR EN 13108-20	Bituminous mixtures. Material specifications. Part 20: Type testing.
SR EN 13108-21	Bituminous mixtures. Material specifications. Part 21: Factory production control.
AND 605	Technical regulation "Standard for hot asphalt mixtures. Technical conditions for design, preparation, and commissioning" *Code AND 605-2016*, as amended by Order No 1114/1205, published in the Official Gazette of Romania, Part I, No 573/26.06.2023, and Order No 1405/1610/2023, published in the Official Gazette of Romania, No 707/02.08.2023.
AND 532	Technical regulation "Standard for the cold recycling of road layers" *Code AND 532-2022,* approved by Order No 1431/1746/2023 of the Ministry of Transport and Infrastructure, and of the Ministry of Development, Public Works and Administration, published in the Official Journal of Romania, Part I, No 766/24.08.2023.
AND 547	The technical regulation "Standard for the prevention and repair of defects in modern road surfaces", *Code AND 547-2013*, approved by the Decision No 1277/11.09.2013 of the Director General of the Romanian National Company for Motorways and National Roads, published in the Technical Road Bulletin No 8-9/2013, with subsequent additions.
AND 554	The technical regulation "Standard on maintenance and repair of public roads" *Code AND 554-2002,* approved by the Decision No 1277/11.09.2013 of the Director General of the National Roads Administration, published in the Technical Road Bulletin No 13/2002.
AND 514	Technical Regulation "Regulation on the acceptance of road and bridge maintenance works", *Code AND 514-2022,* approved by Order No 1415/18/08/2022 of the Ministry of Transport and Infrastructure, published in the Official Gazette of Romania, Part I, No 860 bis /01/09/2022.
PCC 022	Technical regulation "Procedure for the technical inspection of equipment

	for laying asphalt mixtures for road and airfield works", *Code PCC 022-2015*, approved by Order No 821 of 27/04/2015 of the Ministry of Regional Development and Public Administration, published in Official Gazette No 341 of 19/05/2015.
PCC 019	Procedure for the technical inspection of asphalt mixing plants for road and airfield works, Code PCC 019-2005, approved by Order No 91 of 02/06/2015 of the Ministry of Regional Development and Public Administration, published in Official Gazette, Part I No 485 bis /02.07.2015.
G.D. No 492/2018	Government Decision No 492/2018 approving the Regulation regarding state quality control in construction, published in the Official Journal of Romania, Part I, No 594 of 12 July 2018.
G.D. No 273/1994	Government Decision No 273/1994 approving the Regulation on the acceptance of buildings, published in the Official Gazette of Romania, Part I, No 193 of 28 July 1994, as amended.
G.D. No 845/2018	Government Decision No 845/2018 approving the Regulation on the acceptance of buildings in the field of road and rail infrastructure of national interest, published in the Official Gazette of Romania, Part I, No 934 of 6 November 2018.
G.D. No 668/2017	Government Decision No 668/2017 laying down the conditions for the marketing of construction products, as amended.
Act No 50/1991	Law No 50/1991 on the authorization of the execution of construction works, republished, with subsequent amendments and completions.
Act No 10/1995	Law No 10/1995 on constructions quality, republished, with subsequent amendments and completions.

2. For undated references to Romanian standards, the last edition of the mentioned Romanian standard shall be used, including all amendments and errata, unless otherwise provided in the legislation in force.

CHAPTER II

Technical conditions

SECTION 1

Types of recycled asphalt mixtures

Article 11. - The types of asphalt mixtures recycled in accordance with the provisions of this normative document shall comply with Table 1.

Table 1 – Types of recycled asphalt mixtures

Item No	Type of recycled mixture	Symbol*	Domains of use			Conditions relating to:	
			Layer type	Technical class of the road	Technical category of the street	Reclaimed mixture	Natural input aggregates
1.	Open-graded asphalt concrete:						
	- with chippings	BAD_{ar}	Bond	III-V	II -IV	The reclaimed mixture must	- chippings of sizes 4-8; 8-16; 16-22.4-

Item No	Type of recycled mixture	Symbol*	Domains of use			Conditions relating to:	
			Layer type	Technical class of the road	Technical category of the street	Reclaimed mixture	Natural input aggregates
		22.4 AC (EB) 22.4				come from road layers built using chippings.	- Crushing sand or 0-4 crushing aggregated mixture - Natural sand or 0-4 natural aggregate mixture - filler
	- with crushed gravel	BADPC$_{ar}$ 22.4 AC (EB) 22.4	Bond	III-V	II -IV	The recovered mixture must come from road layers built using chippings and/or crushed gravel.	- crushed gravel of sizes 4-8; 8-16; 16-22.4 - Crushing sand or 0-4 crushing aggregated mixture - Natural sand or 0-4 natural aggregate mixture - filler
	- with graded gravel	BADPS$_{ar}$ 22.4 AC (EB) 22.4	Bond	V	IV	The reclaimed mixture must come from road layers built using chippings, crushed gravel, and/or graded gravel.	- graded gravel 4-8; 8-16; 16-22.4 - crushing sand or aggregated mix 0-4 of crushing - Natural sand or 0-4 natural aggregate mixture - filler
2.	Bituminous aggregate						
	- with chippings	AB$_{ar}$ 22.4** AC (EB) 22.4	Base	III-V	II-IV	The reclaimed mixture must come from road layers built using chippings.	- chippings of sizes 4-8; 8-16; 16-22.4 - Crushing sand or 0-4 crushing aggregated mixture - Natural sand or 0-4 natural aggregate mixture - filler
	- with chippings	AB$_{ar}$ 31.5** AC (EB) 31.5	Base	III-V	II-IV	The reclaimed mixture must come from road layers built using chippings.	- chippings of sizes 4-8; 8-16; 16-22.4; 16-31.5 - Crushing sand or 0-4 crushing aggregated mixture - Natural sand or 0-4 natural aggregate mixture - filler
	- with crushed	ABPC$_{ar}$	Base	III-V	II-IV	The recovered mixture must	- crushed gravel of sizes

Item No	Type of recycled mixture	Symbol*	Domains of use			Conditions relating to:	
			Layer type	Technical class of the road	Technical category of the street	Reclaimed mixture	Natural input aggregates
	gravel	22.4 AC (EB) 22.4				come from road layers built using chippings and/or crushed gravel.	4-8; 8-16; 16-22,4 - Crushing sand or 0-4 crushing aggregated mixture - Natural sand or 0-4 natural aggregate mixture - filler
	- with crushed gravel	ABPC*ar* 31.5 AC (EB) 31.5	Base	III-V	II-IV	The recovered mixture must come from road layers built using chippings and/or crushed gravel.	- crushed gravel of sizes 4-8; 8-16; 16-22.4; 16-31.5 - Crushing sand or 0-4 crushing aggregated mixture - Natural sand or 0-4 natural aggregate mixture - filler
	- with graded gravel	ABPS*ar* 31.5 AC (EB) 31.5	Base	V	IV	The reclaimed mixture must come from road layers built using chippings, crushed gravel, and/or graded gravel.	- graded gravel 4-8; 8-16; 16--22.4; 16--31.5 - Crushing sand or 0-4 crushing aggregated mixture - Natural sand or 0-4 natural aggregate mixture - filler

*) The notation "symbol" shall be followed by data on potential additives.

Examples of asphalt mixtures notation:

Symbol: AB_{ar} 22.4

Notation: AB 22.4 base 50/70 with adhesion additive – Bituminous aggregate with crushed stone and reclaimed asphalt, with a maximum grain size of 22.4 mm, for base layer, using 50/70 bitumen and an adhesion additive

**) For AB_{ar} with screenings, reclaimed asphalt up to a maximum of 10% of the total mass of the mix is acceptable, in accordance with AND 605.

SECTION 2

Materials

Article 12. - 1. The natural input aggregates used for the recycling of hot asphalt mixtures in fixed, semi-mobile and mobile preparation plants shall be as follows:

a) chippings of sizes 4-8, 8-16, 16-22.4, and/or 16-31.5,

b) crushed stone, sizes 4-8, 8-16, 16-22.4 and/or 16-31.5,

c) screened gravel, sizes 4-8, 8-16, 16-22.4 and/or 16-31.5,

d) crusher sand or 0-4 crushed aggregate mix,

e) natural sand or aggregate mixture 0-4 natural

(2) The natural aggregates must fulfil the quality conditions according to Standard AND 605, respectively they must come from homogeneous rocks, without traces of degradation, resistant to freeze-thaw and free of foreign bodies.

Article 13. - 1. Each type and sort of aggregate must be stored separately in silos/paddocks equipped with concrete platforms, with gradients for water drainage and separation walls to prevent mixing of the aggregates. Each silo/paddock shall bear a label stating the type and source of the material it contains.

(2) Each batch of materials supplied shall be accompanied by the following:

- declaration of performance, EC conformity marking and Certificate of Conformity of the Factory Production Control,

Article 14. -1. The filler used to recycle asphalt mixtures must comply with the provisions of Standard AND 605.

(2) The filler used to prepare asphalt mixtures shall be limestone filler, chalk filler or hydrated lime filler, in accordance with standard SR EN 13043. The use of other powders as filler replacement is prohibited.

Article 15. - 1. The filler shall be stored in pneumatically loaded silos. Agglomerated filler must not be used.

(2) Each batch of materials supplied shall be accompanied by the following:

- declaration of performance, EC conformity marking and Certificate of Conformity of the Factory Production Control,

Article 16. - 1. The bitumen used in the preparation of recycled asphalt mixtures may be of the type:

a) bitumen penetration class 35/50 or 50/70, according to SR EN 12591, National Annex NB, for the hot climate zone;

b) bitumen penetration grade 70/100 or 50/70, in accordance with SR EN 12591, National Annex NB, for the cold climatic zone.

(2) If modified bitumens are to be used, they shall be selected as follows:

- for hot zones: modified bitumen Class 3 (PmB 25-55) or modified bitumen Class 4 (PmB 45-80);

- for cold zones: polymer-modified bitumen class 4 (PmB 45-80) or polymer-modified bitumen class 5 (PmB 40-100), but with a penetration greater than 70 (1/10 mm).

(3) The climate zones are delimited according to Standard AND 605 Annex A.

(4) The adhesiveness of the bitumen towards the natural contribution aggregates, determined in accordance with SR 10969, must be at least. 80%. Otherwise, bitumen with additives shall be used.

NOTE: The level of adhesion shall be determined using the quantitative method described in SR 10969 (using a spectrophotometer) and/or one of the qualitative methods - in accordance with SR EN 12697-11. During the initial stage of establishing the mixture, the quantitative method described in SR 10969 must be used (using a spectrophotometer) and the solution for improving adhesion shall be adopted when applicable (type and dosage of additive).

In the case of the use of recycled mixtures with crushed gravel, in order to assess the effect of moisture on the combination of aggregate and binder (susceptibility to de-fouling), it is necessary to carry out the affinity by the rotary balloon method according to SR EN 12697-11.

(5) In addition to the requirements stipulated in SR EN 12591 and SR EN 14023, bitumen must meet the additional requirement regarding ductility at 25ºC (determined in accordance with SR 61):

- greater than 100 cm for bitumen penetration class 50/70 and 70/100;
- greater than 50 cm for bitumen penetration grade 35/50;
- greater than 50 cm for bitumen penetration grade 50/70, aged using the RTFOT method;
- greater than 75 cm for bitumen penetration grade 70/100, aged using the RTFOT method;
- greater than 25 cm for bitumen penetration grade 35/50, aged using the RTFOT method.

Article 17. - 1. Bitumen, polymer modified bitumen and doped bitumen shall be stored separately, by type of bitumen, in accordance with the bitumen manufacturer's specifications and the technical storage specifications for asphalt mixing plants. The storage period and temperature shall be chosen depending on the manufacturer's specifications, so that the initial properties of the bitumen remain unchanged until the mixture is prepared.

(2) Fast-breaking cationic bituminous emulsions made using bitumen or modified bitumen shall be used for priming.

(3) Each batch of materials supplied shall be accompanied by the following:

- declaration of performance, EC conformity marking and Certificate of Conformity of the Factory Production Control,

Article 18. - The reclaimed mixture used in the preparation of recycled asphalt mixtures shall meet the following conditions:

a) have a maximum grain size of 22.4 mm/31.5 mm (depending on the type of mixture designed) and a residue on the upper sieve of max. ≤ 5% by mass;

b) The bitumen contained must have a softening point IB of max. 80°C. Otherwise, the reclaimed mixture shall be reused by the same process, without taking into account the quantity/quality of the contained binder.

NOTE: The description, classification and identification information of reclaimed asphalts used as components of asphalt mixtures shall be carried out in accordance with the provisions of SR EN 13108-8.

Article 19. - 1. Other materials employed:

a) bitumen regenerators - if the bitumen in the reclaimed mixture exhibits an advanced degree of aging (IB = 65 ... 80°C), and the dosage of the reclaimed mixture is more than 10%. The regenerator must be technically approved and compatible with the bitumen, ensuring that the composition of the bitumen in the reclaimed mix is restored in such a way that the ternary mixture: input bitumen, existing bitumen and regenerator, has a softening point IB corresponding to the conditions imposed on the bitumen corresponding to the type of mix designed, in accordance with Art. 16, para. 1;

b) bitumen additives - if the adhesiveness of the intake bitumen (with regenerator, if applicable) to the natural aggregates used is less than 80%, the additives must be compatible with the bitumen, be thermally stable at min. 200°C and ensure an adhesiveness of min. 80% compared to the natural aggregates used, without affecting the other characteristics of the bitumen;

c) fast-breaking cationic bituminous emulsion according to SR EN 13808 for priming the support layer before laying the recycled mixture.

(2) To ensure that the asphalt mixtures reach the level of performance required by this regulation, additives with declared properties, which have been assessed in accordance with the legislation in

force, can be used. These additives can be added either directly to the bitumen or to the asphalt mixture.

(5) Each batch of additive supplied shall be accompanied by conformity documents, in accordance with the marketing legislation in force.

SECTION 3

Composition and characteristics of recycled asphalt mixtures

Article 20. - The granularity range prescribed for the total mixture of natural aggregates (input and reclaimed mixture) for each type of recycled asphalt mixture shall be in accordance with Table 2.

Table 2 - Granulometric area of recycled asphalt mix

Sieve mesh size, (mm)	Type of recycled asphalt mixture		
	BAD_{ar} 22.4 $BADPC_{ar}$ 22.4 $BADPS_{ar}$ 22.4	AB_{ar} 22.4 $ABPC_{ar}$ 22.4	AB_{ar} 31,5 $ABPC_{ar}$ 31.5 $ABPS_{ar}$ 31.5
	Specified grading limits / Passing (%)		
45	-	-	100
31.5	100	100	90-100
22.4	90-100	90-100	82-94
16	73-90	70-86	72-88
8	42-61	38-58	54-74
4	28-45	27-43	37-60
2	20-35	19-34	22-47
0.125	5-10	3-8	3-12
0.063	3-7	2-5	2-7

Article 21. - 1. The optimal binder content in the recycled asphalt mixture from existing bitumen and input bitumen shall be established by preliminary laboratory testing.

(2) The recommended limits for carrying out preliminary laboratory studies, in order to determine the optimal binder content, are given in Table 3.

(3) When carrying out the preliminary laboratory tests, the provisions of Article 19 shall be taken into account.

Table No 3 – Determination of optimal binder content

Current No	Type of recycled asphalt mixture	Binder content min. %
1.	BAD_{ar} 22.4; $BADPC_{ar}$ 22.4; $BADPS_{ar}$ 22.4	4.2
2.	AB_{ar} 22.4; $ABPC_{ar}$ 22.4; AB_{ar} 31.5; $ABPC_{ar}$ 31.5;	4.0

	$ABPS_{ar}$ 31.5	

NOTE: If the dosage study results in an optimal percentage of binder outside the limit in Table 3, it can be accepted with the approval of the designer and the beneficiary.

Article 22. - 1. Recycled asphalt mixture according to SR EN 12697-35 shall be prepared in the laboratory, with 5 different binder dosages. The optimal dosage will be selected as the variant with the binder content for which the recycled asphalt mixture exhibits performance characteristics that fall within the prescribed limits.

(2) The recycled asphaltic mix shall be accompanied, where appropriate, by:

- declaration of performance, EC conformity marking and Certificate of Conformity of the Factory Production Control,

or

- the declaration of performance, EC conformity marking and test reports (issued by authorised/accredited laboratories) certifying the quality of the material, including dosage and conformity documents for the component materials that will comply with the requirements of this regulatory document.

Article 23. - The characteristics of recycled asphalt mixtures, depending on the layer (bonding or base layer), shall be within the limit values in Tables 4A, 4B and 4C.

Table no. 4A - Determined physical and mechanical properties
by means of tests on cylindrical specimens

Current No	Type of recycled asphalt mixture	Quality conditions				
		Stability (S) at 60 °C, KN*	Creep (F), mm**	Marshall coefficient, S/F, min. KN/mm	Water absorption, % vol.	Sensitivity to water, %
1.	Open-graded asphalt concrete	5.0...13	1.5...4.0	1.2	1.5...6.0	min. 80
2.	Bituminous coated aggregate	6.5...13	1.5...4.0	1.6	1.5...6.0	min. 80

* Maximum values do not apply for modified bitumen mixtures.

** Minimum values shall not apply for modified bitumen mixtures.

Table 4B - Characteristics of the mixtures for the bonding layer determined
through dynamic testing

Current No	Characteristic	Recycled asphalt mixture for the binder course
	Technical class of road	III-IV
	Road technical category	II- III
1.	Properties determined on cylinders prepared using a gyratory compactor	
1.1.	Air void content, at 120 rotations, maximum %	10.5
1.2.	Resistance to permanent deformation (dynamic creep) - deformation at 40°C, 200 KPa and 10,000 impulses, µm/m, max. - deformation rate at 40 ºC, 200 KPa and 10,000 impulses, µm/m/cycle, max.	30,000 3.0

1.3.	Rigidity module at 20 ºC, 124 ms, MPa, min.	4,500
1.4.	Fatigue resistance, cylindrical test requested at indirect stretch: minimum number of cycles until cracking at 15 °C	300,000
2.	Resistance to fatigue, trapezoidal or prism-shaped specimens, ε 6 10-6, minimum	100

Notice: The fatigue resistance shall be determined either on the cylindrical sample under indirect tensile stress, or on trapezoidal or prism-shaped specimens.

Table No 4C - Characteristics of base layer mixtures determined through dynamic testing

Current No	Characteristic	Recycled asphalt mixture for the base course
	Technical class of road	III-IV
	Road technical category	II-III
1.	Properties determined on cylinders prepared using a gyratory compactor	
1.1.	Air void content, at 120 rotations, maximum %	10
1.2.	Resistance to permanent deformation (dynamic creep) - deformation at 40°C, 200 KPa and 10,000 impulses, µm/m, max. - deformation speed at 40°C, 200 KPa and 10,000 impulses,	30,000 3.0
1.3.	Modulus of rigidity at 20 ºC, 124 ms, MPa, minimum	5,600
1.4.	Resistance to fatigue, cylindrical sample under indirect tensile stress: Minimum number of cycles until cracking at 15 ºC	400,000
2.	Resistance to fatigue, trapezoidal or prism-shaped specimens ε 6 10-6, minimum	100

Notice: The fatigue resistance shall be determined either on the cylindrical sample under indirect tensile stress, or on trapezoidal or prism-shaped specimens.

Article 24. - The characteristics of the recycled mixture are checked during the elaboration of the dosages, at the transposition on the station, during the execution of the works and on cores extracted from the ready-mixed layer, according to the Standard AND 605.

CHAPTER III

General execution specifications

SECTION 1

Machinery, plants and equipment

Article 25. – Machinery, installations and equipment shall ensure:

a) recovery of the mixture from the existing bituminous layer, after prior cleaning;

b) transportation of the reclaimed mixture to the asphalt mixture preparation station;

c) preparation of reclaimed mixture (crushing, sorting, storage);

d) hot recycling;

e) transport and laying of the recycled asphalt mixture.

Article 26. - 1. For the recovery of asphalt mix from bituminous road surfaces, milling machines of small or large capacity are usually used, depending on the type of works, so as to ensure the designed milling depth.

(2) Milling equipment must have the capability to adjust the milling depth, and the milled mixture must have a maximum grain size of max. 22.4 mm/31.5 mm (depending on the type of projected mix), in accordance with Article 18 (a).

(3) In cases where recovery of the existing mixture cannot be achieved with the drill, it shall be removed by appropriate mechanical means.

(4) Before recovering the mixture, the existing layer shall be thoroughly cleaned with mechanical brushes and, if necessary, with equipment fitted with a jet of water under pressure or compressed air.

(5) The milled mixture shall be loaded directly into means of transport/dumpers with coating systems.

Article 27. - For transporting the reclaimed asphalt mixture, dump trucks with clean beds must be used.

Article 28. - 1. The asphalt mixture reclaimed by pickling, unlike that obtained by milling, must be crushed in order to be brought to a grain size of 0...22.4 mm / 0...31.5 mm (depending on the type of mixture designed), in accordance with Article 18(a).

(2) The crushing of the pickled mixture can be carried out by means of a crushing plant consisting of a metal hopper of receiving the reclaimed mixture, a conveyor belt and a crusher with jaws or a crushing-granulation plant.

(3) If the crushed mixture displays granules with a size greater than 22.4 mm /31.5 mm (depending on the type of designed mixture), the crushed mixture shall be sorted and the material remaining on the 22.4 mm/31.5 mm sieve shall be re-inserted into the crusher.

Article 29. - The recycling of reclaimed mixture can be carried out in asphalt mixture preparation installations, in accordance with Standard AND 605, equipped with equipment adapted to the use of reclaimed asphalt mixtures and devices for pre-dosing and gravimetric dosing, respectively.

Article 30. - The transport and putting into operation of the recycled asphalt mix is carried out with the same machinery and equipment as for hot asphalt mixes, in accordance with Standard AND 605, with the stipulation that, for the preparation and cleaning of the backing layer, the following will be used:

a) mechanical brushes;

b) compressed air installation;

c) mechanical priming installations.

SECTION 2

Recycling technological process

Article 31. - The technological process of recycling includes, as main operations, the phases described in Article 7, namely the recovery of the mixture, transport, storage, crushing, sorting,

determination of the average composition of the reclaimed mixture, the preparation of dosages and the preparation/recycling itself, in accordance with Articles 32 to 38.

Article 32. - 1. The recovery of asphalt mix from bituminous road surfaces shall be carried out by milling or stripping, after prior cleaning of the surface.

(2) It is recommended to recover the milled material, with installations fitted with a system for loading the milled mixture directly into the means of transport.

(3) The milling depth shall be determined on the basis of surveys so that only the bituminous road layers are milled. The depth to which the road layers are milled shall be determined in such a way as to ensure the quotas required by the documentation/project.

Article 33. - The transport of the reclaimed mixture to the work site is carried out using dump trucks with clean beds. Transport of the mixture with dumpers whose strip is contaminated with scrap of other materials shall not be permitted.

Article 34. - It is recommended that the milled and crushed mixture be stored in spaces equipped with concrete platforms and partitions. Their shelf life should not exceed 20-25 days at temperatures above 25°C.

NOTE: If the milled / crushed mix is stored for a period longer than 20-25 days at temperatures higher than 25 degrees C, it is necessary to move the stores in the pile with the help of front loader machines, in order to ensure aeration and avoid clenching of the milled / crushed mix. If, however, agglomeration (sticking) of the milled mixture in the heap does occur, it will be crushed and the granularity of the resulting product will be determined.

Article 35. - The asphalt mixture reclaimed by pickling shall be crushed to a grain size of max. 22.4 mm/31.5 mm (depending on the type of mixture designed), in accordance with Article 18(a), preferably by means of a crushing-sorting plant, in accordance with Article 28.

Article 36. - 1. For the development of the doses of the recycled mix, the existing mixture in the landfill (milled/crushed) as well as the input materials shall be analysed.

(2) In order to analyse the existing asphaltic mix:

a) sampling of the mixture (minimum 5 incremental samples of 3 kg for each 200 tonnes of mixture) according to SR EN 12697-27; the test samples shall be constituted as average samples from the incremental samples according to SR EN 12697-28;

b) determination of the granularity of the milled or crushed mixture, according to SR EN 933-1 for the verification of the maximum grain size;

c) determination of the composition of the milled or crushed mixture (bitumen content and natural aggregate grain size), in accordance with SR EN 12697-1 and SR EN 12697-2;

d) determination of the softening point IB on the extracted bitumen.

(3) In the case of the use of regenerators, the adhesiveness will be determined on the intake bitumen with the addition of the regenerator, as some regenerators may decrease the adhesiveness.

(4) In the case of the use of additive or regenerator-added bitumen, the optimal dosage of the additive shall be determined and the IB soaking point on the residual bitumen verified, respectively.

(5) On the basis of the analysis of the constituent materials, the dosages for the recycled asphalt mix shall be developed, taking into account the type of natural aggregates and the prescribed limits for the composition of the respective type of mix.

(6) The dosage of the mixture reclaimed from the composition of the recycled mixture will be determined on the basis of laboratory studies and the requirements of the beneficiary/designer's recommendation.

Article 37. - 1. Depending on the technology used, the manufacture of the recycled asphalt mixture requires:

a) supplying the pre-dose hopper with milled/crushed mixture in parallel with supplying the pre-dose hoppers with natural intake aggregates;

b) the introduction into the dryer of the natural input aggregates where they are dried and heated, followed by their resorting and dosing;

c) dosage and introduction of milled or crushed mixture into the flow of warm natural aggregates;

d) the natural aggregates and the reclaimed mixture are introduced into the mixer, followed by mixing, after which the filer and the hot bitumen, volumetrically or gravimetrically proportioned, are introduced into the mixer, mixing being continued until a homogeneous mixture is obtained; the mixing time, depending on the type of plant, must be sufficient to achieve complete and uniform crushing of the natural aggregate;

e) unloading the batch of mixture into the storage bunker;

f) unloading the mixture into the means of transport.

(2) In the case of using additive-modified/modified bitumen and/or bitumen with added regenerators, the technological process will also include the operations of bitumen modification according to the technology described below, and the introduction of the regenerator into the bitumen, in accordance with the technical approval, as follows:

Preparation of additive-modified bitumen

A. The preparation of the added bitumen at the site may be carried out by one of the following ways:

- by means of a special installation which ensures the dosing and injection of the additive into the bitumen entering the mixer;
- by means of an adapted installation for the supply and dosage of the additive in the bitumen tank;
- with existing equipment at the construction site.

B. The addition of bitumen according to the first variant shall be executed according to the instructions in the technical documentation of the equipment/additive/modifier.

C. The addition of bitumen according to the other two processes involves:

- the existence at the site of a separate metal tank for bitumen (with heating system, temperature recording system, manhole and recirculation pump) and the possibility of dosing the additive (volumetric or gravimetric);
- knowledge of the amount of bitumen in the tank and the dosage of the additive.

The bitumen additive-modification technology flow in this case includes the following operations:

- heating the bitumen to 150...160°C;
- calculation of the necessary amount of additive, its dosage and introduction into the bitumen tank;
- homogenization of the mixture by simple recirculation with the pump for 30...40 minutes (until the bitumen in the tank passes through the pump at least once).

D. The additive-modified bitumen may be used immediately or stored in accordance with Art. 16 without risk of separation of the additive or its degradation. The only requirement is that the additive-modified bitumen must not be overheated, reheated more than once or kept at working temperature for too long.

Article 38. The temperatures of the natural aggregates, bitumen and asphalt mixture upon coming out of the mixer shall be established depending on the type of binder, (or in accordance with the manufacturer’s specifications), with the note that the maximum temperatures shall be applied at all

points of the asphalt mixture preparation installation and the minimum temperatures shall apply upon delivery.

The thermal regime applied in the manufacture of recycled asphalt mixtures shall be in accordance with Table 5.

Table no. 5 - Thermal regime applied in the manufacture of recycled asphalt mixes

Current No	Material or phase of execution	Temperature, °C
1.	Natural input aggregates	170-200, depending on the reclaimed mixture dosage
2.	Additive bitumen	150 ... 170
3.	Recycled asphalt mixture:	
	- on exit from the mixer	155 ... 180
	- during laying	Min. 150
	- at the beginning of compaction	Min. 145
	- at the end of compaction	Min. 110

NOTE: Different temperatures can be applied when using modified bitumen, hard bitumen or additives. In this case, the temperature must be documented and declared on the regulated marking.

SECTION 3

Transport and commissioning

Article 39. - The transport of recycled asphalt mixtures shall be carried out in accordance with Standard AND 605 using special means of transport with double-walled, watertight wells and special tarpaulins, so that temperature losses are limited to a maximum of 5°C. The wells of the means of transport shall be clean and dry.

Article 40. - 1. The commissioning of recycled asphalt mixtures shall be carried out at substrate temperatures and an outside temperature of not less than 10°C on a clean, dry surface.

NOTE: - In the case of polymer-modified bitumen asphalt mixtures, the asphalt mixing shall be performed at underlying layer temperatures and at an outdoor temperature of at least 15° C on a clean and dry surface.

(2) The base course shall be covered by the bituminous surface layers, so that it is not left unprotected under the traffic.

(3) Given its high porosity, a binder course made of open-graded asphalt concrete shall not be left uncovered. The binder course shall be covered before the cold season to prevent the occurrence of structural degradation.

(4) In case of remediation of degradations with recycled asphalt mixture, these will be executed according to Standard AND 547.

CHAPTER IV

WORK QUALITY CONTROL

Article 41. - 1. The quality control of the recycling works of asphalt mixtures in fixed, semi-mobile and mobile preparation plants shall be carried out in phases, as follows:

a) quality control of materials;

b) control of the recycling technological process;

c) quality control of the recycled asphalt mixture.

(2) The quality control of the ready-made layer shall be carried out in accordance with the technical specifications/requirements governing the work, depending on the type of recycled mixture, as per Standard AND 605.

SECTION 1

Quality control of materials

Article 42. - 1. When preparing the doses, the materials used to recycle asphalt mixes in fixed, semi-mobile and mobile preparation plants shall be checked in accordance with the requirements of the product standards and regulations and the conditions laid down in Articles 12 to 19 and Article 36 of this Regulation.

(2) The laboratory study for the preparation of the doses and the checking of the quality of the materials shall be carried out by the entrepreneur's laboratory or by another approved/accredited laboratory.

Article 43. – During the execution of the works, *the minimum checks and determinations* to be carried out on the site by the contractor's laboratory, on each batch of input materials supplied and on each batch of milled/crushed mixture, as well as weekly from the deposits of natural aggregates and reclaimed mixture, respectively from the bitumen storage tank, consist of the following:

a) Bitumen
   - penetration at 25°C, SR EN 1426;
   - softening point, IB, SR EN 1427.

b) Chippings
   - granularity, SR EN 933-1;
   - form coefficient, SR EN 933-4;
   - fine parts content, SR EN 933-1;
   - quality of fine particles (methylene blue test), SR EN 933-9.

c) Sorted / crushed gravel
   - granularity, SR EN 933-1;
   - form coefficient, SR EN 933-4 ;
   - fine parts content, SR EN 933-1.

d) Crushed sand
   - granularity, SR EN 933-1;
   - fine parts content, SR EN 933-1;
   - quality of fine particles (methylene blue test), SR EN 933-9.

e) Natural sand
   - granularity, SR EN 933-1;

- fine parts content, SR EN 933-1;
- quality of fine particles (methylene blue test), SR EN 933-9;
- sand equivalent, SR EN 933-8.

f) Filler

- air stream granularity, SR EN 933-10;
- water content, SR EN 1097-5.

g) Reclaimed mixture (milled or crushed)

- granularity, SR EN 933-1;
- composition, SR EN 12697-1 and SR EN 12697-2.

SECTION 2

Technological process control

Article 44. – The control of the technological recycling process shall consist of the following operations:

a) Control of the adjustment of the asphalt mixing plant:

i. proper operation of pre-dispensers for natural aggregates and reclaimed mixture: daily;

ii. proper operation of the gravimetric or volumetric dosing devices: at the beginning of each working day.

b) Control of the thermal conditions under which the asphalt mixture is prepared in accordance with SR EN 12697-13;

i. temperature of the binder entering the mixer: constantly;

ii. temperature of the dried and heated natural aggregates exiting the dryer: constantly;

iii. temperature of the asphalt mixture upon exiting the mixer: constantly.

c) Verification of the composition of the recycled asphalt mixture (granulometric composition and bitumen content) by extraction, on mixture samples taken from the mixer or from the laying: daily.

SECTION 3

Quality control of recycled asphalt mixture

Article 45. - 1. The quality of the recycled asphalt mixture shall be checked by laboratory tests carried out by an authorised/accredited laboratory on asphalt mixture samples (1 sample/200...400 tonnes recycled mixture, for installations with a productivity of up to 40 t/h and 1 sample/400...800 tonnes recycled mixture, for installations with a productivity greater than or equal to 40 t/h), but at least one sample per day, as follows:

a) the composition of the asphalt mixture, which must fall within the limits given in Tables 2 and 3 and correspond to the dosages established by the preliminary laboratory study, the permissible deviations being those given in Table 6;

b) the characteristics of the recycled asphalt mixtures must be within the limits laid down in Art. 23.

Table No 6 - Permissible deviations of the recycled asphalt mixture components

Current No	Elements of the mixture components	Permissible deviations from the prescribed dosage, %
1.	Bitumen content	± 0,2
2.	Aggregates Pass on the sieve of, (mm)	
	31.5	± 5
	22.4	± 5
	16	± 5
	8	± 5
	4	± 4
	2	± 3
	0.125	± 1.5
	0.063	± 1.0

(2) The types of tests and their frequency, depending on the type of mixture and the technical class of the road, are presented in Standard AND 605

(3) The quality control of the execution of binder and base layers made of reclaimed asphalt mixtures is carried out in accordance with the provisions of Standard AND 605.

(4) The control on determining phases, established in the technical project, on the asphalt mixture layers made will be carried out in accordance with *the Regulation on state control of quality in construction approved* by Government Decision No 492/2018.

CHAPTER V

Works acceptance

SECTION 1

Acceptance at the end of the work

Article 46. - 1. Acceptance at the end of the works shall be carried out by the beneficiary, in accordance with the *Regulation on the acceptance of construction works* approved by Government Decision No 273/1994, as subsequently amended and supplemented, the *Regulation on the acceptance of construction works in the field of road and railway infrastructure of national interest* approved by Government Decision No 845/2018 or the *Regulation on the acceptance of road and bridge maintenance works,* Code AND 514, approved by Order No 1415/18.08.2022 of the Minister of Transport and Infrastructure, as applicable. The acceptance committee examines the executed works in accordance with the approved technical documentation, the execution project, the specifications, as well as the necessary determinations for the completion acceptance of the works, in accordance with Standard AND 605.

SECTION 2

Final acceptance

Article 47. - The final acceptance will be carried out in accordance with *Regulation on the acceptance of construction works* approved by Government Decision No 273/1994, with subsequent amendments and additions, *Regulation on the acceptance of construction works in the field of road and railway infrastructure of national interest*, or *Regulation on the acceptance of road and bridge maintenance works*, Code AND 514, as appropriate, according to the contractual provisions, after the expiry of the warranty period, according to Standard AND 605.