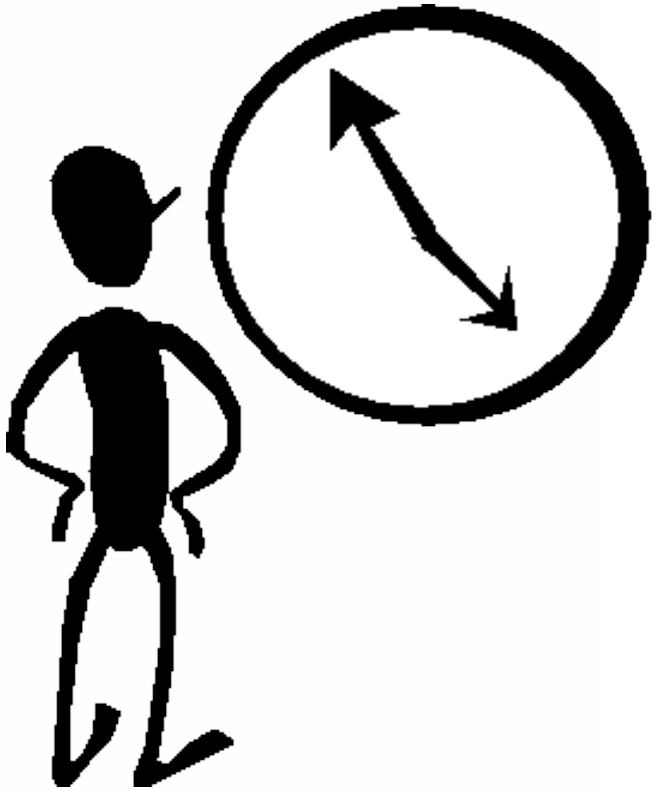
DR. IGOR RUTTMAR
HAD, OPATIJA 6.4.2016

STRABAG
TEAMS WORK.

PERPETUAL
HALT PAVEMENT

Expressway S8 in Poland

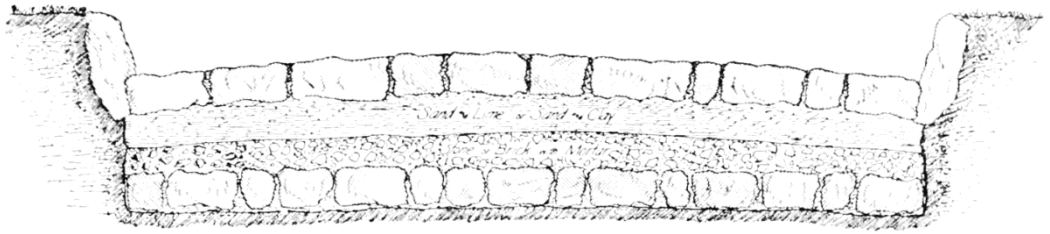


WE DO NOT
REINVENT
THE WHEEL

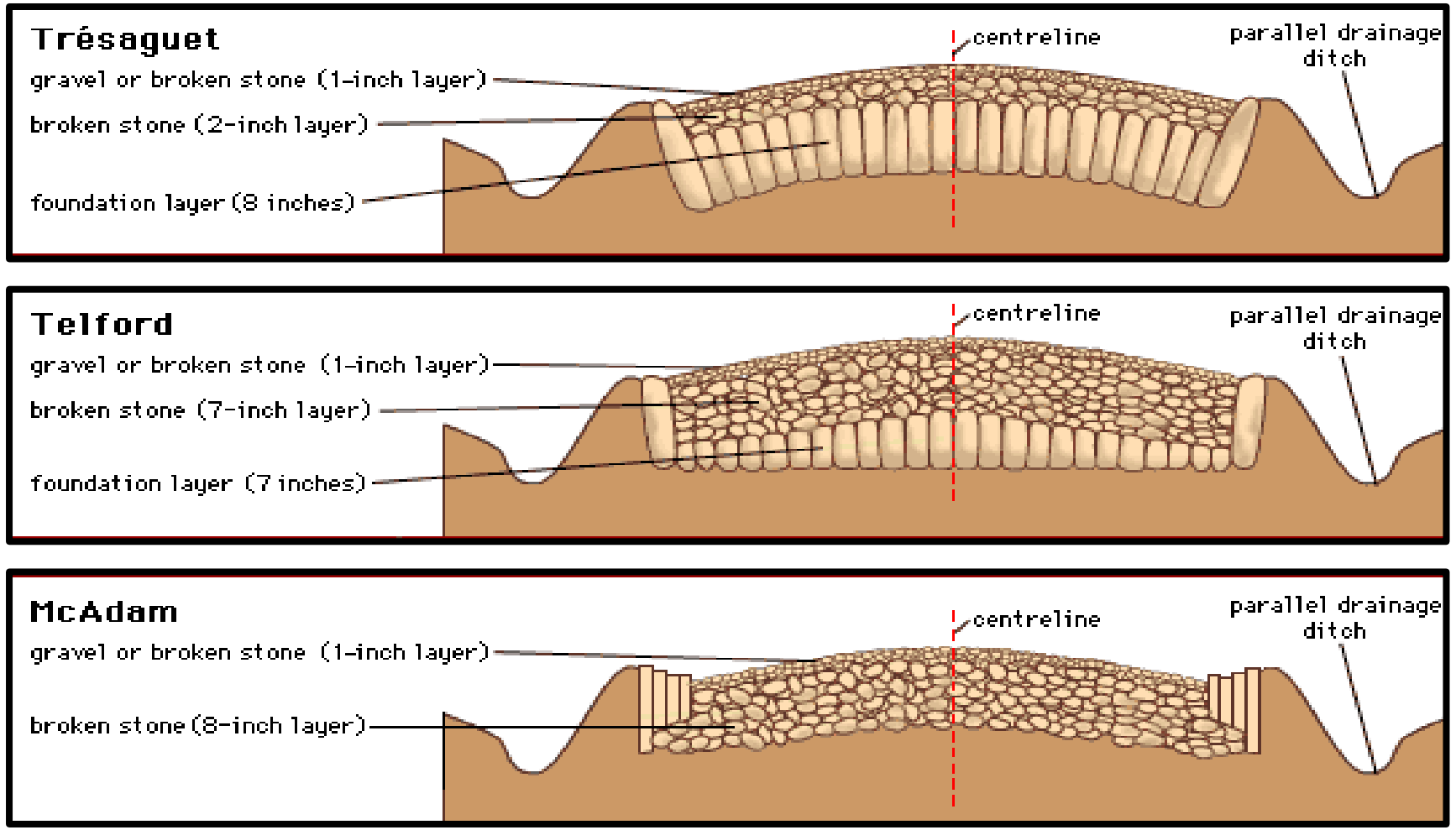
PAST AND PRESENT


CALZADA ROMANA
Los romanos crearon una gran red de vías de comunicación por todo su imperio. En un principio sirvieron para facilitar los movimientos de tropas con una rapidez nunca vista hasta entonces. En el aspecto económico agilizaron notablemente el transporte de mercancías. También tuvieron gran importancia para la propagación de la cultura romana.
312 B.C.
VIA APPIA
1 Gremium
2 Statumen

ROMAN ROADS



2000 years later...



E. Britannica ®

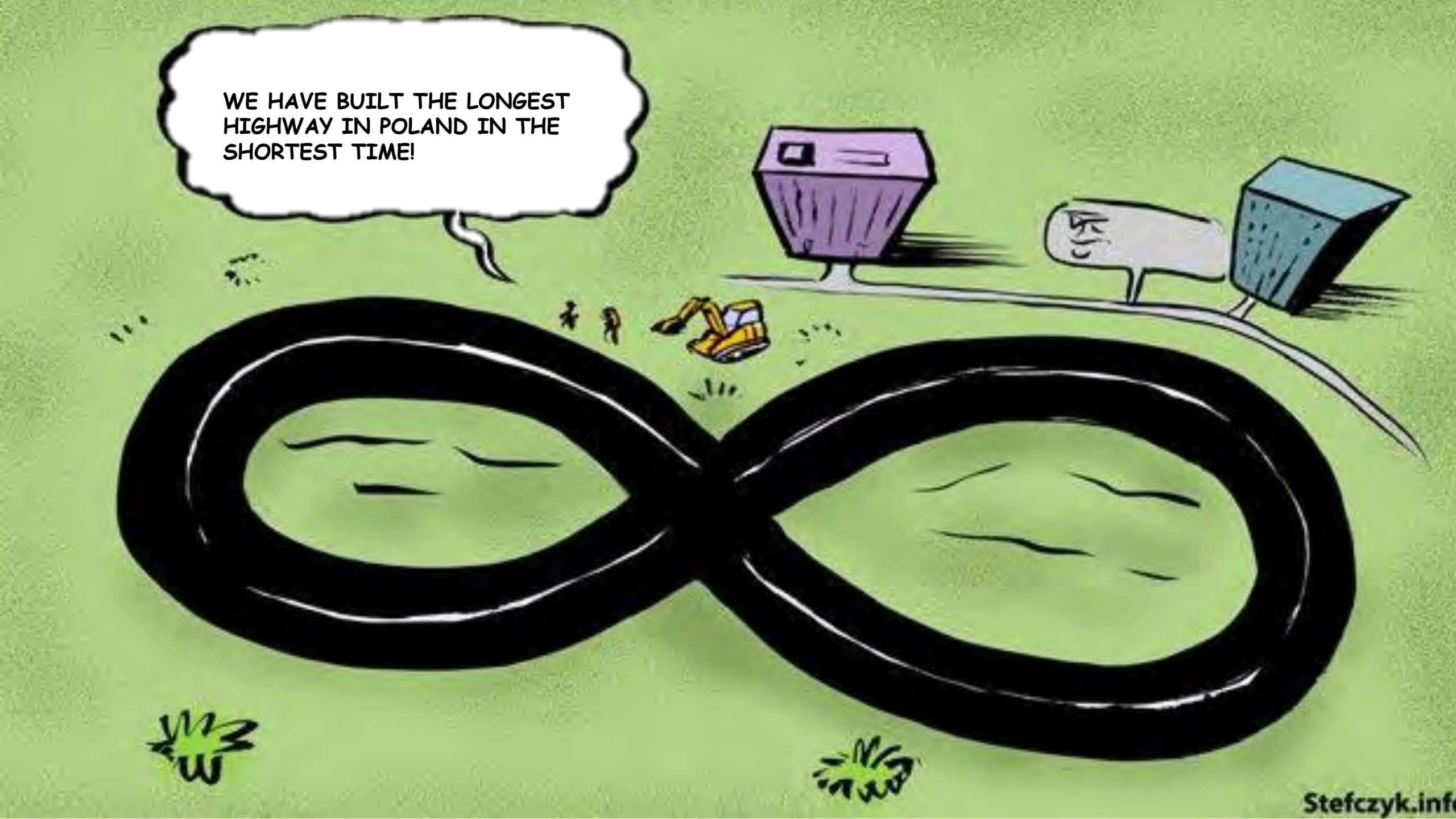
Revolution in road constuction


Control is important!
1823
MACADAM ROAD CONSTRUCTION


Less control?
2000
PRESENT
ASPHALT
CONSTRUCTION

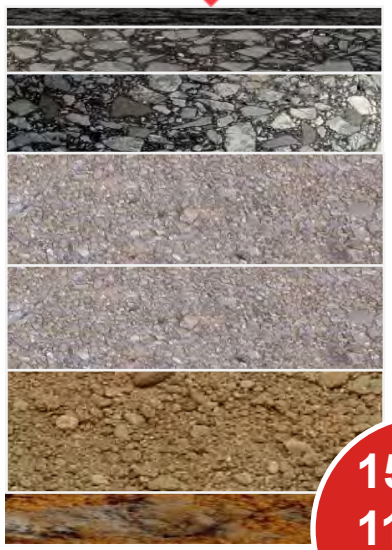
PRESENT ASPHALT PAVEMENTS IN POLAND

HIGHWAYS AND EXPRESSWAYS CONSTRUCTION IN POLAND


WE HAVE BUILT THE LONGEST HIGHWAY IN POLAND IN THE SHORTEST TIME!
Stefczyk.inf

200 TRADITIONAL ASPHALT PAVEMENT

1



WEARING COURSE, SMA 11 (0/12.8), 4CM (5 CM)

BINDER COURSE, AC 20, 9CM (8 CM)

ASPHALT BASE COURSE, AC 25, 16CM

▼- 29 CM

UNBOUND SUB-BASE OF CRUSHED AGGREGATE 0/31.5, 22CM

SUB-BASE OF NATURAL AGGREGATE 0/31.5, 20CM

FROST PROTECTION LAYER, 24CM

▼- 95 CM

SUBGRADE

15 mln 115 kN ESALs

All HMAs with binder D50

– CALCULATED OPERATION LIFE 20 YEARS

200 4

ASPHALT CONCRETE WITH HIGH STIFFNESS MODULUS

WEARING COURSE SMA 11, 4CM

BINDER COURSE, AC 20 WITH PMB, 9CM

AC WMS (EME TYPE) 20 WITH 20/30 BINDER, 13CM

▼- 26 CM

UNBOUND SUB-BASE, CRUSHED AGGREGATE, 22CM

CEMENT BOUND SUB-BASE, R_{M28} = 2.5 ÷ 5.0 MPA, 20CM

FROST PROTECTION LAYER, 27CM

SUBGRADE

16.5 mln 115 kN ESALs

– REDUCED TOTAL THICKNESS OF ASPHALT LAYERS
– INCREASED DURABILITY

201 ASPHALT CONCRETE WITH HIGH STIFFNESS MODULUS

1

WEARING COURSE, SMA 11, 4CM

BINDER COURSE, AC WMS 16 20/30, 8 CM

ASPHALT BASE COURSE, AC WMS 16 20/30, 17 CM

▼- 29 CM

UNBOUND SUB-BASE OF CRUSHED AGGREGATE, 22CM

CEMENT BOUND SUB-BASE, R_{M28} = 2.5 ÷ 5.0 MPA, 20CM

FROST PROTECTION LAYER, 30CM

SUBGRADE

54 mln 115 kN ESALs

– REDUCED TOTAL THICKNESS OF ASPHALT LAYERS
– CALCULATED OPERATION LIFE 30 YEARS

UEFA EURO2012 POLAND-UKRAINE

201 LOW TEMPERATURE CRACKING

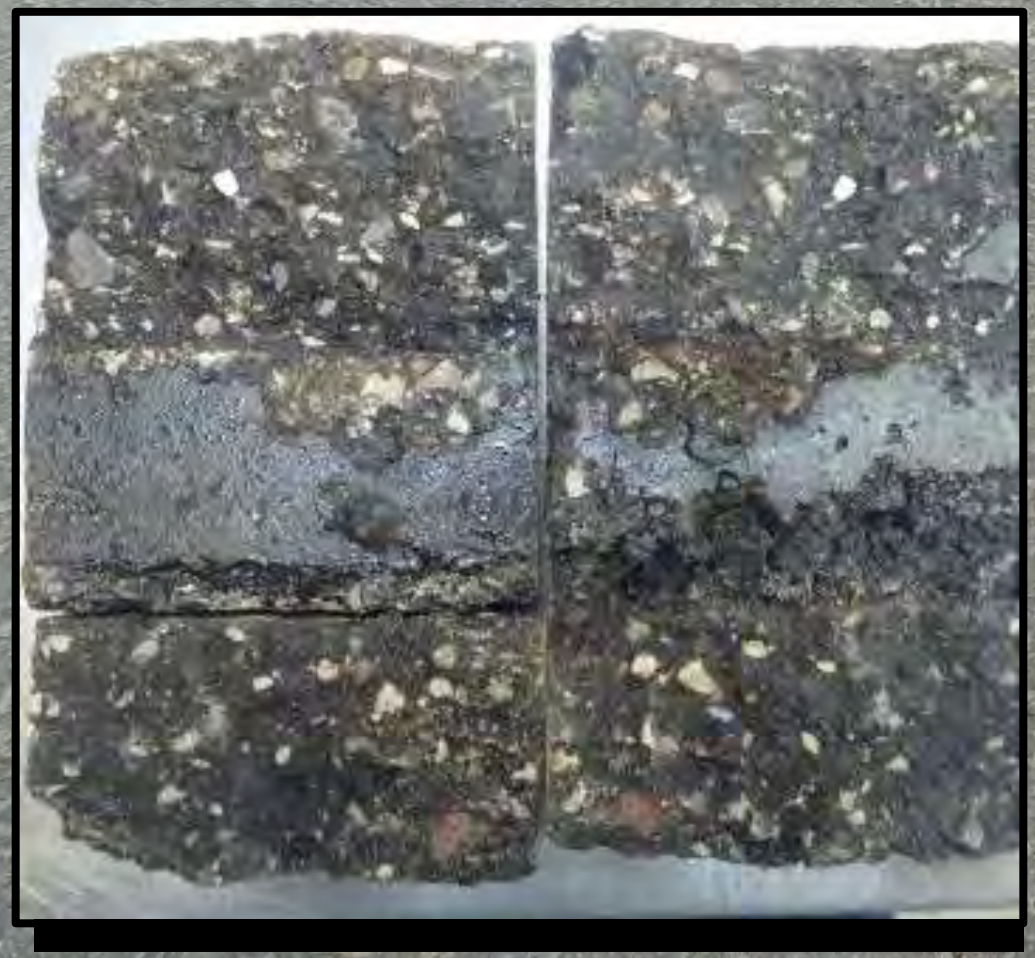
2

cut too deep

cracks above joint cuts in asphalt base and binder layers (without wearing course)

201 LOW TEMPERATURE CRACKING

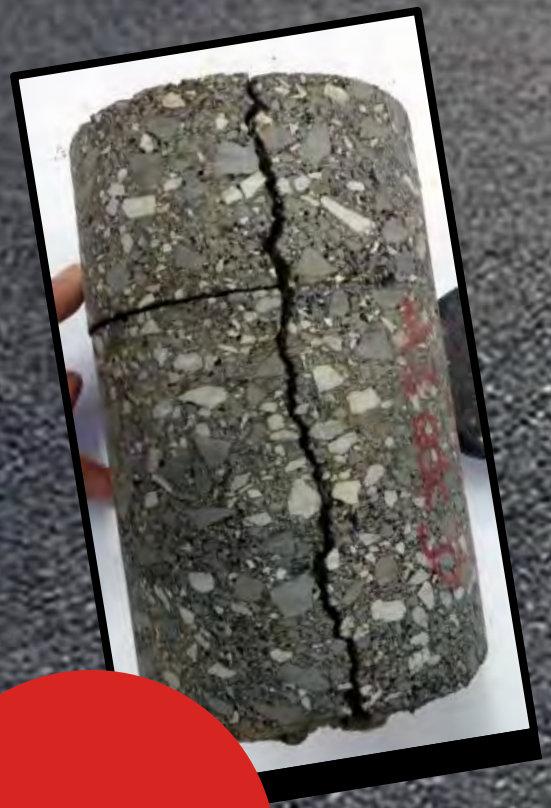
2



cracks at joints with sealants

201 LOW TEMPERATURE CRACKING

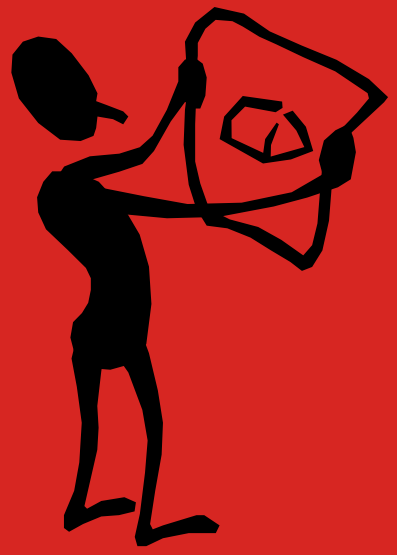
2



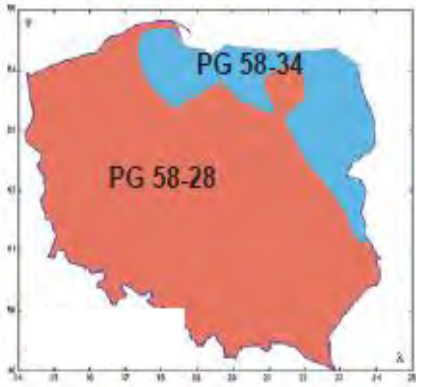
Too stiff!

uncontrolled „wild" crack

Authors during low-temperature testing

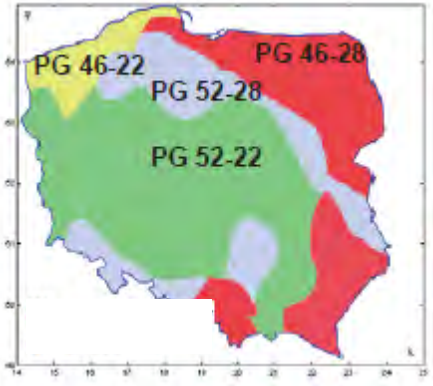


BINDER SELECTION FOR EACH LAYER



Wearing course
h = 20 mm

Binder course
h = 90 mm



Base course
h = 200 mm

Low Temperature, °C \ High Temperature, °C	52	58	64	70	76
-16	52-16	58-16	64-16	70-16	76-16
-22	52-22	58-22	64-22	70-22	76-22
-28	52-28	58-28	64-28	70-28	76-28
-34	52-34	58-34	64-34	70-34	76-34
-40	52-40	58-40	64-40	70-40	76-40

= Crude Oil
= High Quality Crude Oil
= Modifier Required

BINDER SELECTION FOR EACH LAYER

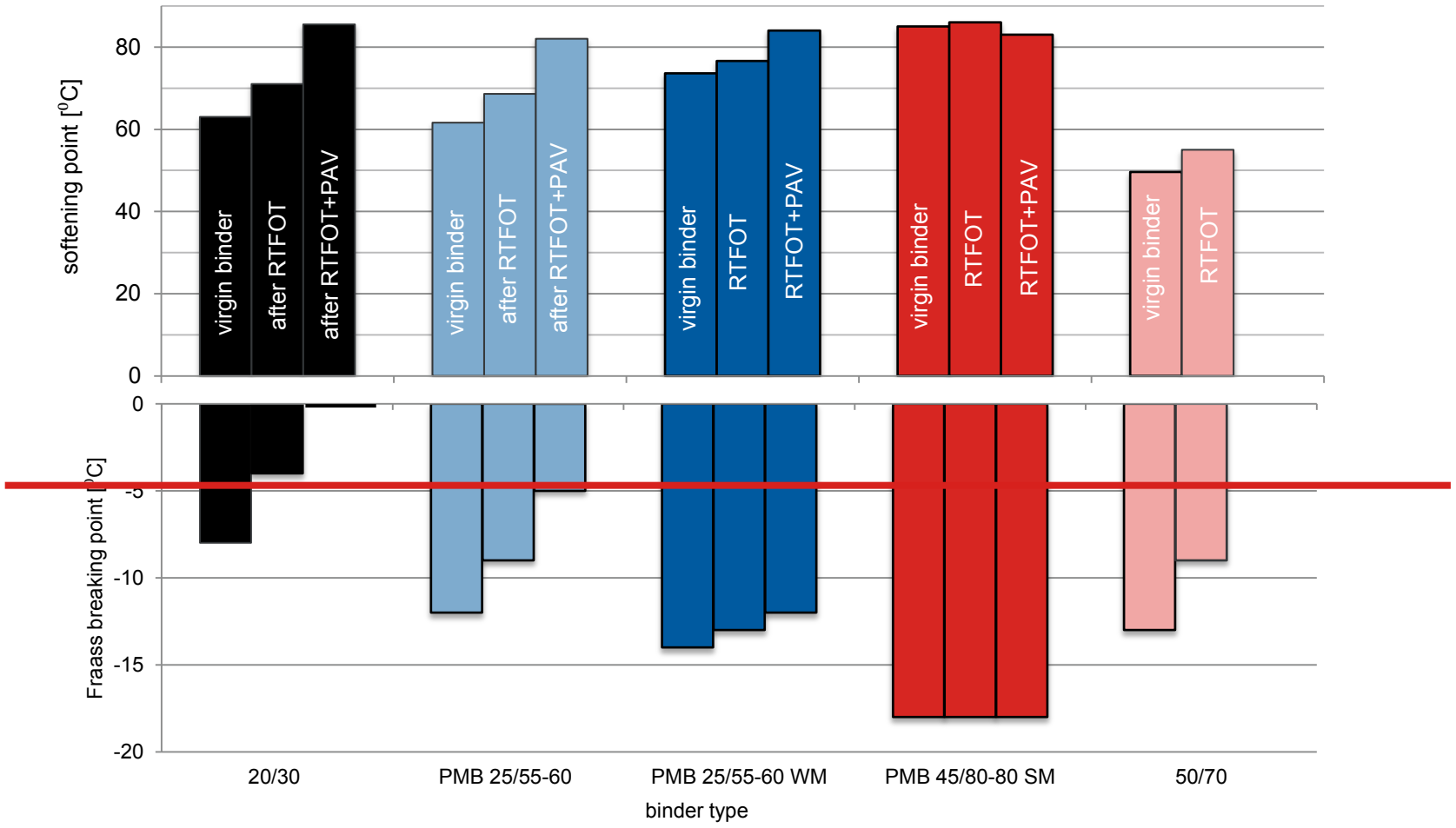
PROPOSITION OF IMPLEMENTING THE PERFORMANCE GRADE (PG) SYSTEM IN POLAND

AC WMS (HIGH MODULUS) MIXES WITH DIFERENT BINDERS

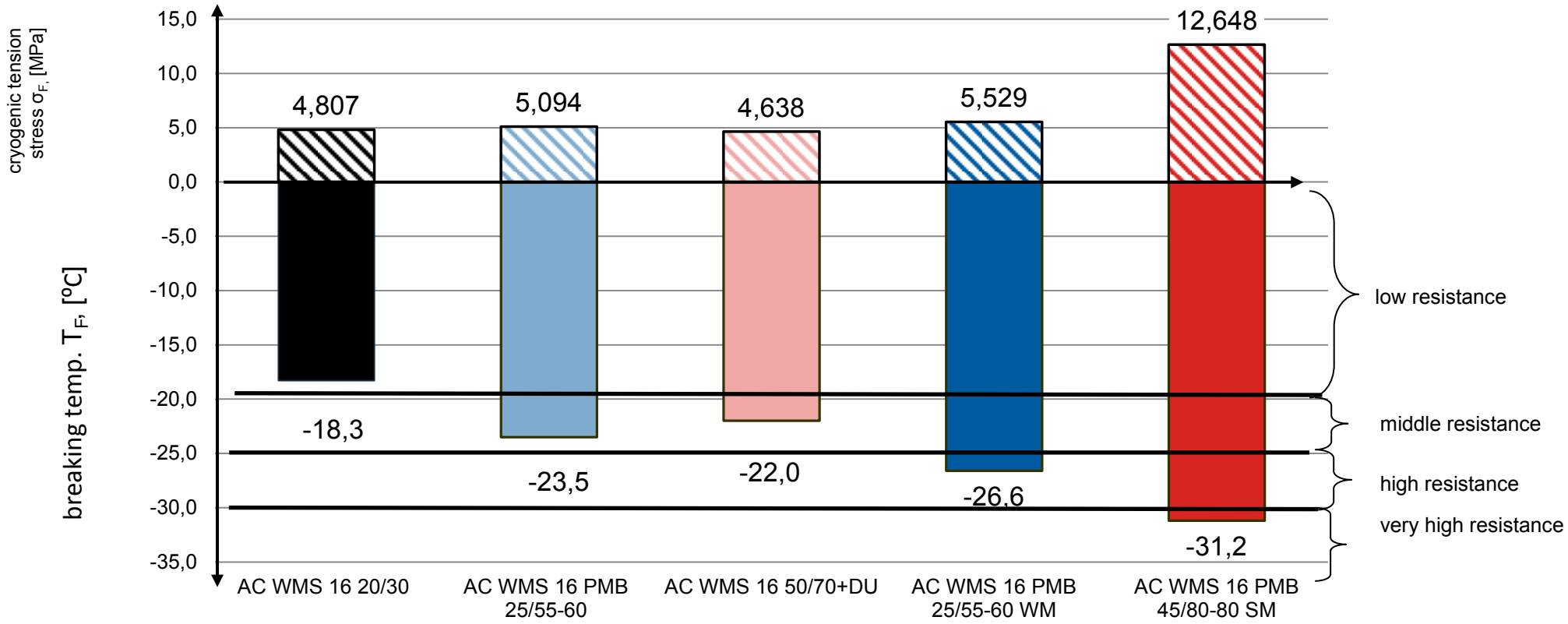
LABORATORY WORKS IN TPA PRUSZKÓW

Properties of tested binders after aging

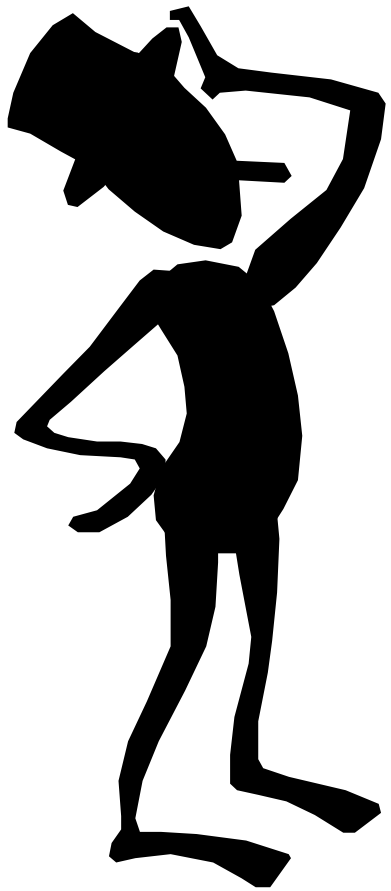
SOFTENING POINT ACC. PN-EN 1427,
FRAASS BREAKING POINT ACC. PN-EN 12593



Low temperature cracking resistance
TSRST acc. PN-EN 12697-46



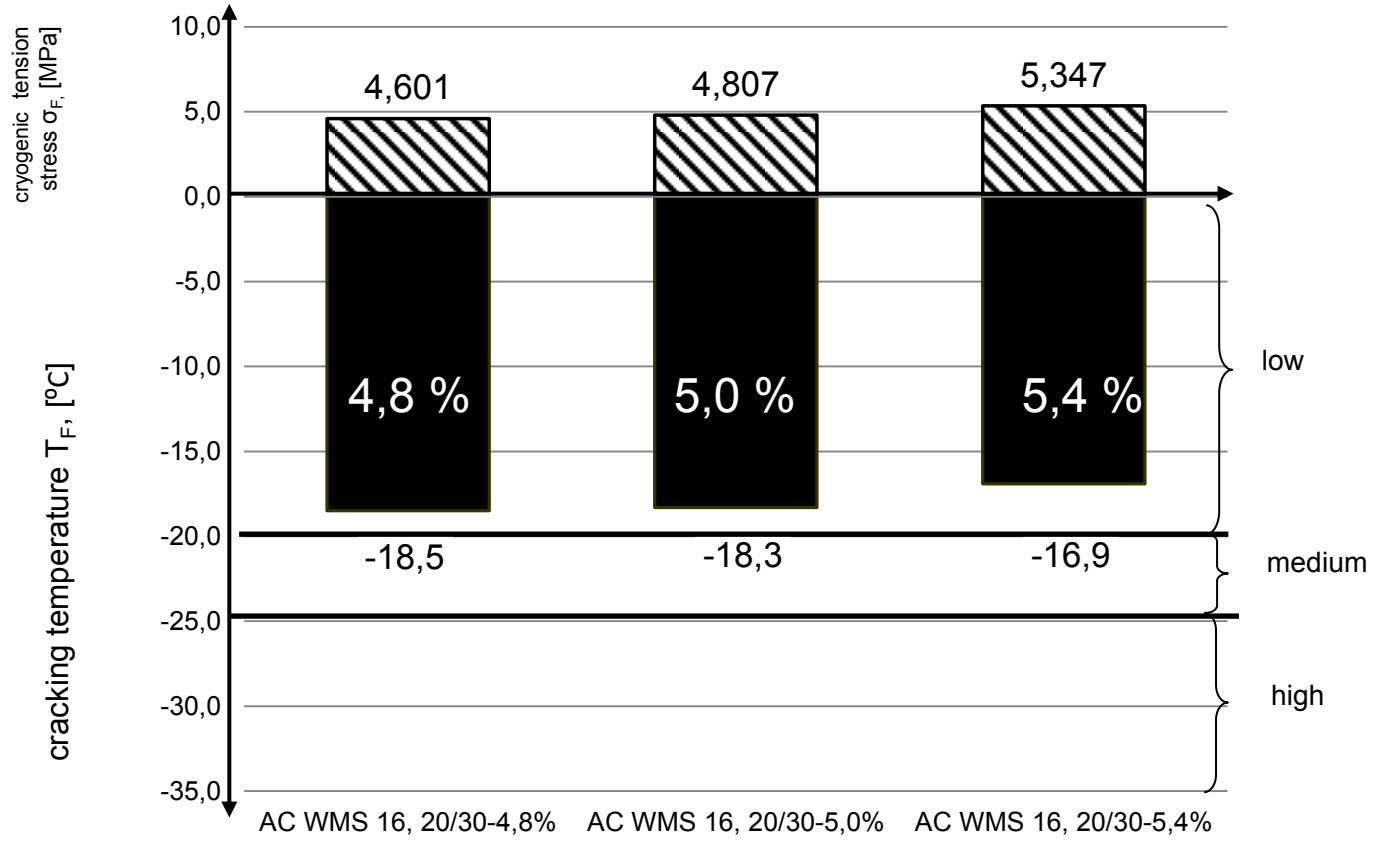
Low temperature cracking?

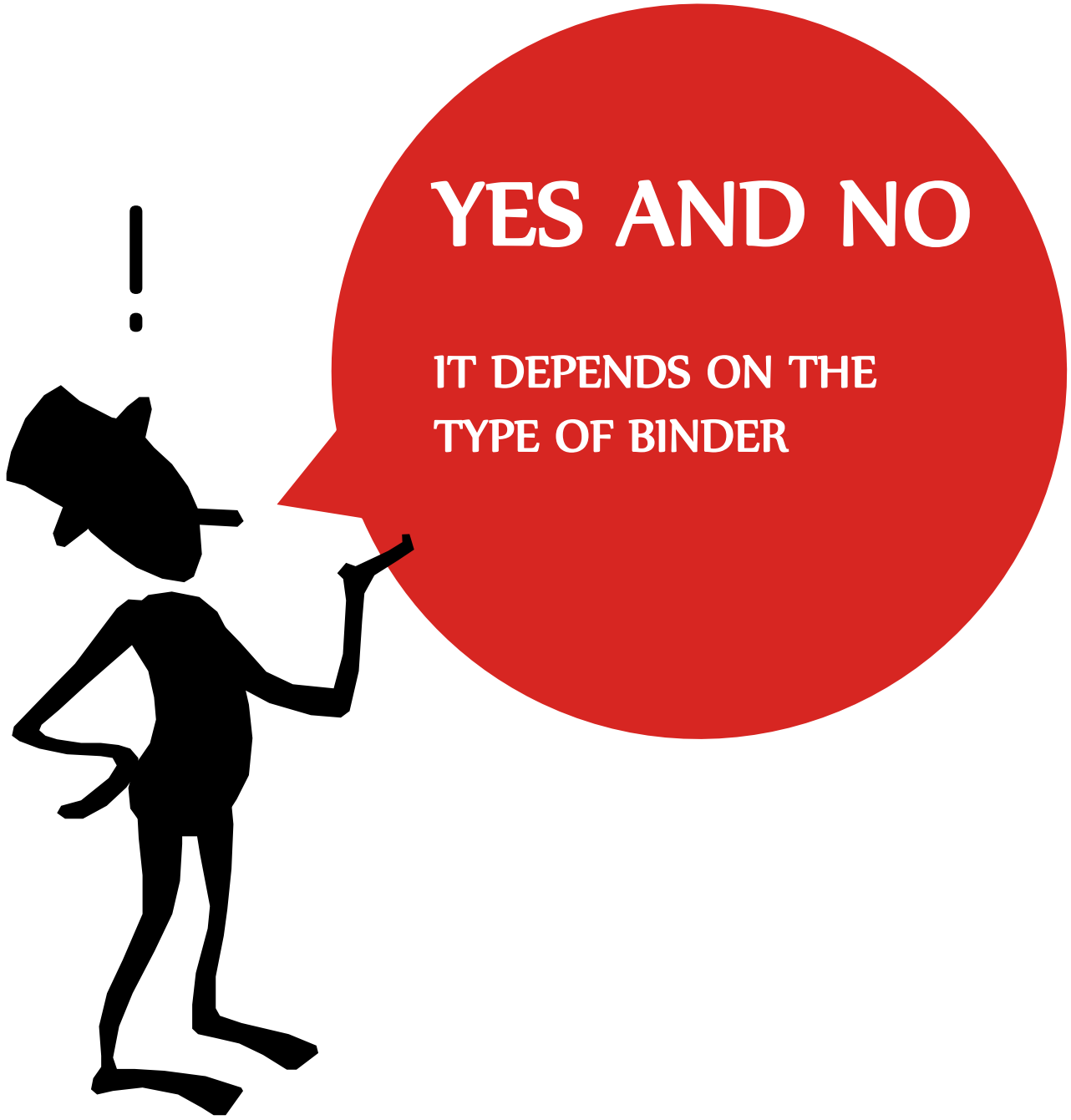


THE MORE BINDER
THE BETTER?!

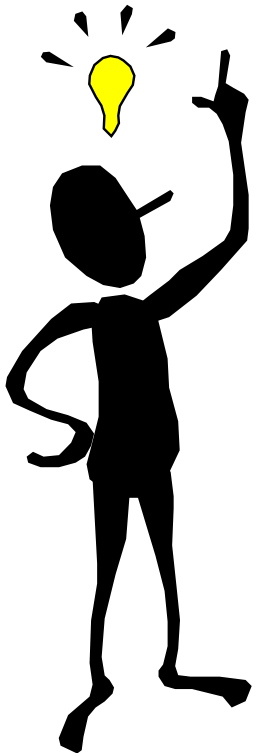
Low temperature cracking resistance

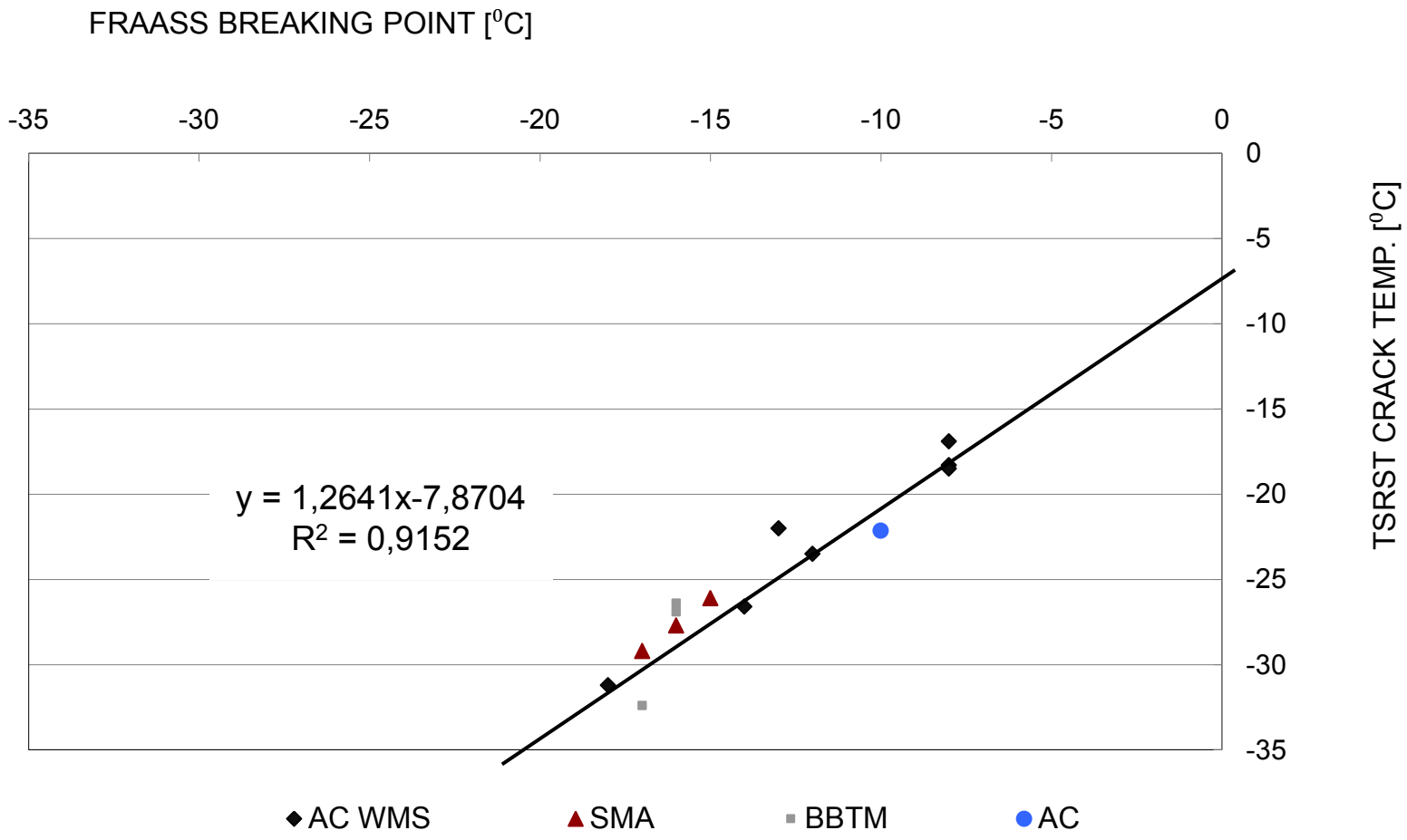
AC WMS WITH DIFFERENT AMOUNTS OF BINDER 20/30 (TSRST) ACC. EN 12697-46

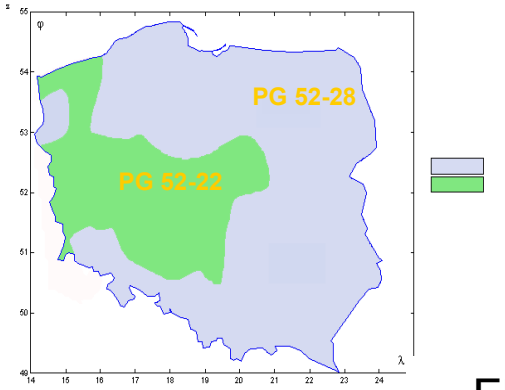



!
YES AND NO
IT DEPENDS ON THE
TYPE OF BINDER

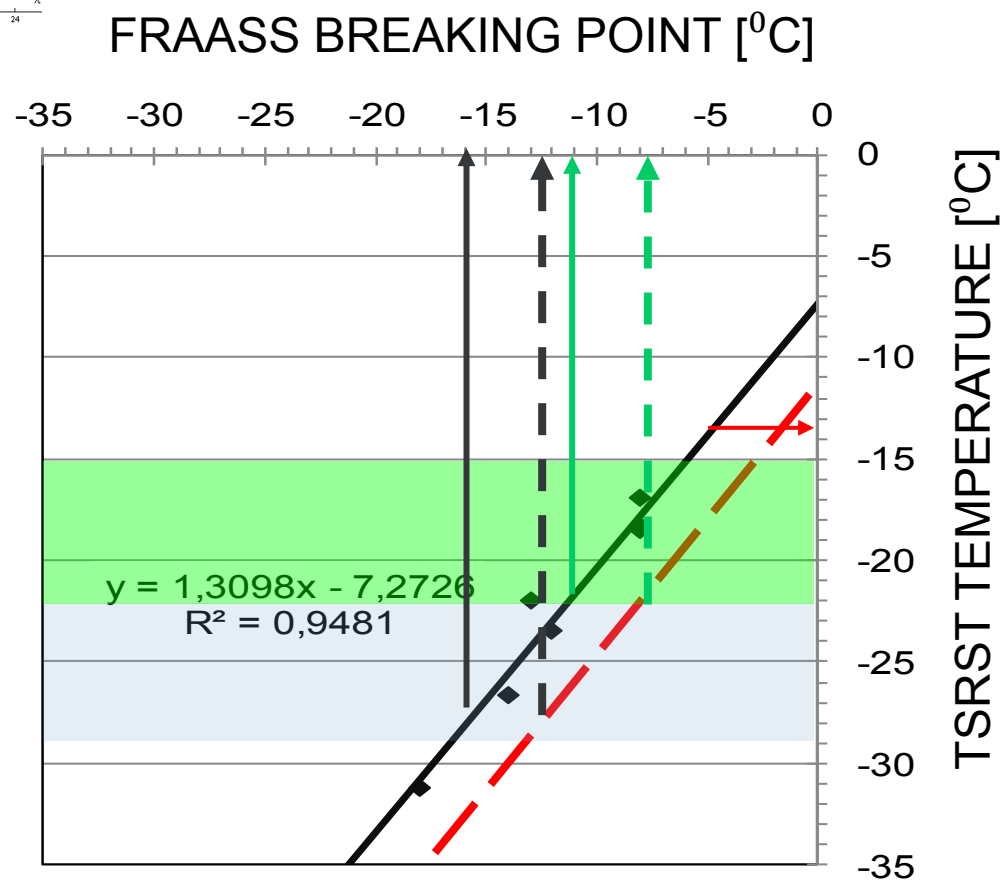
CORRELATION BETWEEN BINDER AND MIX PROPERTIES?



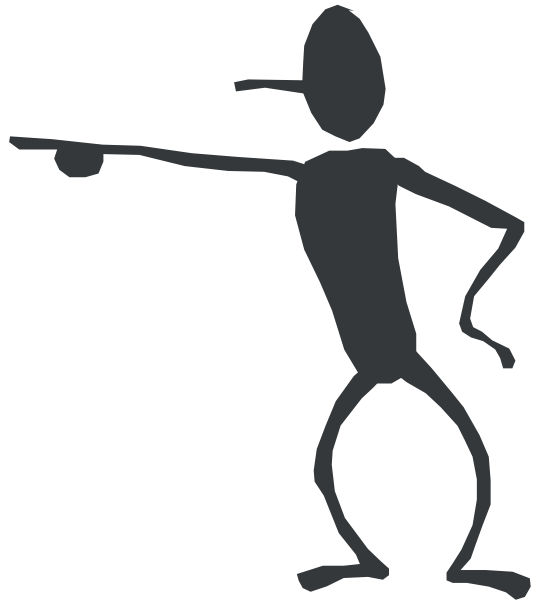




CORRELATION BETWEEN BETWEEN BINDER AND MIX PROPERTIES (FRAASS vs. TSRST)

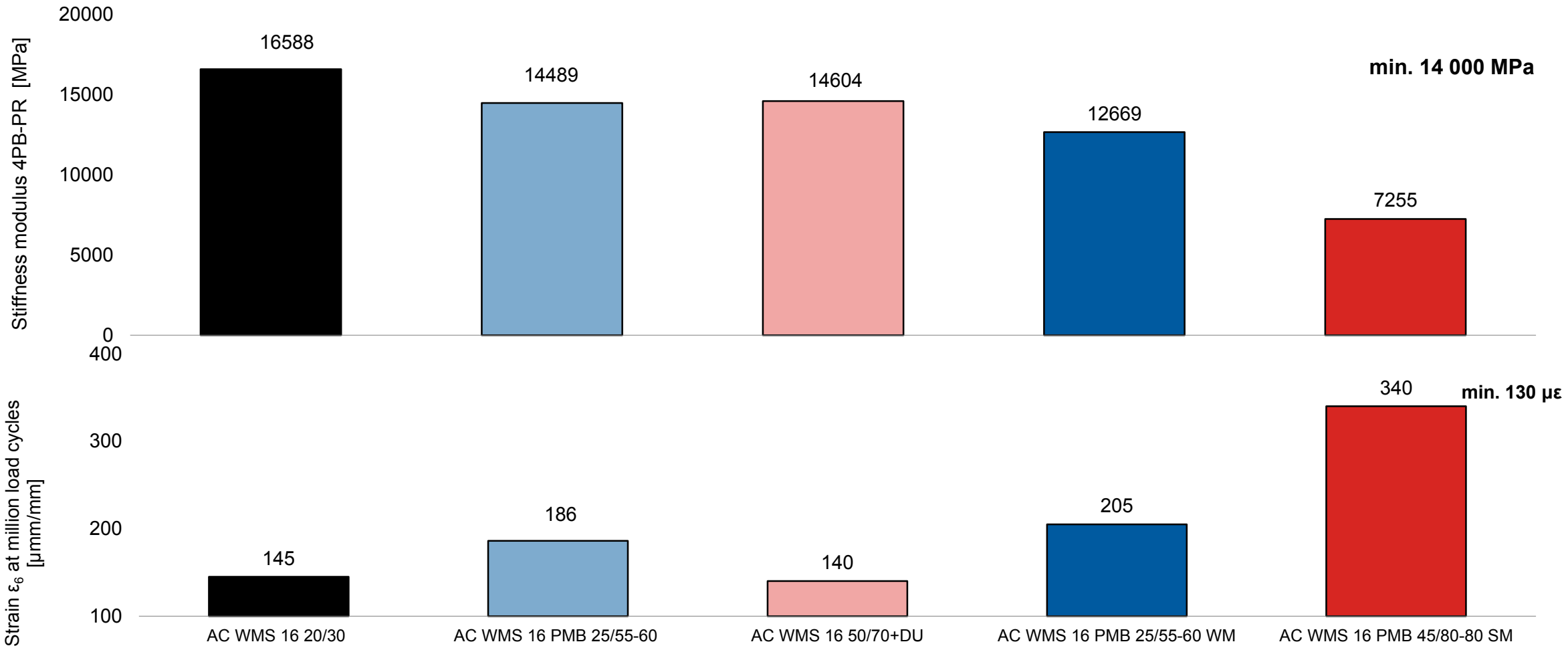


T cr = TSRST - 4



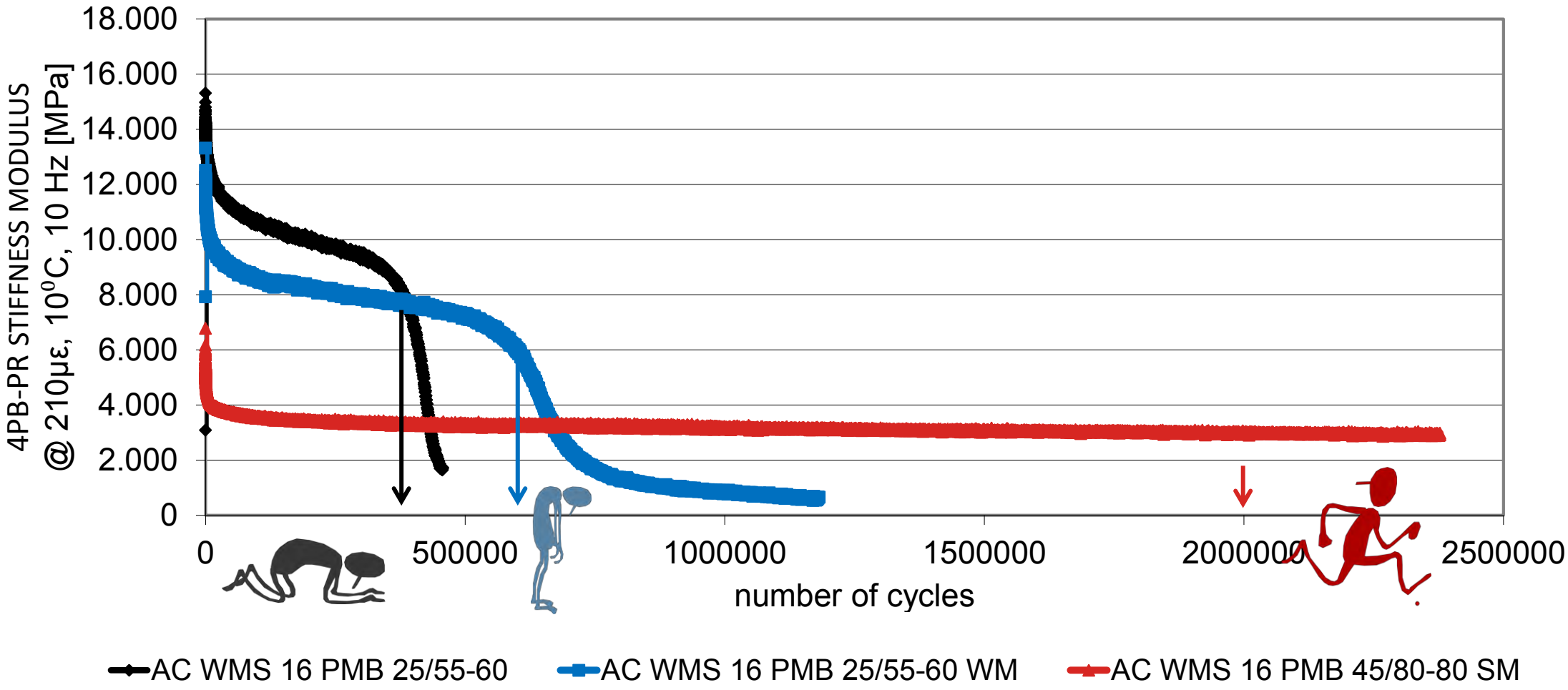

Durability
?
The higher the stiffness the better?

Stiffness modulus and fatigue resistance 4PB-PR (10^{0}C, 10 Hz)



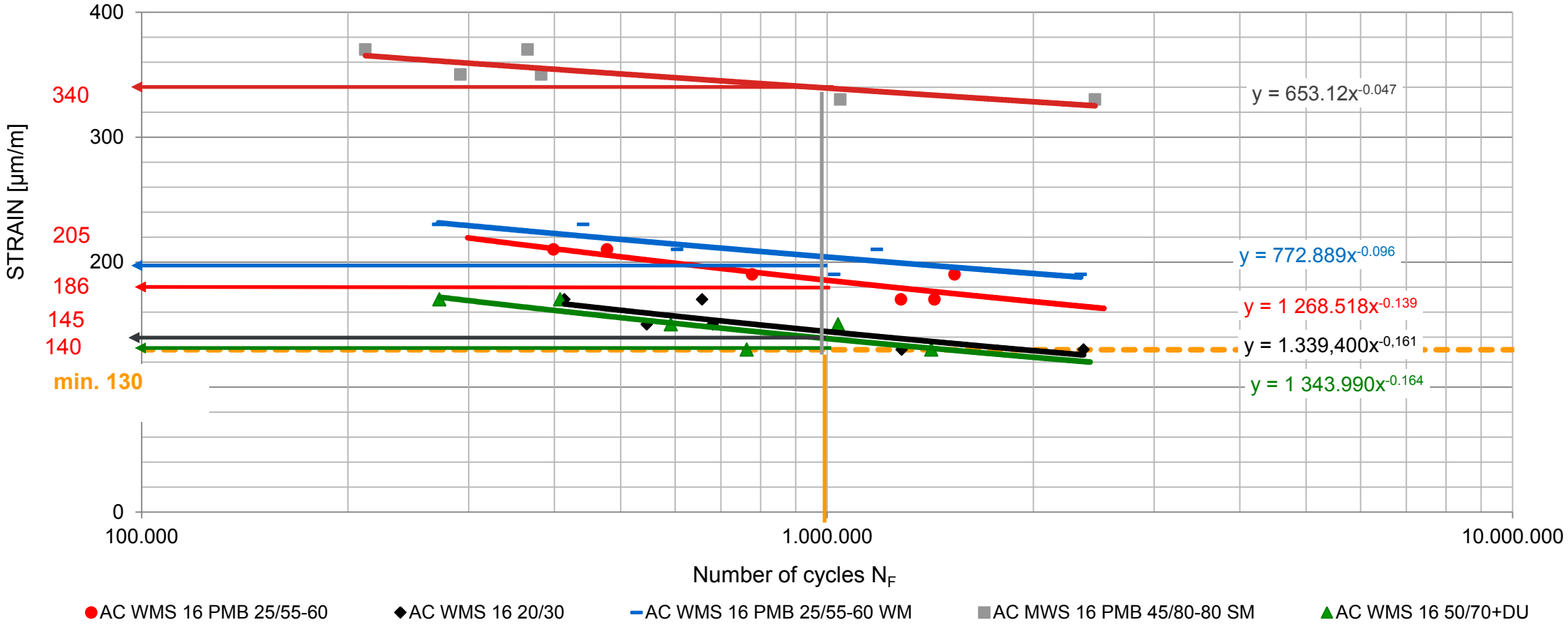
Decrease of stiffness modulus by 50 %

FATIGUE RESISTANCE
AT 210 με 4PB-PR, 10 °C, 10 HZ

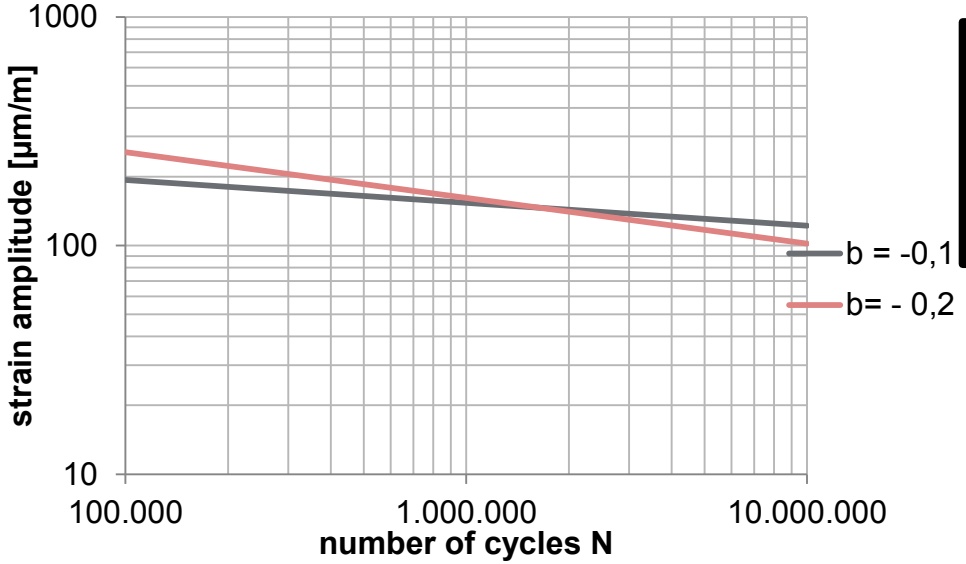


FATIGUE LIFE OF AC WMS MIXES WITH VARIOUS BINDERS

Fatigue diagram
4PB-PR (10 °c, 10 hz) nach PN-EN 12697-24

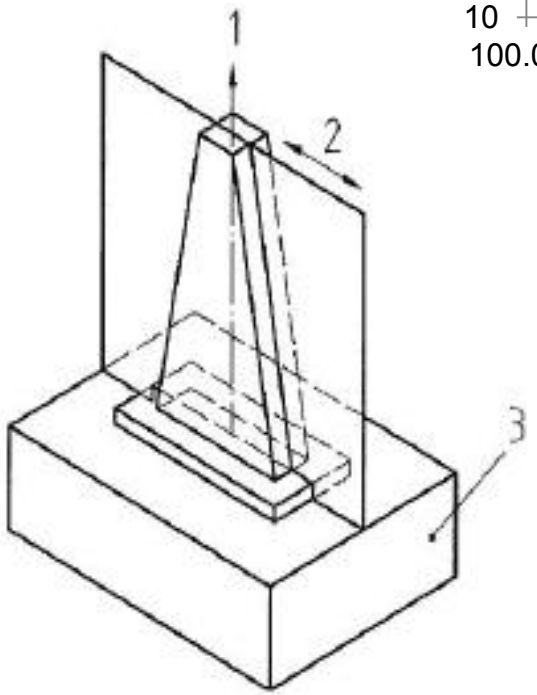


Fatigue criterion



French method of pavement design

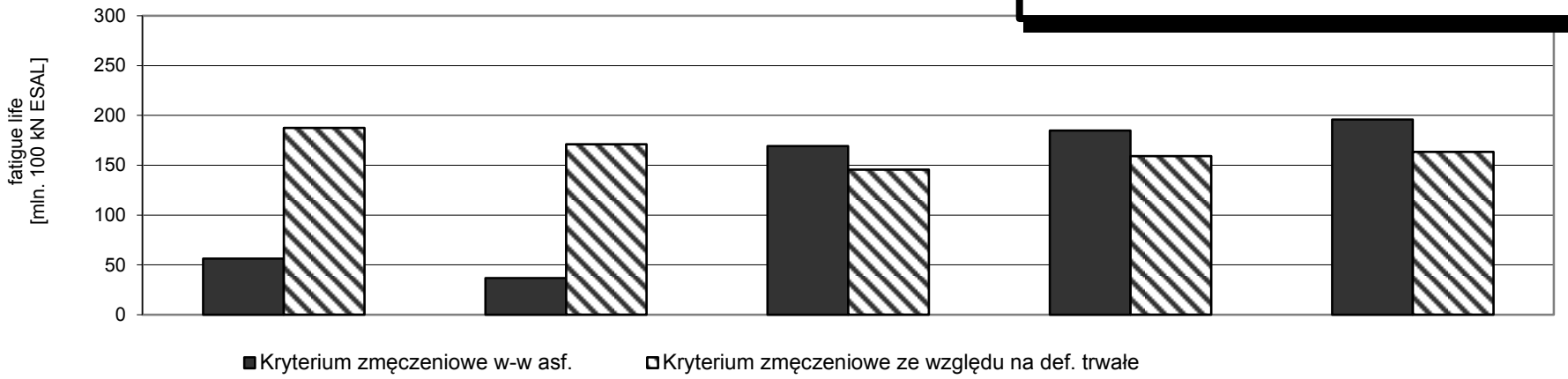
Fatigue criterion

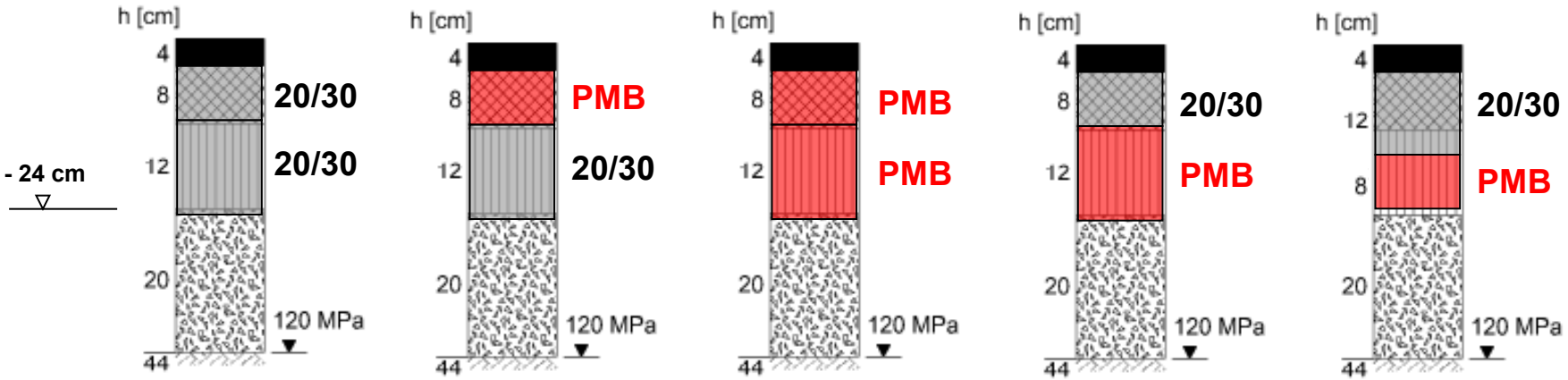


$$NE = \left(\frac{\varepsilon_{t,ad}}{\varepsilon_6(10°C, 25Hz) \cdot \left[\frac{E(10°C)}{E(\theta_{eq})} \right]^{0,5} \cdot k_r \cdot k_c \cdot k_s} \right)^{\frac{1}{b}} \cdot 10^6$$

Traffic load class KR5

AC WMS WITH 20/30 AND/OR PMB 25/55-60





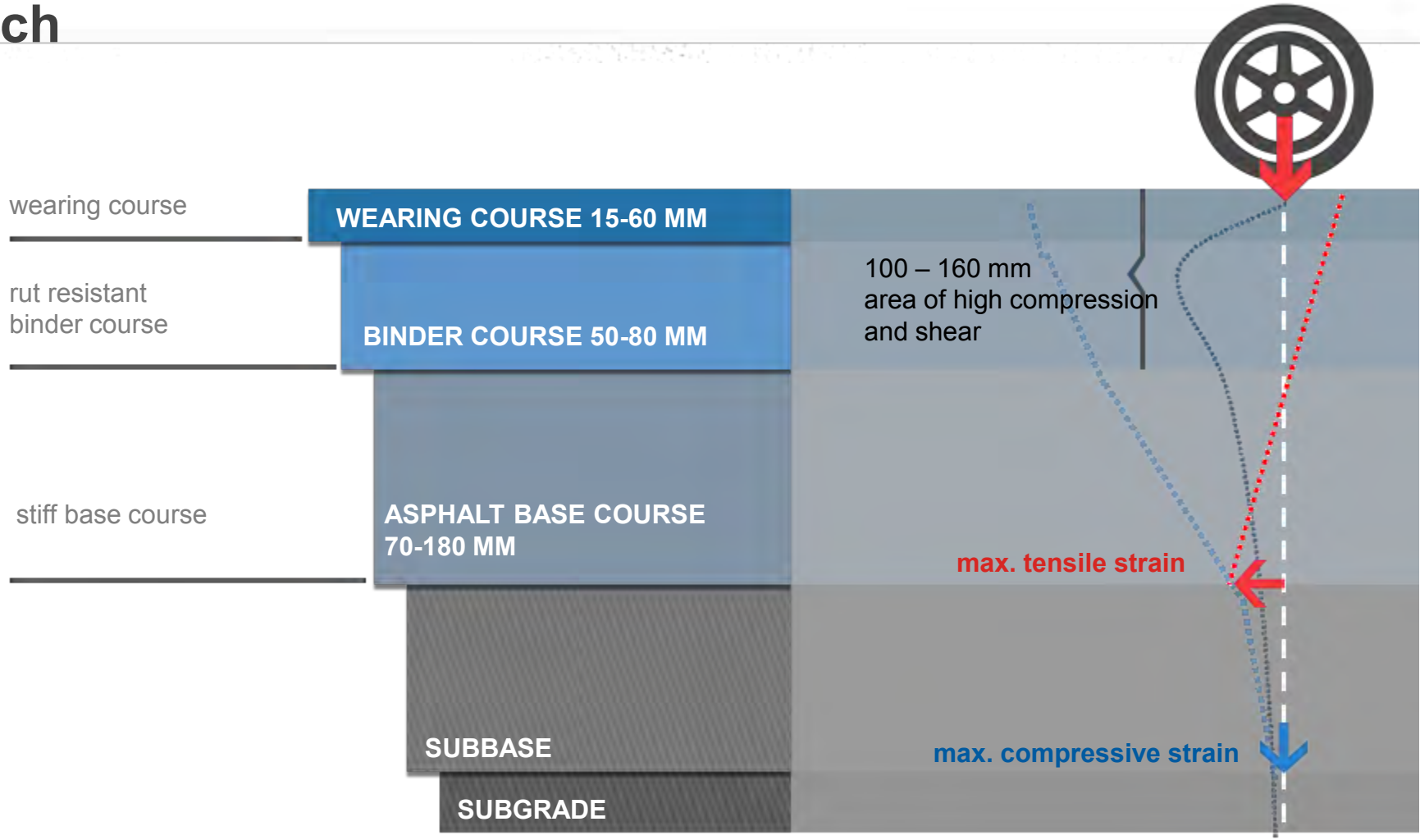
AC WMS 16 PMB 25/55-60

AC WMS 16 20/30

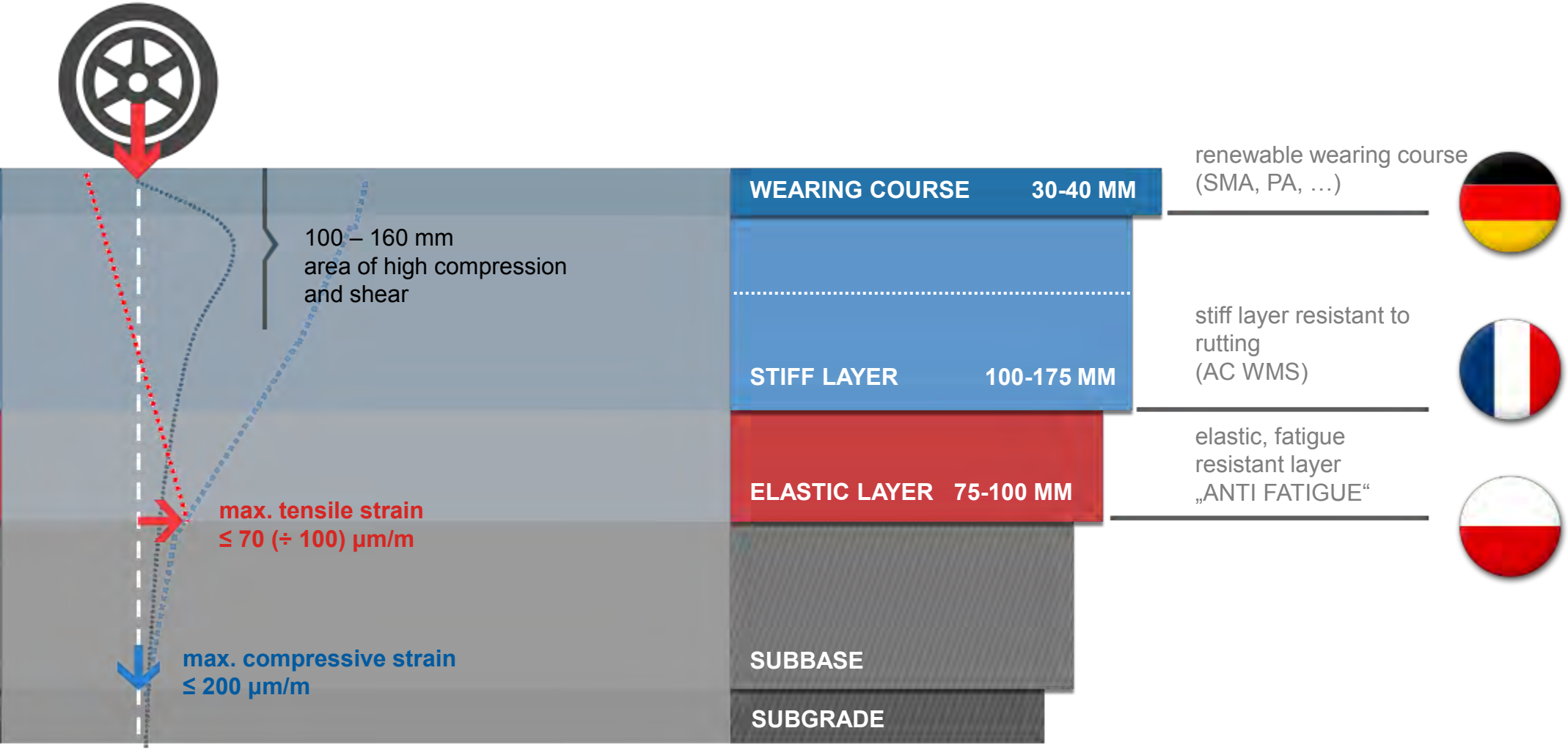
Perpetual pavement is „an asphalt pavement designed and built to last longer than 50 years without requiring major structural rehabilitation or reconstruction, and needing only periodic surface renewal (…)”

APA definition

Traditional flexible pavement structure – conventional approach

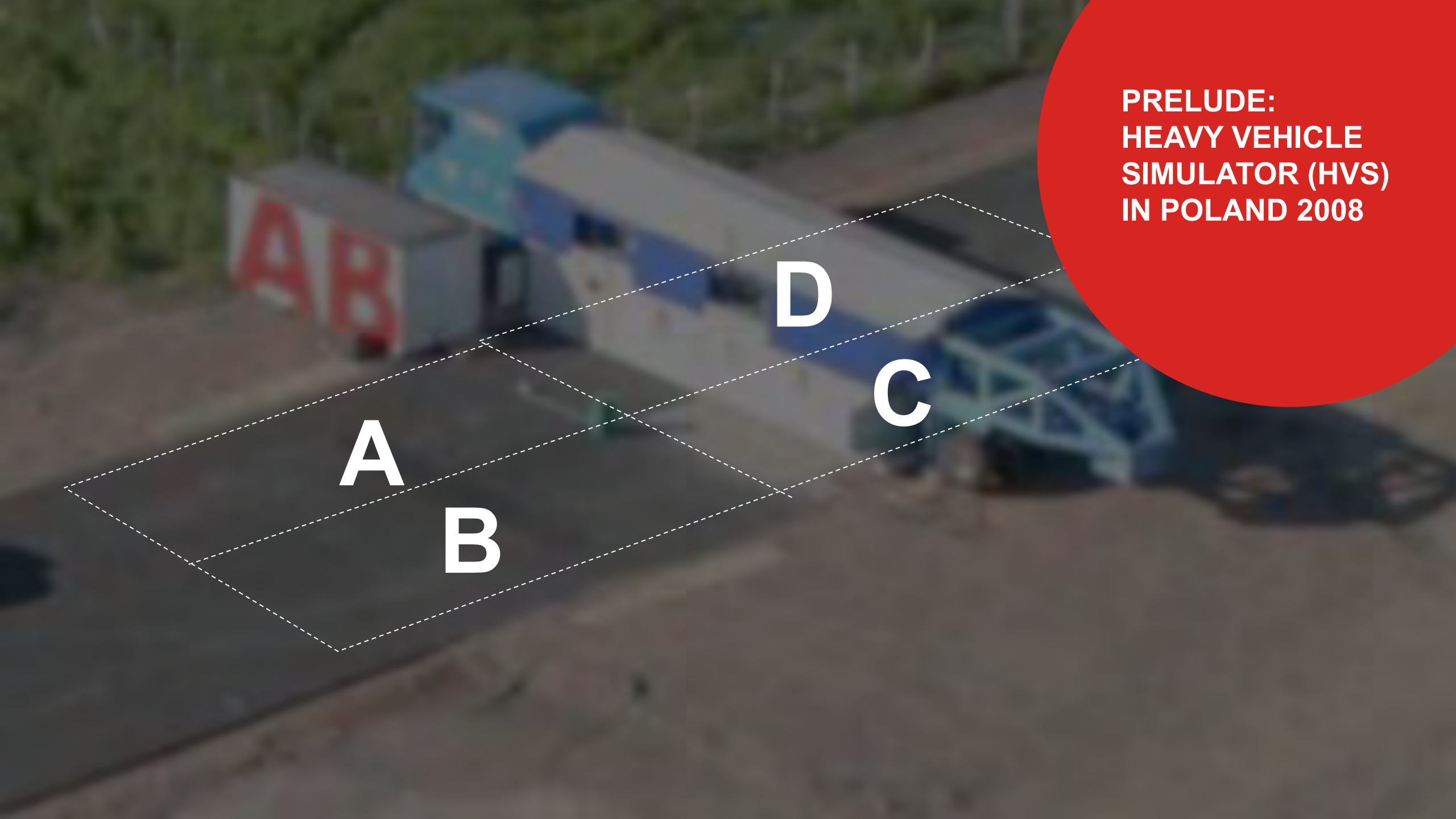


Perpetual pavement



lit. e.g.: Newcomb at all, 2000

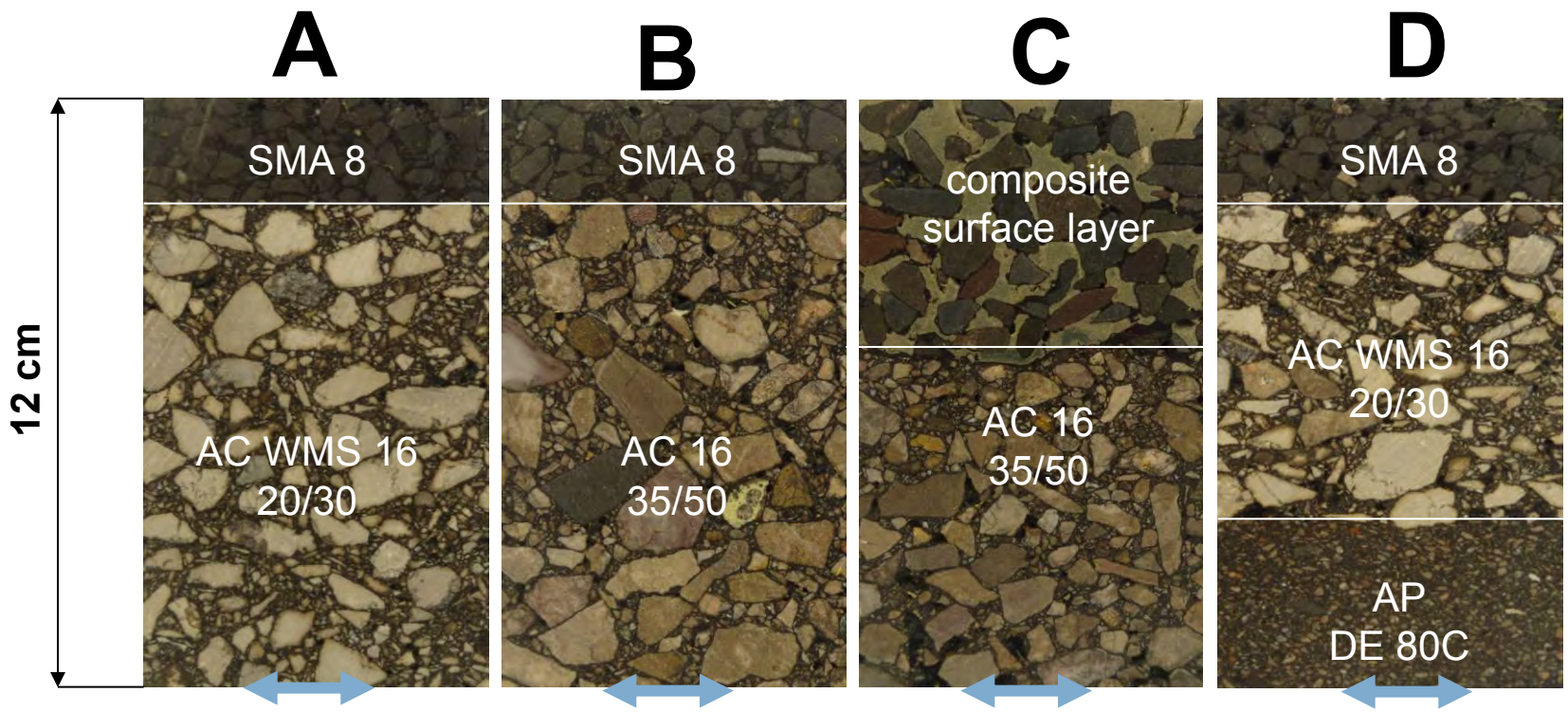
PRELUDE: HEAVY VEHICLE SIMULATOR (HVS) IN POLAND 2008



PRELUDE: HEAVY VEHICLE SIMULATOR (HVS) IN POLAND 2008

SPENS Research Program, 2008

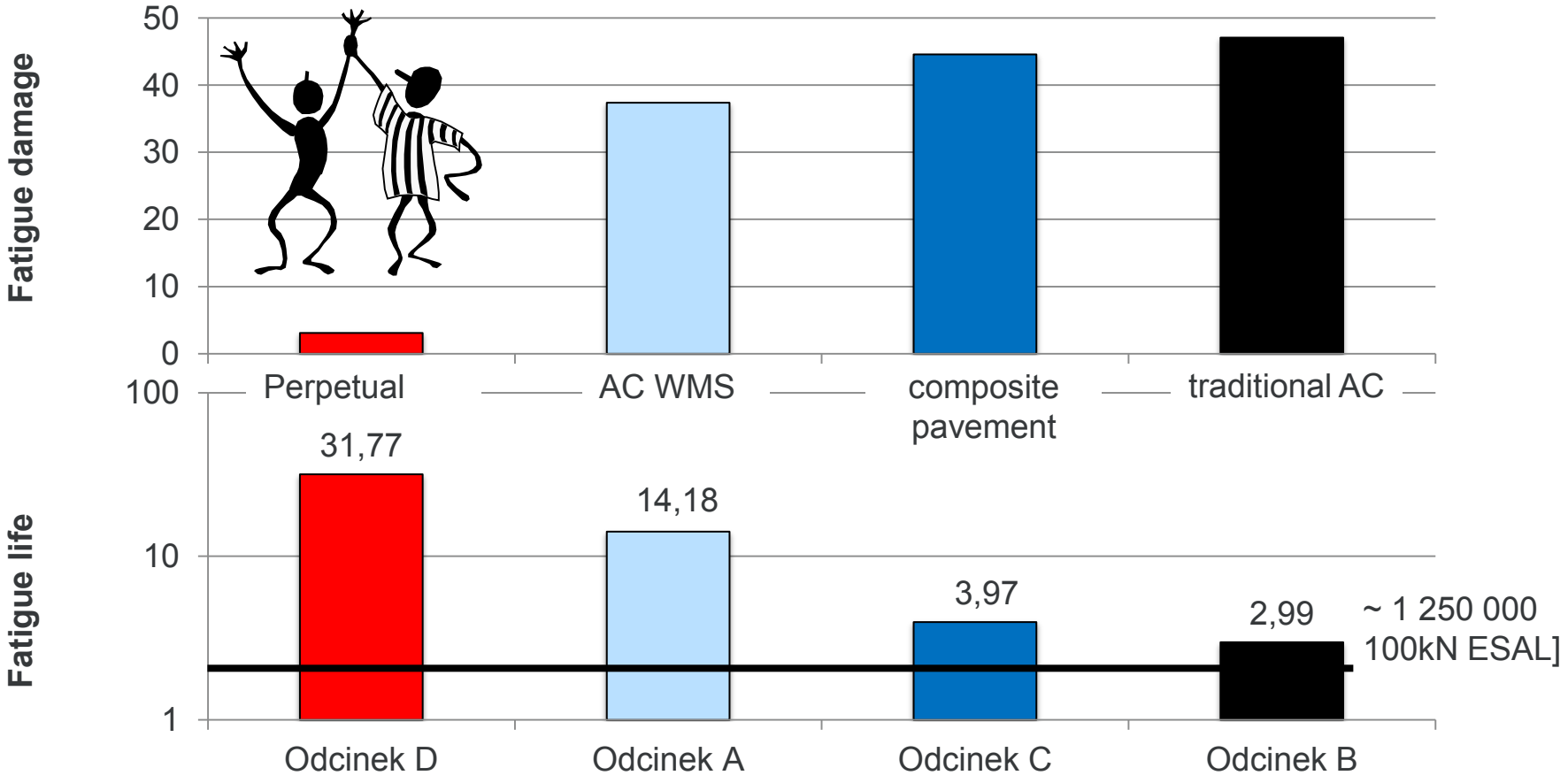
TESTED PAVEMENT TYPES



Mini „Perpetual Pavement

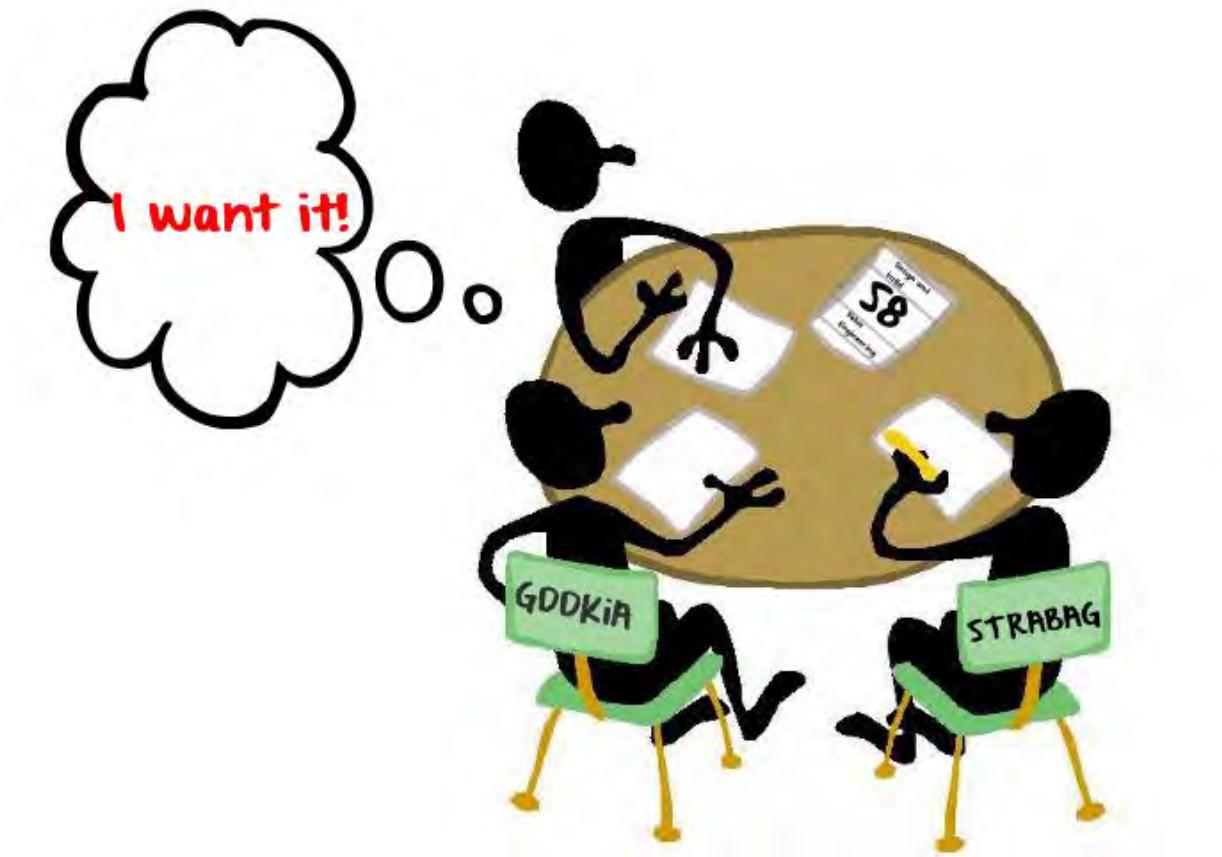
SPENS Research Program, 2008

COMPARISON OF THE HVS FATIGUE DAMAGE AND CALCULATED RESIDUAL FATIGUE LIFE



FROM IDEA TO IMPLEMETATION

the moment of truth

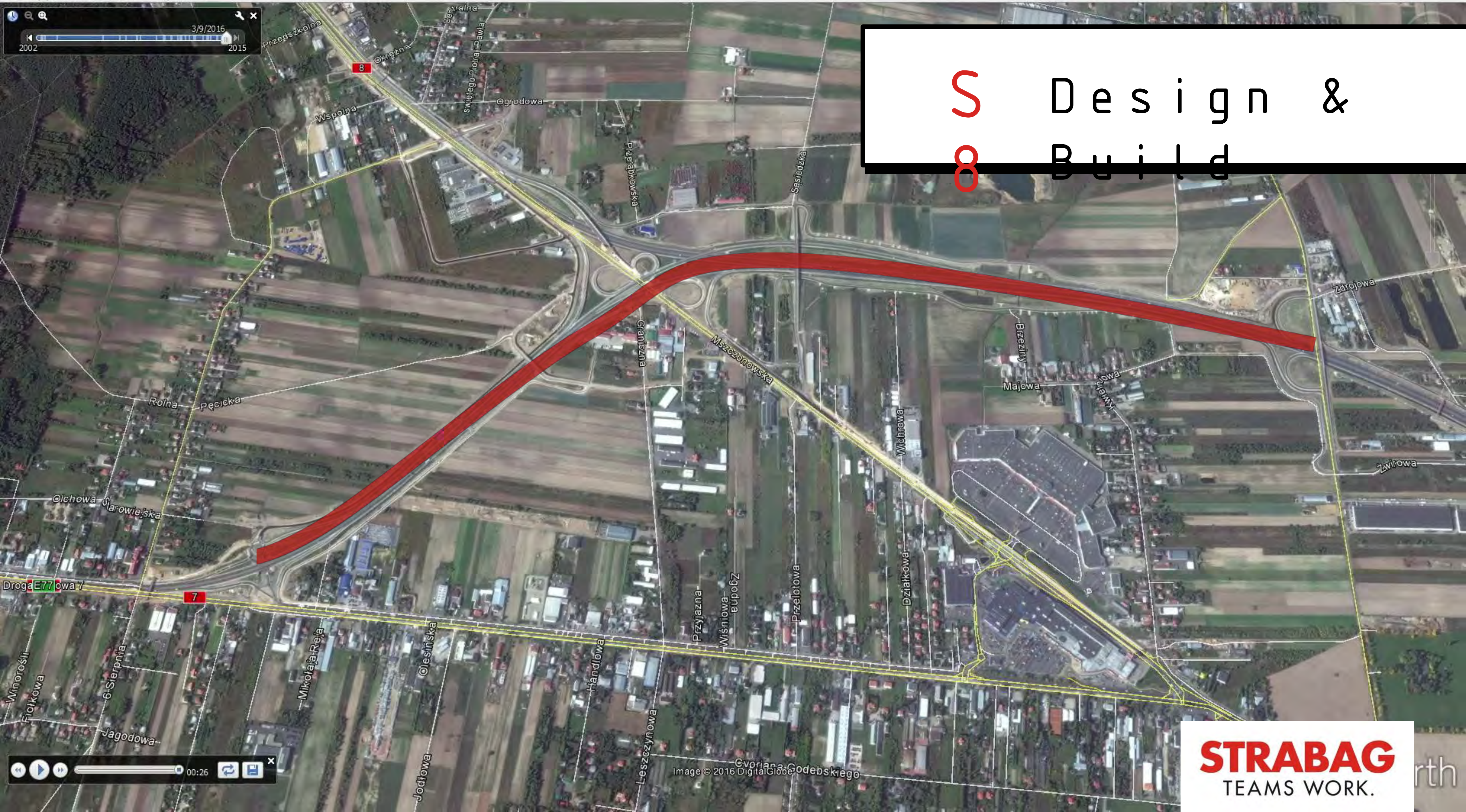


we're close to the finish line!

FIRST PERPETUAL PAVEMENT IN POLAND S8 CLOSE WARSAW

Plik Edycja Widok Narzędzia Dodaj Pomoc

S8 Design & Build



STRABAG
TEAMS WORK.

S 8

S 8 Opacz

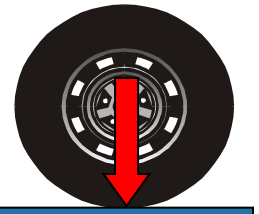
Comparison of designs tender / perpetual

TRADITIONAL PAVEMENT (TENDER)

SERVICE LIFE = **32 M** 100KN ESAL

PERPETUAL PAVEMENT

SERVICE LIFE = **142 M** 100 KN ESAL



3 cm wearing course SMA 8 with PMB 45/80-55	3 cm wearing course SMA 8 with PMB 45/80-55
7 cm binder course AC 16 with binder 35/50	15 cm binder course with high stiffness modulus AC WMS 16 with PMB 25/55-60
21 cm base course AC 22 with binder 35/50	8 cm base course with high fatigue resistance AC AF 16 with special binder PMB POLYGUM 45/80-70
20 cm subbase course 0/31,5 mm	20 cm subbase course 0/31,5 mm
15 cm cement treated subbase course compressive strength after 28 days = 5 MPa	20 cm cement treated subbase course compressive strength after 28 days = 5 MPa
improved subgrade	improved subgrade

10 YEARS

18 YEARS

2013 FIRST SAMPLING

S8

2013

TRIAL SECTION (150 M)
„ANTI-FATIGUE" LAYER


S 8

Informacje Magazyny Na żywo

2013 NEWS OF THE DAY

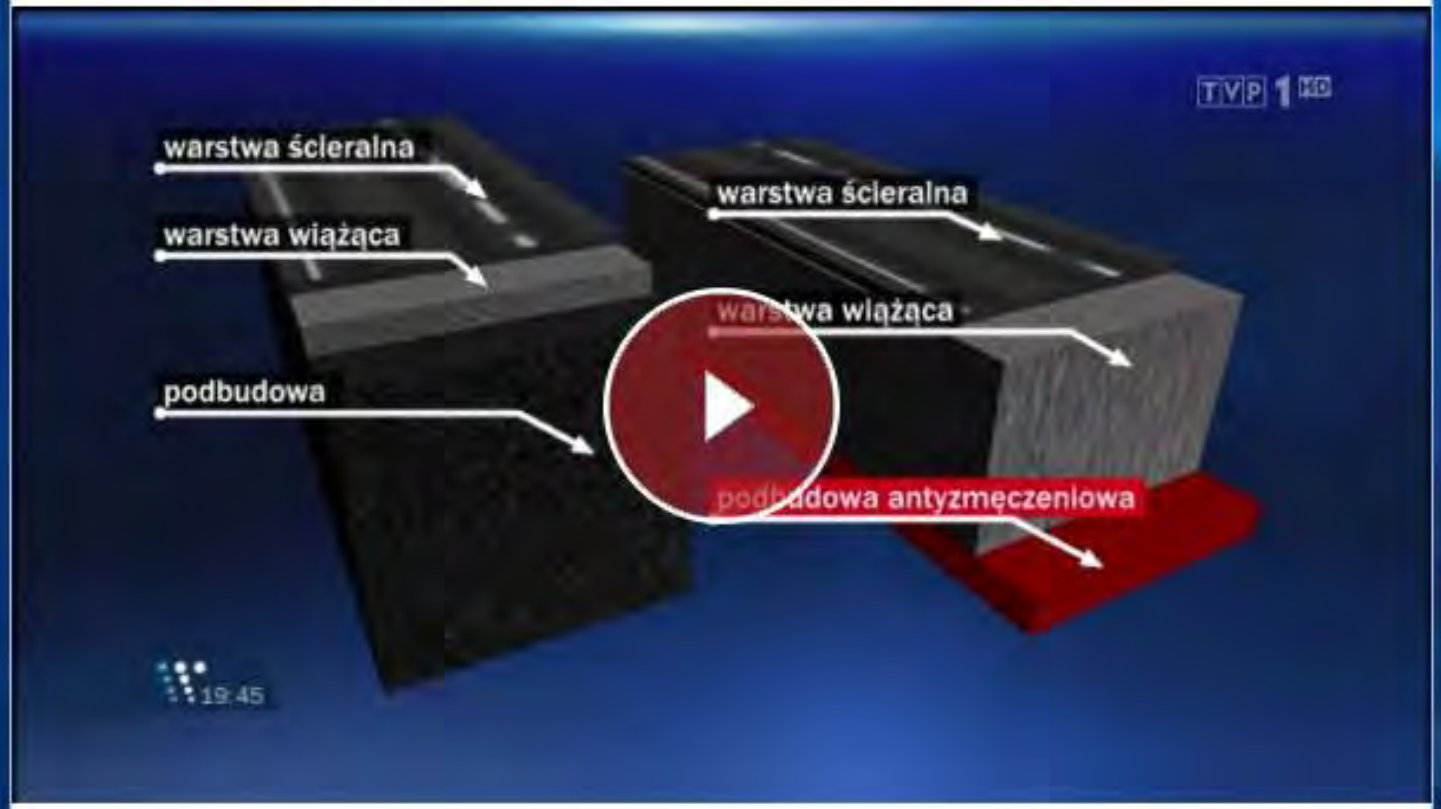
| Źródło: Fakty TVN

13.09.2014 | Superasfalt prosto z Polski – 18 lat gwarancji, 50 lat bez remontu

Drogowa rewolucja to nie żarty. Testowe 150 metrów superasfaltu leży już na S8. Żadnych dziur, kolein i nierówności – to będzie nowa polska specjalność. Drogowcy sprawdzają, czy asfalt się nie męczy, a zmęczeni kierowcy pewnie ... rozwiń

DŁUGOWIECZNA DROGA

Publikacja: 13 września 2014, 19:53



Dobrych dróg w Polsce przybywa, ale dziury i koleiny, są wciąż zmorą wielu z nas. Kierowcy płaczą i płacą. Drogowcy zazwyczaj tłumaczą się klimatem, że albo mamy upał albo siarczysty mróz. Ale uwaga, nadchodzi rewolucja - pod Warszawą jest właśnie testowany

TWARZE WIADOMOŚCI

TOP 10

1. Anna Przybylska 1978-2014
2. Pożegnanie
3. (Nie)trzeźwy poranek
4. Groźny zabójca
5. Wojny stadionowe
6. Putin jak Herkules
7. System obrony
8. W spirali długu
9. Tragedia pod ziemią
10. Wirus strachu

2013 VISIT OF THE GESTRATA FROM AUSTRIA


STRABAG
STRABAG
STRABAG

2015

LONG LIVE 50 YEARS!

AND THE STORY GOES ON…