

CEMENT GROUTED BITUMINOUS MIXES

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Failures in Flexible Pavements,



Cracking



**Moisture induced
damage**



Rutting

Cement Grout Bituminous Mix (CGBM)

Preparation of high voids Bituminous
Mix

+

Cementitious Grouting

- ✓ Design of high void Bituminous mix
- ✓ Development of Grout Material
- ✓ Performance Studies (Both Laboratory and Field)
- ✓ IRC: SP 125 -2019

Advantages of CGBM

- ✓ **Impermeability** & Resistance against **Moisture Induced Damages and** Resistance to **Permanent Deformation**
- ✓ Higher **Flexibility** & **Absence of joints** in comparison to Rigid Pavements
- ✓ High static bearing capacity and distribution of stress
- ✓ **Lower Thermal Susceptibility**
- ✓ Good **Skid Resistance**

✓ France	✓ Japan	✓ Sweden
✓ USA	✓ Spain	✓ Norway
✓ Germany	✓ Portugal	✓ Finland & Others

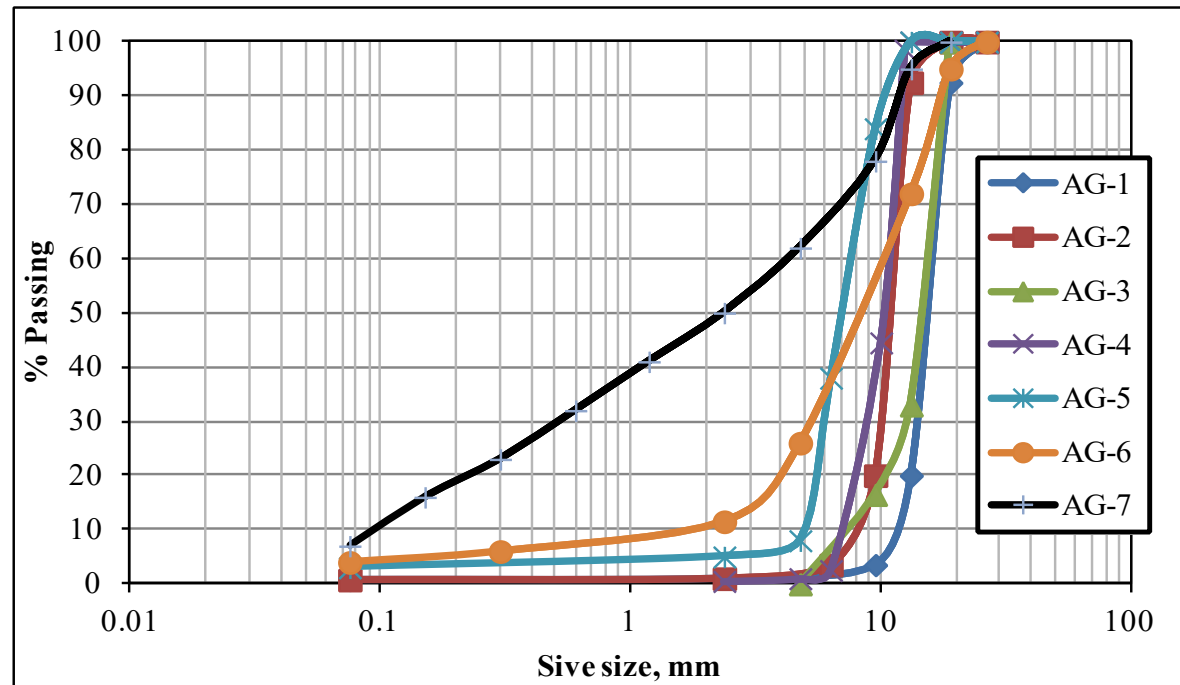


Physical Properties

Specific Gravity: Avg **2.90**

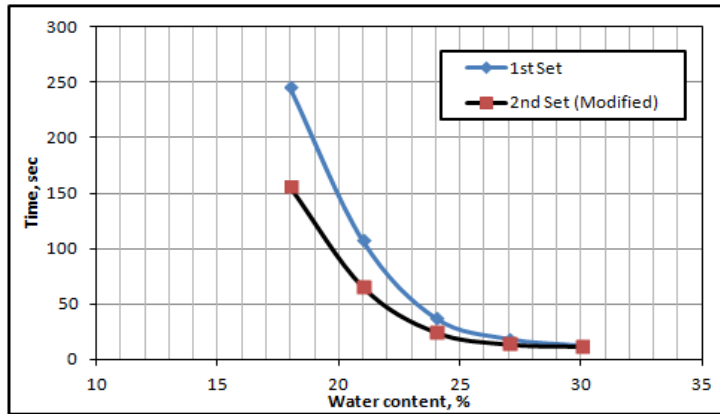
Impact Value Test: **17%** (24%-Max allowed)

Flakiness and Elongation Test: **19%** (35%- Max allowed)





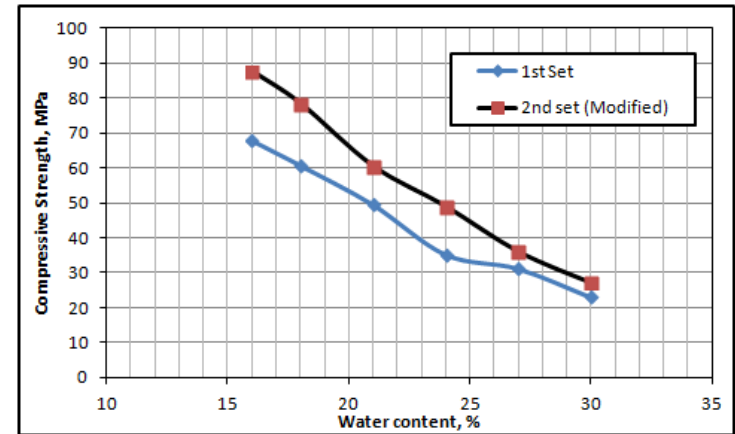
Consist of **Cement-Sand** blend with **Special additives**



Consistency for grout material



Marsh flow cone apparatus



7 days Compressive Strength

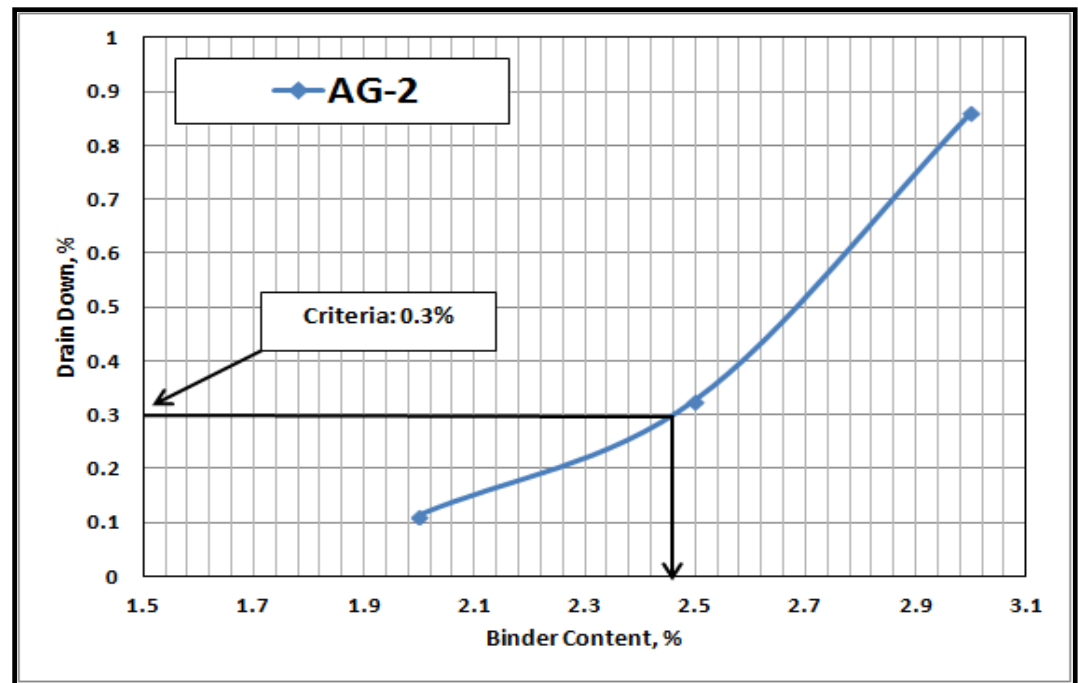
Optimum Binder contents

Type of binder used: VG 30

•Based on the Drain down test O.B.C. are determined for all selected gradations



Drain Down
Apparatus



MIX DESIGN

• Grout quality is considered based on the Full Depth Penetration in bituminous mix

- ✓ Compact Porous bituminous mix at target air voids for selected gradation and bitumen content
- ✓ Prepare grout at **different water** % (18 to 25%)
- ✓ Select optimum water content based on the **full depth grout** penetration in bituminous mix, while with maximum strength



Partial Depth of grouting

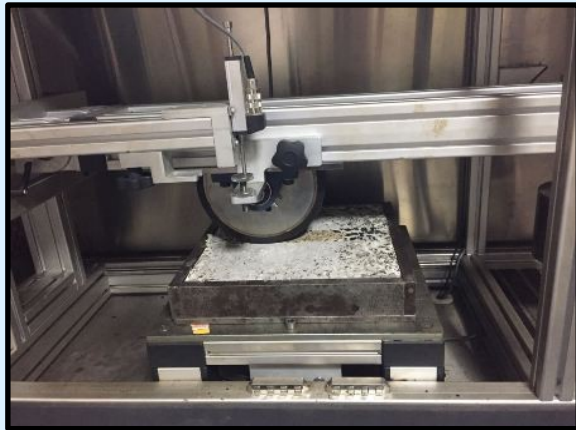


Full Depth grouting

Results and Analysis

CGBM Mixes: Performance Characteristics

Permanent Deformation (PD): Wheel Tracking

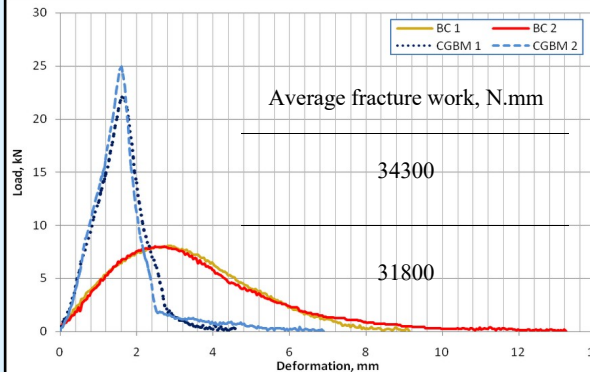
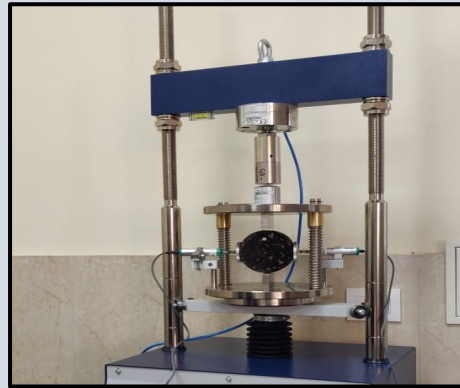


Slab size: 30 cm x 30 cm
 Testing Temperature : 60 °C

CGBM mixes: After 20000 passes:
0.26 mm

Conventional Bituminous Mixes:
 After 20000 passes: **8 mm**

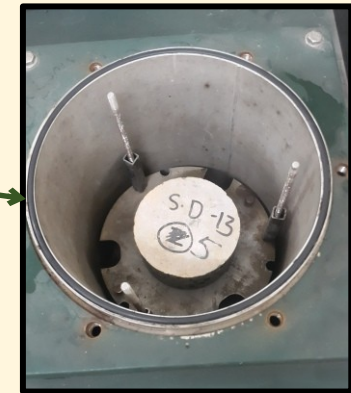
Fracture work: Indirect Tensile Strength



Moisture Damage MIST



Pressure: 40 psi
 Temperature: 60 °C
 Cycles: 3500



Mix Type	ITS, MPa @ 25 °C		TSR, %
	Unconditioned Specimen	Moisture Conditioned Specimen	
CGBM	2.33	2.30	98.7
BC	0.99	0.81	81.8

SELECTED SECTIONS



SD Jain College Road, Surat



TP Road, Surat (100 m)

CGBM CONSTRUCTION



FINISHED SURFACE (AFTER 2 DAYS OF CONSTRUCTION)



**SD Jain College
Road**



**TP Nagar
Road**



View of two Sections after 6 Months



CGBM SURFACE



after two months



after six months



after one year

CGBM section after 5 Monsoon



CGBM FIELD CORES



**Middle Core shows the bottom
of CGBM Layer Surface**



**Top surface
(Core taken from Pavement)**



**Side View of core taken from
pavement showing full depth grout**

THANK YOU

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