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Propertis Porous Asphalt used Quarsite Dolomite Stone with Buton Natural Asphalt After Loading

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I. Introduction

Permeable asphalt pavement or porus friction course is commonly knews as porous asphalt. The porous pavement is commonly used in Europe and Japan. The pavement cousist in a porous overlay and then to drain on he edges to the pavement (*Michael. E Barret. Ph.D*). The lot deposit of Quarsite Dolomite Stone in Indonesia was still not be exploited better. Among the exiting utilization of it most of it was exploited for traditional needs fireplace material, some last rasearch in the field of road construction showed that Quarsite Dolomite Stone was powerfull enough when mixtured material for pavemen stabilization. Quarsite Dolomite Stone is local material from sea location in the island of banggai half Sulawesi Indonesia. Its was kwarsit Dolomitan material Celebes (*Car Donald*, 1985). This Experimental be done for mesuring propertis permeability asphalt pavement with using Quarsite Dolomite Stone as Local material who was come from sea location at the Banggai Island half Celebes Indonesia with used Rice Hash as Filler.

As course agregate on the surface layer Road Pavement. Capasity drain porous Asphalt were connecting correlasion with spacing hight and small porousity in structure Asphalt. Stability and Durability and Hydrolic conductivity its must be hight test than 20% (*Ruz. et. al,* 1990). Asphalt porous is open graded course Aggregate. Porousity asphalt porous (10%-15%) the structure made drain for flow water (*Nur Ali, et al.* 2005).

Figure 1 : Permeable Friction Course

Aggregate was specimen mineral who was done for mixture road konstruktion in the asphalt pavement it's mush be 90%-95% for the total weight strukture or 77%-85% for all volume (*Alkin, et. al* 1997).

Clasification agregate be measured by spacing at all : course aggregate it must be lost for filter No.8 it is higher than 2,36 mm. Fine aggregate it must be lostfor filter No.8 and stoped to No. 200 or it is 2,36 mm and 75 μm. Filler it must be smaller than 75 μm and lost filter No. 200

Figure 2 : Quarsite Dolomite Stone (Local Containe of Banggai island in half celebes)

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II. Literature Review

Two different test, the indirect tensile test (IDT) and the semi-circular bending test (SCB) were performed on a Permeable asphalt pavement. The mixture was a 10 mm nominal maximum size produced with limestone and marly limestone, calcarenite, and fine and coarse sand. It has 6.5% (±0.5%) air void and 5.4% design asphalt content, produced with 60/70 PEN virgin bitumen. Specimens were compacted using a Superpave Gyratory compactor at *N* = 109 revolutions to produce a 6500 g, 150 mm diameter Gyratory-compacted specimen. Specimens 150 mm diameter by 25 mm thick were used to perform Superpave IDT test with the *system developed* by Roque and Buttlar [9,10]. Some of these thin specimens were sliced to obtain 75 mm height semi circular specimens in order to conduct SCB test.

The tests were performed on three replicates at 10 °C using an MTS closed-loop servo-hydraulic loading system. The experimental set-up of each test is shown in Fig. 1.

a) The indirect tensile test (IDT)

The IDT loads monotoniealiy a 152 mm diameter circular specimen to failure applying a constant stroke of 0.084 mm/s. Two strain gauges with a length of 38.1 mm are placed at the centre of the specimen to measure vertical and horizontal deformations during loading. The horizontal stress occurring at the centre of the specimen is computed using the following IDT plane stress equation, according to the superpave indirect tension test procedure [9,10]:

$$\sigma h = 2P/\pi Dt$$

where:

σh tensile stress at the centre of the specimens,
P load of the specimen,
D diameter of the specimen,
t thickness of the specimen.

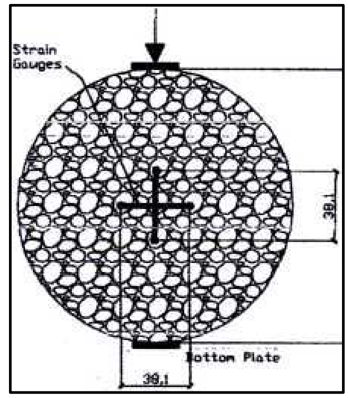
In addition, the procedure developed by Roque and Buttlar [9,10] was used to calculate horizontal and vertical strains at the center of the specimen from horizontal and vertical train gauge measurements.

III. Materials and Methods

a) Indirect Testing

Permeable asphalt pavement was produced with used Quarsite Dolomite Stone as course aggregate. The Quarsite Dolomite Stone broked in the spacing ∅ 3/8" ½"-¾" with the BNA Blend Pertamina penetration 60/70. Briket at the Bitumen be done as the standard variation asphalt 3%, 3,5%, 4%, and 5% for testing experimental Indirect Tensile Strength (ITS) and Catambro Lost. We was controlling testing for composition asphalt permeable pavement with Standar National Indonesia (SNI) and American Association for Testing and Material (ASTM), Permeability and Marshal

Test with asphalt variation 4-7% integral spacing 1% who use variation open gradation. Asphalt optimum standar is 4% be used to controlling variation asphalt. For optimum asphalt test be use variation asphalt 3% - 5% with spacing 5%.



For open gradation we use lost aggregate ¾", ½" and lost filter by comparative 50 : 50. Fine aggregate we use filter number 4, finally number 200, we used 10%. BNA Blend Pertamina we use all variation asphalt category: 3%, 3.5%, 4%, 4.5% and 5%. Test Indirect Tensil Strength (ITS) be controlling by ASTM D6931-07.

Figure 6 : Test Indirect Tensile Strength

b) Mix Design Permeable Asphalt Pavement Testing

Mix design permeable asphalt pavement the used composition open graded sistem. Who was Mix Trial Gradation lost of material ¾", 1/2 " be stoped filter ½" and lost of material ½" be stoped filter 3/8" with composition comparative 50-50 to course aggregate. The used fine aggregate lost filter number 4, and stoped filter number 200 all of 10% for mould capacity. Asphalt Blend Pertamina the use variation standard 3%, 3.5%, 4%, 4.5% and 5%. Briket make in for ∅ 10 cm and depth + 6.5cm and Briket make in ∅40x40 cm, depth + 6.5cm.

Figure 9 : Permeable asphalt pavement

Table 1 : Total briket test indirect tensile strength and Cantabro

Item Testing	BNA Blend Pertamina *(%)*	Planning Briket (unit)
Indirect tensile strength	3	5
	3,5	5
	4	5
	4,5	3
	5	5
Cantabro	3	5
	3,5	5
	4	5
	4,5	5
	5	5
Total briket		50

Before briket test in cantabro, briket was plum to Los Angeles machine drum, speed (V) 30-33 rpm for rotation.

$$L = \frac{Mo - Mi}{Mo} \text{ x } 100$$

Figure 10 : Test Cantabro Machine

IV. Result and Discussion

a) *Analysis Indirect Tensile Strength*

Table 2 : Outcome Indirect Tensile Strength test

Sam pel	Percen tage asphalt quality (%)	Diameter briket	High Briket	Load Value (P)	ITS Value
		mm	mm	kgf	Mpa
		D	H		
I		102.3	66.9		0
II		102.22	69.3	75.00	0.066134591
III		102	68.5	100.00	0.089401701
IV	3.0	102.4	67.7	75.00	0.067578595
V		102.4	67	125.00	0.113807734
Average					0.067384524
I		102.5	67.5	275.00	0.24827991
II		101.8	67.2	225.00	0.205448034
III	3.5	102.4	68.4	250.00	0.222956672
IV		102.1	68.8	200.00	0.177849373
V		102	68	275.00	0.247662431
Average					0.220439284
I		102.8	69	350.00	0.308221097
II		102.5	68.2	400.00	0.357427756
III	4.0	102.2	68.9	350.00	0.310480586
IV		102	69	375.00	0.332826983
V		102.3	67.4	350.00	0.317080137
Average					0.325207312
I		102.3	68.4	300.00	0.267809539
II		102.4	68.3	250.00	0.223283109
III	4.5	102.5	69.5	275.00	0.241135164
IV		102.6	67.6	325.00	0.292702092
V		102.2	68	275.00	0.247177769
Average					0.254421535
I		102.2	61.7	275.00	0.272416342
II		102.5	68	225.00	0.201644445
III	5.0	102.4	65	250.00	0.234619021
IV		102.4	66.1	225.00	0.207643158
V		102.2	68.2	300.00	0.268857717
Average					0.237036137

Figure 12 : Correlation quality asphalt with Indirect Tensile Strength

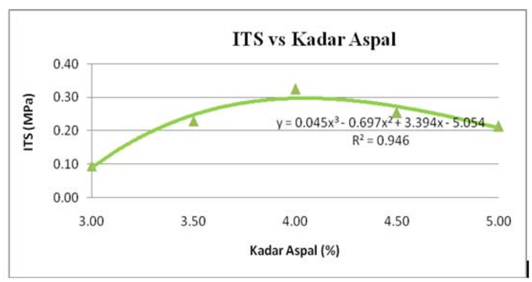


Figure 13 : Briket after Indirect Tensile Strength Test

Tabel 3 : Recapitulation R_{maks} value

No.	Quality asphalt	Maximum Loading (Kgf)	ITS Value (MPa)	RMaks
1	3,00	125	0,1140	0,0180
2	3,50	275	0,2483	0,0234
3	4,00	400	0,3574	0,0283
4	4,50	325	0,2927	0,0253
5	5,00	250	0,2346	0,0225

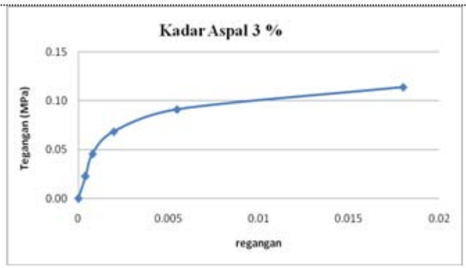


Figure 14 : Corelation ITS Value and R value 3%

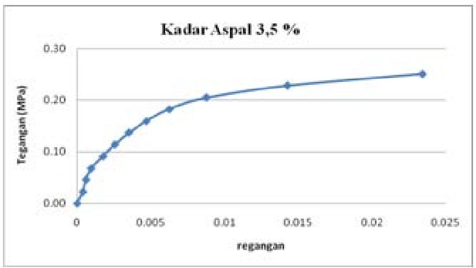


Figure 15 : Corelation ITS Value and R value 3.5%

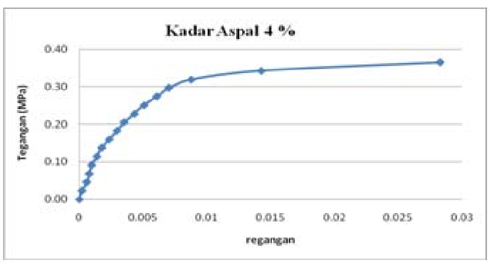


Figure 16 : Corelation ITS Value and R value 4%

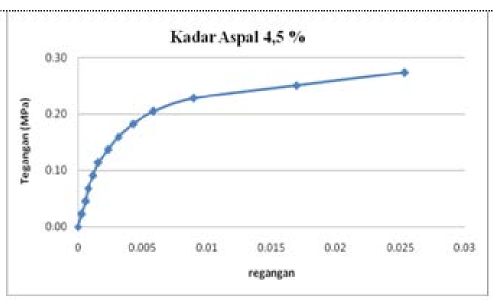


Figure 17 : Corelation ITS Value and R value 4.5%

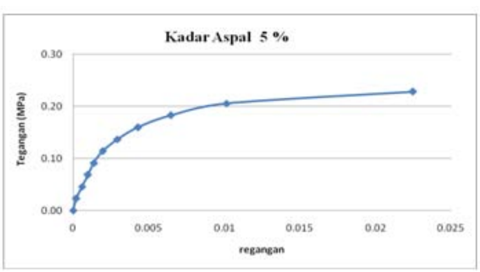


Figure 18 : Corelation ITS Value and R value 5%

b) *Analysis Cantabro*

Table 4 : Outcome Cantabro test

Sampel	Percentage quality asphal	Weight before test (Gram) Mo	Weight after test (Gram) Mi	Loss Weight (Gram)	Loss Weight (%) L
I	3.0	1081	244	837.00	77.43
II		1083	248	835.00	77.10
III		1090	281	809.00	74.22
IV		1091	226	865.00	79.29
V		1070	241	829.00	77.48
Average					77.10
I	3.5	1085	731	354.00	32.63
II		1089	760	329.00	30.21
III		1071	748	323.00	30.16
IV		1069	711	358.00	33.49
V		1088	705	383.00	35.20
Average					32.34
I	4.0	1081	913	168.00	15.54
II		1082	936	146.00	13.49
III		1088	931	157.00	14.43
IV		1086	944	162.00	13.09
V		1090	913	177.00	16.24
Average					14.56
I	4.5	1084	959	125.00	11.53
II		1082	952	130.00	12.01
III		1086	940	146.00	13.44
IV		1088	961	127.00	11.67
V		1084	948	136.00	12.55
Average					12.24
I	5.0	1075	956	119.00	11.07
II		1084	968	116.00	10.70
III		1090	984	106.00	9.72
IV		1078	994	84.00	7.79
V		1105	1003	102.00	9.23
Average					9.70

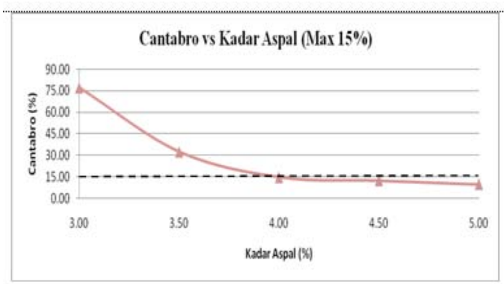


Figure 19 : Corelation quality asphalt with value cantabro loss

1. Indirect tensile strength 0,1140 MPa for total load 125 Kgf, for the quality asphalt 3% R_{maks} 0,0180. Indirect tensile strength 0, 2483 MPa for total load 275 Kgf, for the quality asphalt 3.5% Rmaks 0,0234. Indirect tensile strength 0, 3574 MPa for total load 400 Kgf, for the quality asphalt 4% R_{maks} 0, 0283. Indirect tensile strength 0, 2927 MPa for total load 325 Kgf, for the quality asphalt 4.5% Rmaks 0,0253. Indirect tensile strength 0,2346 MPa for total load 250 Kgf, for the quality asphalt 5% Rmaks 0,0225.

2. Permeable asphalt pavement mixture for Cantabro test we can see that optimum BNA Blend Pertamina for the coarse agregate Quarsite Dolomite Stone it was bigger porous when quality asphalt 3%. Loss weight Cantabro 77.10% correlation with quality asphalt 3%, loss weight Cantabro 32,34% correlation with quality asphalt 3.5%, loss weight Cantabro 14,56% correlation with quality asphalt 4%, Loss weight Cantabro 12,24% correlation with quality asphalt 4.5% and loss weight Cantabro 9,70% correlation with quality asphalt 5%.

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