BAB 5

KESIMPULAN DAN SARAN

5.1 KESIMPULAN

1. Dari hasil pembahasan maka factor-faktior penyebab kerusakan ruas jalan Halilaran- LauleraTimor Leste berdasarkan analisa teknisdan pengamatan secara visual adalah ukuran drainase lebih kecil dari yang dibutuhkan dan elevasi dasar saluran berada di atas lapis pondasi bawah. Pemeliharaan saluran drainase tidak maksimal, dengan tingginya curah hujan maka kerusakan konstruksi perkeran jalan tidak dapat dihindari
2. Untuk melakukan perbaikan kerusakan maka perlu dilakukan pembangunan saluran dengan kedalaman minimal 65, kemudian dilakukan perbaikan pada badan jalan dengan menggunakan bahan perkuatan dari lapis geotextile dan menimbun lapis pondasi bawah dan lapis pondasi atas sesuai tebal rancangan semula.
3. Diperlukan biaya sebesar $ 10,847.18 untuk memperbaiki kerusakan secara menyeluruh hingga konstruksi perkerasan jalan dapat memberikan pelayanan maksimal kepada masyarakat.

5.2 SARAN

1. Perlu dilakukan uji CBR terhadap lapis pondasi dengan uji test pit untuk mengetahui nilai CBR sebenarnya dari lapis pondasi atas dan pondasi bawah di laboratorium untuk menjamin bahwa menurunnya nilai CBR benar-benar karena terendam air, bukan karena material ataupun metoda pelaksanaan.

2. Perlu direcanakan drainase secara menyeluruh pada ruas jalan Halilaran-LaularaTimor Leste untuk mencegah terjadi kerusakan pada segmen-segmen lain dengan jenis kerusakan yang sejenis.

3. Perlu ditingkatkan system pemeliharaan jalan, terutama terhadap saluran drainase agar tidak terjadi genangan-genangan pada saat musim hujan, sehingga kondisi badan jalan akan tetap terjaga dari ancaman air yang terjebak pada lapis pondasi.

4. Dalam penangan perbaikan yang di akibatkan karena longsor selain dari struktur perkerasan dan kelangkpan jalan perlu di perhatikan juga geoteks untuk memperkuat struktur tanah tersebut.

DAFTAR PUSTAKA

1. Andini Rizki Febriana[1],Ronny Durrotun Nasihien[2], PENENTUAN JENIS KERUSAKAN JALAN DENGAN METODE VISUAL DAN IRI (STUDI KASUS:JALAN RAYA TROSOBO KM 22 – 36, KECAMATAN TAMAN),Metode“Sistem Informasi Geografi (SIG)”. Pembuatan Permodelan ini menggunakan perangkat lunak citra satelit Google Earth, pemanfaatan Microsoft Office 2007, Google Map. Permodelan SIG ini dapat menampilkan informasi ruas jalan yang menginformasikan kondisi kerusakan jalan.
2. Ardy Firmansyah 2017, dengan judul Studi Analisa Tingkat Pengaruh Prioritas Penyebab Kerusakan Jalan Pada Ruas Jalan Raya Balongbendo – Ruas Jalan Raya Bypass Mojokerto (Sta 0+100 – Sta 21+100), Dari hasil menggunakan Metode Bina Marga kondisi kerusakan jalan terbesar terdapat pada jenis kerusakan berupa amblas dengan nilai kerusakan 31 pada lokasi segmen V STA 12+100 – 15+100. Nilai terbesar 31 yang menunjukan jalan tersebut dalam kondisi buruk maka jalan yang mengalami kerusakan amblas perlu dilakukan perbaikan dapat berupa *patching* dengan perbaikan tanah dasar atau melakukan pelapisan *(overlay)* disertai pekerjaan *lavelling* serta membuat saluran drainase yang memiliki fungsi untuk menangkap air dan mengalirkan air agar tidak terjadi banjir di jalan raya saat musim penghujan datang.
3. Dina Fitriyah 2016, dengan judul Analisis Tingkat Kerusakan Pada Jalan Arteri Sekunder Di Kota Surabaya Dengan Sistem Informasi Geografis, Dengan menggunakan Sistem Informasi Geografis (SIG) didapat gambaran secara spasial jenis kerusakan jalan yang terjadi. Aplikasi SIG mampu melakukan analisis data serta menyajikan informasi hasil analisis yang dibutuhkan dalam bentuk peta yang mudah dimengerti, dipahami dan dapat mengatasi permasalahan yang ada saat ini di ruas jalan Dupak – jalan Tambak Osowilangun.
4. Fadhillah Eka Putra, ANALISA KERUSAKAN JALAN DENGAN METODE LHR BINA MARGA (STUDI KASUS RUAS JALAN AMD PROJAKAL KARIANGAU, KOTA BALIKPAPAN), metode ”LHR Bina Marga” Survei visual kondisi keruskan jalan di lakukan sepanjang 1km dengan membagi 5 segmen dengan masingmasing segmen sepanjang 200 m dan mengelompokkan sesuai jenis kerusakan. Hasil penelitian pada ruas Jalan AMD Projakal Kariangau Balikpapan menunjukkan hasil survei LHR adalah 2,131 smp/hari yang menandakan bahwa kondisi lalu-lintas cukup ramai, dan kerusakan yang paling dominan adalah jenis lubang (butiran

lepas) dan retak (memanjang dan melintang) dengan luas sebesar 4,75 m² untuk butiran lepas dan 2,85 m² untuk retak (memanjang dan melintang).

5. Herta Novianto[1], Titin Wartini[2], ANALISIS TINGKAT KERUSAKAN JALAN RIGID DENGAN METODE PAVEMENT CONDITION INDEX (PCI) DALAM PENANGANAN UPAYA PERBAIKAN, Metode ”Pavement Condition Index (PCI)”. Penelitian ini bertujuan untuk mengetahui jenis jenis kerusakan dan nilai kondisi pada perkerasan kaku di ruas jalan KowangBanyu Urip Desa Cancung Kec.Bubulan Kab.Bojonegoro beserta pemeliharaan atau penanganannya. Berdasarkan hasil penelitian, diketahui kondisi perkerasan kaku pada ruas jalan Kowang-Banyu Urip Desa Cancung Kec.Bubulan Kab.Bojonegoro masih dalam keadaan sempurna (excellent) dengan presentase 94,75 %.
6. Noor Dewi Yuliani1) Analisa Kerusakan Jalan Purwodadi – Solo STA 80+000 s/d STA 82+000 menggunakan metode “Pavement Condition Index (PCI)” Kemudian, tiap segmen jalan dilakukan pengamatan (secara visual) Dari Hasil pengamatan diperoleh jenis kerusakan berupa (Corner Break), Joint Seal, retak memanjang, pemompaan (Pumping), Punch-Out, Penurunan/Patahan (Seulentent Faulting), Popouts, Scaling, Shrinkage, Spalling corner, Polished aggregats, Patching, Divided slab, durabililty crack, dan Spalling joint.
7. Nurul Fadhilah 2013, dengan judul Pengaruh Volume Kendaraan Terhadap Tingkat Kerusakan Jalan Pada Perkerasan Rigid Di Kota Semarang, tugas akhir – Teknik Sipil , Universitas Negeri Semarang, Semarang; dengan hasil 86% kerusakan jalan di pengaruhi volume jenis kendaraan ringan dan kendaraan berat dan semakin tinggi volume kendaraan maka peluang kerusakan jalan semakin besar.
8. Penelitian yang dilakukan oleh Kamandoko, tahun 2006 dengan judul Studi Kerusakan Jalan Akibat Volume Kendaraan Yang Berlebih Pada Ruas Jalan Mastrip (STA 2 + 100 – STA 7 + 100 Surabaya), dari hasil penelitian dijelaskan bahwa pengamatan dilapangan selama survei I dan survei II jenis kerusakan yang terbanyak pada ruas jalan Mastrip STA 2+100 – STA 7+100 adalah jenis kerusakan *raveling/weathering* dengan persentase sebesar 13.80%, sedangkan jenis kerusakan yang paling sedikit adalah *block cracking* dengan persentase 6.04%. Persentase penyebab kerusakan terbesar adalah jenis kendaraan berat tipe trailer dengan persentase 31.98%. Secara keseluruhan penyebab kerusakan jalan karena beban kendaraan komersil yang mencapai 99.84%.
9. Penelitian yang dilakukan oleh Kamandoko, tahun 2006 dengan judul Studi Kerusakan Jalan Akibat Volume Kendaraan Yang Berlebih Pada Ruas Jalan Mastrip (STA 2 + 100 – STA 7 + 100 Surabaya), dari hasil penelitian

dijelaskan bahwa pengamatan dilapangan selama survei I dan survei II jenis kerusakan yang terbanyak pada ruas jalan Mastrip STA 2+100 – STA 7+100 adalah jenis kerusakan *raveling/weathering* dengan persentase sebesar 13.80%, sedangkan jenis kerusakan yang paling sedikit adalah *block cracking* dengan persentase 6.04%. Persentase penyebab kerusakan terbesar adalah jenis kendaraan berat tipe trailer dengan persentase 31.98%. Secara keseluruhan penyebab kerusakan jalan karena beban kendaraan komersil yang mencapai 99.84%.

10. Risal Rifa'i[1], Theresia Maria Candra Agusdini[2], EVALUASI KERUSAKAN JALAN DAN DRAINASE PADA RUAS JALAN RAYA SUGIO DENGAN METODE BINA MARGA (Studi Kasus : Ruas Jalan Sugio, Kabupaten Lamongan), metode tata cara penyusunan program pemeliharaan jalan kota 1990. diperlukan evaluasi guna mengetahui tindakan penanganan yang harus dilakukan. Hasil yang diperoleh dari survei mengenai kerusakan perkerasan, Jalan Raya Sugio masuk pada urutan prioritas 0-3 yang artinya jalan dimasukkan ke dalam program peningkatan

LAMPIRAN

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TEST REPORT ON MOISTURE - DENSITY RELATIONS

Test Method: AASHTO T 99-01/180-01

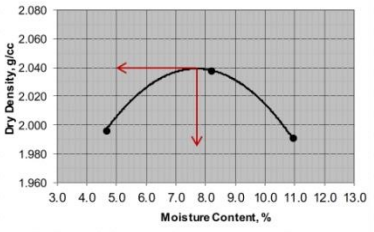
Contractor :		Laboratory No. :	
Kind of Material :	Original Ground	Item No.	
Sampled At :	Insitu (Sta. 4+320)	Tested At :	UNTL-Road Technology Laboratory
Original Source :	Insitu (Sta. 4+320)	Date Received in Lab. :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	Date Test Commenced :	7-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	Date Test Completed :	8-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	Date Test Released :	9-Oct-20

DENSITY DETERMINATION

Trial Number	1	2	3		
A.Water added	4%	4%	4%		
B.Weight of Mold + Weight of Soil, g	10030	10279	10287		
C.Weight of Mold, g	5539	5539	5539		
D.Weight of Wet Soil, g (B-C)	4491	4740	4748		
E.Volume of Mold, cc	2150.00	2150.00	2150.00		
F.Wet Density, g/cc (D/E)	2.089	2.205	2.208		
G.Dry Density, g/cc F/(1+MC/100)	1.996	2.038	1.991		

MOISTURE CONTENT DETERMINATION

Can Number	39	18	45		
a.Weight of Can + Wet Soil, g	74.30	73.80	71.90		
b.Weight of Can + Dry Soil, g	72.24	70.40	67.60		
c.Weight of Water, g (a-b)	2.06	3.40	4.30		
d.Weight of Can, g	27.80	28.80	28.20		
e.Weight of Dry Soil, g (b-d)	44.44	41.60	39.40		
f.Moisture Content, % (c/e)*100	4.64	8.17	10.91		



AASHTO :	T180
Method Used :	D
Rammer Description :	Modified
Water Content as Received :	
% Passing 19.0 mm (3/4-in.) :	100
Weight of Rammer, lbs :	10.0
Volume of Molds, cc :	2150.00
No. of Layers :	5
No. of Blows/Layer :	56
MDD, kg/m³ :	2.040
OMC %	7.700

Remarks:

Pripared By: Confirmed by:

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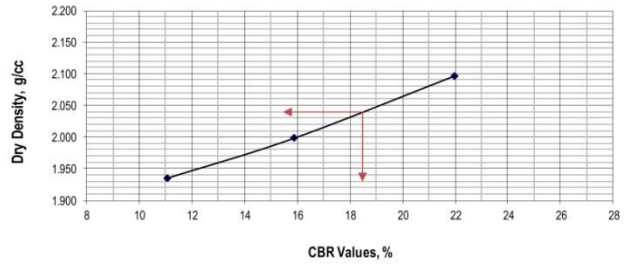
TEST REPORT ON THE CALIFORNIA BEARING RATIO

Test Method : AASHTO T 193-99

			Laboratory No.	:	
Kind of Material	:	Original Ground	*Item No.*	:	
Sampled At	:	Insitu (Sta. 4+320)	*Tested At*	:	UNTL-Road Technology Laboratory
Original Source	:	Insitu (Sta. 4+320)	*Date Sample Received*	:	October 3, 2020
Sampled By	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced*	:	October 11, 2020
Tested By	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed*	:	October 12, 2020
Computed BY	:		*Date Test Released*	:	October 13, 2020

CBR Values

No. of Blows	CBR Value, %		Corrected CBR Value, %		Dry Density
	0.100 in.	0.200 in.	0.100 in.	0.200 in.	
10	8	11	-	-	1.934
30	11	16	-	-	1.998
65	16	22	-	-	2.097



MDD, g/cc	:	2.04			
OMC, %	:	7.7	CBR Value @ 100 % MDD	:	18.5

Remarks:

Prepared By: Confirmed by:

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TEST REPORT ON DETERMINING THE LIQUID LIMIT AND PLASTIC LIMIT OF SOILS

Test Method: AASHTO T 89-00 AND AASHTO T 90-00

		Laboratory No. :	
Kind of Material :	Embankment (Selected Material)	*Item No.*	
Sampled At. :	Insitu (Sta. 4+320)	*Tested At* :	TL-Road Technology Laborat
Original Source :	Insitu (Sta. 4+320)	*Date Sampled* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	8-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	9-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	10-Oct-20

Trial Number	Liquid Limit			Plastic Limit	
	1	2	3	1	2
Container No.	1	2	3	4	5
Wt. Cont. + Wet Soil, g.	21.80	27.00	25.95	15.90	16.20
Wt. Cont. + Dry Soil, g.	19.56	23.69	22.64	14.99	15.04
Wt. Of Moisture, g.	2.24	3.31	3.31	0.91	1.16
Wt. Of Container, g.	8.00	8.00	8.20	8.80	8.00
Wt. Of Dry Soil, g.	11.56	15.69	14.44	6.19	7.04
Moisture Content, %	19	21	23	15	16
No. of Blows	31	24	17	Average:	16

Sieve No. 10 :	32
Sieve No. 40 :	21
Sieve No. 200 :	13
Liquid Limit :	22
Plastic Limit :	16
Plasticity Index :	6
Group Index :	0
Group Classification :	A-1-a(0)

Remarks :

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TEST REPORT ON MOISTURE - DENSITY RELATIONS

Test Method: AASHTO T 99-01/180-01

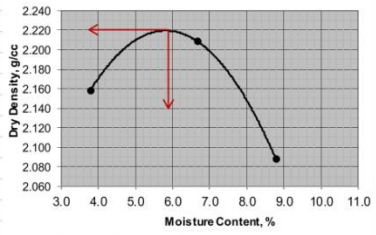
Contractor :		*Laboratory No.* :	
Kind of Material :	Embankment (Selected Material)	*Item No.*	
Sampled At :	Insitu (Sta. 4+320)	*Tested At* :	UNTL-Road Technology Laboratory
Original Source :	Insitu (Sta. 4+320)	*Date Received in Lab.* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	7-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	8-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	9-Oct-20

DENSITY DETERMINATION

Trial Number	1	2	3	4	5
A.Water added	3%	3%	3%		
B.Weight of Mold + Weight of Soil, g	11260	11509	11328		
C.Weight of Mold, g	6444	6444	6444		
D.Weight of Wet Soil, g (B-C)	4816	5065	4884		
E.Volume of Mold, cc	2150.00	2150.00	2150.00		
F.Wet Density, g/cc (D/E)	2.240	2.356	2.272		
G.Dry Density, g/cc F/(1+MC/100)	2.158	2.209	2.088		

MOISTURE CONTENT DETERMINATION

Can Number	26	29	48		
a.Weight of Can + Wet Soil, g	74.30	72.70	74.20		
b.Weight of Can + Dry Soil, g	72.60	69.90	70.40		
c.Weight of Water, g (a-b)	1.70	2.80	3.80		
d.Weight of Can, g	27.69	27.90	27.10		
e.Weight of Dry Soil, g (b-d)	44.91	42.00	43.30		
f.Moisture Content, % (c/e)*100	3.79	6.67	8.78		



AASHTO :	T180
Method Used :	D
Rammer Description :	Modified
Water Content as Received :	
% Passing 19.0 mm (3/4-in.) :	100
Weight of Rammer, lbs :	10.0
Volume of Molds, cc :	2150.00
No. of Layers :	5
No. of Blows/Layer :	56
MDD, kg/m³ :	2.220
OMC %	5.9

Remarks:

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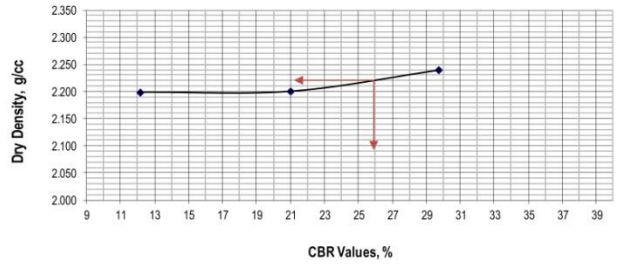
TEST REPORT ON THE CALIFORNIA BEARING RATIO
Test Method : AASHTO T 193-99

Laboratory No.	:		
Kind of Material	: Embankment (Selected Material)	*Item No.*	:
Sampled At	: Insitu (Sta. 4+320)	*Tested At*	: UNTL-Road Technology Laboratory
Original Source	: Insitu (Sta. 4+320)	*Date Sample Received*	: October 3, 2020
Sampled By	: ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced*	: October 11, 2020
Tested By	: ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed*	: October 12, 2020
Computed BY	: ROAD TECHNOLOGY LABORATORY Team	*Date Test Released*	: October 13, 2020

CBR Values

No. of Blows	CBR Value, %		Corrected CBR Value, %		Dry Density
	0.100 in.	0.200 in.	0.100 in.	0.200 in.	
10	10	12	-	-	2.198
30	12	21	-	-	2.200
65	20	30	-	-	2.239



MDD, g/cc	:	2.22			
OMC, %	:	5.9	CBR Value @ 100 % MDD	:	26.0

Remarks:

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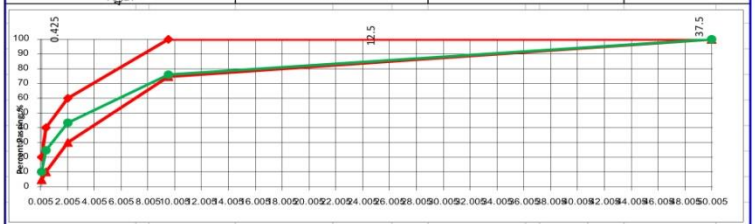
Test Method : AASHTO T-11 & T-27

		Laboratory No. :	
Kind of Material :	Aggregate Subbase Course	*Item No.* :	
Sampled At :	Insitu (Sta. 4+320)	*Tested At* :	UNTL-Road Technology Laboratory
Original Sorce :	Insitu (Sta. 4+320)	*Date Sample Received* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	11-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	12-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	13-Oct-20

Weight of Original Sample, g :	3215		
Weight of Oven-Dried Sample, g :	3188	Moisture Content, % :	0.8
Wash Oven-Dried Sample, g :	2862		

Sieve Size		Retained, g.	% Retained	Cumulative		Specifications
Standard, mm	Alternative, in.			Wt. Passing, g.	% Passing	% Passing
75.0	3					
50.0	2		0	3188	100	
37.5	**1 1/2**		0.00	3188	100	
25.0	1		0.00	3188	100	100
19.0	3/4	246	7.72	2942	92	
12.5	**1/2**	305	9.57	2637	83	
9.5	3/8	208	6.52	2429	76	75-100
4.75	**#4**	465	14.59	1964	62	
2.36	#8	352	11.04	1612	51	
2.00	#10	235	7.37	1377	43	30-60
1.18	#16	255	8.00	1122	35	
0.60	#30	250	7.84	872	27	
0.425	**#40**	88	2.76	784	25	10-40
0.300	**#50**	176	5.52	608	19	
0.150	**#100**	177	5.55	431	14	
0.075	**#200**	100	3.14	331	10	5-20
PAN		5		0.16		
#200 Wash Loss		326		10.23		
#425 Total		3188		10.38		



Remarks

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TEST REPORT ON DETERMINING THE LIQUID LIMIT AND PLASTIC LIMIT OF SOILS

Test Method: AASHTO T 89-00 AND AASHTO T 90-00

		Laboratory No. :	
Kind of Material :	Original Ground	*Item No.*	
Sampled At. :	Insitu (Sta. 4+320)	*Tested At* :	TL-Road Technology Laborat
Original Source :	Insitu (Sta. 4+320)	*Date Sampled* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	10-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	11-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	12-Oct-20

Trial Number	Liquid Limit			Plastic Limit	
	1	2	3	1	2
Container No.	1	5	IV	40	3
Wt. Cont. + Wet Soil, g.	25.90	23.90	30.20	17.10	16.20
Wt. Cont. + Dry Soil, g.	21.90	20.24	24.90	15.74	15.10
Wt. Of Moisture, g.	4.00	3.66	5.30	1.36	1.10
Wt. Of Container, g.	8.00	8.10	8.80	8.10	9.00
Wt. Of Dry Soil, g.	13.90	12.14	16.10	7.64	6.10
Moisture Content, %	29	30	33	18	18
No. of Blows	34	27	16	Average:	18

Sieve No. 10 :	51
Sieve No. 40 :	33
Sieve No. 200 :	21
Liquid Limit :	31
Plastic Limit :	18
Plasticity Index :	13
Group Index :	0
Group Classification :	A-2-6(0)

Remarks :

Pripared By: Confirmed by:

UNTL
FACULDADE DE ENGENHARIA, CIÊNCIAS E TECNOLÓGIA
Departamentu de Engenharia Civil
ROAD TECHNOLOGY LABORATORY
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TEST REPORT ON DETERMINING THE LIQUID LIMIT AND PLASTIC LIMIT OF SOILS

Test Method: AASHTO T 89-00 AND AASHTO T 90-00

		Laboratory No. :	
Kind of Material :	Aggregate Subbase Course	*Item No.*	
Sampled At. :	Insitu (Sta. 4+320)	*Tested At* :	TL-Road Technology Laborat
Original Source :	Insitu (Sta. 4+320)	*Date Sampled* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	11-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	12-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	13-Oct-20

Trial Number	Liquid Limit			Plastic Limit	
	1	2	3	1	2
Container No.	6	17	28	33	242
Wt. Cont. + Wet Soil, g.	27.40	25.40	28.30	15.40	15.30
Wt. Cont. + Dry Soil, g.	24.50	22.46	24.70	14.30	14.27
Wt. Of Moisture, g.	2.90	2.94	3.60	1.10	1.03
Wt. Of Container, g.	9.20	8.20	9.00	8.00	8.10
Wt. Of Dry Soil, g.	15.30	14.26	15.70	6.30	6.17
Moisture Content, %	19	21	23	17	17
No. of Blows	35	27	16	Average:	17

Sieve No. 10 :	43
Sieve No. 40 :	25
Sieve No. 200 :	10
Liquid Limit :	21
Plastic Limit :	17
Plasticity Index :	4
Group Index :	0
Group Classification :	A-1-a(0)

Remarks :

Pripared By:

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TEST REPORT ON MOISTURE - DENSITY RELATIONS

Test Method: AASHTO T 99-01/180-01

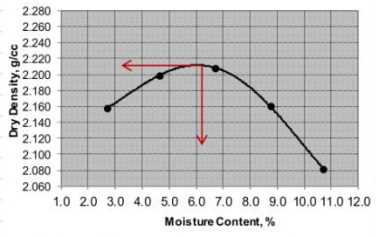
Contractor :		*Laboratory No.* :	
Kind of Material :	Aggregate Subbase Course	*Item No.*	
Sampled At :	Insitu (Sta. 4+320)	*Tested At* :	UNTL-Road Technology Laboratory
Original Source :	Insitu (Sta. 4+320)	*Date Received in Lab.* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	7-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	8-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	9-Oct-20

DENSITY DETERMINATION

Trial Number	1	2	3		
A.Water added	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**
B.Weight of Mold + Weight of Soil, g	10303	10487	10605	10589	10495
C.Weight of Mold, g	5539	5539	5539	5539	5539
D.Weight of Wet Soil, g (B-C)	4764	4948	5066	5050	4956
E.Volume of Mold, cc	2150.00	2150.00	2150.00	2150.00	2150.00
F.Wet Density, g/cc (D/E)	2.216	2.301	2.356	2.349	2.305
G.Dry Density, g/cc F/(1+MC/100)	2.158	2.199	2.209	2.160	2.082

MOISTURE CONTENT DETERMINATION

Can Number	20	50	40	#3	10
a.Weight of Can + Wet Soil, g	69.70	70.20	81.40	70.70	86.40
b.Weight of Can + Dry Soil, g	68.12	67.50	76.90	65.80	78.68
c.Weight of Water, g (a-b)	1.58	2.70	4.50	4.90	7.72
d.Weight of Can, g	9.40	9.40	9.60	9.70	6.60
e.Weight of Dry Soil, g (b-d)	58.72	58.10	67.30	56.10	72.08
f.Moisture Content, % (c/e)*100	2.69	4.65	6.69	8.73	10.71



AASHTO :	T180
Method Used :	D
Rammer Description :	Modified
Water Content as Received :	
% Passing 19.0 mm (3/4-in.) :	100
Weight of Rammer, lbs :	10.0
Volume of Molds, cc :	2150.00
No. of Layers :	5
No. of Blows/Layer :	56
MDD, kg/m³ :	2.210
OMC %	6.200

Remarks:

Pripared By: Confirmed by:

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Departamentu de Engenharia Civil

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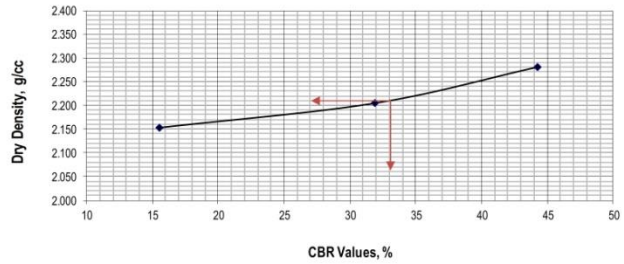
TEST REPORT ON THE CALIFORNIA BEARING RATIO

Test Method : AASHTO T 193-99

			Laboratory No.	:	
Kind of Material	:	Aggregate Subbase Course	*Item No.*	:	
Sampled At	:	Insitu (Sta. 4+320)	*Tested At*	:	UNTL-Road Technology Laboratory
Original Source	:	Insitu (Sta. 4+320)	*Date Sample Received*	:	October 3, 2020
Sampled By	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced*	:	October 10, 2020
Tested By	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed*	:	October 11, 2020
Computed BY	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released*	:	October 12, 2020

CBR Values

No. of Blows	CBR Value, %		Corrected CBR Value, %		Dry Density
	0.100 in.	0.200 in.	0.100 in.	0.200 in.	
10	9	16	-	-	2.152
30	16	32	-	-	2.204
65	33	44	-	-	2.280



MDD, g/cc	:	2.21			
OMC, %	:	6.2	CBR Value @ 100 % MDD	:	33.0

Remarks:

Prepared By: Confirmed by:

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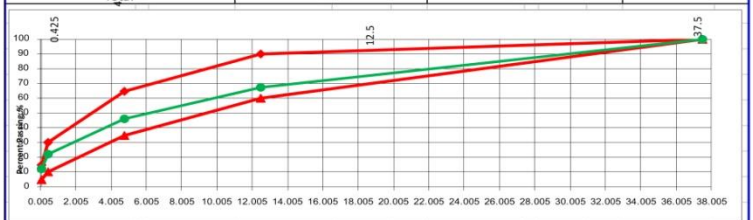
Test Method : AASHTO T-11 & T-27

Laboratory No. :			
Kind of Material :	Crushed Aggregate Base Course	*Item No.* :	
Sampled At :	Insitu (Sta. 36+164)	*Tested At* :	UNTL-Road Technology Laboratory
Original Sorce :	Insitu (Sta. 36+164)	*Date Sample Received* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	10-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	11-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	12-Oct-20

Weight of Original Sample, g :	3785		
Weight of Oven-Dried Sample, g :	3718	Moisture Content, % :	1.8
Wash Oven-Dried Sample, g :	3289		

Sieve Size		Retained, g.	% Retained	Cumulative		Specifications
Standard, mm	Alternative, in.			Wt. Passing, g.	% Passing	% Passing
75.0	3					
50.0	2					
37.5	**1 1/2**		0.00	3718	100	100
25.0	1	338	9.09	3380	91	
19.0	3/4	360	9.68	3020	81	
12.5	**1/2**	504	13.56	2516	68	60-90
9.5	3/8	295	7.93	2221	60	
4.75	**# 4**	508	13.66	1713	46	35-65
2.36	# 8	305	8.20	1408	38	
2.00	# 10	160	4.30	1248	34	
1.18	# 16	170	4.57	1078	29	
0.60	# 30	155	4.17	923	25	
0.425	**# 40**	100	2.69	823	22	10-30
0.300	**# 50**	68	1.83	755	20	
0.150	**# 100**	175	4.71	580	16	
0.075	**# 200**	120	3.23	460	12	5-15
PAN		31		0.83		
#200 Wash Loss		429		11.54		
#425 Total		3718		12.37		



Remarks

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TEST REPORT ON DETERMINING THE LIQUID LIMIT AND PLASTIC LIMIT OF SOILS

Test Method: AASHTO T 89-00 AND AASHTO T 90-00

		Laboratory No. :	
Kind of Material :	Crushed Aggregate Base Course	*Item No.*	
Sampled At. :	Insitu (Sta. 36+164)	*Tested At* :	TL-Road Technology Laborat
Original Source :	Insitu (Sta. 36+164)	*Date Sampled* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	9-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	10-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	11-Oct-20

Trial Number	Liquid Limit			Plastic Limit	
	1	2	3	1	2
Container No.	1	2	3	4	5
Wt. Cont. + Wet Soil, g.	26.70	29.60	22.90	16.10	14.30
Wt. Cont. + Dry Soil, g.	23.50	25.60	20.00	15.02	13.36
Wt. Of Moisture, g.	3.20	4.00	2.90	1.08	0.94
Wt. Of Container, g.	8.00	8.10	8.00	9.00	8.10
Wt. Of Dry Soil, g.	15.50	17.50	12.00	6.02	5.26
Moisture Content, %	21	23	24	18	18
No. of Blows	34	24	18	Average:	18

Sieve No. 10	:	34
Sieve No. 40	:	22
Sieve No. 200	:	12
Liquid Limit	:	23
Plastic Limit	:	18
Plasticity Index	:	5
Group Index	:	0
Group Classification	:	A-1-a(0)

Remarks :

Pripared By:

Confirmed by:

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TEST REPORT ON MOISTURE - DENSITY RELATIONS

Test Method: AASHTO T 99-01/180-01

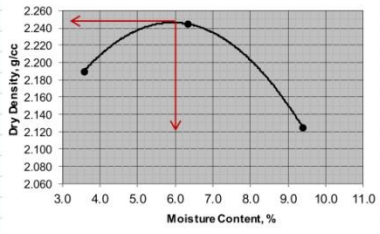
		Laboratory No. :	
Kind of Material :	Crushed Aggregate Base Course	*Item No.*	
Sampled At :	Insitu (Sta. 36+164)	*Tested At* :	UNTL-Road Technology Laboratory
Original Source :	Insitu (Sta. 36+164)	*Date Received in Lab.* :	3-Oct-20
Sampled By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced* :	6-Oct-20
Tested By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed* :	7-Oct-20
Computed By :	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released* :	8-Oct-20

DENSITY DETERMINATION

Trial Number	1	2	3	4	5
A.Water added	**2.5%**	**2.5%**	**2.5%**		
B.Weight of Mold + Weight of Soil, g	11333	11588	11455		
C.Weight of Mold, g	6444	6444	6444		
D.Weight of Wet Soil, g (B-C)	4889	5144	5011		
E.Volume of Mold, cc	2155.40	2155.40	2155.40		
F.Wet Density, g/cc (D/E)	2.268	2.387	2.325		
G.Dry Density, g/cc F/(1+MC/100)	2.190	2.245	2.125		

MOISTURE CONTENT DETERMINATION

Can Number	30	33	1		
a.Weight of Can + Wet Soil, g	72.8	78.6	95.6		
b.Weight of Can + Dry Soil, g	70.6	74.4	88.2		
c.Weight of Water, g (a-b)	2.2	4.2	7.4		
d.Weight of Can, g	9.1	8.0	9.4		
e.Weight of Dry Soil, g (b-d)	61.5	66.4	78.8		
f.Moisture Content, % (c/e)*100	3.58	6.33	9.39		



AASHTO :	T180
Method Used :	D
Rammer Description :	Modified
Water Content as Received :	
% Passing 19.0 mm (3/4-in.) :	100
Weight of Rammer, lbs :	10.0
Volume of Molds, cc :	2155.40
No. of Layers :	5
No. of Blows/Layer :	56
MDD, kg/m³ :	2.244
OMC %	6.000

Remarks:

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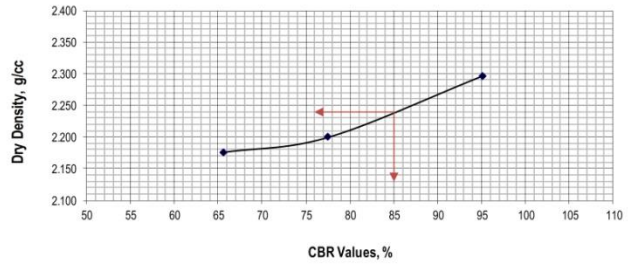
TEST REPORT ON THE CALIFORNIA BEARING RATIO
Test Method : AASHTO T 193-99

			Laboratory No.	:	
Kind of Material	:	Crushed Aggregate Base Course	*Item No.*	:	
Sampled At	:	Insitu (Sta. 36+164)	*Tested At*	:	UNTL-Road Technology Laboratory
Original Source	:	Insitu (Sta. 36+164)	*Date Sample Received*	:	October 3, 2020
Sampled By	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Commenced*	:	October 11, 2020
Tested By	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Completed*	:	October 12, 2020
Computed BY	:	ROAD TECHNOLOGY LABORATORY Team	*Date Test Released*	:	October 13, 2020

CBR Values

No. of Blows	CBR Value, %		Corrected CBR Value, %		Dry Density
	0.100 in.	0.200 in.	0.100 in.	0.200 in.	
10	53	66	-	-	2.176
30	61	78	-	-	2.200
65	71	95	-	-	2.297



MDD, g/cc	:	2.24			
OMC, %	:	6.0	CBR Value @ 100 % MDD	:	85.0

Remarks:

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