

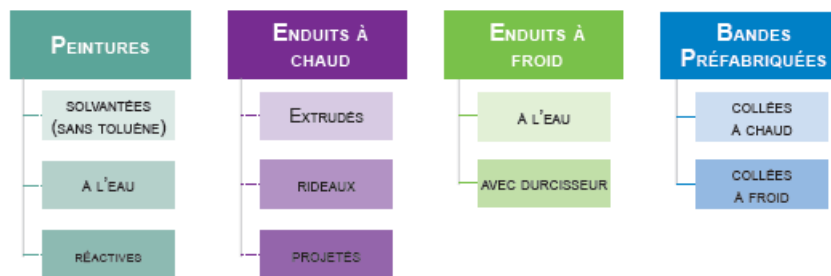
# SER position for ERF microplastic sub working group

## Introduction:

Most of the information shared below are extracted from the official IDRRIM guidebook for road marking, edited and published in 2019. This guide describes all best knowledge from road marking experts and main players from French market (raw material supplier, paint producers, contractors and road authorities/administration), under the patronage of SER association.

Road marking used in France are based on different technologies:

Il existe quatre grandes familles de produits de marquage basées sur des technologies différentes et correspondant à des besoins particuliers.



Un produit de marquage est principalement structuré autour d'une matrice composée d'un liant, de charges, de pigments et d'adjuvants. Chaque produit se différencie selon le mode de formation du film qui va venir adhérer au sol support.

Peuvent être ajoutées :

- Des micro billes de verre pour assurer la visibilité de nuit (rétro-réflexion des ondes lumineuses des phares des véhicules),
- Des charges pour assurer l'anti-glissance des produits.

L'ajout de billes ou de charges joue un rôle important dans la durabilité du marquage (cf. -3).

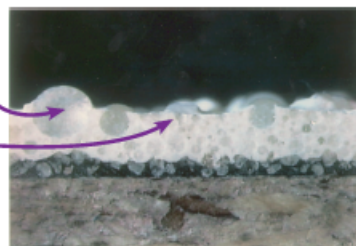


Figure 4 : Illustration montrant la présence de billes de verre et de charges

Figure 1: Description of the different road marking products used in France from IDRRIM Guidebook

Around 30 000 metric tons of road marking materials have been applied in France in 2017:



PRODUCTS NF 2015	Amount produced (MT)	Share in Volume (%)	Share by surface (%)
Paints	16212	54	88
Hot Melt Thermoplastics	8927	30	8
2K Cold Plastics	3528	12	3
Preformed tapes	1242	4	1
Total	29909	100	100

Figure 2: French market share (Source: ASCQUER, 2017)

It is important to understand that all road marking have drop on particles applied on the surface : glass beads (different sizes and amount) as illustrated below:

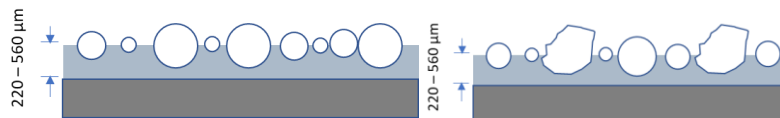


Figure 3: Example of generic paint (thin layer) applied with different drop-on (pure glass beads, blend of glass beads and aggregates)

Those drop-on materials play a critical role for road marking: visibility during nighttime (retroreflexion) and antiskid during day time. **Their presence on the surface will directly impact the performance and durability of the road marking system**, as illustrated below:

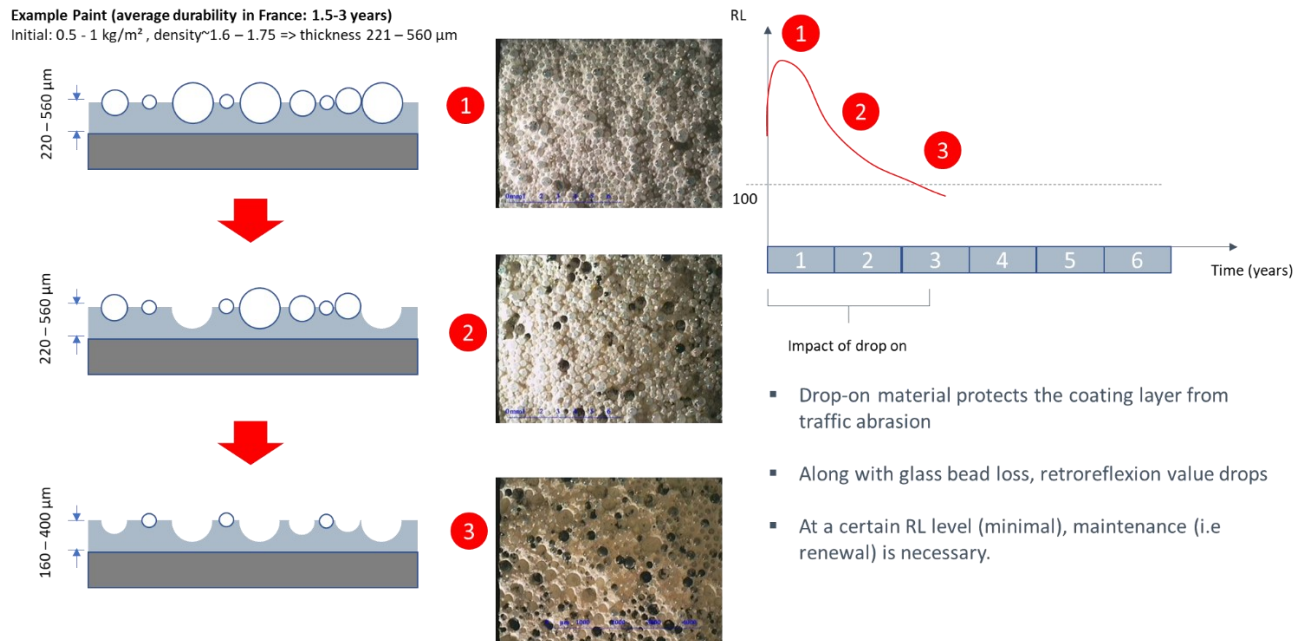


Figure 4: Illustration of Retroreflexion evolution with traffic, and corresponding surface aspect

As soon as the drop-on material starts to be removed by friction from wheel contact, performances of the road marking system start to decrease.

To be applied on French public roads (highways, national, urban...) all road marking products must be certified according to European norm EN-1824 (field application), and comply with French specifications NF2:



*Figure 5: RN2 test field for French certification*

A NF certified product will get an official document which will state its performance measured on a road under real traffic (RN2):

- Durability of the criteria (in # of wheel hits) from P1 (50 000) to P6 (2 000 000)
- Level of retroreflexion: minimum is R3 (150mCd/lx/m<sup>2</sup>) for dry retroreflexion
- Level of Luminance: minimum is Q2 (100 mCd/lx/m<sup>2</sup>)
- Level of skid resistance: minimum is S1 (0.45)

As soon as any of these performance criteria (RL, QD or SRT) is below minimum specifications, road marking system is no longer valid and **must be renewed**.

Renewal of road marking is done by applying a fresh new layer of coating + drop-on (as illustrated below: glass beads protect the marking)

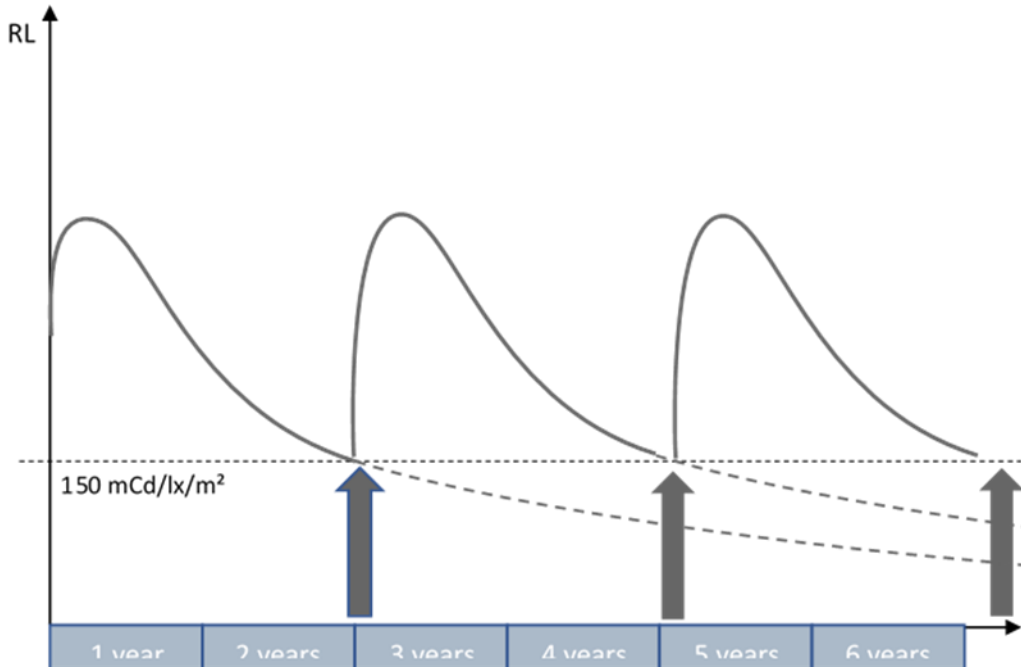


Figure 6: Example of a maintenance (renewal) of a road marking system over the year when reaching out the minimum specifications, here retroreflexion.

When retroreflexion (or other properties like Luminance, or skid resistance) reaches the minimum specification, there are still a significant amount of glass beads remaining on the surface (= still protecting a huge surface of coating layer from traffic).

Given the average initial amount of glass beads applied on fresh road marking, (~400 g/m<sup>2</sup>), SER Road marking expert group states that average residual amount of glass beads remaining on the surface<sup>1</sup> is 30 to 35% (~120 to 140 g/m<sup>2</sup>) for a retroreflexion of 150 mCd/lx/m<sup>2</sup> and 20 to 25% (~80 to 100 g/m<sup>2</sup>) for a retroreflexion of 100mCd/lx/m<sup>2</sup>.

<sup>1</sup> Many other parameter can affect the remaining % of glass beads (amount of TiO<sub>2</sub> in the formulation, glass bead particle size and distribution, thickness of the coating, embedment of the glass beads...

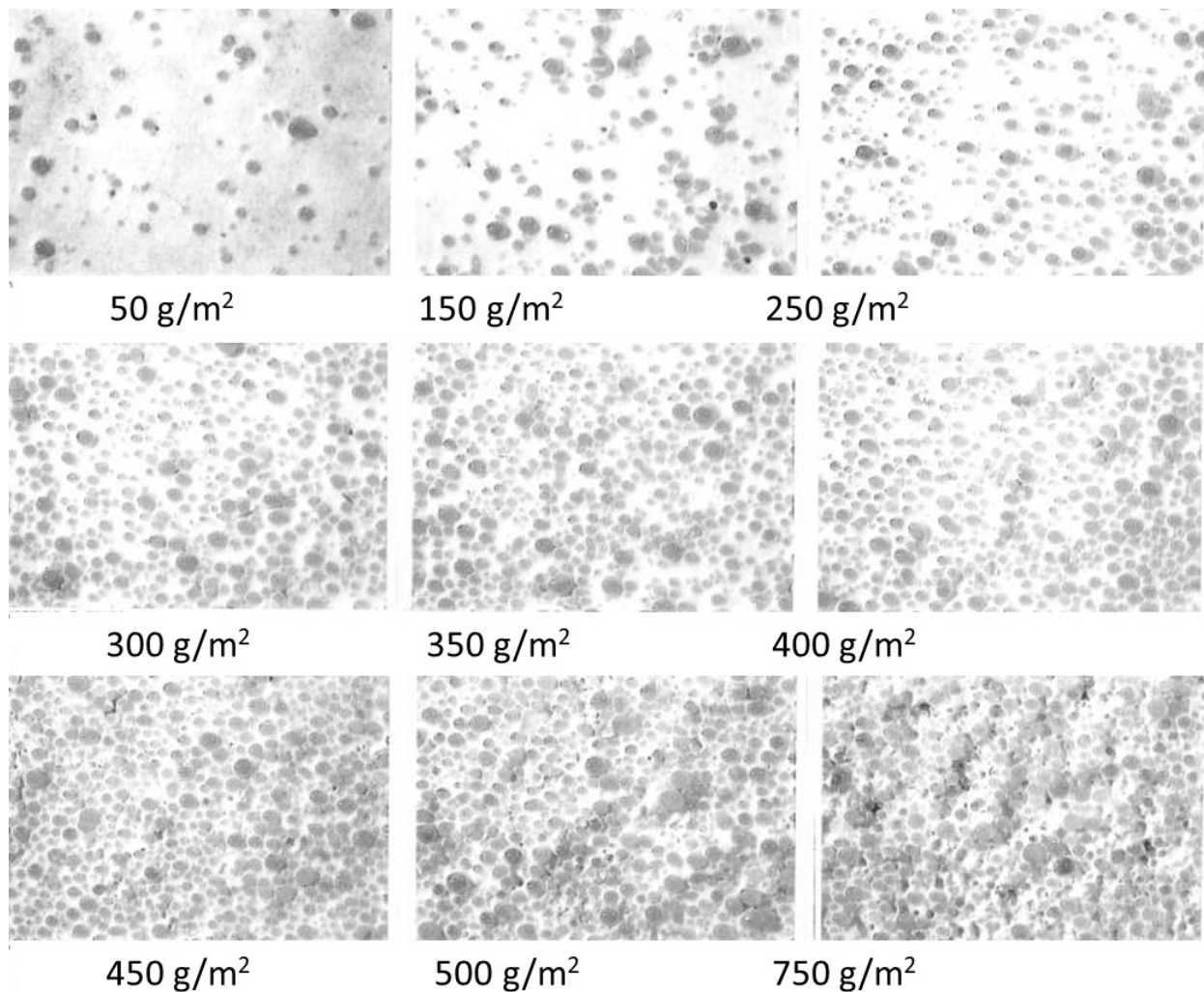


Figure 7: visual aspect of road marking surfaces with different dosage of drop on glass beads

**Hence maintenance is performed before the complete drop on material is removed from the surface.**

#### **Where the abrasion of road marking systems come from?**

As shown in the below table, from official road marking measurement on certification test deck, the first criteria that goes below min specification is RL for reflective systems, and SRT for non reflective systems. To illustrate this purpose, below is an extraction from an official technical datasheet generated by Cerema (French certification body) with all data recorded on the French road trial site (RN2). It explicitly indicates nonconformity of retroreflexion value at P6 (2000000 wheel hits).


RESULTATS DE L'ESSAI CONVENTIONNEL						
<b>CARACTERISTIQUES DU SITE :</b>		N2	OISE	Chaussée PARIS->PROVINCE	PR 15.36 à 16.28	<b>Année</b>
Nature du revêtement : BETON BITUMINEUX		Application en : 2018 - R044		PMT : 0.9 mm	2018	<b>Trafic (veh/j)</b>
					2019	<b>% PL</b>
					8100	17
					8164	17
<b>CARACTERISATION DU PRODUIT :</b>						
(Produit temporaire: avant 6 mois, Produit permanent de P1 à P5: après 1 cycle climatique, Produit permanent P6: après 2 cycles climatiques)						
Classe de roulage	Visibilité de nuit	Adhérence	Visibilité de jour			
			Chromaticité		Qd	
Nb de passages de roues	RI (mcd.m-2.lx-1)	SRT	(x)	(y)	(mcd.m-2.lx-1)	
<b>Exigences :</b>	<b>150</b>	<b>0.45</b>	<b>Blanc</b>		<b>100</b>	
Etat neuf	329	0.57	0.3206	0.3389	213	
(P1) 50000	232	0.52	0.3287	0.3462	128	
(P2) 100000	239	0.54	0.3276	0.3450	119	
(P3) 200000	214	0.50	0.3256	0.3433	112	
(P4) 500000	157	0.47	0.3262	0.3445	129	
(P5) 1000000	153	0.47	0.3250	0.3433	122	
(P6) 2000000	70*	0.48	0.3218	0.3397	100	
<b>(P5) 1000000</b>	<b>Classe R3</b>	<b>Classe S1</b>	/		<b>Classe Q2</b>	
ESSAIS ET CONSTATATIONS REALISES PAR LE CEREMA Hauts-de-France site de Saint-Quentin (accrédité COFRAC sous le n°1-5710)						
Organisme Technique représenté par : CEREMA Cité des Mobilités - 25, Avenue François Mitterrand - CS 92803 - 69674 BRON Cédex Tel : +(33)4 72 14 30 30 Fax : /						
MARQUAGE DES PRODUITS				VISAS		
Conformément aux annexes de certification "Signalisation horizontale", chaque produit et/ou emballage élémentaire doit être marqué de façon indélébile. Ce marquage comporte :				Fiche établie par le CEREMA - Dter NP		
* l'appellation du produit, le numéro d'admission, le numéro de lot, la date de fabrication exprimée en clair, la masse nette ou la surface pour les produits préfabriqués, le nom du titulaire et l'identification de l'usine				 Le 17/05/2022		
* le graphisme défini par la charte graphique de l'AFNOR tel que représenté ci-contre :						

Figure 8: exemple of a Technical Datasheet issued from RN2 certification test process by Cerema

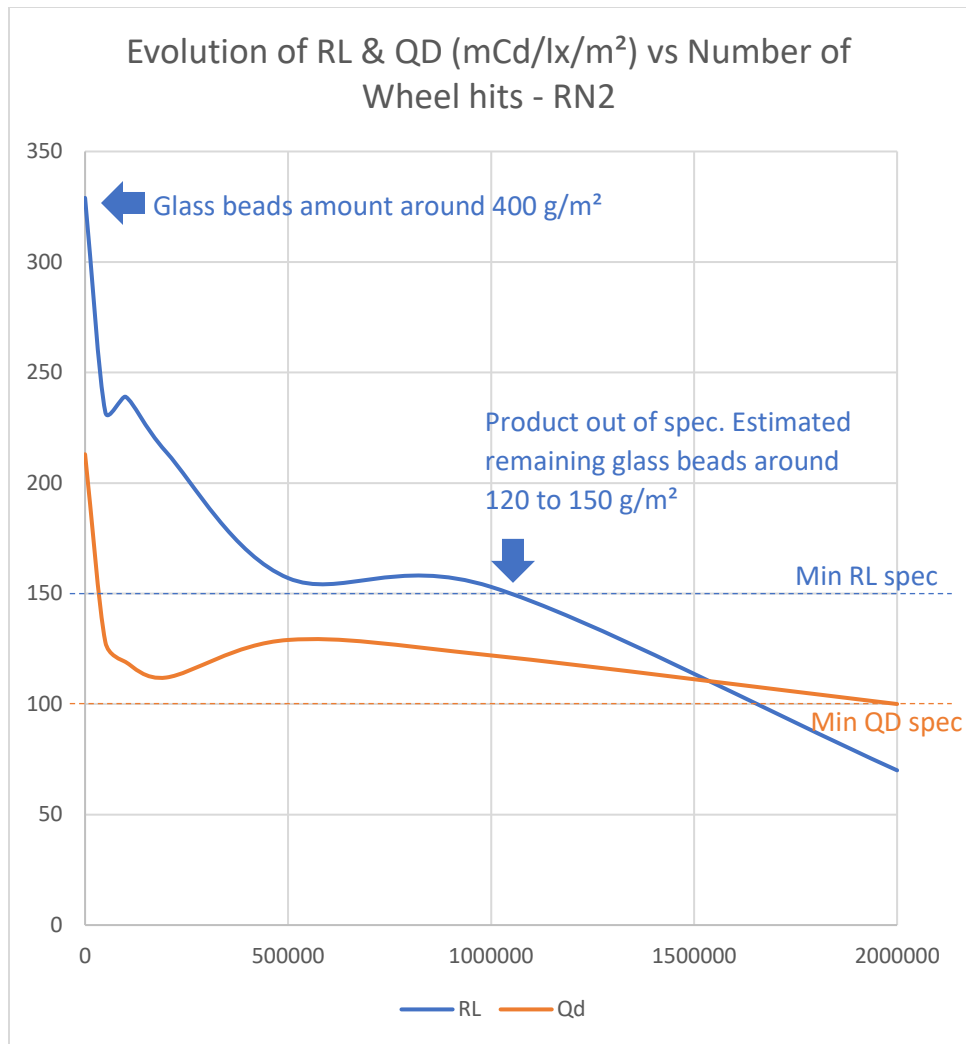


Figure 9: Evolution of RL and QD from selected example extracted from Cerema technical datasheet

As illustrated above, road marking systems will first lose its retroreflexion or skid resistance by losing its drop on material. Both drop on material are either silica (glass beads, aggregates) or even harder minerals (cristobalite, bauxite...).

Therefore, there is almost no abrasion of the coating layer until drop on material is removed by around 70%, and this is generated by the friction of wheel tires on the surface of road marking system.

### Microplastics and French road marking:

The road marking expert group in SER association have investigated what could be the fair amount of abrasion of road marking on French roads.

1. Primary microplastics (aka intentionally added microplastics).

According to the latest definition from ECHA, as road marking products does contain synthetic polymer microparticles which are contained by technical means so that releases to the environment are prevented when used in accordance with the instructions for use during the intended end use (derogation 5a), synthetic polymer microparticles of which the physical properties are permanently modified during intended end use, in such a way that it no longer falls within the scope of restriction (derogation 5b) and synthetic polymer microparticles which are permanently incorporated into a solid matrix during intended end use (derogation 5c), SER position consider road marking products to excluded from the scope of primary intentionally added microplastics.

2. Secondary microplastics (generated from wear and tear):

SER expert group used a calculator to estimate in the most fair and appropriate way the amount of secondary generated microplastics, based on the abrasion of road marking systems applied on French roads.

Based on the different technologies and their inherent behavior against traffic wearing, in line with IDDRIM guidebook (see below), our expert group calculated 1546 metric tons of abraded material providing from 29909 metric tons applied in the year. This represents around 5% of potential microplastic generated by road marking systems applied on French road.



FAMILLES	PRODUITS	TYPE PERMANENT ET / OU TEMPORAIRE	VNTP	CONDITIONS D'APPLICATIONS : PEU ADAPTÉ (-) À SANS INCIDENCE (++)			TEMPS DE SÉCHAGE RAPIDITÉ	FORT TRAFIC PL ADAP- TATION	HYGIÈNE ET SÉCURITÉ DES PER- SONNELS	NF ENVIRON- NEMENT	DURABI- LITÉ
				Sur 44 produits certifiés VNTP	Chaleurs	Humidité					
PEINTURES	Solvantées	Permanent et Temporaire	5	-	-	+	3 à 15	*	-	Dispo	1 à 2
	À l'eau	Permanent et Temporaire	9	++	--	--	1 à 10	**	++	Dispo	1 à 3
	Réactives	Permanent et Temporaire	5	++	+	-	10 à 20	**	--	Non Dispo	2 à 4
ENDUITS A CHAUD	Extrudées	Permanent	7	-	+	+	1 à 2	***	-	Dispo	3 à 5
	Rideau	Permanent	2	-	+	+	1 à 2	***	-	Dispo	4 à 6
	Projetées	Permanent	0	-	+	+	1 à 2	**	-	Dispo	2 à 4
ENDUITS A FROID	À l'eau	Permanent	5 EF + 8 (EF + Pe)	++	--	--	30 à 60	****	-	Dispo	5 à 7
	À durcisseur	Permanent et Temporaire		+	++	++	8 à 20	****	--	Non Dispo	5 à 7
BANDES PRÉ-FABRIQUÉES	Thermo-collées	Permanent	1	-	++	++	2 à 4	***	-	Dispo	4 à 6
	Collées à froid	Permanent et Temporaire	2	++	-	++	0 à 15 s	****	+	Non Dispo	8 à 10

Figure 10: summary table from IDRRIM guidebook showing the differences in various properties of the road marking products applied on French roads

SOL SUPPORT ACCEPTABILITÉ DE 2 - À 3 +						VIABILITÉ HIVERNALE RÉSISTANCE AUX ENGINs	RENOUVELLEMENT DEGRÉ DE LIBERTÉ DU CHOIX FUTUR	RENDEMENTS APPLICATION	MARQUES EXISTANTES COMPATIBILITÉ	CONDITIONS BALISAGE FIXE (À MINIMA) OU MOBILE	COÛTS VALEURS RELATIVES
BB SG	BB Dr	ECF	ESU	Béton	Pavés	Faible 1 à bonne 4*	Du plus faible : 1 au plus fort : 4	D'un rendement faible + à très rapide +++	Voir le tableau de compatibilité des produits entre eux – chapitre 2		Echelle de 1 à 10
3+	2+	3+	3+	1+	1+	****	4	+++		M*	1 à 2
3+	2+	3+	3+	1+	1+	****	4	+++		M*	1 à 2
3+	3+	3+	3+	1+	1-	***	2	+++		F	2 à 3
3+	1+	3+	3+	1-	1-	**	3	+		M	3 à 5
3+	1+	3+	3+	1-	1-	**	3	++		M	3 à 5
3+	2+	3+	3+	1+	1-	***	3	+++		M	2 à 4
3+	1+	2+	1+	1-	2-	*	2	+		F	5 à 7
3+	1+	2+	1+	1-	2-	*	2	+		F	5 à 7
3+	1+	3+	3+	3+	1+	*	1	+		F	7 à 8
3+	3+	3+	1+	3+	2+	*	1	++	F	8 à 10	

Figure 11: summary table from IDRRIM guidebook showing the differences in various properties of the road marking products applied on French roads (continued)

This amount of microplastic remains very limited compared to our estimated corresponding amount of rubber particles potentially emitted from wheel tires in France (estimated at 39 000 metric tons by SER expert group).

**Conclusion:**

According to the definition of primary intentionally added microplastics, none of the road marking products shall be considered as intentionally added microplastics. All systems fall into derogation 5a to c.

According to the road marking expert group from French road marking association SER, it appears the fair estimation of particles generated by the wear and tear of road marking systems represents around 5% of the total amount of product applied per annum. This can potentially be considered as secondary microplastics, if all particles are considered containing more than 1% organic polymer with sizes below 5mm.

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The best way to limit even further this amount of particles generated from wear and tear is to **implement a regular maintenance of the road marking**, as dropped on **glass beads protect the marking from wear**. In addition it will improve nighttime visibility for all vehicles, and as such safety on the road for all users.