

Argentina Road Association

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Paper Title: Sustainable Road Rehabilitation Solution using Reclaimed Asphalt: Camps Bay Drive Case Study

Argentina

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Introduction

- Camps Bay Drive situated in Camps Bay, Western Cape, South Africa
- Major scenic route – Links Cape Town CBD to Camps Bay and Hout Bay
- Future feeder route for BRT (MyCiti)
- The City of Cape Town (City)
  - Extensive stockpiles of reclaimed asphalt (RA);
  - Poor use of this high quality materials.
- First trial from the City using off-site static mobile mixing BSM-foam

BACKGROUND

- 1848 John Montagu provided access over Kloof Nek to Camps Bay
- 1902 Tramway from Camps Bay over Kloof Nek Constructed
  - Was known as “The Finest Tram Ride in the World”.
- 1933 Tramway ceded to the City Council - converted to a motor road called Camps Bay Drive.
- No attempt to alter the old tram route by straightening the curves
- Originally constructed 20ft wide (6m) using 100 men and completed in 1 year

- **Road design “allowed for a margin for further widening at a later date, should traffic requirements warrant it”, (Cape Argus, 1934)**

- With this in mind, a substantial increase in traffic volumes, vehicle loading and vehicle sizes resulted in the need to widen and rehabilitate Camps Bay Drive

BACKGROUND

View of Camps Bay tram on line showing Lions Head in background (AG 6437)

View of fist motor cars using the new Camps Bay drive (Cape Argus 25-06-34/)

KEY DESIGN ASPECTS

Design Traffic

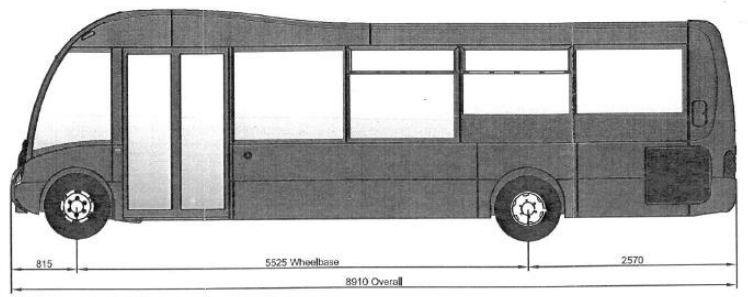
- 7-day traffic count
- 2.28 – 5.10 MESA (20 yr Horizon)

% Growth / E80/hv veh	Expected cumulative Traffic (MESA) over 20-year Design Horizon				
	1.0%	1.5%	2.0%	2.5%	3.0%
1.25	2.28	2.40	2.54	2.68	2.83
1.50	2.73	2.88	3.04	3.22	3.40
1.75	3.19	3.36	3.55	3.75	3.97
2.0	3.64	3.84	4.06	4.29	4.53
2.25	4.10	4.33	4.57	4.83	5.10

LEGEND		
ES3	1.0 - 3.0	MILLION E80'S
ES10	3.0 - 10.0	MILLION E80'S

Geometric Design

- 16 of 25 curves below 60 km/hr
- 50% to 80% road required widening
  - (based on IRT vehicle tracking).
- Widen Camps Bay Drive by 1,4m.



KEY DESIGN ASPECTS

Pavement Design

- Non as-built data available
  - Common for this age pavement

- Pavement Investigations
  - 9 test pits, 6 test trenches and 21 DCP tests
    - 60mm to 190mm Asphalt
    - 60mm to 120mm Penetration Macadam
    - G7 Selected and Subgrade
    - 1 Isolated area of G10




KEY DESIGN ASPECTS

Pavement Design

- Options Considered

COST ANALYSIS FOR PAVEMENT DESIGN OPTIONS (BASE YEAR 2015)			
	200 mm BSM @ 15 km haul distance	150mm G2 + 200mm C4	80mm BTB + 250mm C4
Cost assuming production of 300 m^3/day	R173.08	R179.15	R387.65
Excavation	R51.00	R89.25	R84.15
Total	R224.08	R268.40	R471.80

- BSM Option was selected based on:
  - Reduced cost;
  - Ability to apply traffic directly after construction;
  - Employer has extensive volumes of RA available;
  - Reduced construction time.

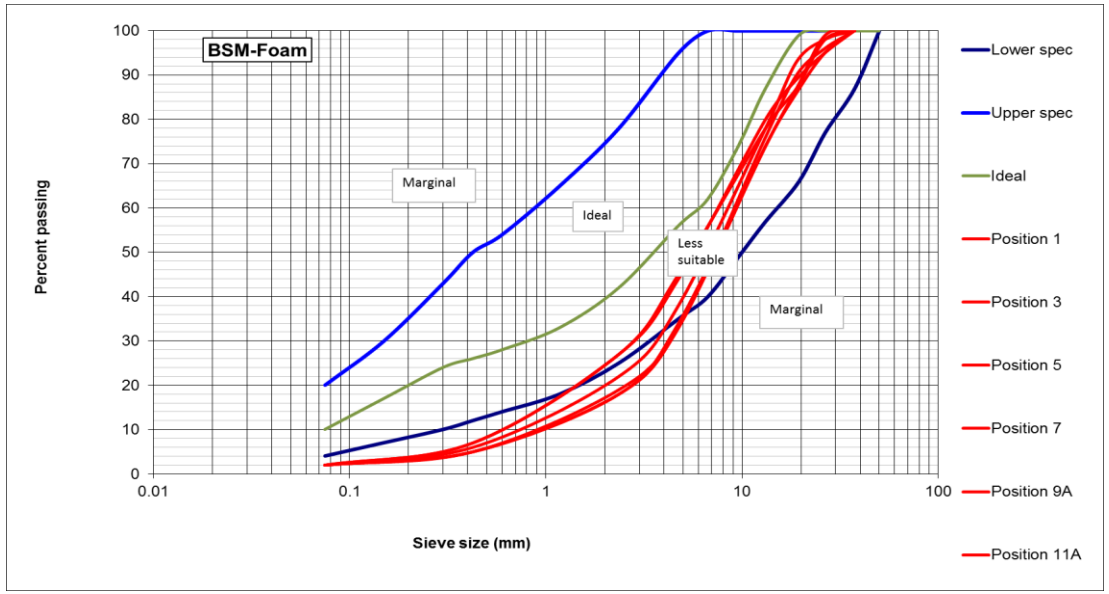
KEY DESIGN ASPECTS

Pavement Design

- BSM Mix Design
  - Required approx. 4200m^3 of RA
  - Tested existing stockpiles
    - 100% RA and Blends

	Material Properties		
Confining Pressure	C	φ	Retained C
Stockpile 1 100% RA	251	43.1	63%
Stockpile 2 100% RA	217	45.4	81%

- Max DSR 30% for 80kN
- Max DSR 39% for 120kN



- BSM 1 Specification (TG2,2009)
  - C > 250 kPa
  - φ > 40°
  - Retained Cohesion > 75%

KEY CONSTRUCTION ASPECTS

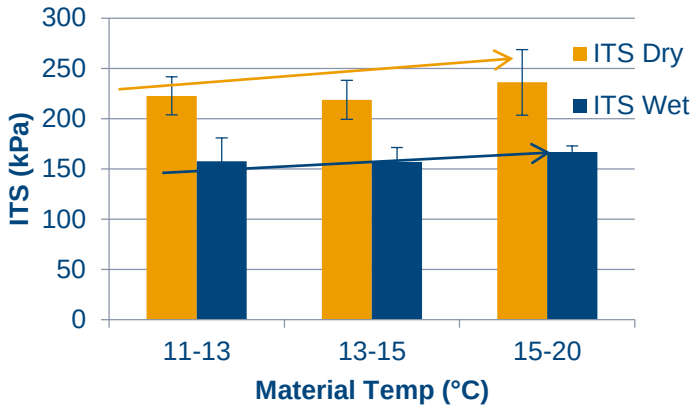
Construction Methodology

- Box Cut road Widening (1.4m)
- Mill off asphalt to Stockpile
- Remove Macadam and Insitu – Road Widening
- Pave 200mm BSM (2x100mm layers)
- Pave 50mm Asphalt




OUTCOMES AND LESSONS LEARNT

- BSM mix – “feel” dependent
- Low fines – Screening vs Crushing
- Mixing Temperatures



- Cape Town – Winter Rainfall
  - Possibly allow embargo period

COCT RA IMPLEMENTATION STRATEGY

- RA in the City stockpiles is typically very varied and inconsistent.
- Need to optimize the use of materials and create consistency.
  - BSM less sensitive to small variations.

- Currently:
  - 3 year RA crushing appointment;
  - 3 year BSM mixing appointment.

- Materials to be used in sidewalks, low volume roads and shoulders.

CONCLUSION

- Using RA in roads construction
  - Reduced use of virgin aggregates;
  - Reduced emissions from transport and asphalt heating;
  - Creates a cycle of material that can be recycled.

- Volume of RA use
  - Asphalt surfacing and bases - 20% to 40% recycled RA in Cape Town;
  - BSM's can use between 90% and 100% RA.

More cost effective and sustainable solution for the future in a world where we are depleting our aggregate resources!

Thank you for your attention!

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