REC MAT Update

RPF

9 May 2018

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RecMat Committee

- Committee formed on resolution of RPF May 2016
- Focus on the use of recovered building materials and concrete as pavement construction materials
- Aim to compile a Best Practice guideline for the use of recovered materials in roads
- Being based on research (Dutch and local) and inputs from industry.

RecMat Committee

Current

- Self-Cementing Mechanisms in Recycled Concrete and Masonry for Road Materials. PhD in Civil Engineering
- Durability and Performance Evaluation of South African Recycled Mixed Granulates in Unbound Pavement Layers. MEng at Delft University of Technology
- The use of Recycled Concrete Aggregate in BSM's. MEng (Research)

Complete

- Modelling the Shrinkage Behaviour of Recycled Concrete Aggregate and Cement Stabilised Materials. MEng (Research), March 2018
- Carbonation of Cement Stabilised Materials in Pavement Layers. MEng (Research), March 2018
- The Performance Properties of Recycled Concrete in Road Pavement Materials. MEng (Research) March 2018
- The Use of Chemical and Strength Tests for Evaluating the Self-cementing Action of Recycled Concrete Aggregate. MEng (Structured), March 2017
- Comparative Shrinkage Properties of Pavement Materials Including Recycled Concrete Aggregates With and Without Cement Stabilisation. MEng (Research). March 2016
- The Influence Of Self Cementation In Recycled Concrete For Road Pavement Materials. MEng (Structured), December 2015
- Material characterisation and response modelling of Recycled Concrete and Masonry in Pavement Layers. MEng (Research), March 2014

Document contents

Material Specifications (Ch.4)

- Based on new COTO document specs, all reclaimed materials must meet the COTO specs for the G or C-grading it is being proposed for
- Additional composition specs being recommended
- Additional durability specs being recommended

Material specs: Composition

Table 4-3: Limitations on the concrete and masonry content for a given G-Class material.

Material Class	Concrete Content (%)	Masonry Content (%)
G4	100	0
G5(a)	80-100	0-20
G5(b)	65-100	0-35
G6	65-100	0-35
G7	65-100	0-35
G8	65-100	0-35
G9	50-100	0-50
G10	50-100	0-50

Table 4-4: Reclaimed concrete and masonry contents applicable to cement stabilised materials.

Material Class	Concrete Content (%)	Masonry Content (%)	Material before treatment
C3 or higher	80-100	0-20	G5(a)
C4	80-100	0-20	G5(b) & G6

Material specs: Composition

Table 4-1: Reclaimed concrete granulates constituent limits (CROW, 1995).

Reclaimed Concrete Granulates			
Constituents		**Description**	**Limit (% mass/mass)**
Main	A	Crushed gravel concrete and crushed-stone concrete, with a particle density of at least 2100 kg/m^3	A + B ≥ 80 B ≤ 10
	B	Other crushed stone material and stony material, with a particle density of at least 2100 kg/m^3	
Secondary	C	Crushed masonry with a particle density of at least 1600 km/m^3 and other crushed stony material (light weight concrete, glass, slag, etc.)	C + D ≤ 10 D ≤ 5
	D	Crushed asphalt	
Impurities	E	Gypsum and non-stony material ((non)-ferro metal, plastics, rubbers, polystyrene, etc.)	E ≤ 1
	F	Decomposed organic material (wood, rope, paper, plants, remains, etc.)	F ≤ 0.1

Table 4-2: Mix granulates constituent limits (CROW, 1995).

RCA and RMA – Reclaimed Concrete and Masonry Aggregate			
Constituents		**Description**	**Limit (% mass/mass)**
Main	A	Crushed gravel concrete or crushed-stone concrete, with a particle density of at least 2100 kg/m^3	A+B ≥ 50 A ≥ 45
	B	Other crushed stone and stony material, with a particle density of at least 2100 kg/m^3	
	C	Crushed masonry, other crushed stone and stony material, with a particle density of at least 1600 kg/m^3	C ≤ 50
Secondary	D	Other crushed stone and stony material (light weight concrete, glass, slag, etc.)	D + E ≤ 10 E ≤ 5
	E	Crushed asphalt	
Impurities	F	Gypsum and non-stony material ((non)-ferro metal, plastics, rubbers, polystyrene, etc.)	F ≤ 1
	G	Decomposed organic material (wood, rope, paper, plants, remains, etc.)	G ≤ 0.1

Material specs: Suitability

Material Class	Suitability	Traffic Volume
G4	- Unbound base layer	Low
G5(a)	- Unbound base layer - Bound subbase layer (C3 or higher)	Low High
G5(b)	- Unbound base layer - Bound subbase layer (C4)	Low Low
G6	- Unbound base layer - Bound subbase layer (C4)	Low Low
G7	- Selected material	-
G8	- Selected material	-
G9	- Selected material	-
G10	- Fill material	-

Material specs: Composition

- For a G5(a), max 20% Masonry, but 20% of what?
  - 20% by mass?
  - 20% by volume?
  - What fraction sizes? > 2mm? >5mm? >7.1mm?
- Netherlands visually sort and weigh material retained on 7.1mm sieve only. Good enough?
- New reliable SA test method to determine % masonry is required.
- Current suggestion is everything retained on 5mm and above is sorted and weighed. Practical?

Material specs: Durability

- Questions remain around the durability and variable quality of clay masonry.
- Also durability specs are material dependant (e.g. DMI) and Reclaimed materials will consist of various material
- Suggesting that all reclaimed materials go through DMI and 10% FACT wet (SANS 3001 AG-10)
- DMI: Reclaimed materials must meet < 35% passing 0.475mm sieve spec
- Reclaimed materials must have $\geq$ 10% FACT wet value than the alternative proposed commercial source.
- Suggestions/comments on durability?

Request for information

- The committee would love to get any information and test results of materials used in projects or up coming projects to form a data base and help with the formation of proposed specs.

- Info to ian.bowker@capetown.gov.za or kirsten@green-cape.co.za

Thank you