

Experimental Study of WMA by Using Sasobit Additive

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Abstract

Warm Mix Asphalt (WMA) is a quick developing new innovation which can possibly supplant Hot Mix Black-top (HMA) and altogether decreases the creation temperature of black-top blends through bringing down the consistency of black-top covers. The innovation can diminish creation temperatures by as much as 30 percent. Black-top blends are by and large delivered at 150° C or more prominent temperatures depending mainly on type of binder utilized. WMA blends can be created at temperatures of around 135°C or lower.

In the present study sasobit additive used WMA mix of about the dosage rate 1% to 5% by the weight of bitumen. In this study, the fundamental properties of asphalt binders modified with additive (Sasobit) were evaluated.

Keywords: warm mix asphalt, Sasobit, MoRTH, Indirect tensile strength

Introduction

This section manages the investigation of WMA conduct and research center execution of added substances on execution attributes, the WMA examples are contrasted and the HMA blends. Customary hot blend black-top (HMA) is the essential clearing material, as the greater part of the cleared streets are made of HMA, which contains totals and fastener, which are warmed and blended combindly. HMA has been utilized as a part of black-top clearing in past decades. The hot blend black-top is created either drum blenders or clump blend plants. The regular blend delivered at the temperature of 150°c to 170°c. Be that as it may, contrasted with regular HMA blends, warm-blend black-top (WMA) blends have demonstrated incredible conceivable, and offer advantage, since the WMA blends can create at bring down temperatures, without trading off an asphaltic asphalt execution.

Objective

The primary target of this examination is to assess the execution qualities of the bituminous cement (BC) blend

utilizing Sasobit of differing level of 1% to 5%by weight of binder.

- 1) Evaluate the physical properties of aggregates and bitumen by conducting the basic tests.
- 2) To determine OBC value for HMA by marshal method of mix design
- 3) To think about the Stability and stream (flow) estimation of the bituminous solid blend utilizing added substance.
- 4) To decide the Indirect Tensile Strength properties of bituminous blend
- 5) To Compare between WMA properties to that of HMA for the bituminous solid blend according to the MORTH particular.
- 6) To decide viable use of sasobit in the warm blend black-top.

Materials & Methodology

The details of the various materials and additive used in the laboratory experimentation are reported in the following sections.

Materials

In this overview, coordinate cements, modifiers, three polymers and four WMA added substances were arranged. With this, the MORTH (2013) Asphalt Concrete evaluating 1 incorporated reviewing was utilized. Metal/lime clean is wanted to utilize 100% mineral filler through 0.6 mm strainer.

Aggregates

Coarse Aggregates

Coarse aggregates comprised of stone chips gathered from a neighborhood source, up to 4.75 mm IS sieve estimate. Its particular gravity was found as 2.72. Standard tests were led to decide their physical properties as abridged in underneath table.

The aggregates utilized as a part of the examination are gathered from a quarry close Bangalore (Mittaganahalli)

Fine Aggregates

Fine aggregates, comprising of stone crusher tidies were gathered from a neighborhood crusher with parts passing 4.75 mm and held on 0.075 mm IS sieve.

Binder

Here 60/70 penetration grade bitumen is used as binder for preparation of Mix. Black-top Binder Bitumen is produced from raw petroleum.

WMA additive (sasobit)

Sasobit is fine crystalline long chain aliphatic hydrocarbon. Also known as WAX and it is available in a solid form.

Table 1: Physical properties of aggregates

SL.NO	Test	Obtained value	Test method	Specification as per MORT&H
1	Aggregate impact test	21.56%	IS: 2386 part 4-1963	Max 27%
2	Crushing test	23.50%	IS:2386 part 4-1963	Max 30%
3	Los angeles abrasion test	26.60%	IS: 2386 part 4-1963	Max 40%
4	Flakiness and elongation test	25%	IS :2386 part 1-1963	Max 30%
5	Specific gravity	2.7	IS :383-1970	>2.5

Table: 2 Physical properties of control and WMA modified binder

SL.NO	Test	Test method	Control binder	Sasobit modified binder	Requirement as per MORT&H
1	Penetration	IS: 1203-1925	67	42	50-70
2	Ductility	IS: 1208-1978	80	85	Min 75
3	Softening point	IS : 1205-1978	56	72	Min 74
4	Flash point	IS :1209-1978	280	310	Min 220
5	Specific gravity	IS :1202	1.01	1.02	-

Gradation as per JMF

In this present study three different sizes of aggregates (20 mm down, 12.5 mm down, 4.75 mm down) were considered. For this study BC-2 were adopted.

Blending of aggregates proportions are

- 1) 40% for 20 mm down size
- 2) 22% for 12.5 mm down size
- 3) 24% for 6 mm down size aggregates
- 4) 14% for M sand

Specimen Preparation

Number of specimen: at least three specimens are prepared for each combination of aggregates and bitumen content.

Preparation of aggregate

Sieve analysis of aggregates

Preparation of compaction and mixing temperature

Preparation of mould and hammer

Compaction of the Specimen: These study 75 blows were applied on each side.

Basic parameters of Marshall Test: Mould is put out on Marshall Apparatus and Marshall Stability as well as Marshall Flow is measured by proving ring and flow dial gauge respectively. After that calculate the other factors like unit weight, VMA(%), VFB (%), etc.

Indirect tensile strength

- 1) The ITS esteems for the WMA blend utilizing a sasobit with the level of 1%,2%, 3%, 4% and 5% measurements are observed to be 440.21, 446.22, 452.36, 461.20and 469.56 kPa.
- 2) The ITS esteems are observed to increment with the increasing the dose of sasobit additive in the mix.

Table: 3 Marshall Stability of varying % of with and without additive

Mix	Dosage (%)	% air voids	VFB (%)	Gb(Kg/m3)	Stability (kg)	Flow (mm)
HMA	0	3.8	74.54	2360.53	1206.3	4.76
WITH SASOBIT	1	4.1	75.2	2357.3	940	5.5
	2	4	76.32	2353.3	1065	5.2
	3	3.8	77.15	2363.6	1250	4.6
	4	3.5	79.15	2355.6	1220	4.4
	5	3.38	80.1	2373.33	1150	4.3

Table: 4 Tensile Strength Ratio Results

Dosage (%)	Mix	Unconditioned	Conditioned	TSR (%)
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		(kPa)	(kPa)	
0	HMA	546.57	510.2	93.34
1	with sasobit	440.21	325.21	73.87
2		446.22	344.5	77.2
3		452.36	370	81.82
4		461.2	389.63	84.48
5		469.56	405.5	86.35

Results and Discussion

OBC estimations value for HMA

The OBC for the HMA blend has found to be 5.5%.

Marshall Stability esteems

- 1) The Marshall stability esteem for the HMA blend without added substance are observed to be 1206.3Kg with the WMA of sasobit of 1% 2% 3% 4% and 5% measurements are observed to be 940kg 1065 kg 1250kg 1220kg and 1150 kg.
- 2) The Marshall Stability esteems are observed to be increment in added substance measurements. This increasing stability value because of the better covering and holding between the blend. At 3% of sasobit maximum stability is obtained.

Conclusion

The physical properties were directed on the totals utilized as a part of the present examinations fulfills the necessities according to the MORT&H details.

The physical properties were directed on the 60/70 (VG -30) review bitumen and warm blend cover utilized for the present examinations and fulfills the requirement according to MORT&H particulars.

Expanding level of added substance measurements to rate of Marshall Properties additionally increments and fulfills the MoRT&H determinations and the Marshall properties of HMA in the present examinations fulfills the MoRT&H determinations.

The optimum bitumen content was observed to be 5.5% for HMA blend at 160°C temperature. The most extreme strength for 60/70 review bitumen is accomplished at 135°C temperature with the added substance measurement rate of 3% of sasobit by the weight of binder.

The expansion of added substance of sasobit enhances mass thickness of the blend. The Percentage air voids in the blend were found to diminish with the expansion of WMA added substance 5% of sasobit at 135°C was most reduced when contrasted with HMA.

The indirect tensile strength of a blend with WMA added substance sasobit of 5% has 0.48 N/mm². The WMA added substance meets the necessity of HMA.

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