ROAD PAVEMENTS FORUM

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TRH20 – Disappearance Act?

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TRH20

THE STRUCTURAL DESIGN, CONSTRUCTION AND MAINTENANCE OF

UNPAVED ROADS

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DEFINITIONS

Wearing course - the gravel layer constituting the uppermost (top) layer of an unsealed/unpaved road.

Gc -

Sp -

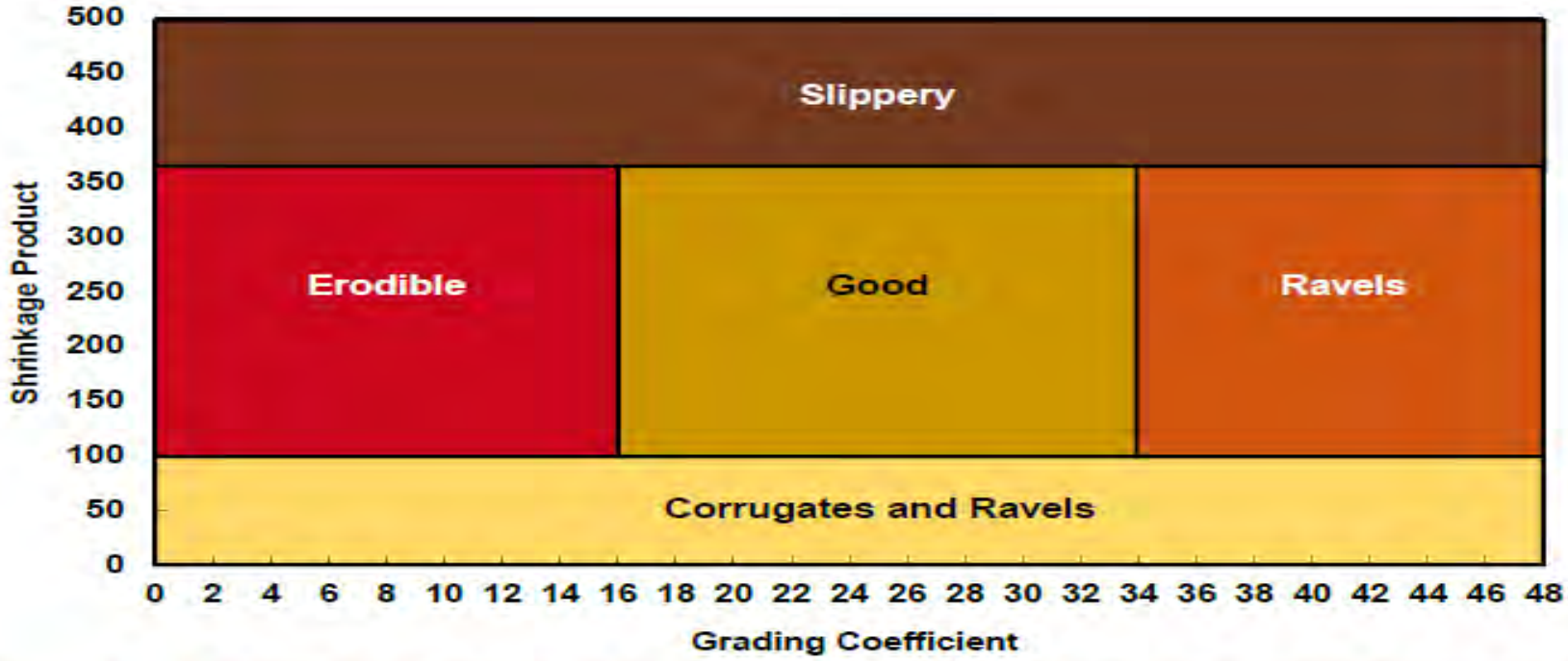

Figure 1. Relationship Between Shrinkage Product, Grading Coefficient and Performance of Gravel Wearing Course Gravels

HOW are Gc and Sp defined in TRH20?

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As per TMH1 Sieves

Gc = (Percentage passing 26.5 mm - percentage passing 2.0 mm) x percentage passing 4.75 mm)/100

As per SANS3001 Sieves

Gc = (Percentage passing 28 mm - percentage passing 2.0 mm) x percentage passing 5.00 mm)/100

Both TMH1 and SANS3001:

Sp = Linear shrinkage x percent passing 0.425 mm sieve

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TRH 20

Grading Coefficient **(Gc) and** ***Shrinkage Product (Sp),*** **must be based on a conventional particle size distribution determination SANS 3001-GR1 which must be NORMALISED for 100% passing the 37.5 mm sieve**

Here is the problem

……Designers and Laboratories no longer NORMALISE, prior to calculating Gc and Sp.

Why?

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Why? – 1

TRH 20 refers to **Grading Modulus** ,clause 3.5 version 1.5 and 1.6

this is an error

It should be **Grading Coefficient (Gc)**

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TRH 20

Why? – 2

- COLTO 1998 Refers to **TRH 20 Normalising**
- COTO 2020 Does not refer to **TRH 20 Normalising**
- SAPEM CHAPTER 4 2014 Refers to **TRH20 Normalising**
- SANS1200 M & ME Does not refer to **TRH20 Normalising**

TRH 20

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LET US COMPARE THE TWO WELL KNOWN GO-TO PUBLICATIONS

COLTO 1998 and COTO 2020

THEN WE LOOK AT

SAPEM chapter 4, SANS1200 M and SANS1200 ME

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COTO Table A4.1.5-11:
Requirements for gravel wearing course material other than calcrete

PROPERTY	REQUIREMENT	
	RURAL & URBAN ROADS	HAUL ROADS FOR HEAVY VEHICLES
Description of Material	Natural gravel or crushed material, except calcrete	
Maximum particle size	37,5mm	50mm
Oversize Index (Io)	n/a	≤ 5%
Grading Coefficient (Gc)	15 – 35	20 – 35
Shrinkage Product (Sp)	100 – 240	100 – 240
PI on the P0.425mm fraction	6 – 12	6 – 12
Strength (CBR at 95% of MDD)	CBR ≥ 15 @ 95% MDD	CBR ≥ 25 @ 95% MDD
No reference to TRH20 or Normalising the grading to 37.5mm		

COLTO Table 3402/4:
Requirements for gravel wearing course

PARAMETER	LIMIT	
	TYPE 1	TYPE 2
Maximum size, mm	37,5mm	37,5mm
Oversize Index (Io), maximum	≤ 5%	0
Grading Coefficient (Gc)	16 – 34	16 – 34
Shrinkage Product (Sp)	100 – 365 (preferably 240)	100 – 240
Strength (CBR at 95% of MOD)	CBR ≥ 15 @ 95% MOD	CBR ≥ 15 @ 95% MOD
NOTE: All Parameters in Table 3402/4 are defined in TRH20		

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Section 2.9 States:

Gravel, or unpaved roads, form a major part of the road network in South Africa. Careful selection of gravel for wearing courses is essential to improve the performance of these roads and to reduce maintenance costs.
In considering the standards required for gravel wearing courses, a number of factors are **listed in TRH20** that should to be considered to provide good performance.

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Section 2.9 also States:

It is essential that all grading analyses are normalized to 100% passing the 37,5 mm sieve.

TRH20 recommends gravel for the wearing course of unpaved roads that meets criteria based on:

- Maximum **particle size**
- **Oversize** index
- **Shrinkage product**
- **Grading coefficient**
- **California Bearing Ratio** (CBR)

Different limits for these parameters are recommended for rural and urban roads, as well as for haul roads. **These details are available in TRH20.**

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Section 2.9 FINALLY ALSO STATES

To use Figure 1, the gradings must be normalised. This is carried out by dividing the percentage passing each of the fractions by that passing the 37.5 mm screen, and multiplying by 100. This has the effect of proportionally increasing the percentage passing each fraction by the quantity retained on the 37,5 mm screen.

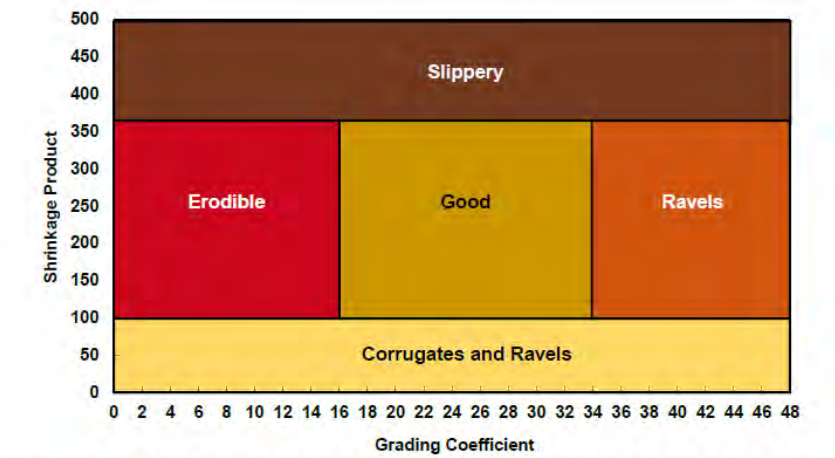

Figure 1. Relationship Between Shrinkage Product, Grading Coefficient and Performance of Gravel Wearing Course Gravels

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SANS1200 - M

1. Specification for Roads in general.
2. It defines:
   - 2.2.28 **Gravel wearing course**: The final course of an unsurfaced roadway.
   - 2.2.54 **Surfacing**: The layer or layers of processed material constructed upon the completed base. (Surfacing is sometimes referred to as "wearing course")
3. **Wearing Course:** The term only appears in clauses 2.2.28 and 2.2.54 in the SANS1200-M, and not mentioned anywhere else.
4. It refers to SANS1200 - ME

SANS1200 - ME

1. Standardized Specification: Subbase
2. The Specification covers requirements for Subbase and Gravel Wearing Course.
3. The Gravel Wearing Course referred in SANS1200-ME, does not reference the TRH20.
4. The SANS1200-ME, does not take into account the same perimeters as that of the TRH20.
5. It refers to a CBR, at 95% MOD AASHTO, of 45 (Does it mean G5?)

Why all the drama?

- Haul Road documented project specification stated G5 material to be used, based on CBR value in SANS1200.
- Drawing Spec: What's wrong with this picture?

WEARING COURSE SPECIFICATION	
CRITERIA	LIMIT
CBR @ 95% MOD AASHTO DENSITY	≥45
MAXIMUM PARTICLE SIZE	ONE THIRD OF LAYER THICKNESS WITH MAXIMUM SIZE 63mm
PLASTICITY INDEX	10
GRADING COEFFICIENT	>16

What can go Wrong?

Standard Grading		Normalised Grading	
Gc	Sp	Gc	Sp
11.7	56.0	21	74.7
15.3	0.0	22	0.0
10.8	0.0	20	0.0
14.9	51.0	22	61.4
15.6	39.0	27	51.3
5.1	60.0	18	113.2
11.8	0.0	23	0.0

TRH20 - 2009

3.5.3 Haul roads

The material selected for an unsealed mine or forest haul road should preferably have the following properties (Table 8):

Table 8 Recommended material specifications for unsealed mine or forest haul roads

Maximum size (mm)	50
Oversize index (I_o)	≤ 5 %
Shrinkage product (S_p)	100 - 365 (max. preferably < 240)
Grading coefficient (G_c)	16 - 34
Soaked CBR (at 95 per cent Mod AASHTO compaction)	≥ 18 %
Treton impact value (%)	20 – 65

Even if the Material Complies to a G5, it DOES NOT Comply to a Haul Road Wearing Course specification and will not perform

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TRH20 - RECOMMENDATION

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I ask that this Forum please look into bringing back the reference to the TRH20 into the latest COTO.

&

Look into what is defined in the SANS1200M & SANS1200ME for Gravel Wearing Course

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TRH20 - RECOMMENDATION

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Dr. Phil Paige-Green & Gerrie van Zyl's research of the past 10-15 years be taken into account and the TRH20 be published not only in DRAFT format but be FINALISED

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Thank you!

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To all involved with the TRH20 Research
ESPECIALLY
Gerrie Van Zyl
Dr Phil Paige Green

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