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Use of Quarsite Dolomite Stone in Permeable Asphalt, for Load Test as Research Overview and Application in the Laboratory

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Abstract- This study is to examine the nature of the stress and strain by using permeable asphalt and Quarsite Dolomite Stone with But on Natural Asphal. But on Natural Asphal is a type of modified asphalt is made of75% oiland25% asphalt bitumen extraction of stones, permeable porous asphalt road asphalt pavement. In the laboratory tests on strains that result aret strength: 1.95M pa for the stress:0, 012 vertical strain on the quality of the Buton Natural Asphal 3%, to 2.05 M pastress: 0,03 vertical strain on the quality of the Buton Natural Asphal 4%, to 1.75 Mpa stress: 0,031 vertical strain on the quality of the Buton Natural Asphal 5.5%. For the compressive strength test Result is the maximum quality Buton Natural Asphal is 4% and The results of Ever Stress FE analysis for multilayer soil-rigid are vertical decrease 0.5 mm, vertical micro strain (εz) $\pm$ 0 s/d 200 on deepness 150 mm, and for multilayer soil-rigid-asphalt results vertical decrease (Uz) $\pm$ 0.64 mm on the surface and $\pm$ 0.4 mm on the deepness of 50 mm, and vertical micro stength (εz) $\pm$ -6400 s/d -7200 on the surface, $\pm$ -4800 s/d -5600 on the deepness of 150 mm. As the result of laboratory test soil-rigid are vertical decrease each point 1.535 mm, 1.535 mm, 4.505 mm, 2.45 mm, 4.19 mm, dan 3.61 mm, and micro stength C1 to C4 0.36, -37.68, 44.44, 43.48, and the results of test Multilayer soil-rigid-asphalt are vertical decrease each point 1.576 mm, 0.075 mm, 3.7 mm, 1.985 mm, 2.48 mm, 0.986 mm, and the value of asphalt course micro stength is 655.

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Strictly as per the compliance and regulations of :

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I. Introduction

The natural rock asphalt is a sedimentary rock containing of high hydrocarbon substances. The natural rock asphalt with deposit of approximately 60,991,554.38 ton (24,352,833.07 barrel oil equivalent) occurs in the southern area of Buton Island, Indonesia (Asep Suryana et.all, 2003). Buton natural asphalt (BNA) blend is a type of modification asphalt which is made of 75% petroleum asphalt and 25% rock asphalt extraction. The rapid growth of national economic in recent years resulted in a lot of transportation infrastructure demand. Approximately 600,000 tons of petroleum bitumen must be imported annually to fulfill the maintenances and construction of new road demand. The utilization of Buton Natural Asphal for the road development increases the national asphalt industry growth.

The water ponding on the road surface is caused by the heavy precipitation of high intensity rain fall. The water ponding problem during the rainy condition can be decreased by the employment of the permeable asphalt (porous asphalt) as a surfacing road pavement.

Many islands in Indonesia possess lime stones resources that can be used as coarse aggregate. Quarsite Dolomite stone is a local name of lime stone (quartzite dolomite) that can be found in around of Banggailaut area, Indonesia. In order to produce permeable asphalt, Firdaus et.al (2014) employed Quarsite Dolomite stone and Buton Natural Asphal as coarse aggregate and bituminous material, respectively. The results of porosity test, permeability test, stability test, flow test, indirect tensile test and material loss test (Cantabro test) showed the bonding strength between Buton Natural Asphal and Quarsite Dolomite stones can be established thus can enhanced the resistance of porous asphalt against raveling, rutting and shoving.

The solid that is subjected to the short time load are fundamentally characterized by the parameters of stress-strain curve. The failure of asphalt concrete specimens, the behavior of asphalt concrete under load as degeneration of the material and the limit of elasticity can be described by the stress-strain relationship for asphalt concrete in compression (S. Starodusbsky et.all., 1994). The unconfined compressive test combined with the indirect strength test can be used to calculate the cohesion strength and the angle of internal strength of the porous asphalt (Wu Shao Peng.all., 2006).

S. Stardubski et all, the peak strain changes on average from 19 mill strain (0.0019) to 22 (0.0022) or 23 mill strain (0,0023) in the compressive strength of dense asphalt concrete with interval of 1.6 Mpa-5.4 Mpa. As the strength of permeable asphalt increases from 1,2Mpa to 2,1Mpa, the range of its peak strain is average from 0.001 to 0.005, which is similar to the peak strain of dense asphalt concrete.

WU Shao Peng, et. all. (2006) employed asphalt butadiene styrene polymer (SBS) modified asphalt with performance grade PG76-22, crushed basalt aggregate and limestone to product porous asphalt. Unconfined

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compression test was run using 100 mm by 100 core drilled. At 4.5% asphalt content, unconfined the compressive strength and void ratio were 3601 kPa (3.6 Mpa) and approximated 19.5%, respectively.

The unconfined compressive test result of porous asphalt containing Quarsite Dolomite stone and Buton Natural Asphal showed that the mixtime with 4% has compressive strength value and void, respectively.

This work is a part of various extensive investigation projects on the development liquid Asbuton as bituminous asphalt binder and the suitability of Quarsite Dolomite stone as coarse aggregate in the permeable asphalt production. This paper reported the test results those are carried out to study the compressive strength and the strength strain curve in compression of the permeable asphalt.

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).

Fig.1 : Permeable Asphalt Pavement

Aggregate was specimen mineral who was done for mixture road construktion 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

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

II. Methodology

a) *Mix Design Permeable Asphalt Pavement Testing*

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

Fig. 3 : Permeable asphalt pavement

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

$$L = \frac{Mo - Mi}{Mo} \times 100 \quad (1)$$

Fig. 4 : Test Cantabro Machine

b) *Indirect Tensile Strengthtest*

Permeable asphalt pavement was produced with used Quarsite Dolomite stone as course aggregate. The Quarsite Dolomite stone were broken in the spacing ∅ 3/8" ½"-¾" with the Buton Natural Asphal 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 Cantabro Test. We was controlling testing for composition asphalt permeable pavement with Standard 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 standard 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%. Buton Natural Asphal we use all variation asphalt category: 3%, 3.5%, 4%, 4.5% and 5%.

Test Indirect Tensile Strength (ITS) has been controlled by ASTM D6931-07.

Fig. 5 : Universal Testing Machine

Fig. 6 : Test Indirect Tensile Strength

c) *Permeability Test*

i. *Limitation Of Darcy's Law*

In a porous media, the hydraulic conductivity K represents the specific discharge per unithydraulic gradient, which means that the coefficient depends on both matrix and fluidproperties (*Bear*, 1972). From a dimensional analysis, the hydraulic conductivity can bederived as (*Nutting*, 1930):

$$K = \frac{k\,g}{v} \qquad (2)$$

Where k is the intrinsic permeability, v the kinematic viscosity and g the gravity acceleration.The intrinsic permeability is only a function of the matrix composing the porous media and its characteristics such as grain size distribution, tortuosity and porosity. For porous media, the Reynolds number (Re) can be defined as (*Charbeneau*, 2000):

$$\mathrm{Re} = \frac{q\,d}{v} \qquad (3)$$

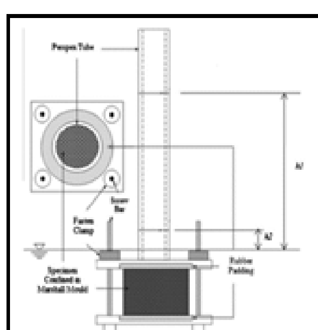

Fig. 7 : Setup of the Permeability Test

b) *Multi Layer Test*

The roads are very important for land transportation infrastructure especially for distribution of goods and services, and to support the economic growth. The safety, comfortable, robust and economic roads will make people easier in their movement. There are three types of pavement construction known today, such as flexible pavement, rigid pavement, and the combinations that known ascomposite pavement.

By the information the writers have, to determine the loads effect to the pavement construction of multilayer can be simulated using computer software i.e. EverStressFE.A pavement construction is a construction of pavement put over the subgrade to serves the traffic loads.

Based on the bonding materials,pavement construction can be divided to:a. Flexible Pavement, b. Rigid Pavement, c. Composite Pavement. Modulus of elasticity, often called as Young Modulus isa coMparison between stress axial strainin an elastic deformation, so that modulus of elasticity shows the trend to deformed and back to the original form when under loads (SNI 2826-2008). This shownby equation:

$$E = \frac{\sigma}{\varepsilon} \quad (4)$$

while E = modulus of elasticity, σ = stress and ε = strain

Poisson Ratio (μ) is the values of coMparison between horizontal strain (lateral strain) and vertical strain (axial strain) caused by loads thatparallel to axisand axial strain (Yoder, E.Y. and M.W Witczak. 1975). This shown by equation:

$$\mu = \frac{\varepsilon_h}{\varepsilon_v} \quad (5)$$

While:μ = poisson ratio, ε_h = lateral strain, ε_v = axial strain

EverStressFE 1.0 version 1.0 (available for download at www.civil.umaine.edu/EverStressFE 1.0) is a user-friendly three-dimensional (3D) finite-element based software package for the analysis of asphalt pavement systems subjected to various wheel/axle load combinations.EverStressFE 1.0 is useful for both flexible pavement researchers and designers who must perform complex mechanics-based analyses of flexible asphalt pavement systems.Some of the major features of EverStressFE 1.0 are summarized below, Intuitive and user-friendly graphical user interface., Ability to model systems with 1-4 layers.., Modeling of multiple-wheel systems, Batch analysis capabilities. , Visualization of results.

Research Methods

Methods that using in the tests are laboratory experimentaland analysis using software EverStressFE 1.0. The steps are :

- Unconfined Compressive Strength Tests for Material Soil, Rigid, and Asphalt.

The purposes are to determine the value of modulus of elasticity and Poisson Ratio each element. The process of the tests are:

a) Prepare the test instruments, such as: set Universal Testing Machine (UTM), Data Logger, Computer, LVDT cables, Strain Gauge, and bearing plate.
b) Connect the data logger and computer that has been installed software Visual Log.
c) Connect the LVDT cables to data logger
d) Put the testing material briquettesson UTM, and put the bearing plate upon the briquettes.
e) Install the LVDT cables around the briquettesas a sensor of deformation.
f) Start the test, as the loads doing mechanically by the UTM, and the value of deformationrecorded on computer.

- *Load test multilayer*

Two types of specimens multilayer that has been done will get through the load test to find the values of deformation, stress, strain, and the capacity of maximum load that can be overhead by each specimens. The work steps of the test are:

a) Install the 1x1 m box at the portal
b) Embedding the strain gauge at the specimens
c) Put the specimens to the box
d) Install the sets of hydraulic pump to portal, then set the load cell.
e) Install the LVDT cables to data logger, connect data logger to computer that has been installed of software Visual Log.
f) Doing the test, as the loading using hydraulic pump that operated manually, and the results are recorded to the computer.

The type of asphalt that has been used in the test are asphalt gradation of 4%.

Fig. 8 : Model Test Multilayer Machine

Fig. 9 : Specimen of mltilayer (rigid pavement)

III. Result and Discussion

a) Analysis Indirect Tensile Strength

Table 1 : Outcome Indirect Tensile Strength Test

Sampel	Percen tage asphalt quality (%)	Diameter briket	High Briket	Load Value (P)	ITS Value
		mm	mm	kgf	Mpa
		D	H		
I	3.0	102.3	66.9		0
II		102.22	69.3	75.00	0.066134591
III		102	68.5	100.00	0.089401701
IV		102.4	67.7	75.00	0.067578595
V		102.4	67	125.00	0.113807734
Average					0.067384524
I	3.5	102.5	67.5	275.00	0.24827991
II		101.8	67.2	225.00	0.205448034
III		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	4.0	102.8	69	350.00	0.308221097
II		102.5	68.2	400.00	0.357427756
III		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	4.5	102.3	68.4	300.00	0.267809539
II		102.4	68.3	250.00	0.223283109
III		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	5.0	102.2	61.7	275.00	0.272416342
II		102.5	68	225.00	0.201644445
III		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

Tabel 2 : RecapitulationRmaks 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

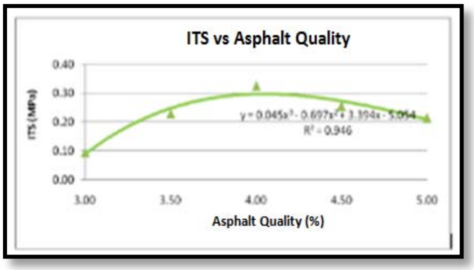

Fig. 10 : Correlation quality asphalt with Indirect Tensile Strength

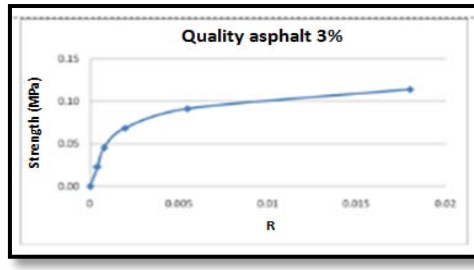

Fig. 11 : Corelation ITS Value and R value 3%

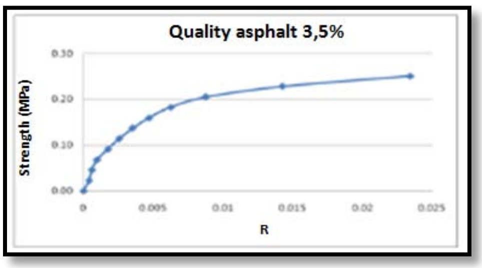

Fig. 12 : Corelation ITS Value and Rvalue 3,5%

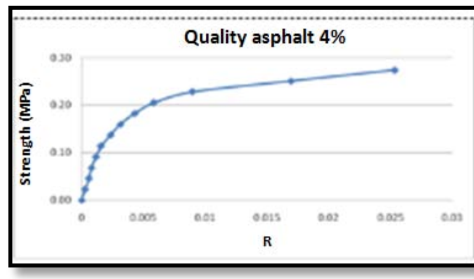

Fig.13 : Corelation ITS Value and R value 4%

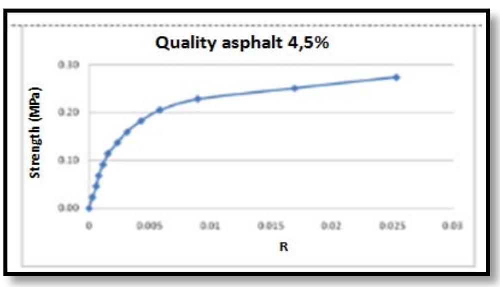

Fig.14 : Corelation ITS Value and R value 4.5%

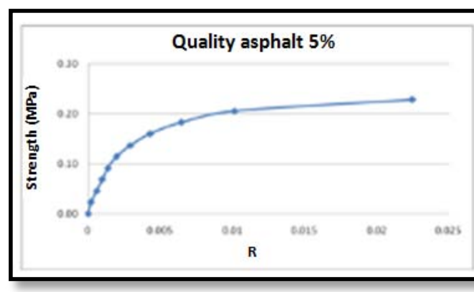

Fig. 15: Corelation ITS Value and R value 5%

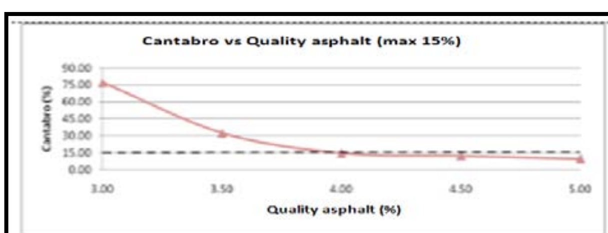

Fig. 16 : Corelation quality asphalt with value cantabro loss

b) Analysis Cantabro

Table 3 : Outcome CantabroTest

Sample	Percen tage quality asphalt (%)	Weight before test (Gram) M	Weight aftertest (Gram) M	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**

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Table 4 : OutcomeUnconfined Compressive Strength

Quality Asphalt (%)	Weight (Kg)	Height (mm)	Peak Load (KN)	UCS (N/mm^2)	Vertical Strain	Modulus Elasticity	Poisson rasio
3	1,69	128,3	15,51825	1,918	0,0130875	146,543	0,095831
	1,67	127	15,347	1,897	0,030	63,683	0,309955
	1,71	131	15,12397	1,869	0,022	85,395	0,251505
3,5	1,715	117	15,22	1,881	0,020	93,452	0,268231
	1,73	119	15,516	1,918	0,065	29,357	0,270587
	1,73	120	16,118	1,992	0,021	97,013	0,420798
4	1,685	121,2	15,7653	1,948	0,021	91,450	0,206009
	1,65	120	16,1498	1,996	0,029	67,990	0,387276
	1,67	123	16,228	2,006	0,038	53,373	0,498677
4,5	1,655	133,5	10,2816	1,271	0,048	26,502	0,384759
	1,675	135	9,838	1,216	0,026	46,140	0,37275
	1,65	131	10,3113	1,274	0,039	32,710	0,371893
5	1,67	114	9,922	1,226	0,038	32,119	0,778059
	1,69	117	10,219	1,263	0,033	38,682	0,398318
	1,63	113	15,234	1,883	0,018	104,238	0,532377

c) *Analysis Permeability*

Table 5 : Outcome Permeability Test

Quality Asphalt (%)	Thickness (cm)	Time (det)	CoefficientPermeability per-item (k)	CoefficientPermeabilityAverage (k)	(k) Average All item
3	7.97	88	0.179507355		
	7.96	85	0.179507356	0.179507355	
	7.94	87	0.179507354		
3.5	7.56	80	0.19161554		
	7.60	78	0.19161553	0.19161554	
	7.58	77	0.19161556		
4	7.64	76	0.202917436		
	7.61	74	0.202917437	0.202917436	0.1873
	7.63	73	0.202917435		
4.5	7.45	75	0.202680493		
	7.47	77	0.202680494	0.202680493	
	7.49	74	0.202680492		
5	7.42	95	0.159640625		
	7.44	90	0.159640624	0.159640624	
	7.46	94	0.159640626		

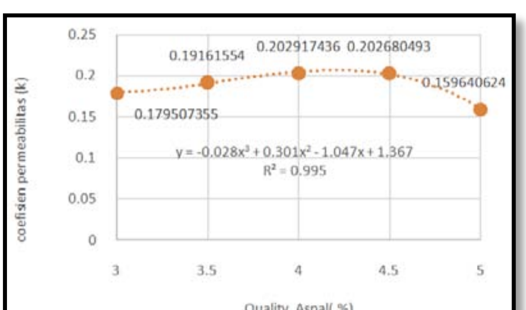

Fig . 17 : Corelation Quality Asphalt and Coeficient Vertical Permeability

d) *Analysis Unconfined Compressed Test*

There are two configurations of stress strain curve were seen in all mixtures irrespective of the Buton Natural Asphal content. The first configuration shows some porous asphalt specimens have the initial bottom concave part that represents the settling of the specimen, the linear zone, the nonlinear zone of the ascending branch and comprises the peak and stretch immediately adjoining it on other side. This pattern is similar to the pattern of the dense asphalt concrete. The second configuration shows some porous asphalt specimens have the linear zone, the nonlinear zone of the ascending branch and comprises the peak and stretch immediately adjoining it on other side without the initial bottom concave part. This pattern slightly differs to the pattern of the dense asphalt concrete. The nonlinear part of stress strain curve of porous asphalt reflects the degeneration of the latter rather than the flow of very thin bitumen micro layers in it. Micro cracking process characterizes the nonlinear part of the ascending branch. The elastic behaviour is reflected by the linear part of the stress strain curve. Under the short term static compressive, all test showed no significant change in the peak strain with increasing compressive strength of porous asphalt.

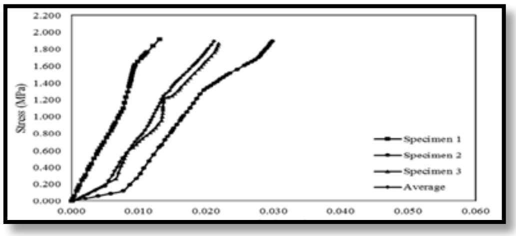

Fig. 18 : Stress strain curve (Buton Natural Asphal Content 3%)

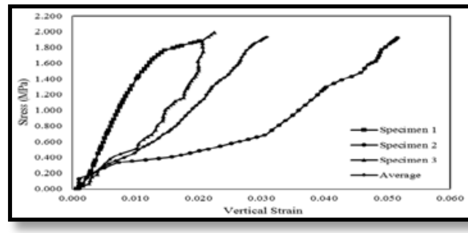

Fig. 19 : Stress strain curve (Buton Natural Asphal Content 3,5%)

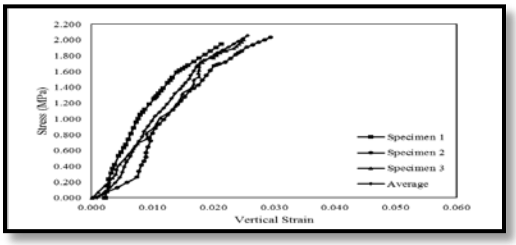

Fig. 20 : Stress strain curve(Buton Natural Asphal Content 4%)

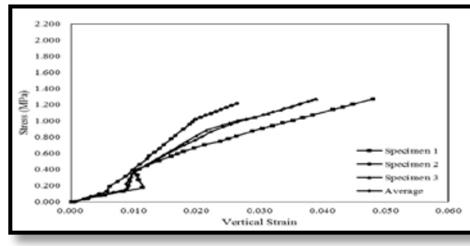

Fig. 21 : Stress strain curve(Buton Natural Asphal Content 4.5%)

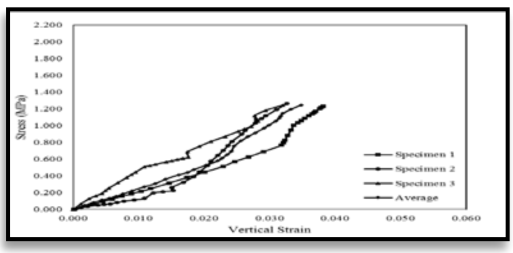

Fig. 22 : Stress strain curve(Buton Natural Asphal Content 5%)

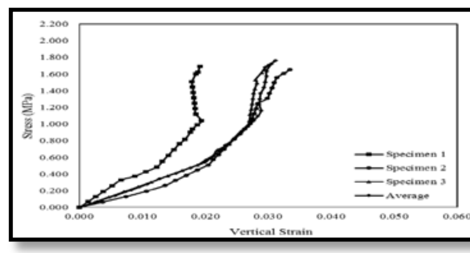

Fig. 23 : Stress strain curve(Buton Natural Asphal Content 5.5%)

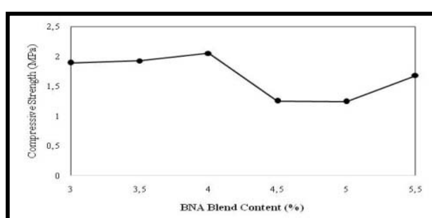

Fig. 24 : Compressive strength

e) Multilayer Test

Fig. 25 : Specimen of multilayer model test ofrigid pavement with asphalt

i. *Analysis Load test for Multilayer Soil-Rigid*

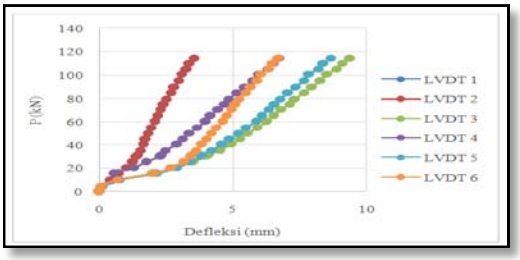

Fig. 26 : Graphs of correlation between loads and decrease

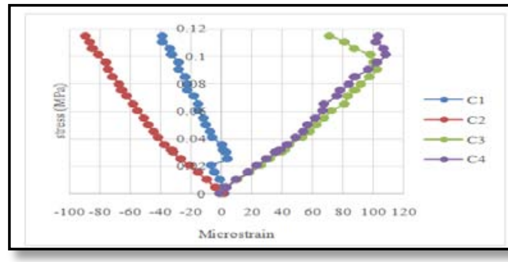

Fig. 27 : Graphs of correlation between stress and strain

ii. *Testing Multilayer Soil-Rigid-Asphalt*

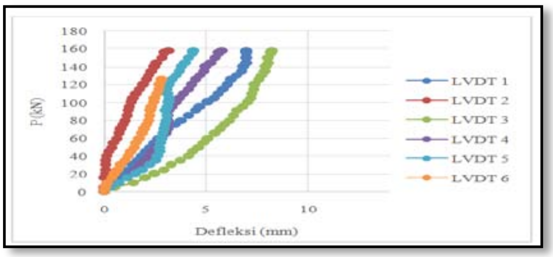

Fig. 28 : Graphs of correlation between loads and decrease

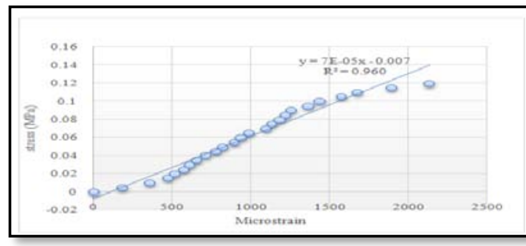

Fig. 29 : Graphs of correlation between and strain of asphalt course

iii. *Analysis Multilayer using Software EverStressFE*

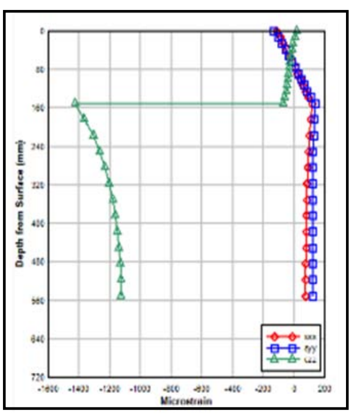

Fig. 30 : Graphs of correlation between depth and strain formultilayer soil-rigid

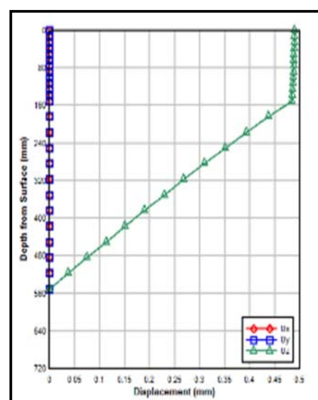

Fig. 31: Graphs of correlation between depthand eflection/displacement for multilayer soil-rigid

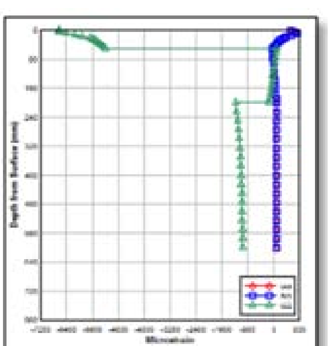

Fig. 32 : Graphs of correlation between depth and strain for multilayer soil-rigid-asphalt

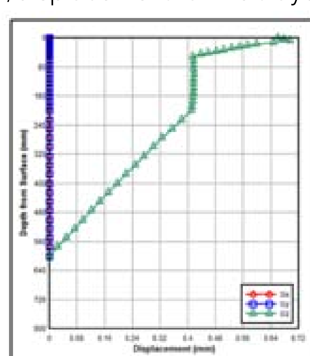

Fig. 33 : Graphs of correlation between depth and deflection/displacement for multilayer soil-rigid-asphalt

IV. Conclusions

1. Permeable asphalt pavement mixture for Cantabro test we can see that optimum Buton Natural Asphal for the coarse aggregate 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%.
2. Unconfined Compressive Strength, Modulus elasticity 146.543 and ratio poisson 0.095831 for asphalt 3%, Modulus elasticity 93.452 and ratio poisson 0.268231 for asphalt 3,5%, Modulus elasticity 91.450 and ratio poisson 0.206009 for asphalt 4%, Modulus elasticity 26.502 and Poisson rasio 0.384759 for asphalt 4,5%, and Modulus elasticity 32.119 and Poisson rasio 0.778059 for asphalt 5%.
3. The result of test Multilayer Soil–Rigid are: the values of deflection at the maximum load on LVDT 1 to LVDT 6 are 3.545 mm, 3.545 mm, 9.4 mm, 6.745 mm, 8.65 mm, and 6.705 mm. At the maximum stress result the microstrain C1 to C4 -38.65, -89.85, 71.21, 103.5. At the load 35 kN, the value of deflection on LVDT 1 to LVDT 6 are 1.535 mm, 1.535 mm, 4.505 mm, 2.45 mm, 4.19 mm, and 3.61 mm, while at value of stress 0.035 MPa results the microstrain C1 to C4 0.36, -37.68, 44.44, 43.48.
4. The results of test Multilayer Soil-Rigid-Asphalt are : the values of decrease at the maximum load on LVDT 1 to LVDT 6 are 6.98 mm, 3.2 mm, 8.25 mm, 5.75 mm, 4.38 mm, are 3.5 mm. At the maximum stress results the micro stength of asphalt course 2133.95. At the load 35 kN, the value of decrease on LVDT 1 to LVDT 6 are 1.576 mm, 0.075 mm, 3.7 mm, 1.985 mm, 2.48 mm, dan 0.986 mm, while at value of stress 0.035 Mpa results the micro stength of asphalt course 655.
5. Stress strain curve of compression test results for asphalt concrete was same with stress strain curve of the porous asphalt using Quarsite Dolomite stone and Buton Natural Asphal.Void ratio of porous asphalt tested by WU Shao-peng relatively similar to the porous asphalt using Quarsite Dolomite stone and Buton Natural Asphal, although the compressive strength according to Wu Shao-peng obtained at 3.6 Mpa while the porous asphalt using Quarsite Dolomite stone and Buton Natural Asphal gained compressive strength of 2.4 Mpa. The unconfined compressive test result of porous asphalt containing Quarsite Dolomite stone showed that the mixture with 4% Buton Natural Asphal has compressive strength value 2.4 Mpa and void ratio 19.2%, respectively

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