

Is Europe in Harmony

The French National Approach

Jean-Luc Delorme

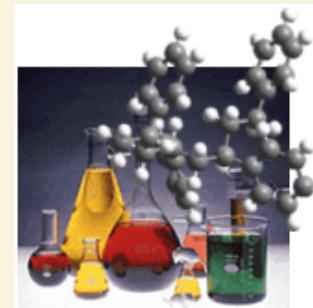
The French National Approach

- Tests
- Main products
- NFP → NF EN
- Guidance documents
- Contracts
- Conclusion



Tests used in France: Principle

- Type testing : Laboratory validation
- Conformity of the composition of finished product
 - Bitumen content
 - Grading curve
- Measurements in place
 - Density
 - thickness
 - Macrotexture
 - Permeability
 - Eveness.....



Tests for type testing

- Type testing
 - Gyratory compaction
 - Water sensitivity
 - Rutting resistance
 - Stiffness
 - Fatigue resistance



Tests for type testing

- Type testing
 - Gyratory compaction
 - 0,82°
 - Void content at a given number of gyration
 - Water sensitivity
 - Method B in compression
 - Rutting resistance
 - Large Device
 - 60°C 10 000 or 30 000 cycles
 - 10%; 7,5%; 5,0%
 - Stiffness
 - 15°C 10 Hz or 0,02s
 - Complex modulus (2points)
 - Direct Tensile
 - Fatigue resistance
 - Trapezoïdal-2points-10°C-25Hz
 - ε_6

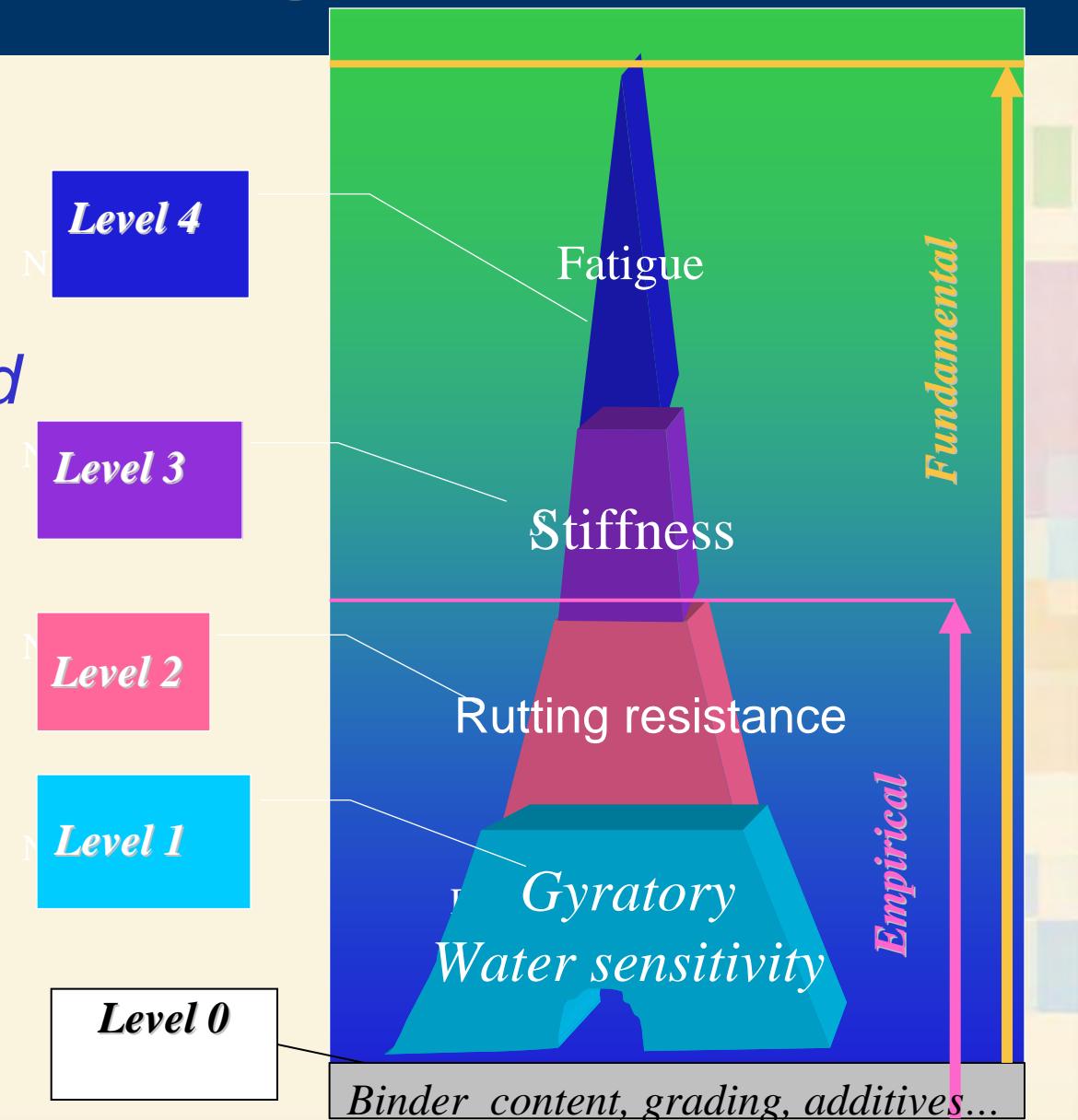


Maximum density: method A in water

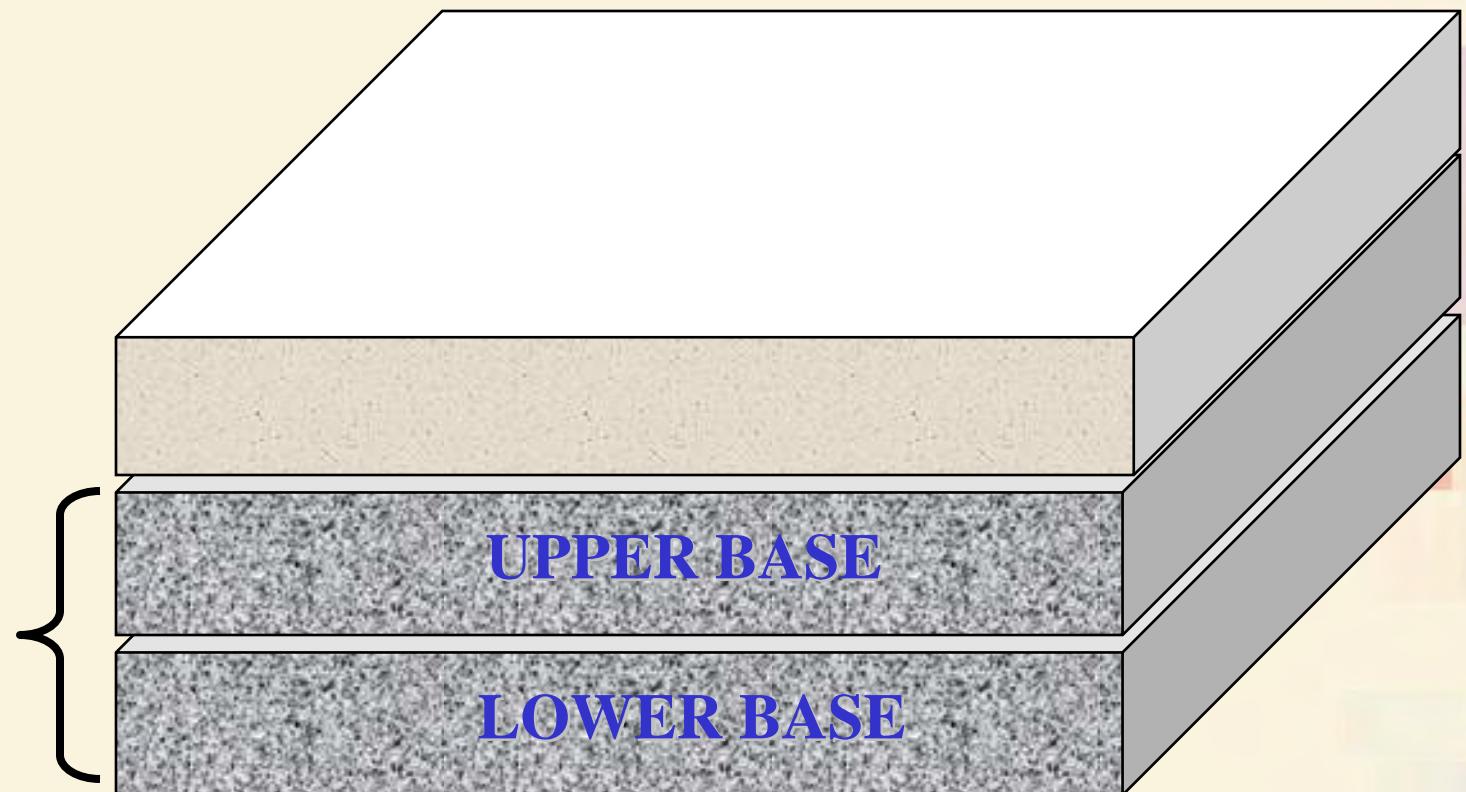


Type testing

- *Gyratory compactor test serves as focal point of the method*
 - Void content by gyratory compaction
- *Appropriate level of specification depending on*
 - Type and use of mixture
 - Loading range



Main products



Asphalt Concrete- GRAVE BITUME

- ***EN 13108-1***

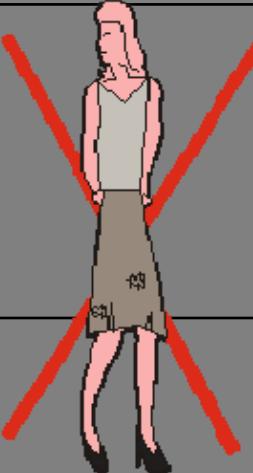
- *Upper sieve size 14 20*
- *Thickness: 80 mm to 160 mm*
- *Aggregate : LA 25, MDE 25, high angularity*
- *Paving grade bitumen 35/50 or (50/70)*



- *Void content 100 or 120 Gyration: $\leq 11\%$*
- *Moisture sensitivity: **ITSR₇₀***
- *Permanent deformation : 60 °C 10000 cycles **P10***

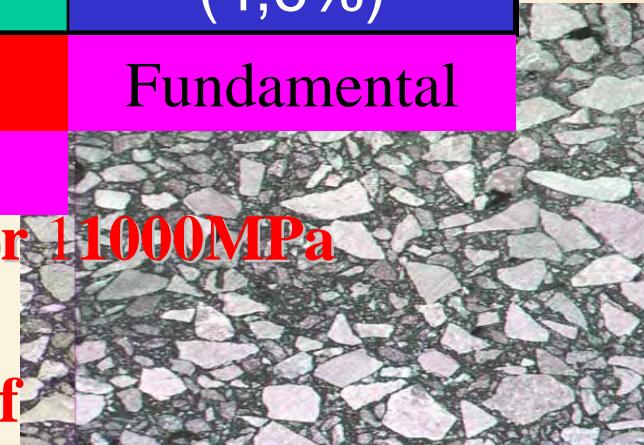
Asphalt Concrete- GRAVE BITUME

Classification

AC-GB1	AC-GB2	AC-GB3	AC-GB4
			
3,5%	3,8%	4,2% or > 3%	>3% (4,6%)
Empirical	Empirical	Empirical	Fundamental

- Stiffness 15°C 10 Hz or 0,02s: **9000MPa or 11000MPa**

- Fatigue 10°C, 25 Hz : ε_6 : **90 μ def, 100 μ def**

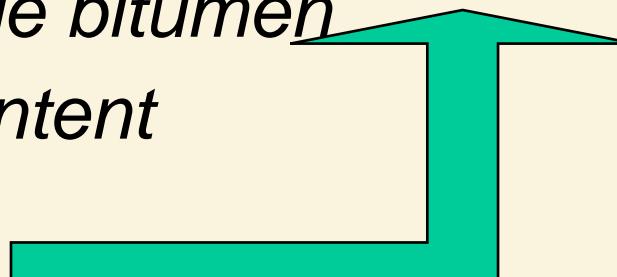


Asphalt concrete – Enrobés à module élevé

AC-EME High Modulus

Same grading curve as AC-GB

- Hard grade bitumen
- Binder content

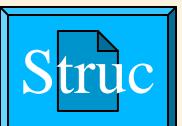
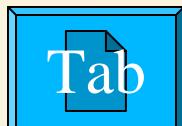


AC-EME according EN 13108-1



Fundamental approach

Stiffness
>=14000MPa



5,5 %



4,5 %

Thickness:

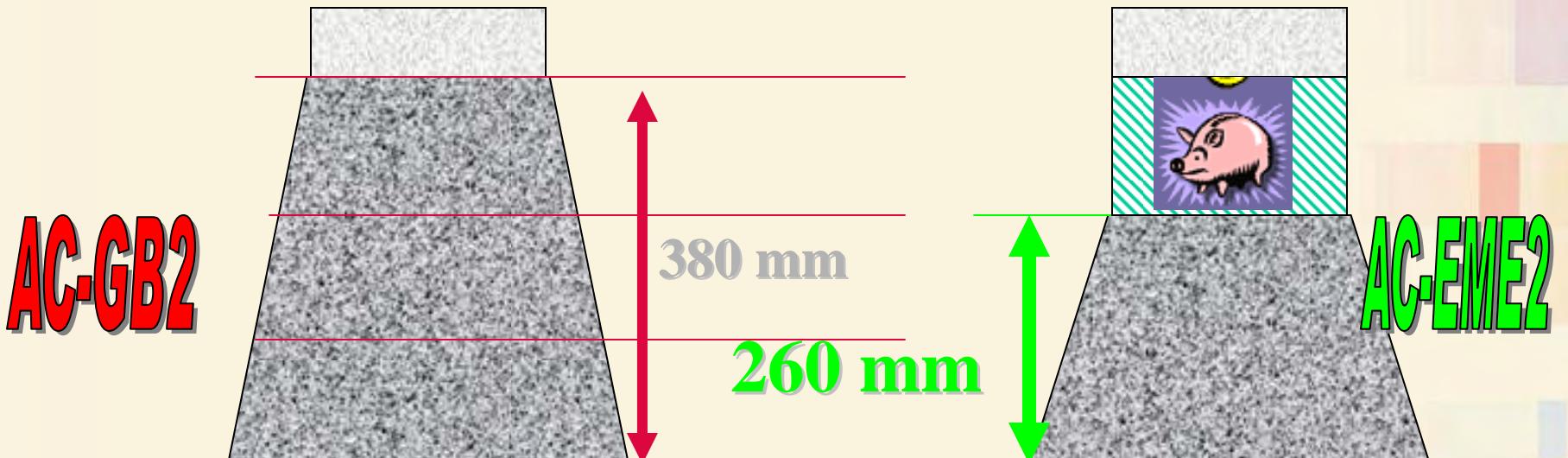
**70 mm to
140 mm**

Performances

	AC-GB2	AC-GB3	AC-GB4	AC-EME 1	AC-EME 2
Stiffness <i>MPa</i> ≥	9000		11000	14 000	
Fatigue \mathcal{E}_6 $\times 10^6$	80	90	100	100	130
Wheel Tracking test 60°C	10% at 10 000 cycles		10% 30 000	7,5% 30 000 Cycles	

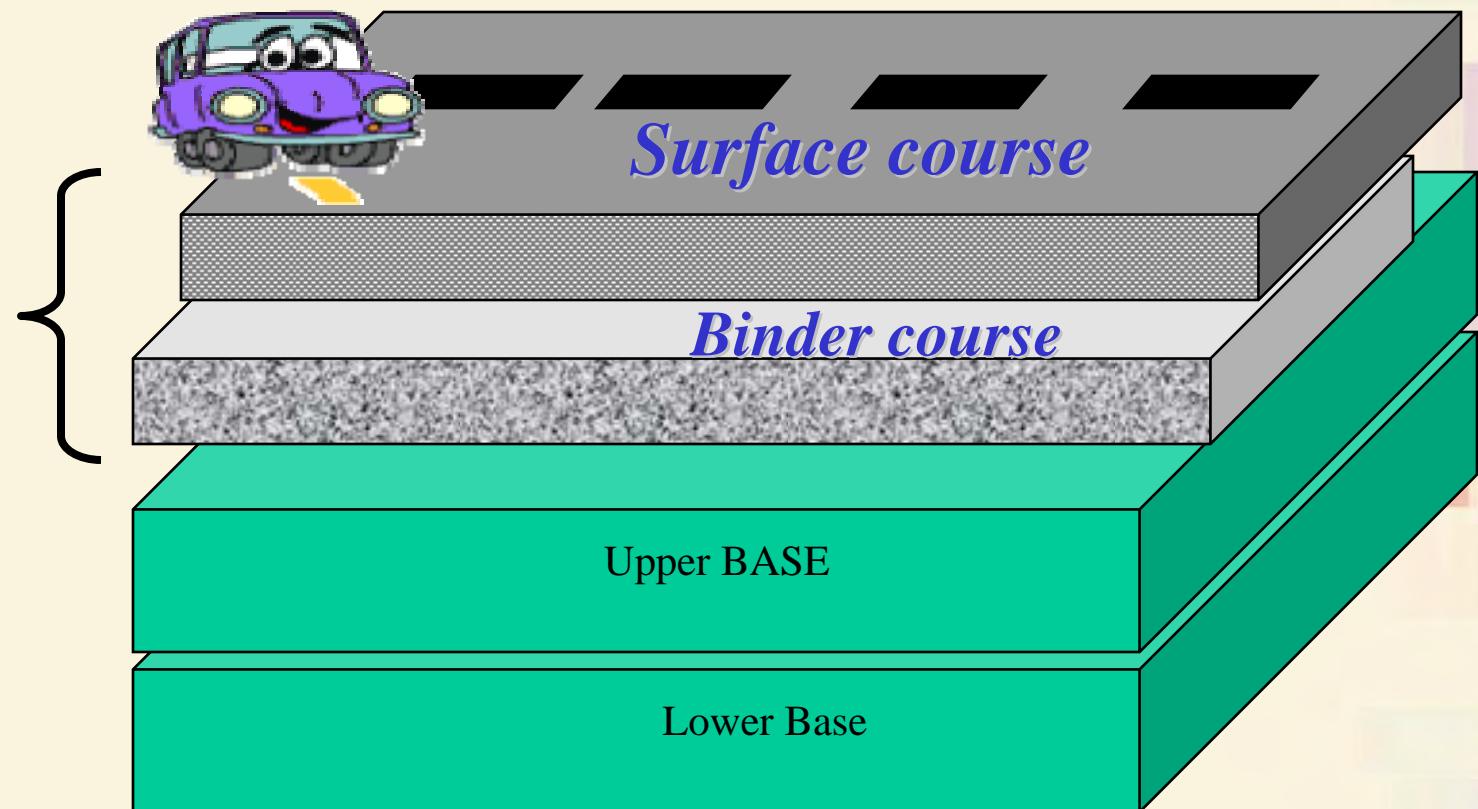
Example of structural design

- PF3 (> 120 MPa)
- TC8 (94 M PL) ₃₀

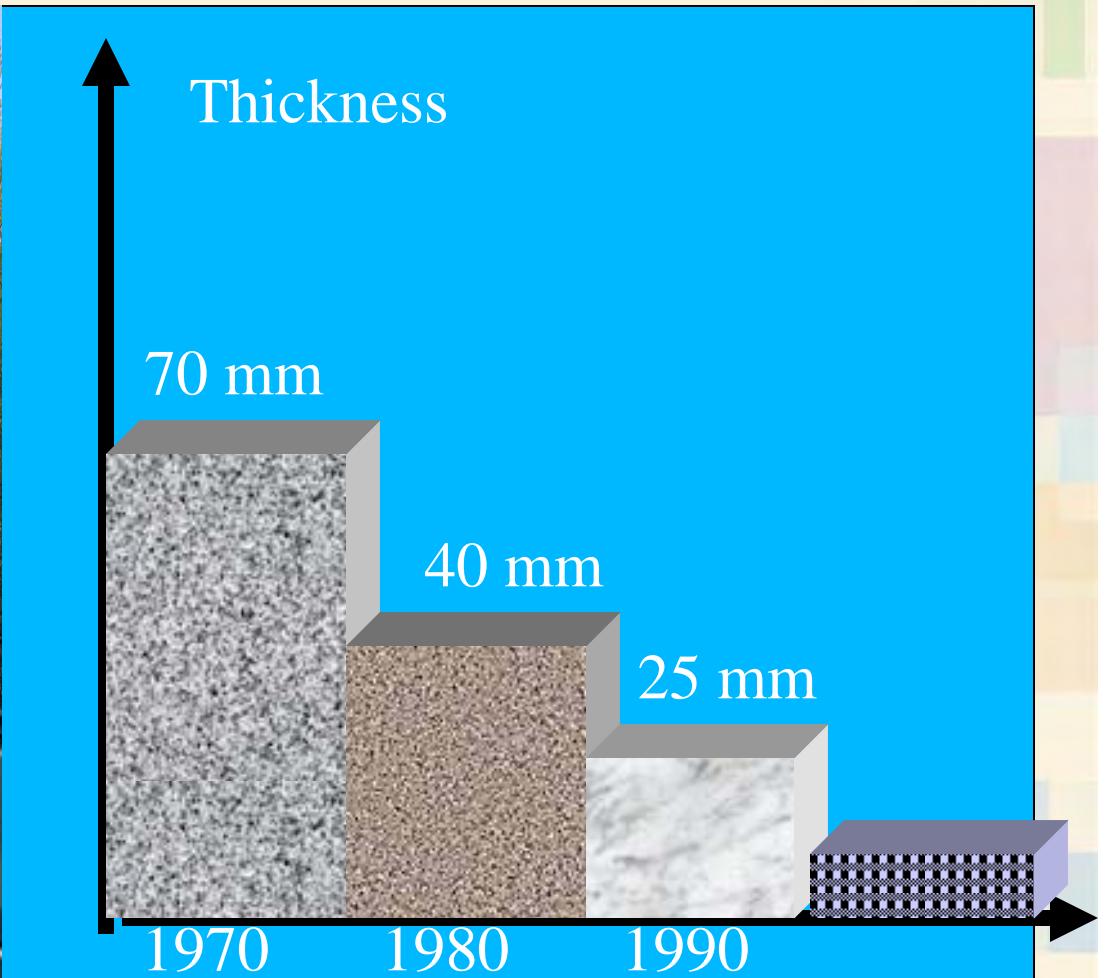


Basement PF3

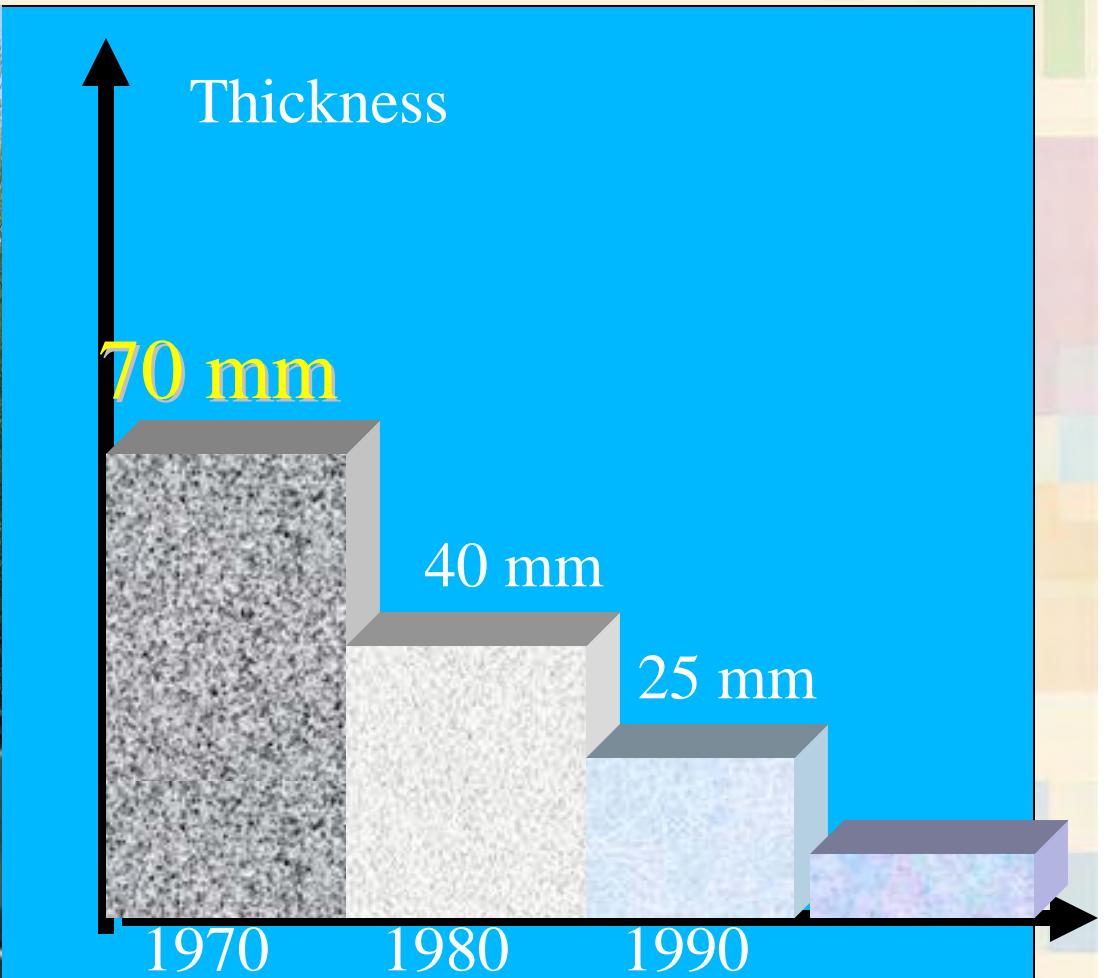
Main products



Surface and binder courses



Surface and binder courses

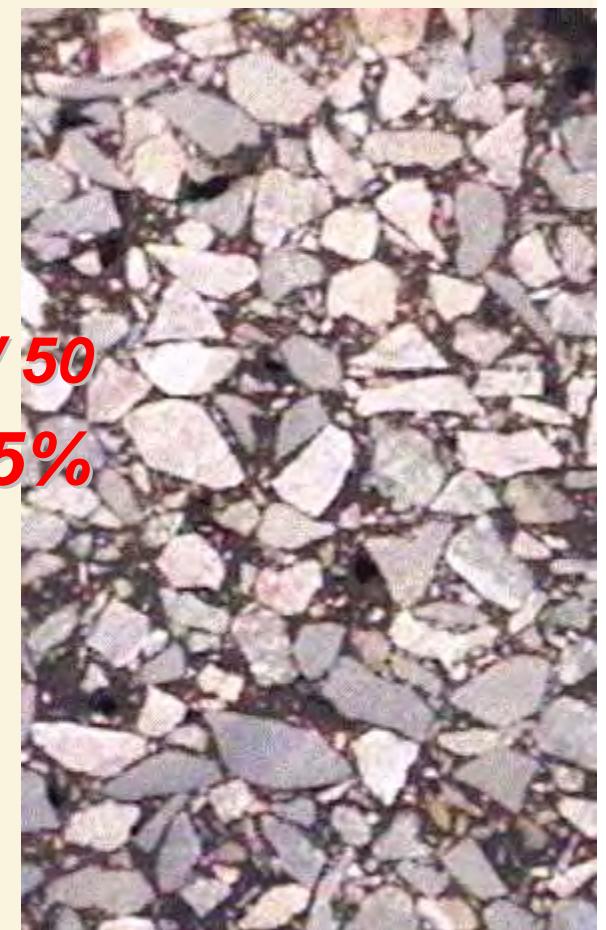


Béton Bitumineux Semi-Grenu

AC10-BBSG AC14-BBSG

Thickness : 50 to 90 mm

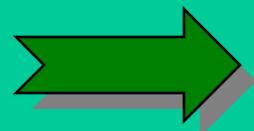
- **Continuous grading**
- **Paving grade bitumen 35/50 50/70**
- **Binder content: 5,0% à 5,7%**
- **Aggregate : LA 15 (20)MDE 15 (20)PSV 50**
- **Filler content (0,063 mm): about 6,5%**



Béton Bitumineux Semi-Grenu

AC10-BBSG AC14-BBSG

Thickness : 50 to 90 mm



COMpromise

Structure Surface
improvement characteristics



Béton Bitumineux Semi-Grenu AC10-BBSG AC14-BBSG

Thickness : 50 to 90 mm

- **Gyratory: 5% to 10% (60 or 80 gyrations)**

- **Water-sensitivity: $ITSR_{70}$**

Empirical approach

Class 0 :No requirement

*Wheel
tracking test
large device
60 °C
30 000 Cycles*

Class 1 : $\leq 10\%$

Class 2 : $\leq 7,5\%$

Class 3 : $\leq 5,0\%$

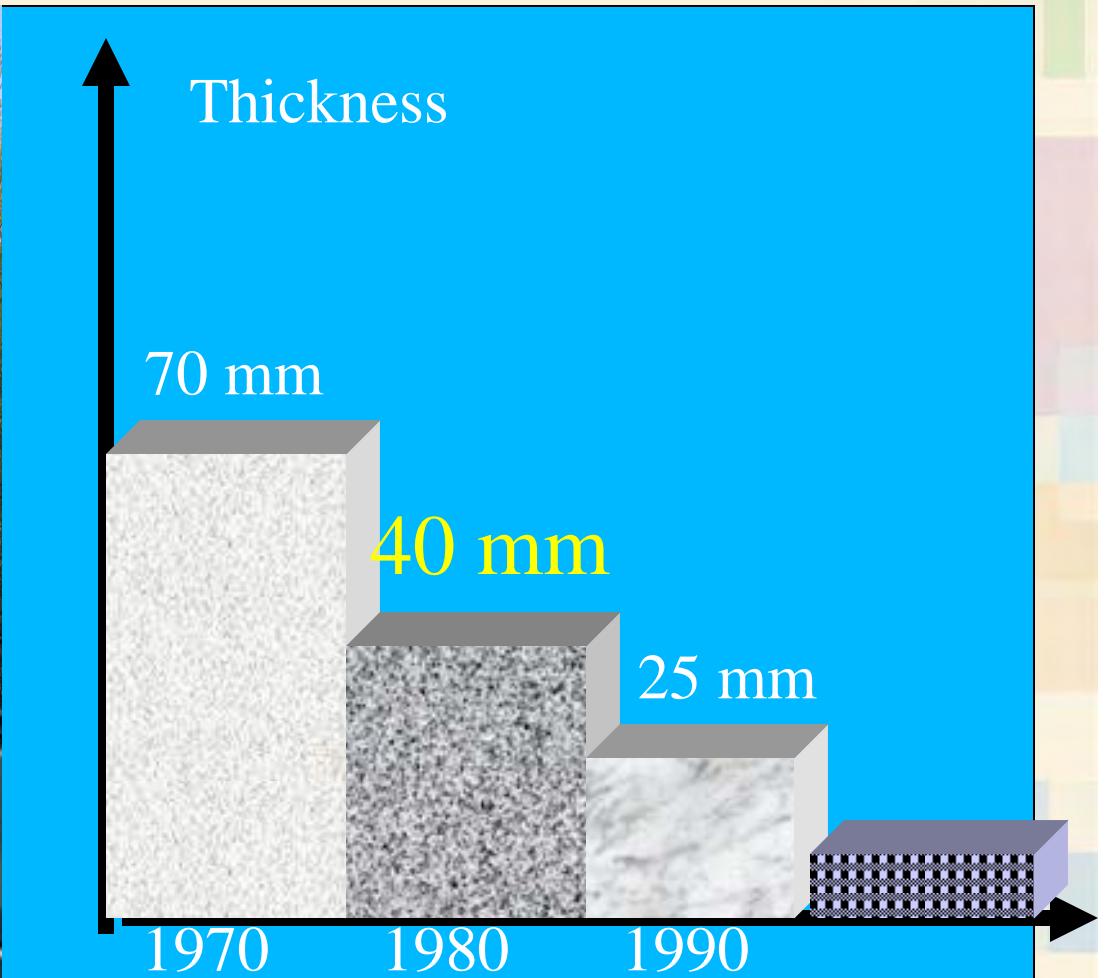


Béton bitumineux à Module Elevé**AC10-BBME AC14-BBME****Thickness : 50 to 90 mm**

- **Continuous grading**
- **Binder content:** 5,0% à 5,7%
- **Aggregate :** LA 15 (20)MDE 15 (20)PSV 50
- **Filler content (0,063 mm):** about 6,5%

Rutting resistance: P10, P7,5, P5**60°C 30000 cycles****Stiffness: 9000MPa or 11000MPa****Fatigue: $\varepsilon_6 \geq 100 \mu\text{def}$** **Fundamental approach**

Surface and binder courses



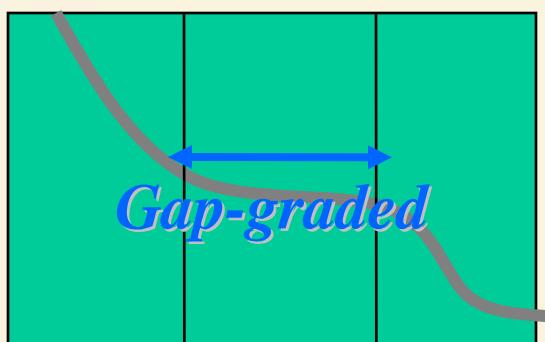
Bétons Bitumineux Minces :

Thickness : 40 mm

Gyratory compaction :
40 gyrations

6% to 11%

Classification by
the rutting
resistance



AC10-BBM



AC14-BBM



Empirical approach



Porous Asphalt : EN 13108-7

Thickness : 40 mm

PA6

PA10

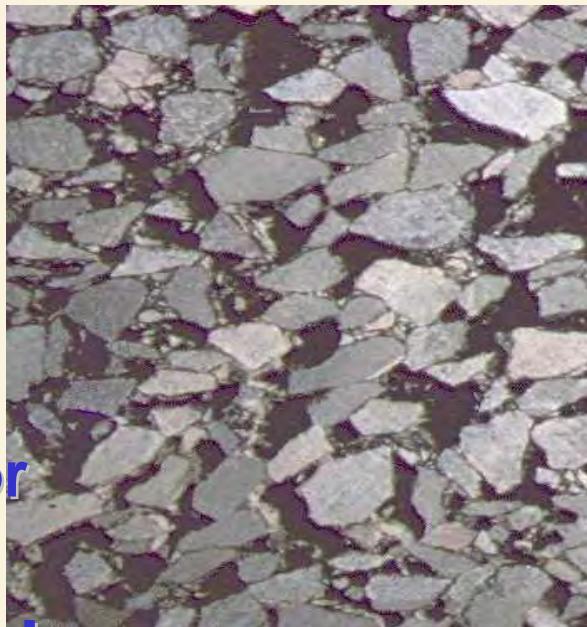
Binder :

Paving grade or
Polymer
Modified Binder

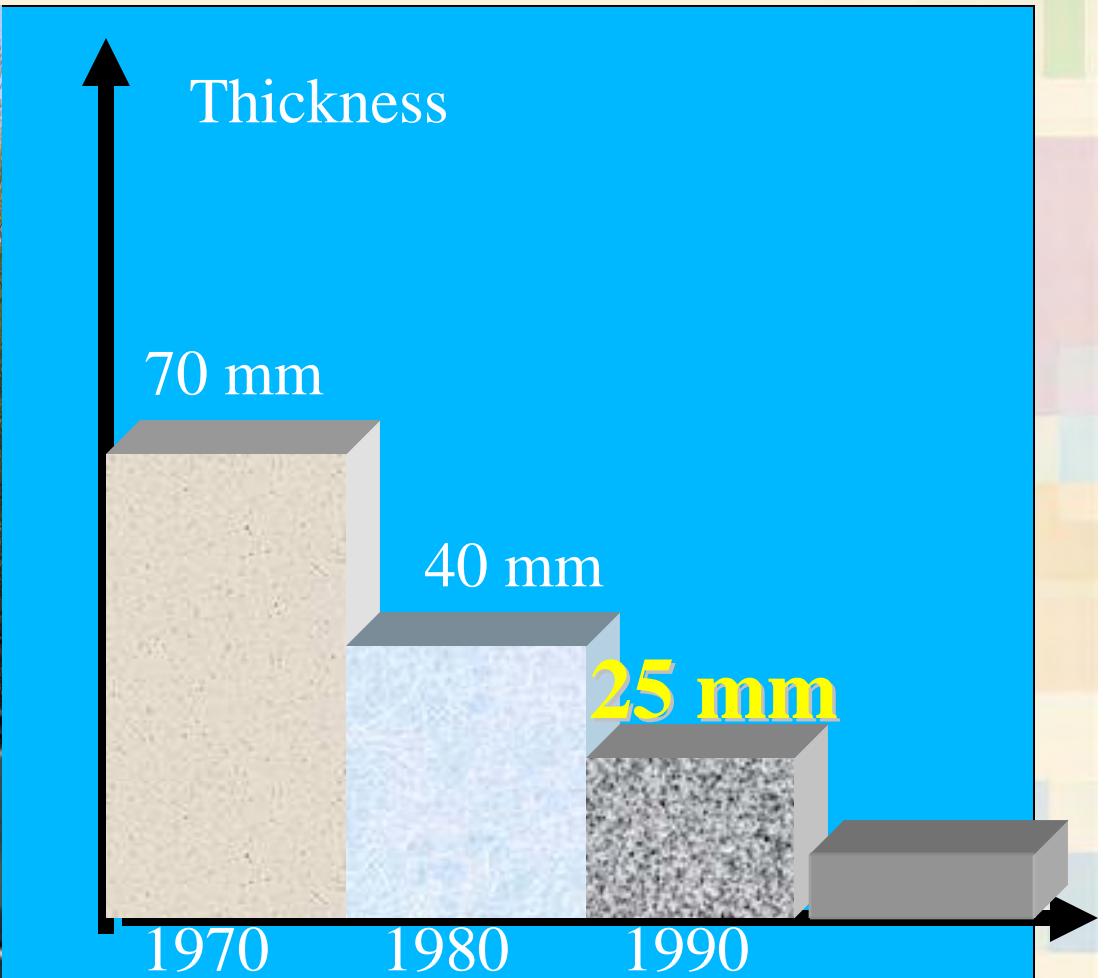
13 % of fine aggregate

Void content : 20 to 25% Gyratory : 40 Gyration

Water sensitivity : **ITSR80**



Surface and binder courses



Bétons bitumineux très minces

BBTM in English → BBTM

Thickness: 25 mm

BBTM6 or BBTM10 : EN 13108-2

Paving grade bitumen or Polymer modified Bitumen

Gyratory compaction : 25 gyrations

Water sensitivity ITSR80



BBTM type A

- **10 to 17 %** Voids
- Fine aggregate 30 to 35 %

BBTM type B

- **18 to 25 %** Voids
- Fine aggregate 20 to 25 %

DREIF - Pôle RST

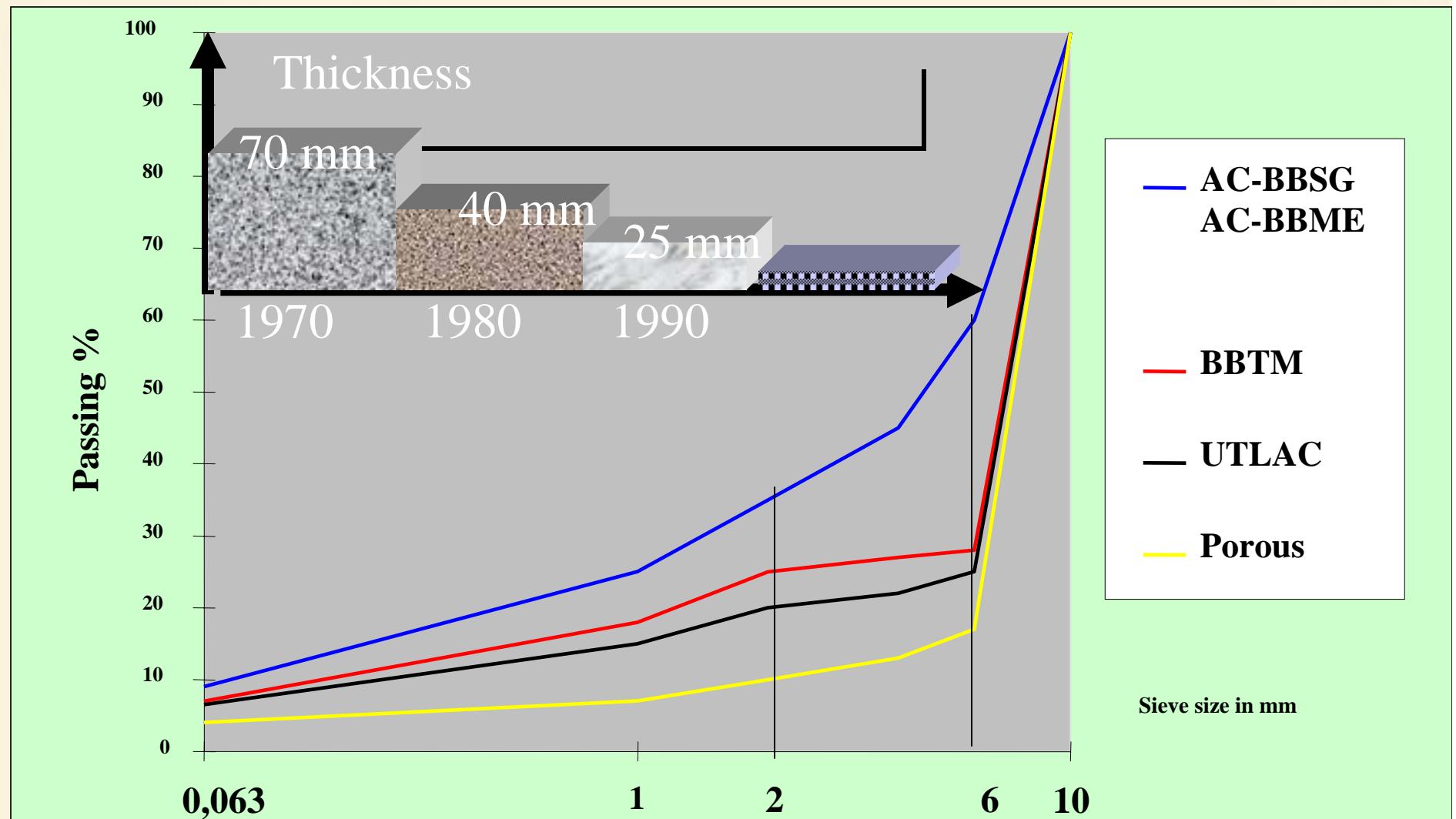
LREP

Laboratoire
Régional
de l'Est
Parisien

→ UTLAC



Typical grading curve

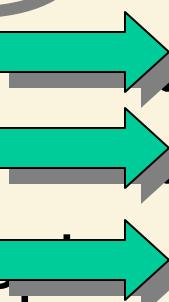


Transition: NFP → NF EN

- NF P 98-130 BBSG
- NF P 98-138 GB
- NF P 98-140 EME
- NF P 98-141 BBME
- NF P 98-132 BBM
- NF P 98-137 BBTM
- NF P 98-136 BBD_r
- XP P 98-135 Rec.AS



NF EN 13108-1



- NF EN 13108-2**
NF EN 13108-7
NF EN 13108-8

- AC-BBSG
- AC-GB
- AC-EME
- AC-BBME
- AC-BBM
- BBTM
- BBD_r
- RA

BBSG 0/10 class2

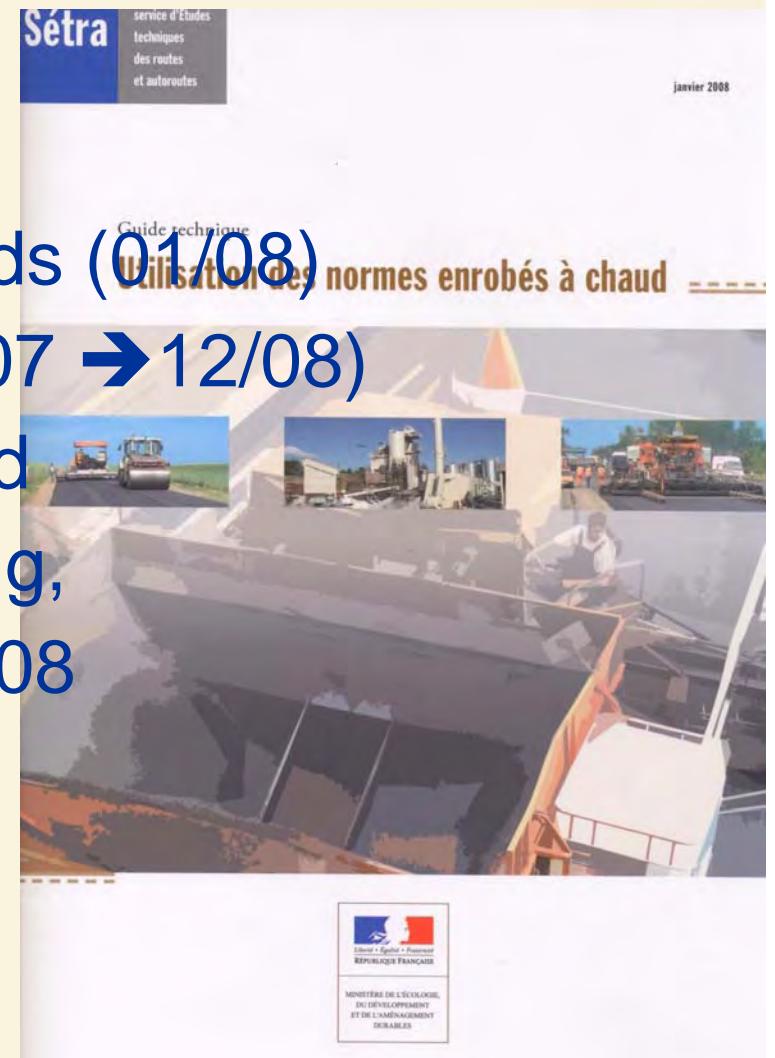


AC10-BBSG class2

NFP → NF EN

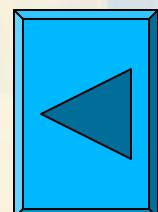
- Foreword of NF EN
- Guidance for the use of standards (01/08)
- Training and presentations (10/07 → 12/08)
- Revision of the General standard about « Constituents, type testing, mixing, laying... » published 01/08

==>NF P 98-150-1



Foreword

Caractéristiques générales							
1	2	3	4	5	6	7	8
Article de la norme		4.2	5.2.1			5.2.2	5.2.4
BBSG3 0/10	EB 10 roulement ou liaison	Type (pour le bitume modifié) et classe à déclarer			10 mm	$V_{\min} 5 \text{ à } V_{\max} 10$ (60 girations)	ITSR ₇₀ (≥ 70 %)
BBSG3 0/14	EB 14 roulement ou liaison	Type (pour le bitume modifié) et classe à déclarer			14 mm	$V_{\min} 4 \text{ à } V_{\max} 9$ (80 girations)	ITSR ₇₀ (≥ 70 %)
Caractéristiques empiriques							
9	10	11	12	13	14	15	16
5.2.6 tableau 7	5.2.10	5.3.1.2				5.3.1.3	
– P_5 (≤ 5 % – 60 °C et 30 000 cycles) – $Vi = 5 \% - Vs = 8 \%$	Selon le liant			20			$TL_{\min} 5,2$ (≥ 5,2 %)
– P_5 (≤ 5 % – 60 °C et 30 000 cycles) – $Vi = 5 \% - Vs = 8 \%$	Selon le liant			20			$TL_{\min} 5,0$ (≥ 5,0 %)



Contracts

- Models for current jobsites distributed
 - Change the references
 - Need a description of the characteristics of the product instead of a reference to a standard
- It takes a long time to reach each local organization



Changes?

- Binder content out → in
- Maximum density (method A in water)
- Reference of tests methods
- Reference of products
- Prefix for designation of previous products
- Clear distinction Empirical / Fundamental
- More detailed description of the products in the contract



Conclusion

- Implementation without major difficulty
- Tests and approach similar
- Editorial adaptation

Thank you for your attention

