DAFTAR PUSTAKA

Agustawijaya, D. S. 2019. *Geologi Teknik*. Yogyakarta: ANDI.

Andreas, A. & Putra, A. 2018. Perbandingan Karakteristik Batuan Beku Erupsi Gunung Gamalama dan Gunung Talang, *Jurnal Fisika Unand*, 7, pp. 293–298.

Arif, I. 2016. *Geoteknik Tambang*. Jakarta: Gramedia Pustaka Utama.

Arikan, F. & Aydin, N. 2012. Influence of Weathering on the Engineering Properties of Dacites in Northeastern Turkey. *International Scholarly Research Network (ISRN) Soil Science*, p. 15. doi: 10.5402/2012/218527.

Aydin, A. & Basu, A. 2005. The *Schmidt Hammer* in Rock Material Characterization. *Engineering Geology*, pp. 1–14. doi: 10.1016/j.enggeo.2005.06.006.

Badan Pusat Statistik Kabupaten Gowa. 2020. *Kabupaten Gowa Dalam Angka 2020*. Gowa: Badan Pusat Statistik Kabupaten Gowa.

Badan Standar Nasional. 2012. *Metode uji angka pantul beton keras (ASTM C 805-02 , IDT)*. Jakarta: Badan Standarisasi Nasional.

Bunaciu, A. A., et al. 2015. X-Ray Diffraction: Instrumentation and Applications. *Critical Reviews in Analytical Chemistry*, pp. 289–299. doi: 10.1080/10408347.2014.949616.

Craig, J. R. & Vaughan, D. J. 1994. *Ore Microscopy Second Edition*. United States of Amerika: A Wiley-Interscience Publication.

Gercek, H. 2007. Poisson's Ratio Values for Rocks. *International Journal of Rock Mechanics and Mining Sciences*, Vol 44 , pp. 1–13. doi: 10.1016/j.ijrmms.2006.04.011.

Goudie, A. S. 2006. The *Schmidt Hammer* in Geomorphologial Research. *Progress in Physical Geography*, Vol 30, No.6, pp. 703–718.

Guskarnali. et al. 2020. Pengaruh Sifat Fisik Batuan Terhadap Kuat Tekan Uniaksial pada Batu Granit di Pulau Bangka. *Jurnal Geomine*, Vol 8, pp. 214–219.

Hanifah, D. A. et al. 2020. Analisis Pengaruh Tingkat Pelapukan Terhadap Kekuatan Batuan (Studi Kasus Pada Batulempung Dari Formasi Warukin). *Jurnal HIMASAPTA*, Vol 5, pp. 89–92.

Hasanah, N. *et al.* 2019. Alternatif Penentuan Uniaxial Compressive Strength Batulempung dari Point Load Strength Index dan Rebound Number *Schmidt Hammer*. *Jurnal GEOSAPTA*, Vol 5(2), pp. 127–132.

Indian Bureau of Mines. 2014. *Application of Rock Mechanics in Surface and Underground Mining*. Nagpur, India: C.S. Gundewar.

Islami, N. 2017. *Fisika Bumi*. 1st edn. Pekenbaru: Universitas Riau Press.

Karaman, K. and Kesimal, A. 2014. A Comparative Study of *Schmidt Hammer* Test Methods for Estimating the Uniaxial Compressive Strength of Rocks'. *Bulletin of Engineering Geology and the Environment* .

Kong, F. *et al.* 2021. Effect of Grain Size or Anisotropy on the Correlation Between Uniaxial Compressive Strength and *Schmidt Hammer* Test for Building Stones.

Construction and Building Materials. Vol 299. doi: 10.1016/j.conbuildmat.2021.123941.

Kurniawan, D. 2019. *Analisis Pengaruh Derajat Pelapukan Terhadap Kekuatan Batuan Menggunakan Uji Kuat Tekan Uniaksial Pada Batuan Trakit*. Universitas Hasanuddin.

Leba, E. P. *et al.* 2020. Analisis Pengaruh Kuat Tekan Batu Andesit Terhadap Model dan Arah Rekahan. *Prosiding Seminar Teknologi Kebumian dan Kelautan (SEMTAN II)*, Vol 2, pp. 417–421.

Melati, S. 2019. Studi Karakteristik Relasi Parameter Sifat Fisik Dan Kuat Tekan Uniaksial. *Jurnal GEOSAPTA*, Vol 5, pp. 133–139.

Minaeian, B. & Ahangari, K. 2013. Estimation Of Uniaxial Compressive Strength Based On P-Wave And *Schmidt Hammer* Rebound Using Statistical Method. *Arab J Geosci*, Vol 6, pp. 1925–1931.

Moon, V. & Jayawardane, J. 2004. Geomechanical And Geochemical Changes During Early Stages Of Weathering Of Karamu Basal, New Zealand. *Engineering Geology*, Vol 74, pp. 57–72. doi: 10.1016/j.enggeo.2004.02.002.

Nazir, R. *et al.* 2013. Prediction of Unconfined Compressive Strength of Limestone Rock Samples Using L-Type *Schmidt Hammer*. *Electronic Journal of Geotechnical Engineering*, Vol 1, pp. 1767–1775.

New York State Department of Transportation. 2013. *Geotechnical Design Manual Chapter 6*. New York : Geotechnical Engineering Bureau.

Purwanto. *et al.* 2017. Pengaruh Derajat Pelapukan Terhadap Kekuatan Batuan Pada Batuan Basal. *Prosiding Seminar Nasional Teknilogi IV*, pp. 27–34.

Pusat Vulkanologi dan Mitigasi Bencana Geologi. 2021. *Basal*. Diakses pada 11 Agustus 2022. *https://magma.esdm.go.id/v1/edukasi/glossary/basal*.

Qaidahiyani, N. F., Purwanto and Djamaluddin. 2021. Characterization Of Rock Strength In Gowa Regency : Implications For Development Planning. *AIP Conference Proceedings*.

Rai, M. A., Kramadibrata, S. and Wattimena, R. K. 2014. *Mekanika Batuan*. Bandung: Institut Teknologi Bandung (ITB).

Rangga, E., Kusnaryo and Kurnia, K. 2019. Analisis Efek Skala Pada Pengujian Kuat Tekan Uniaksial Terhadap Batu Dolomit Pada PT . Polowijo Gosari, Gresik Jawa Timur. *Prosiding Nasional Rekayasa Teknologi Industri dan Informasi XIII Tahun 2019 (ReTII)*, pp. 130–133.

Riswandi. 2016. *Penyelesaian Kasus Penambangan Pasir Ilegal (Studi Kasus Penambangan Pasir di Kabupaten Gowa)*. Universitas Islam Negeri Alauddin Makassar.

Sasmita, F., Ramelan, A. and Indro Basuki, N. 2017. Penentuan Kandungan Asbes Pada Material Gasket Menggunakan Teknik Petrografi Sayatan Tipis Dan Difraksi Sinar-X. *Jurnal Sains Materi Indonesia*, Vol 19(1), pp. 25–31. doi: 10.17146/jsmi.2017.19.1.4126.

Setiadji, P., Sadisun, I. A. and Bandono. 2006. Pengamatan dan Pengujian Lapangan dalam Karakterisasi Pelapukan Andesit di Purwakarta. *Jurnal Geoaplika*, Vol 1(1), pp. 3–13.

Siegesmund, S. and Snethlage, R. 2011. *Stone in architecture: Properties, Durability*, *Geoscience Centre, University of Gottingen*. Gottingen, Jerman: Springer.

Simanjuntak, J. et al. 2015. Kuat Tekan Berdasarkan Hammer Test dan Compression Test pada Benda Uji Silinder. *Prosiding Seminar Nasional HATTi*, pp. 35–42.

Simatupang, A. R. 2018. Korelasi Nilai Rebound *Schmidt Hammer* Dengan Nilai Uniaxial Compressive Strength (UCS) Seam Batubara A2 dan C Pada Pit 3 Timur Banko Barat, di PT. Bukit Asam, Tbk. *Prosiding XXVII Dan Kongres X PERHAPI 2018*, pp. 301–306.

Sumner, P. and Nel, W. 2002. The Effect Of Rock Moisture On *Schmidt Hammer* Rebound: Tests On Rock Samples From Marion Island And South Africa. *Earth Surface Processes and Landforms*, Vol 27(10), pp. 1137–1142. doi: 10.1002/esp.402.

Undul, O. and Tugrul, A. 2012. The Influence of Weathering on the Engineering Properties of Dunites. *Rock Mechanics and Rock Engineering*, Vol 45, pp. 225–239.

Wang, H. et al. 2016. Correlation of UCS Rating with *Schmidt Hammer* Surface Hardness for Rock Mass Classification. *Rock Mechanics and Rock Engineering*.

Wang, M. and Wan, W. 2019. A New Empirical Formula For Evaluating Uniaxial Compressive Strength Using The *Schmidt Hammer* Test. *International Journal of Rock Mechanics and Mining Sciences*, pp. 104094.

Wicaksono, D. *et al.* 2017. Teknik Preparasi Sampel dalam Analisis Minerologi dengan XRD (X-Ray Diffraction) di Departemen Teknik Geologi, Fakultas Teknik, Universitas Gadjah Mada. *Seminar Nasional Kebumian X*, pp. 1864–1880.

Widyawati, N. 2012. *Analisis Pengaruh Heating Rate terhadap Tingkat Kristal dan Ukuran Butir Lapisan Tipis Bzt yang Ditumbuhkan dengan Metode Sol Gel*, *Surakarta : Universitas Sebelas Maret*. Universitas Sebelas Maret.

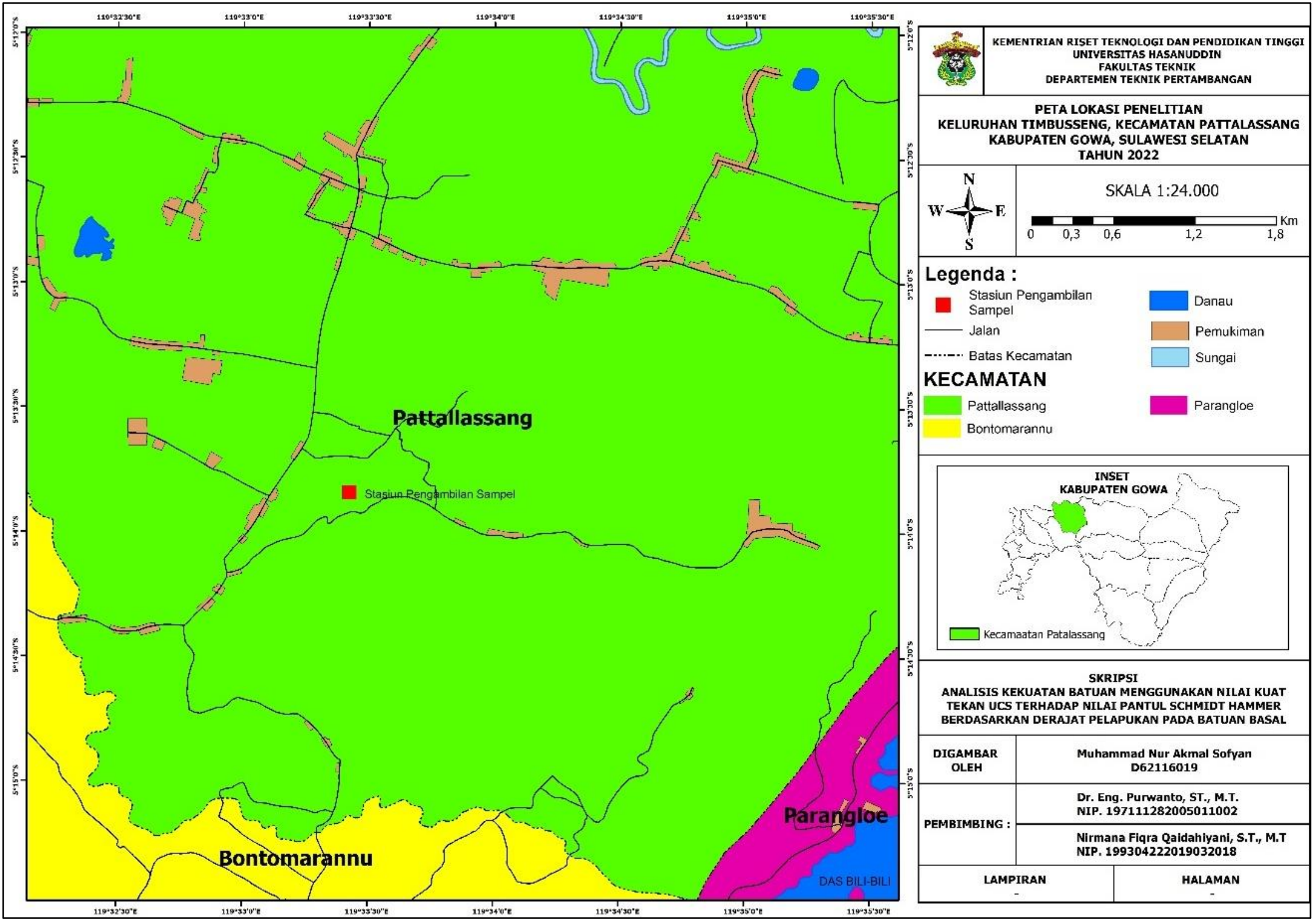
Yilmaz, I. 2009. A New Testing Method For Indirect Determination Of The Unconfined Compressive Strength Of Rocks. *International Journal of Rock Mechanics and Mining Sciences*, Vol 46(8), pp. 1349–1357. doi: 10.1016/j.ijrmms.2009.04.009.

Zakaria, Z. and Jihadi, L. 2016. Peran Ilmu Dasar dalam Geoteknik untuk Menunjang Pembangunan Berkelanjutan yang Berwawasan Lingkungan. *Bulletin of Scientific Contribution Fakultas teknik Geologi Universitas Padjajaran*, Vol 14, pp. 239–250.

LAMPIRAN

LAMPIRAN A

PETA LOKASI PENGAMBILAN SAMPEL



KEMENTRIAN RISET TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS HASANUDDIN
FAKULTAS TEKNIK
DEPARTEMEN TEKNIK PERTAMBANGAN

PETA LOKASI PENELITIAN
KELURUHAN TIMBUSSENG, KECAMATAN PATTALASSANG
KABUPATEN GOWA, SULAWESI SELATAN
TAHUN 2022

N
W E
S

SKALA 1:24.000

0 0,3 0,6 1,2 1,8 Km

Legenda :

- Stasiun Pengambilan Sampel
- Jalan
- Batas Kecamatan

KECAMATAN

- Pattallassang
- Bontomarannu
- Danau
- Pemukiman
- Sungai
- Parangloe

INSET
KABUPATEN GOWA

SKRIPSI
ANALISIS KEKUATAN BATUAN MENGGUNAKAN NILAI KUAT TEKAN UCS TERHADAP NILAI PANTUL SCHMIDT HAMMER BERDASARKAN DERAJAT PELAPUKAN PADA BATUAN BASAL

DIGAMBAR OLEH	**Muhammad Nur Akmal Sofyan** **D62116019**
PEMBIMBING :	**Dr. Eng. Purwanto, ST., M.T.** **NIP. 197111282005011002**
	Nirmana Fiqra Qaidahiyani, S.T., M.T **NIP. 199304222019032018**

LAMPIRAN	**HALAMAN**
-	-

LAMPIRAN B

LEMBAR DESKRIPSI MAKROSKOPIS BATUAN

LEMBAR DESKRIPSI BATUAN BEKU

Jenis Batuan : Batuan Beku

Warna

- Warna Segar : Abu-Abu Kehitaman
- Warna Lapuk : Coklat

Tekstur

- Kristalinitas : Holokristalin
- Granularitas : Porfiritik
- Fabrik
  - Bentuk : Subhedral
  - Relasi : Equigranular

Struktur : Masif

Komposisi Mineral :

Fenokris : Piroksin (Hitam)

Massa Dasar : Olivin (Hijau), Plagioklas Feldpar (Putih),

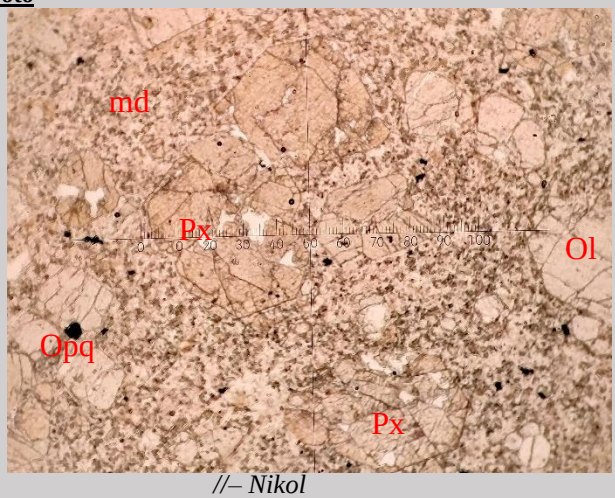
Nama Batuan : Basal Porfiri

LAMPIRAN C

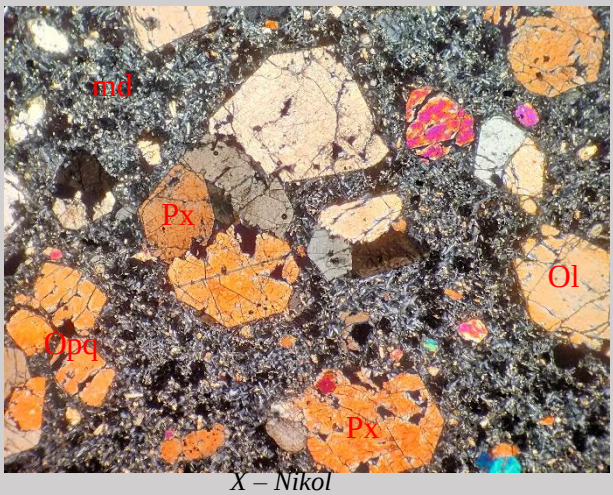
ANALISIS MIKROSKOPIS

Kode Sampel : DP. 2 **Lokasi : Kec.Pattalassang, Kab.Gowa**

Foto



//– Nikol



X – Nikol

Lensa Okuler : 10x *Lensa Obyektif : 4x* *Perbesaran Total : 40x*

Tipe Batuan **: Batuan Beku**

Tipe Stuktur **: Masif**

Klasifikasi **: Travis (1955)**

Mikroskopis **:**

Warna absorbsi kuning kecoklatan dan warna interferensi abu-abu kehitaman, warna-warni. Tekstur batuan kristalinitas hipokristalin, granularitas porfiritik, ukuran mineral 1,25 – 1,5 mm, bentuk mineral subhedral-anhedral, Komposisi mineral terdiri dari Piroksen, Olivin, Opaq, dan Massa dasar.

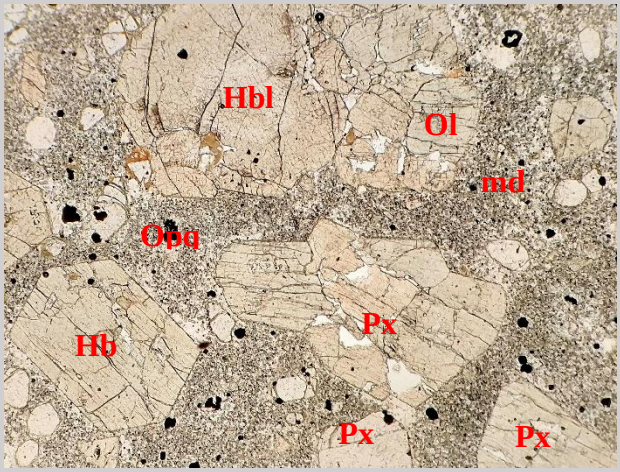
Deskripsi Material

Komposisi Material	Jumlah (%)	Keterangan Optik Material
Piroksen (Px)	**30**	Warna absobsi kuning kecoklatan, warna interferensi berwarna warni, bentuk subhedral–anhedral, relief sedang, intensitas sedang, pleokroisme dwikroik, memiliki belahan dan pecahan even. Ukuran mineral 1,25 – 1,5 mm, tidak memiliki kembaran, sudut pemadaman p=20, q=16. Indeks bias Nmin>Ncb.
Olivin (Ol)	**17**	Warna absobsi kuning kecoklatan, warna interferensi berwarna warni, bentuk subhedral–anhedral, relief sedang, intensitas sedang, pleokroisme dwikroik, tidak memiliki belahan dan pecahan uneven. Ukuran mineral 1,25 mm, tidak memiliki kembaran, sudut pemadaman p=20, q=16. Indeks bias Nmin>Ncb.
Massa Dasar (md)	**50**	Warna absorbsi kuning kecoklatan dan warna interferensi hitam putih, bentuk subhedral-anhedral, massa dasar berupa mineral fledspar
Mineral Opaq (Opq)	**3**	Warna absorbsi hitam dan warna interferensi hitam, bentuk subhedral-anhedral. Ukuran mineral 0,125 mm

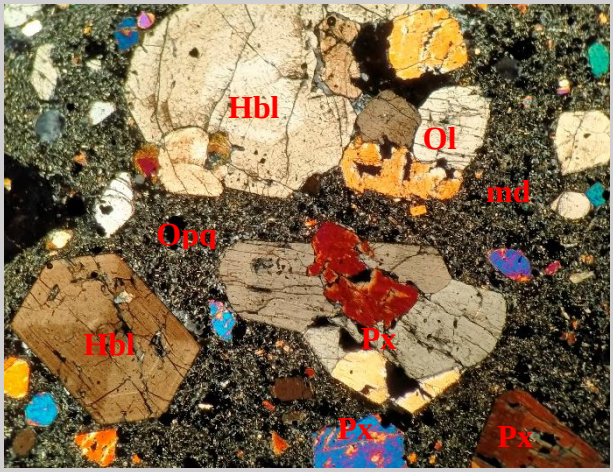
Nama Batuan **: Basal Porfiri (Travis, 1955)**

Kode Sampel : DP. 3 **Lokasi : Kec.Pattalassang, Kab.Gowa**

Foto



//– Nikol



X – Nikol

Lensa Okuler : 10x *Lensa Obyektif : 4x* *Perbesaran Total : 40x*

Tipe Batuan : **Batuan Beku**

Tipe Stuktur : **Masif**

Klasifikasi : **Travis (1955)**

Mikroskopis :

Warna absorbsi kuning kecoklatan dan warna interferensi abu-abu kehitaman, warna-warni. Tekstur batuan kristalinitas hipokristalin, granularitas porfiritik, ukuran mineral 0,05 – 1,75 mm, bentuk mineral subhedral-anhedral, Komposisi mineral terdiri dari Piroksen, Olivin, Hornblend, Muskovit, Opaq, dan Massa dasar.

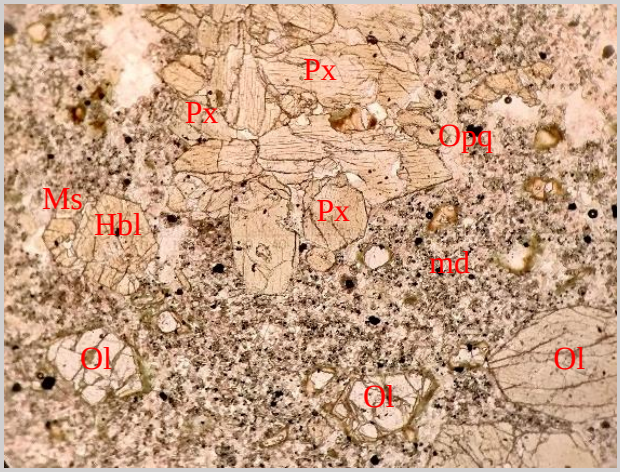
Deskripsi Material

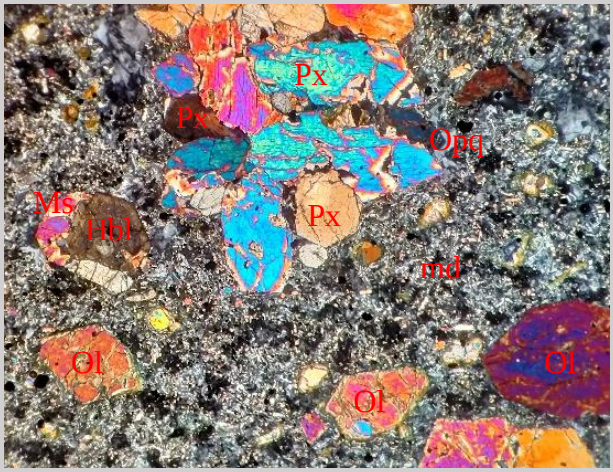
Komposisi Material	Jumlah (%)	Keterangan Optik Material
Piroksen (Px)	**20**	Warna absobsi kuning kecoklatan, warna interferensi berwarna warni, bentuk subhedral–anhedral, relief sedang, intensitas sedang, pleokroisme dwikroik, memiliki belahan dan pecahan even. Ukuran mineral 1,25 – 1,5 mm, tidak memiliki kembaran, sudut pemadaman p=20, q=16. Indeks bias Nmin>Ncb.
Olivin (Ol)	**12**	Warna absobsi kuning kecoklatan, warna interferensi berwarna warni, bentuk subhedral–anhedral, relief sedang, intensitas sedang, pleokroisme dwikroik, tidak memiliki belahan dan pecahan uneven. Ukuran mineral 1,25 mm, tidak memiliki kembaran, sudut pemadaman p=20, q=16. Indeks bias Nmin>Ncb.
Hornblende (Hbl)	**15**	Warna absobsi abu-abu kecoklatan, warna interferensi berwarna abu-abu kehitaman, bentuk subhedral–euhedral, relief sedang-tinggi, tidak memiliki belahan, intensitas sedang, pleokroisme dwikroik, ukuran mineral 1,5 –1,75 mm, sudut pemadaman 32°, jenis gelapan miring
Opaq (Op)	**3**	Warna absorbsi interferensi hitam, bentuk subhedral-anhedral, Ukuran mineral 0,125 mm
Massa Dasar	**50**	Warna absorbsi kuning kecoklatan dan warna interferensi hitam putih, bentuk subhedral-anhedral, massa dasar berupa mineral fledspar.

Nama Batuan : **Basal Porfiri (Travis, 1955)**

Kode Sampel : DP. 4 **Lokasi : Kec.Pattalassang, Kab.Gowa**

Foto





//– Nikol *X – Nikol*

Lensa Okuler : 10x *Lensa Obyektif : 4x* *Perbesaran Total : 40x*

Tipe Batuan : **Batuan Beku**

Tipe Stuktur : **Masif**

Klasifikasi : **Travis, 1955**

Mikroskopis :

Warna absorbsi kuning kecoklatan dan warna interferensi abu-abu kehitaman, warna-warni. Tekstur batuan kristalinitas hipokristalin, granularitas porfiritik, tekstur khusus rims texture dan intergrowth texture, ukuran mineral 0,25 – 1,5 mm, bentuk mineral subhedral-anhedral, Komposisi mineral terdiri dari Piroksen, Olivin, Muskovit, Hornblend, Opaq dan Massa dasar.

Deskripsi Material

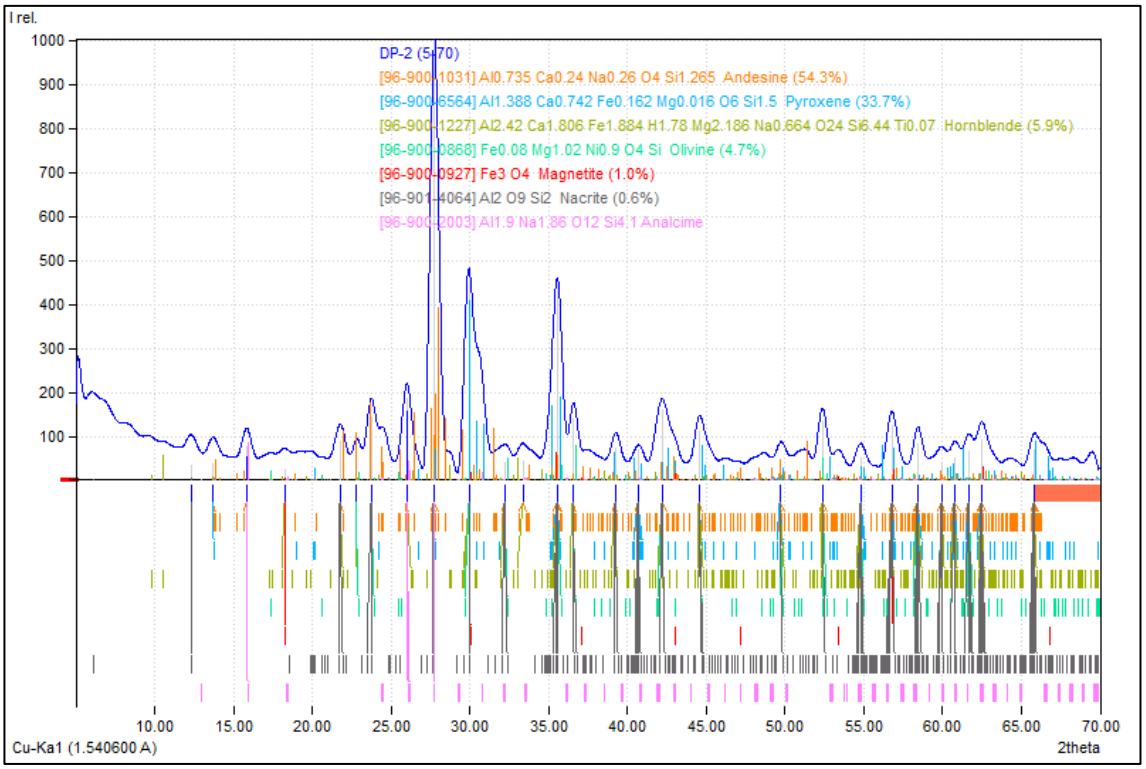
Komposisi Material	Jumlah (%)	Keterangan Optik Material
Piroksen (Px)	**25**	Warna absobsi kuning kecoklatan, warna interferensi berwarna warni, bentuk subhedral–anhedral, relief sedang, intensitas sedang, pleokroisme dwikroik, memiliki belahan dan pecahan even. Ukuran mineral 0,25 – 0,5 mm, tidak memiliki kembaran, sudut pemadaman p=20, q=16. Indeks bias Nmin>Ncb. Terdapat *intergrowth texture* bersama dengan mineral muskovit.
Olivin (Ol)	**12**	Warna absobsi kuning kecoklatan, warna interferensi berwarna warni, bentuk subhedral–anhedral, relief sedang, intensitas sedang, pleokroisme dwikroik, tidak memiliki belahan dan pecahan uneven. Ukuran mineral 1 – 1,25 mm, tidak memiliki kembaran, sudut pemadaman p=20, q=16. Indeks bias Nmin>Ncb. Terdapat *rims texture* yang mengelilingi mineral tersebut
Hornblende (Hbl)	**5**	Warna absobsi abu-abu kecoklatan, warna interferensi berwarna abu-abu kehitaman, bentuk subhedral–euhedral, relief sedang-tinggi, tidak memiliki belahan, intensitas sedang, pleokroisme dwikroik, ukuran mineral 0,75 mm, sudut pemadaman 32°, jenis gelapan miring. Terdapat *intergrowth texture* bersama dengan mineral muskovit.
Opaq (Opq)	**3**	Warna absorbsi interferensi hitam, bentuk subhedral-anhedral, Ukuran mineral 0,125 mm
Massa Dasar	**65**	Warna absorbsi kuning kecoklatan dan warna interferensi hitam putih, bentuk subhedral-anhedral, massa dasar berupa mineral fledspar

LAMPIRAN D

ANALISIS XRD

1. Hasil analisis XRD derajat pelapukan II

A. Diffraction Pattern Graphics



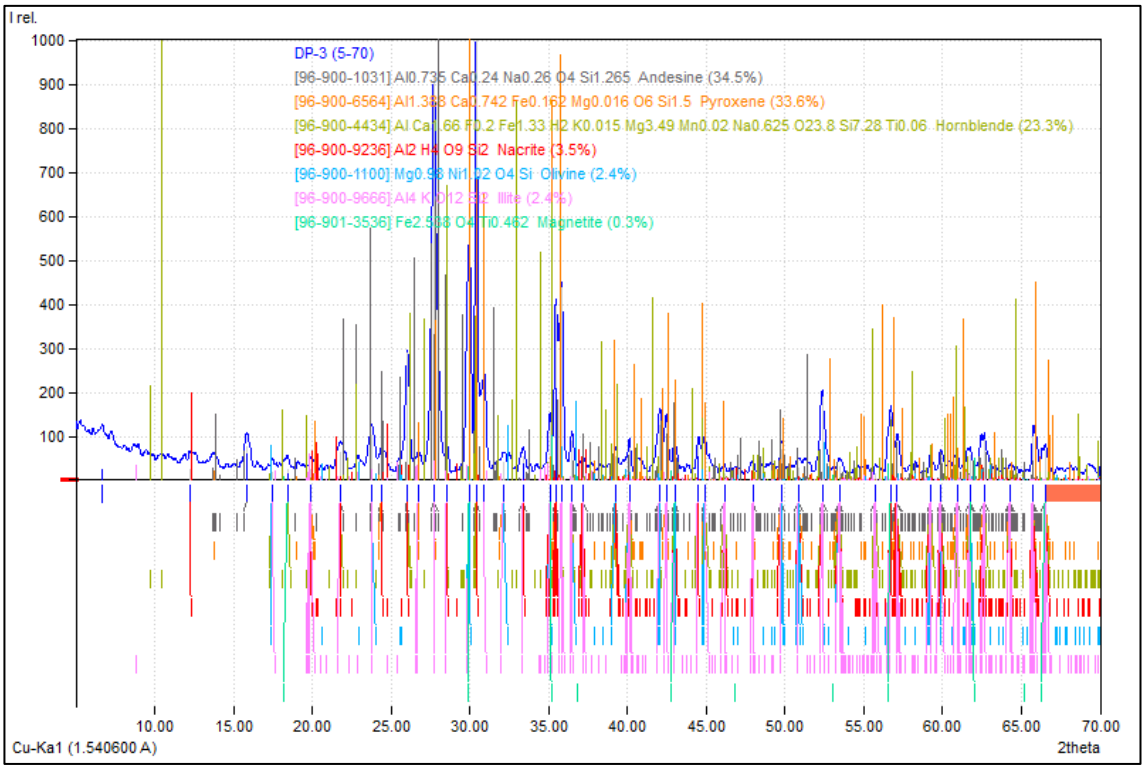
B. Peak list derajat pelapukan II

No.	2theta [º]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
1	12.32	7.1786	33.81	9.57	0.6272	F
2	13.72	6.4491	38.43	10.44	0.6272	A,B
3	15.84	5.5904	75.32	18.78	0.5756	A
4	18.26	4.8546	22.77	10.66	1.0809	C,E
5	21.78	4.0773	87.83	24.99	0.6570	A,C,F
6	22.82	3.8938	49.28	16.60	0.7460	A,C,D
7	23.76	3.7418	143.49	51.89	0.8350	A,D,F
8	26.00	3.4243	186.47	67.44	0.8350	A,C
9	27.76	3.2111	1000.00	277.20	0.6400	A,B,F
10	29.94	2.9820	459.23	155.00	0.7793	B,C,D,E,F
11	32.22	2.7760	39.64	21.50	1.2523	A,C,D,F

No.	2theta [º]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
12	33.36	2.6837	43.86	18.43	0.9703	A,C
13	35.54	2.5239	449.41	133.95	0.6882	A,B,C,D,E,F
14	36.58	2.4545	139.69	41.64	0.6882	A,C,D,F
15	39.26	2.2929	72.10	17.42	0.5577	A,B,C,F
16	40.72	2.2140	70.55	9.78	0.3200	A,B,C,F
17	42.22	2.1388	159.15	56.31	0.8169	A,B,C,D,F
18	44.60	2.0300	110.41	39.06	0.8169	A,B,C,D,F
19	49.74	1.8316	48.32	15.38	0.7346	A,B,C,D,F
20	52.38	1.7453	133.23	33.61	0.5825	A,C,D,F
21	54.80	1.6738	49.63	11.55	0.5373	A,B,C,D,F
22	56.78	1.6201	125.66	34.89	0.6411	A,B,C,E,F
23	58.44	1.5780	83.59	23.21	0.6411	A,B,C,D,F
24	59.92	1.5425	37.22	11.08	0.6873	A,C,D,F
25	60.80	1.5222	50.23	15.96	0.7335	A,B,C,F
26	61.66	1.5030	67.51	24.15	0.8259	A,B,C,D,F
27	62.48	1.4853	92.23	40.37	1.0107	A,B,C,D,E,F
28	65.82	1.4178	68.46	24.56	0.8284	A,B,C,E,F

2. Hasil analisis derajat pelapukan III

A. Diffraction Pattern Graphics



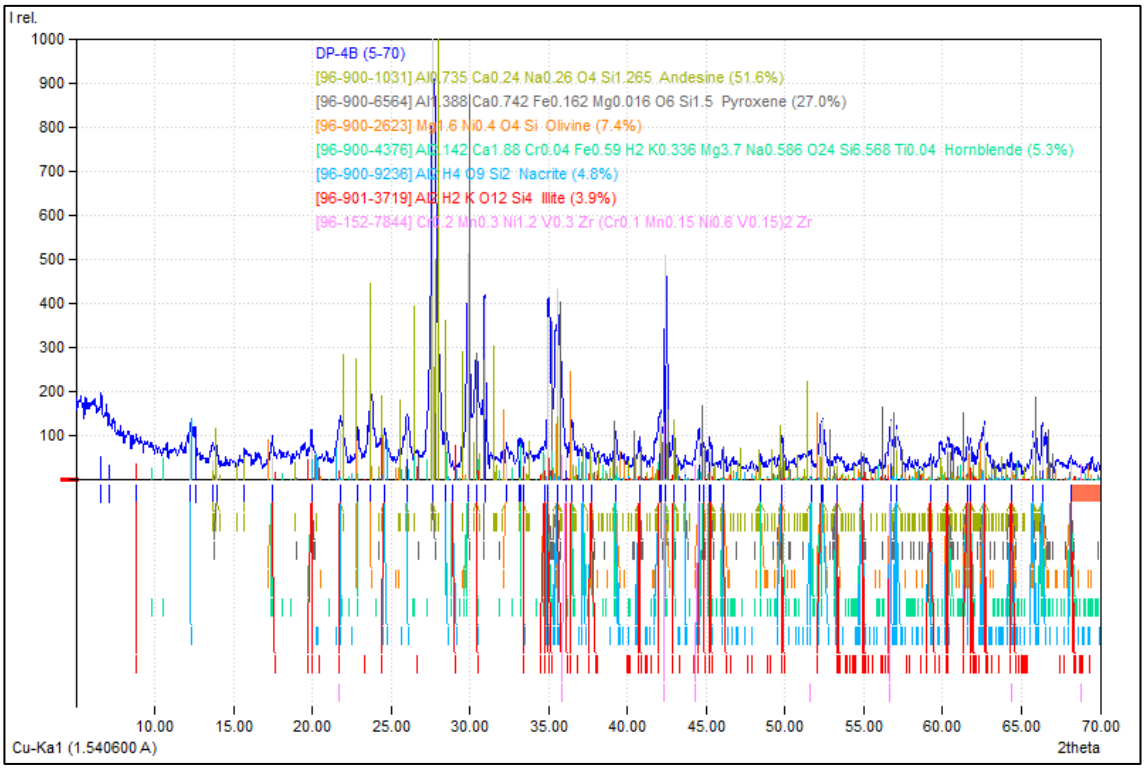
B. Peak list derajat pelapukan III

No.	2theta [°]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
1	12.22	7.2371	23.11	4.69	0.3413	D
2	15.86	5.5834	75.36	19.80	0.4421	A
3	17.48	5.0694	17.75	3.98	0.3771	C,E,F
4	18.44	4.8076	25.39	4.71	0.3122	C,G
5	19.90	4.4580	24.09	4.89	0.3415	B,C,D,F
6	21.78	4.0773	63.61	22.08	0.5840	A,C,D,F
7	23.76	3.7418	102.68	30.04	0.4922	A,E,F
8	24.42	3.6422	58.24	13.65	0.3942	A,B,D
9	26.04	3.4191	289.23	50.92	0.2962	A,C,D
10	26.74	3.3312	43.14	7.59	0.2962	B,F
11	27.72	3.2156	917.35	196.27	0.3600	A,B,F

No.	2theta [º]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
12	28.54	3.1251	59.65	12.76	0.3600	A,C,D,F
13	29.98	2.9782	545.26	108.19	0.3339	B,E,F,G
14	30.42	2.9361	1000.00	118.86	0.2000	A,B,C,D
15	30.92	2.8897	225.25	37.48	0.2800	B,F
16	32.12	2.7844	39.26	12.91	0.5534	A,B,E,F
17	33.38	2.6822	52.58	17.29	0.5534	A,D,F
18	35.08	2.5560	131.83	43.36	0.5534	B,C,D,E,F,G
19	35.46	2.5295	396.05	56.49	0.2400	A,B,D
20	35.80	2.5062	436.39	82.99	0.3200	A,B,C,E,F
21	36.48	2.4610	89.01	16.93	0.3200	A,C,E,F
22	37.16	2.4175	32.15	6.11	0.3200	A,C,D,F
23	39.26	2.2929	54.13	7.49	0.2330	A,B,C,D,E
24	40.14	2.2447	73.44	9.13	0.2092	A,B,C,D,E,F
25	42.06	2.1465	125.13	45.13	0.6069	A,C,E,F
26	42.46	2.1272	129.50	46.71	0.6069	A,B,C,F
27	43.00	2.1018	74.52	26.88	0.6069	A,B,C,D,E,F,G
28	44.52	2.0335	78.74	28.40	0.6069	C,D,F
29	44.90	2.0171	78.13	28.18	0.6069	A,B,C,E,F
30	46.16	1.9650	13.69	4.94	0.6069	A,B,C,D,F
31	47.96	1.8953	23.07	8.32	0.6069	A,B,C,D,F
32	49.80	1.8295	69.69	10.49	0.2533	A,B,C,D,E,F
33	50.90	1.7925	28.20	10.41	0.6213	A,B,D,E,F
34	52.36	1.7459	187.20	36.67	0.3296	A,C,D,E,F
35	53.44	1.7132	29.17	6.81	0.3930	A,B,C,D,E,F
36	55.76	1.6473	15.48	4.01	0.4248	A,C,D,F
37	56.72	1.6217	144.72	39.26	0.4565	A,B,C,D,E,F,G
38	57.12	1.6112	87.69	23.79	0.4565	A,B,C,D,E,F
39	59.24	1.5585	48.39	5.34	0.1858	A,B,C,D,E,F
40	59.88	1.5434	50.49	8.84	0.2944	A,C,D,E,F
41	60.94	1.5191	33.52	10.90	0.5471	A,B,C,F
42	61.74	1.5013	56.98	18.53	0.5471	A,B,C,D,E,F,G
43	62.64	1.4819	90.59	29.46	0.5471	A,B,C,D,E,F
44	64.28	1.4480	13.40	6.25	0.7850	A,B,C,D,F

3. Hasil analisis derajat pelapukan IV

A. Difraction Pattern Graphics



B. Peak list derajat pelapukan IV

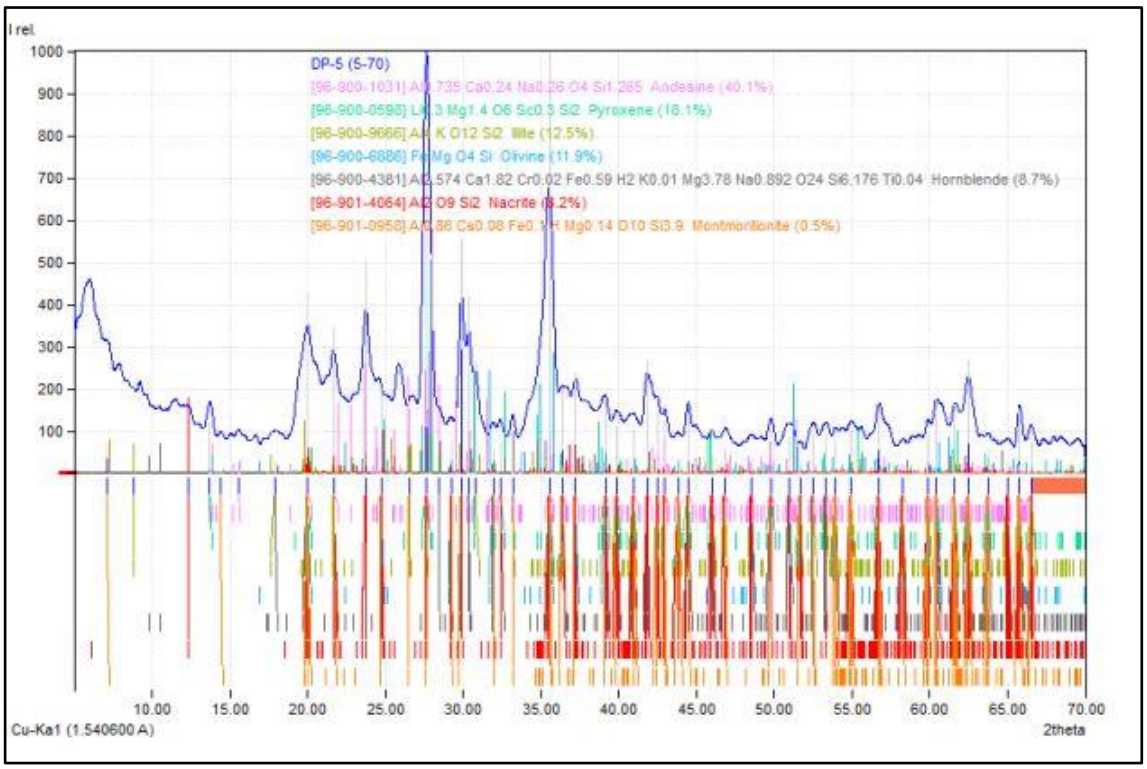
No.	2theta [°]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
1	8.84	9.9952	22.27	0,79	0.0812	F
2	12.26	7.2136	81.30	10.42	0.2926	E
3	13.68	6.4678	42.98	7.78	0.4133	A
4	13.92	6.3568	35.12	7.81	0.4369	A,B
5	15.70	5.6399	19.90	4.02	0.4605	A
6	17.48	5.0694	51.19	4.85	0.2163	C,D,F
7	19.96	4.4448	69.80	8.14	0.2661	B,D,E,F
8	21.80	4.0736	114.34	21.50	0.4290	A,C,D
9	22.90	3.8804	88.04	16.55	0.4290	A,C,D
10	23.70	3.7512	206.06	38.74	0.4290	A,C
11	24.60	3.6159	85.05	15.99	0.4290	A,E,F

No.	2theta [º]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
12	26.02	3.4217	122.42	18.70	0.3486	A,E
13	27.64	3.2247	1000.00	163.02	0.3720	A,B
14	28.44	3.1358	95.96	15.64	0.3720	A
15	28.46	3.1337	86.26	14.95	0.3406	D,E
16	28.90	3.0869	0.75	0.10	0.3093	D,E,F
17	29.90	2.9859	513.09	55.46	0.1672	B,C,D
18	30.44	2.9341	282.42	54.46	0.4400	A,B,D,E,F
19	30.94	2.8879	411.51	30.15	0.1672	B
20	32.30	2.7693	44.99	3.91	0.1986	A,C
21	33.10	2.7042	51.50	8.57	0.3797	A
22	33.26	2.6916	66.01	10.98	0.3797	D
23	33.40	2.6806	54.86	9.13	0.3797	A,E,F
24	34.76	2.5788	56.97	7.78	0.3116	C,D,E,F
25	34.96	2.5645	370.52	39.53	0.2434	B,C,D,E,F
26	35.60	2.5198	433.76	98.85	0.5200	A,B,C,D,E,F
27	36.12	2.4847	52.94	12.06	0.5200	D,F
28	36.50	2.4597	116.92	26.64	0.5200	A,C,D,F
29	37.18	2.4163	54.49	12.42	0.5200	A,D,E
30	37.74	2.3817	53.81	12.26	0.5200	A,B,C,D,E,F
31	39.22	2.2952	91.55	20.86	0.5200	A,B,C,D,E
32	40.78	2.2109	59.39	8.03	0.3087	A,B,D,E,F
33	42.02	2.1485	133.60	18.07	0.3087	A,D,E,F
34	42.12	2.1436	149.04	20.16	0.3087	A,B
35	42.44	2.1282	510.68	44.76	0.2000	A,B,C,D
36	42.92	2.1055	81.31	7.13	0.2000	A,B,D,E,F
37	43.66	2.0715	28.84	1.47	0.1159	A,B,E
38	44.54	2.0326	93.20	11.88	2.907	C,D,E,F
39	44.84	2.0197	66.45	8.47	0.2907	A,B,D,F
40	45.20	2.0044	77.19	9.83	0.2907	A,D,F
41	45.32	1.9994	63.73	8.12	0.2907	A,B,D,E,F
42	46.06	1.9690	49.23	6.27	0.2907	A,B,C,D,E,F
43	48.46	1.8769	34.88	2.34	0.1528	A,C,D
44	49.82	1.8288	79.55	9.59	0.2751	A,B,C,D,E,F

No	2theta [º]	d [Å	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
45	51.64	1.7686	38.66	10.54	0.6219	A,B,D,E
46	52.30	1.7478	129.10	35.19	0.6219	A,C,D,E,F
47	52.42	1.7441	136.38	37.17	0.6219	A,C,E
48	53.28	1.7180	42.60	11.61	0.6219	A,B,C,D,E,F
49	54,92	1.6705	38.05	10.37	0.6219	A,B,D,E,F
50	56.72	1.6217	132.63	36.15	0.6219	A,B,C,E,F
51	57.08	1.6123	115.53	31.49	0.6219	A,B,C,D,E
52	59.24	1.5585	43.23	11.78	0.6219	A,B,C,D,E,F
53	60.36	1.5323	87.52	23.85	0.6219	A,B,C,D,E,F
54	61.58	1.5048	83.86	22.86	0.6219	A,B,C,D,E,F
55	61.78	1.5048	83.86	22.86	0.6219	A,C,D,F
56	62.64	1.4819	125.08	34.09	0.6219	A,B,C,D,E,F
57	64.34	1.4468	41.79	11.39	0.6219	A,B,C,D,E,F
58	65.74	1.4193	96.67	26.35	0.6219	A,B,C,D,E
59	66.34	1.4079	121.17	33.02	0.6219	A,B,C,D,E
60	68.14	1.3750	38.10	10.39	0.6219	B,C,D,E,F

4. Hasil analisis derajat pelapukan V

A. Difraction Pattern Graphics



B. Peak list derajat pelapukan V

No.	2theta [º]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
1	8.84	9.9952	22.27	0,79	0.0812	F
2	12.26	7.2136	81.30	10.42	0.2926	E
3	13.68	6.4678	42.98	7.78	0.4133	A
4	13.92	6.3568	35.12	7.81	0.4369	A,B
5	15.70	5.6399	19.90	4.02	0.4605	A
6	17.48	5.0694	51.19	4.85	0.2163	C,D,F
7	19.96	4.4448	69.80	8.14	0.2661	B,D,E,F
8	21.80	4.0736	114.34	21.50	0.4290	A,C,D
9	22.90	3.8804	88.04	16.55	0.4290	A,C,D
10	23.70	3.7512	206.06	38.74	0.4290	A,C
11	24.60	3.6159	85.05	15.99	0.4290	A,E,F

No.	2theta [º]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
12	26.02	3.4217	122.42	18.70	0.3486	A,E
13	27.64	3.2247	1000.00	163.02	0.3720	A,B
14	28.44	3.1358	95.96	15.64	0.3720	A
15	28.46	3.1337	86.26	14.95	0.3406	D,E
16	28.90	3.0869	0.75	0.10	0.3093	D,E,F
17	29.90	2.9859	513.09	55.46	0.1672	B,C,D
18	30.44	2.9341	282.42	54.46	0.4400	A,B,D,E,F
19	30.94	2.8879	411.51	30.15	0.1672	B
20	32.30	2.7693	44.99	3.91	0.1986	A,C
21	33.10	2.7042	51.50	8.57	0.3797	A
22	33.26	2.6916	66.01	10.98	0.3797	D
23	33.40	2.6806	54.86	9.13	0.3797	A,E,F
24	34.76	2.5788	56.97	7.78	0.3116	C,D,E,F
25	34.96	2.5645	370.52	39.53	0.2434	B,C,D,E,F
26	35.60	2.5198	433.76	98.85	0.5200	A,B,C,D,E,F
27	36.12	2.4847	52.94	12.06	0.5200	D,F
28	36.50	2.4597	116.92	26.64	0.5200	A,C,D,F
29	37.18	2.4163	54.49	12.42	0.5200	A,D,E
30	37.74	2.3817	53.81	12.26	0.5200	A,B,C,D,E,F
31	39.22	2.2952	91.55	20.86	0.5200	A,B,C,D,E
32	40.78	2.2109	59.39	8.03	0.3087	A,B,D,E,F
33	42.02	2.1485	133.60	18.07	0.3087	A,D,E,F
34	42.12	2.1436	149.04	20.16	0.3087	A,B
35	42.44	2.1282	510.68	44.76	0.2000	A,B,C,D
36	42.92	2.1055	81.31	7.13	0.2000	A,B,D,E,F
37	43.66	2.0715	28.84	1.47	0.1159	A,B,E
38	44.54	2.0326	93.20	11.88	2.907	C,D,E,F
39	44.84	2.0197	66.45	8.47	0.2907	A,B,D,F
40	45.20	2.0044	77.19	9.83	0.2907	A,D,F
41	45.32	1.9994	63.73	8.12	0.2907	A,B,D,E,F
42	46.06	1.9690	49.23	6.27	0.2907	A,B,C,D,E,F
43	48.46	1.8769	34.88	2.34	0.1528	A,C,D
44	49.82	1.8288	79.55	9.59	0.2751	A,B,C,D,E,F

No	2theta [º]	d [Å	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
45	51.64	1.7686	38.66	10.54	0.6219	A,B,D,E
46	52.30	1.7478	129.10	35.19	0.6219	A,C,D,E,F
47	52.42	1.7441	136.38	37.17	0.6219	A,C,E
48	53.28	1.7180	42.60	11.61	0.6219	A,B,C,D,E,F
49	54,92	1.6705	38.05	10.37	0.6219	A,B,D,E,F
50	56.72	1.6217	132.63	36.15	0.6219	A,B,C,E,F
51	57.08	1.6123	115.53	31.49	0.6219	A,B,C,D,E
52	59.24	1.5585	43.23	11.78	0.6219	A,B,C,D,E,F
53	60.36	1.5323	87.52	23.85	0.6219	A,B,C,D,E,F
54	61.58	1.5048	83.86	22.86	0.6219	A,B,C,D,E,F
55	61.78	1.5048	83.86	22.86	0.6219	A,C,D,F
56	62.64	1.4819	125.08	34.09	0.6219	A,B,C,D,E,F
57	64.34	1.4468	41.79	11.39	0.6219	A,B,C,D,E,F
58	65.74	1.4193	96.67	26.35	0.6219	A,B,C,D,E
59	66.34	1.4079	121.17	33.02	0.6219	A,B,C,D,E
60	68.14	1.3750	38.10	10.39	0.6219	B,C,D,E,F

LAMPIRAN E

HASIL UJI *SCHMIDT HAMMER*

Hasil Uji *Schmidt Hammer* Pada Basal

NO	STASIUN	ANGKA PANTUL (R)										RATA-RATA
		1	2	3	4	5	6	7	8	9	10	
1	DP 2A	46	50	46	46	50	48	48	46	48	46	47,4
2	DP 2B	48	50	54	54	49	54	52	54	53	51	51,9
3	DP 2C	54	55	52	56	54	50	52	53	52	50	52,8
4	DP2D	44	49	44	46	46	48	48	44	48	48	46,5
5	DP 3A	33	38	36	34	32	32	32	32	36	36	34,1
6	DP 3B	28	32	28	30	30	32	34	30	32	33	30,9
7	DP 3C	35	32	32	34	31	36	36	34	30	34	33,4
8	DP 3D	36	34	30	33	32	35	35	30	30	30	32,5
9	DP 4A	11	11	11	11	12	11	15	13	13	13	12,1
10	DP 4B	12	13	14	15	16	12	13	14	14	14	13,7
11	DP 4C	14	11	10	10	14	16	14	13	12	11	12,5
12	DP 4D	13	18	12	16	13	14	12	17	15	14	14,4

LAMPIRAN F

PERHITUNGAN SIFAT FISIK BATUAN

A. Data pengujian sifat fisik batuan

Data pengujian sifat fisik berupa berat wadah gantung, berat natural (W_n), berat jenuh (W_w), berat gantung (W_S), dan berat kering (W_O). Berikut merupakan urian data uji sifat fisik sampel batuan.

Kode	W Wadah Gantung (gr)	W Natural (gr), Wn	W Kering (gr), Wo	W Jenuh (gr), Ww	W Gantung (gr), Ws
DP 21	0,9	43,6	43,4	43,8	29
DP 22	0,9	75,8	75,5	76,2	49,8
DP 23	0,9	71,1	70,8	71,5	46,6
DP 24	0,9	68,5	68,2	68,8	44,9
DP 31	0,9	107,9	107,2	108,4	69,1
DP 32	0,9	117,3	116,6	117,8	75,7
DP 33	0,9	75,2	74,7	75,5	48,1
DP 34	0,9	46,5	46,2	46,7	29,7
DP 41	0,9	53,7	53,1	53,9	33,8
DP 42	0,9	93,7	92,5	93,9	59,1
DP 43	0,9	45,3	44,8	45,5	28,4
DP 44	0,9	115,1	113,6	115,3	72,1

B. Bobot isi

Bobot isi terbagi menjadi bobot isi asli (*natural density*), bobot isi kering (*dry density*), dan bobot isi jenuh (*saturated density*). Berikut perhitungan nilai bobot isi batuan.

1. Bobot isi asli (*natural density*)

   Nilai bobot isi asli dihitung menggunakan Persamaan 2.1. Nilai bobot isi asli dari batuan adalah:

   Bobot isi natural DP 21 =

$$\frac{W_n}{W_w - W_s} = \frac{43{,}6\ g}{43{,}8\ g - 29\ g} = \frac{43{,}6\ g}{14{,}8\ g} = 2{,}946$$

Bobot isi natural DP 22 =

$$\frac{W_n}{W_w - W_s} = \frac{75{,}8\ g}{76{,}2\ g - 49{,}8\ g} = \frac{75{,}8\ g}{26{,}4\ g} = 2{,}871$$

Bobot isi natural DP 23 =

$$\frac{W_n}{W_w - W_s} = \frac{71{,}1\ g}{71{,}5\ g - 46{,}6\ g} = \frac{71{,}1\ g}{24{,}9\ g} = 2{,}855$$

Bobot isi natural DP 24 =

$$\frac{W_n}{W_w - W_s} = \frac{68{,}5\ g}{68{,}8\ g - 44{,}9\ g} = \frac{68{,}5\ g}{23{,}9\ g} = 2{,}866$$

Bobot isi natural DP 31 =

$$\frac{W_n}{W_w - W_s} = \frac{107{,}9\ g}{108{,}4\ g - 69{,}1\ g} = \frac{107{,}9\ g}{39{,}3\ g} = 2{,}746$$

Bobot isi natural DP 32 =

$$\frac{W_n}{W_w - W_s} = \frac{117{,}3\ g}{117{,}8\ g - 75{,}7g} = \frac{117{,}3\ g}{42{,}1\ g} = 2{,}786$$

Bobot isi natural DP 33 =

$$\frac{W_n}{W_w - W_s} = \frac{75{,}2\ g}{75{,}5\ g - 48{,}1\ g} = \frac{75{,}2\ g}{27{,}4\ g} = 2{,}745$$

Bobot isi natural DP 34 =

$$\frac{W_n}{W_w - W_s} = \frac{46{,}5\ g}{46{,}7\ g - 29{,}7\ g} = \frac{46{,}5\ g}{17\ g} = 2{,}735$$

Bobot isi natural DP 41 =

$$\frac{W_n}{W_w - W_s} = \frac{53{,}7\ g}{53{,}9\ g - 33{,}8\ g} = \frac{53{,}7\ g}{20{,}1\ g} = 2{,}672$$

Bobot isi natural DP 42 =

$$\frac{W_n}{W_w - W_s} = \frac{93{,}7\ g}{93{,}9\ g - 59{,}1\ g} = \frac{93{,}7\ g}{34{,}8\ g} = 2{,}693$$

Bobot isi natural DP 43 =

$$\frac{W_n}{W_w - W_s} = \frac{45{,}3\ g}{45{,}5\ g - 28{,}4\ g} = \frac{45{,}3\ g}{17{,}1\ g} = 2{,}649$$

Bobot isi natural DP 44 =

$$\frac{W_n}{W_w - W_s} = \frac{115{,}1\ g}{115{,}3\ g - 72{,}1\ g} = \frac{115{,}1\ g}{43{,}2\ g} = 2{,}664$$

2. Bobot isi jenuh (*saturated density*)

Nilai bobot isi jenuh dihitung menggunakan Persamaan 2.2. Nilai bobot isi jenuh dari batuan adalah:

Bobot isi jenuh DP 21 =

$$\frac{W_w}{W_w - W_s} = \frac{43{,}8\ g}{43{,}8\ g - 29\ g} = \frac{43{,}8\ g}{14{,}8\ g} = 2{,}959$$

Bobot isi jenuh DP 22 =

$$\frac{W_w}{W_w - W_s} = \frac{76{,}2\ g}{76{,}2\ g - 49{,}8\ g} = \frac{76{,}2\ g}{26{,}4\ g} = 2{,}886$$

Bobot isi jenuh DP 23 =

$$\frac{W_w}{W_w - W_s} = \frac{71{,}5\ g}{71{,}5\ g - 46{,}6\ g} = \frac{71{,}5\ g}{24{,}9\ g} = 2{,}871$$

Bobot isi jenuh DP 24 =

$$\frac{W_w}{W_w - W_s} = \frac{68{,}8\ g}{68{,}8\ g - 44{,}9\ g} = \frac{68{,}8\ g}{23{,}9\ g} = 2{,}879$$

Bobot isi jenuh DP 31 =

$$\frac{W_w}{W_w - W_s} = \frac{108{,}4\ g}{108{,}4\ g - 69{,}1\ g} = \frac{108{,}4\ g}{39{,}3\ g} = 2{,}758$$

Bobot isi jenuh DP 32 =

$$\frac{W_w}{W_w - W_s} = \frac{117{,}8\ g}{117{,}8\ g - 75{,}7\ g} = \frac{117{,}8\ g}{42{,}1\ g} = 2{,}798$$

Bobot isi jenuh DP 33 =

$$\frac{W_w}{W_w - W_s} = \frac{75{,}5\ g}{75{,}5\ g - 48{,}1\ g} = \frac{75{,}5\ g}{27{,}4\ g} = 2{,}755$$

Bobot isi jenuh DP 34 =

$$\frac{W_w}{W_w - W_s} = \frac{46{,}7\ g}{46{,}7\ g - 29{,}7\ g} = \frac{46{,}7\ g}{17\ g} = 2{,}747$$

Bobot isi jenuh DP 41 =

$$\frac{W_w}{W_w - W_s} = \frac{53{,}9\ g}{53{,}9\ g - 33{,}8\ g} = \frac{53{,}9g}{20{,}1\ g} = 2{,}682$$

Bobot isi jenuh DP 42 =

$$\frac{W_w}{W_w - W_s} = \frac{93{,}9\ g}{93{,}9\ g - 59{,}1\ g} = \frac{93{,}9\ g}{34{,}8\ g} = 2{,}698$$

Bobot isi jenuh DP 43 =

$$\frac{W_w}{W_w - W_s} = \frac{45{,}5\ g}{45{,}5\ g - 28{,}4\ g} = \frac{45{,}5\ g}{17{,}1\ g} = 2{,}661$$

Bobot isi jenuh DP 44 =

$$\frac{W_w}{W_w - W_s} = \frac{115{,}3\ g}{115{,}3\ g - 72{,}1\ g} = \frac{115{,}3\ g}{43{,}2\ g} = 2{,}669$$

3. Bobot isi kering (*dry density*)

Nilai bobot isi kering dihitung menggunakan Persamaan 2.3. Nilai bobot isi kering dari batuan adalah:

Bobot isi kering DP 21 =

$$\frac{W_o}{W_w - W_s} = \frac{43{,}4\ g}{43{,}8\ g - 29\ g} = \frac{43{,}4\ g}{14{,}8\ g} = 2{,}932$$

Bobot isi kering DP 22 =

$$\frac{W_o}{W_w - W_s} = \frac{75{,}5\ g}{76{,}2\ g - 49{,}8\ g} = \frac{75{,}5\ g}{26{,}4\ g} = 2{,}860$$

Bobot isi kering DP 23 =

$$\frac{W_o}{W_w - W_s} = \frac{70{,}8\ g}{71{,}5\ g - 46{,}6\ g} = \frac{70{,}8\ g}{24{,}9\ g} = 2{,}843$$

Bobot isi kering DP 24 =

$$\frac{W_o}{W_w - W_s} = \frac{68{,}2\ g}{68{,}8\ g - 44{,}9\ g} = \frac{68{,}2\ g}{23{,}9\ g} = 2{,}854$$

Bobot isi kering DP 31 =

$$\frac{W_o}{W_w - W_s} = \frac{107{,}2\ g}{108{,}4\ g - 69{,}1\ g} = \frac{107{,}2\ g}{39{,}3\ g} = 2{,}728$$

Bobot isi kering DP 32 =

$$\frac{W_o}{W_w - W_s} = \frac{116{,}6\ g}{117{,}8\ g - 75{,}7\ g} = \frac{116{,}9\ g}{42{,}1\ g} = 2{,}770$$

Bobot isi kering DP 33 =

$$\frac{W_o}{W_w - W_s} = \frac{74{,}7\ g}{75{,}5\ g - 48{,}1\ g} = \frac{74{,}7\ g}{27{,}4\ g} = 2{,}726$$

Bobot isi kering DP 34 =

$$\frac{W_o}{W_w - W_s} = \frac{46{,}2\ g}{46{,}7\ g - 29{,}7\ g} = \frac{46{,}2\ g}{17\ g} = 2{,}718$$

Bobot isi kering DP 41 =

$$\frac{W_o}{W_w - W_s} = \frac{53{,}1\ g}{53{,}9\ g - 33{,}8\ g} = \frac{53{,}1\ g}{20{,}1\ g} = 2{,}642$$

Bobot isi kering DP 42 =

$$\frac{W_o}{W_w - W_s} = \frac{92{,}5\ g}{93{,}9\ g - 59{,}1\ g} = \frac{92{,}5\ g}{34{,}8\ g} = 2{,}658$$

Bobot isi kering DP 43 =

$$\frac{W_o}{W_w - W_s} = \frac{44{,}8\ g}{45{,}5\ g - 28{,}4\ g} = \frac{44{,}8\ g}{17{,}1\ g} = 2{,}620$$

Bobot isi kering DP 44 =

$$\frac{W_o}{W_w - W_s} = \frac{113{,}6\ g}{115{,}3\ g - 72{,}1\ g} = \frac{113{,}6\ g}{43{,}2\ g} = 2{,}630$$

C. Kadar air

Kadar air terdiri atas kadar air asli (*natural water content*) dan kadar air jenuh (*saturated water content*). Berikut perhitungan nilai kadar air batuan berdasarkan hasil uji sifat fisik.

1. Kadar air asli (*natural water content*)

   Perhitungan nilai kadar air asli menggunakan Persamaan 2.6 sebagai berikut.

   Kadar air asli DP 21 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{43{,}6\ \text{g} - 43{,}4\ \text{g}}{43{,}4\ \text{g}}\right) \times 100\% = \left(\frac{0{,}2\ \text{g}}{43{,}4\ \text{g}}\right) \times 100\% = 0{,}461\%$$

Kadar air asli DP 22 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{75{,}8\ \text{g} - 75{,}5\ \text{g}}{75{,}5\ \text{g}}\right) \times 100\% = \left(\frac{0{,}3\ \text{g}}{75{,}5\ \text{g}}\right) \times 100\% = 0{,}397\%$$

Kadar air asli DP 23 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{71{,}1\ \text{g} - 70{,}8\ \text{g}}{70{,}8\ \text{g}}\right) \times 100\% = \left(\frac{0{,}3\ \text{g}}{70{,}8\ \text{g}}\right) \times 100\% = 0{,}424\%$$

Kadar air asli DP 24 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{68{,}5\ \text{g} - 68{,}2\ \text{g}}{68{,}2\ \text{g}}\right) \times 100\% = \left(\frac{0{,}3\ \text{g}}{68{,}2\ \text{g}}\right) \times 100\% = 0{,}44\%$$

Kadar air asli DP 31 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{107{,}9\ \text{g} - 107{,}2\ \text{g}}{107{,}2\ \text{g}}\right) \times 100\% = \left(\frac{0{,}7\ \text{g}}{107{,}2\ \text{g}}\right) \times 100\% = 0{,}653\%$$

Kadar air asli DP 32 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{117{,}3\ \text{g} - 116{,}6\ \text{g}}{116{,}6\ \text{g}}\right) \times 100\% = \left(\frac{0{,}7\ \text{g}}{116{,}6\ \text{g}}\right) \times 100\% = 0{,}6\%$$

Kadar air asli DP 33 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{75{,}2\ \text{g} - 74{,}7\ \text{g}}{74{,}7\ \text{g}}\right) \times 100\% = \left(\frac{0{,}5\ \text{g}}{74{,}7\ \text{g}}\right) \times 100\% = 0{,}669\%$$

Kadar air asli DP 34 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{46{,}5\ \text{g} - 46{,}2\ \text{g}}{46{,}2\ \text{g}}\right) \times 100\% = \left(\frac{0{,}3\ \text{g}}{46{,}2\ \text{g}}\right) \times 100\% = 0{,}649\%$$

Kadar air asli DP 41 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{53{,}7\ \text{g} - 53{,}1\ \text{g}}{53{,}1\ \text{g}}\right) \times 100\% = \left(\frac{0{,}6\ \text{g}}{53{,}1\ \text{g}}\right) \times 100\% = 1{,}13\%$$

Kadar air asli DP 42 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{93{,}7\ \text{g} - 92{,}5\ \text{g}}{92{,}5\ \text{g}}\right) \times 100\% = \left(\frac{1{,}2\ \text{g}}{92{,}5\ \text{g}}\right) \times 100\% = 1{,}297\%$$

Kadar air asli DP 43 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{45{,}3\ \text{g} - 44{,}8\ \text{g}}{44{,}8\ \text{g}}\right) \times 100\% = \left(\frac{0{,}5\ \text{g}}{44{,}8\ \text{g}}\right) \times 100\% = 1{,}116\%$$

Kadar air asli DP 44 = $\left(\frac{W_n - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{115{,}1\ \text{g} - 113{,}6\ \text{g}}{113{,}6\ \text{g}}\right) \times 100\% = \left(\frac{1{,}5\ \text{g}}{113{,}6\ \text{g}}\right) \times 100\% = 1{,}32\%$$

2. Kadar air jenuh (*saturated water content*)

Perhitungan nilai kadar air jenuh menggunakan Persamaan 2.7 sebagai berikut.

Kadar air jenuh DP 21 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{43{,}8\ \text{g} - 43{,}4\ \text{g}}{43{,}4\ \text{g}}\right) \times 100\% = \left(\frac{0{,}4\ \text{g}}{43{,}4\ \text{g}}\right) \times 100\% = 0{,}922\%$$

Kadar air jenuh DP 22 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{76{,}2 - 75{,}5\ \text{g}}{75{,}5\ \text{g}}\right) \times 100\% = \left(\frac{0{,}7\ \text{g}}{75{,}5\ \text{g}}\right) \times 100\% = 0{,}927\%$$

Kadar air jenuh DP 23 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{71{,}5\ \text{g} - 70{,}8\ \text{g}}{70{,}8\ \text{g}}\right) \times 100\% = \left(\frac{0{,}7\ \text{g}}{70{,}8\ \text{g}}\right) \times 100\% = \ 0{,}989\%$$

Kadar air jenuh DP 24 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{68{,}8\ \text{g} - 68{,}2\ \text{g}}{68{,}2\ \text{g}}\right) \times 100\% = \left(\frac{0{,}6\ \text{g}}{68{,}2\ \text{g}}\right) \times 100\% = 0{,}88\%$$

Kadar air jenuh DP 31 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{108{,}4\ \text{g} - 107{,}2\ \text{g}}{107{,}2\ \text{g}}\right) \times 100\% = \left(\frac{1{,}2\ \text{g}}{107{,}2\ \text{g}}\right) \times 100\% = 1{,}119\%$$

Kadar air jenuh DP 32 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{117{,}8\ \text{g} - 116{,}6\ \text{g}}{116{,}6\ \text{g}}\right) \times 100\% = \left(\frac{1{,}2\ \text{g}}{116{,}6\ \text{g}}\right) \times 100\% = \ 1{,}029\%$$

Kadar air jenuh DP 33 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{75{,}5\ \text{g} - 74{,}7\ \text{g}}{74{,}7\ \text{g}}\right) \times 100\% = \left(\frac{0{,}8\ \text{g}}{74{,}7\ \text{g}}\right) \times 100\% = 1{,}071\%$$

Kadar air jenuh DP 34 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{46{,}7\ \text{g} - 46{,}2\ \text{g}}{46{,}2\ \text{g}}\right) \times 100\% = \left(\frac{0{,}5\ \text{g}}{46{,}2\ \text{g}}\right) \times 100\% = 1{,}082\%$$

Kadar air jenuh DP 41 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{53{,}9\ \text{g} - 53{,}1\ \text{g}}{53{,}1\ \text{g}}\right) \times 100\% = \left(\frac{0{,}8\ \text{g}}{53{,}1\ \text{g}}\right) \times 100\% = 1{,}507\%$$

Kadar air jenuh DP 42 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{93{,}9\ \text{g} - 92{,}5\ \text{g}}{92{,}5\ \text{g}}\right) \times 100\% = \left(\frac{1{,}4\ \text{g}}{92{,}5\ \text{g}}\right) \times 100\% = 1{,}514\%$$

Kadar air jenuh DP 43 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{45{,}5\ \text{g} - 44{,}8\ \text{g}}{44{,}8\ \text{g}}\right) \times 100\% = \left(\frac{0{,}7\text{g}}{44{,}8\ \text{g}}\right) \times 100\% = 1{,}563\%$$

Kadar air jenuh DP 44 = $\left(\frac{W_w - W_o}{W_o}\right) \times 100\%$

$$= \left(\frac{115{,}3\ \text{g} - 113{,}6\ \text{g}}{113{,}6\ \text{g}}\right) \times 100\% = \left(\frac{1{,}7\ \text{g}}{113{,}6\ \text{g}}\right) \times 100\% = 1{,}496\%$$

D. Derajat kejenuhan

Perhitungan nilai derajat kejenuhan menggunakan Persamaan 2.8 diuraikan sebagai berikut.

Derajat kejenuhan DP 21 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{43{,}6\ \text{g} - 43{,}4\ \text{g}}{43{,}8\ \text{g} - 43{,}4\ \text{g}}\right) \times 100\% = 50\%$$

Derajat kejenuhan DP 22 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{75{,}8\ \text{g} - 75{,}5\ \text{g}}{76{,}2\ \text{g} - 75{,}5\ \text{g}}\right) \times 100\% = 42{,}857\%$$

Derajat kejenuhan DP 23 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{71{,}1\ g - 70{,}8\ g}{71{,}5\ g - 70{,}8\ g}\right) \times 100\% = 42{,}857\%$$

Derajat kejenuhan DP 24 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{68{,}5\ g - 68{,}2\ g}{68{,}8\ g - 68{,}2\ g}\right) \times 100\% = 50\%$$

Derajat kejenuhan DP 31 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{107{,}9\ g - 107{,}2\ g}{108{,}4\ g - 107{,}2\ g}\right) \times 100\% = 58{,}33\%$$

Derajat kejenuhan DP 32 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{117{,}3\ g - 116{,}6\ g}{117{,}8\ g - 116{,}6\ g}\right) \times 100\% = 58{,}33\%$$

Derajat kejenuhan DP 33 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{75{,}2\ g - 74{,}7\ g}{75{,}5\ g - 74{,}7\ g}\right) \times 100\% = 62{,}5\%$$

Derajat kejenuhan DP 34 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{46{,}5\ g - 46{,}2\ g}{46{,}7\ g - 46{,}2\ g}\right) \times 100\% = 60\%$$

Derajat kejenuhan DP 41 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{53{,}7\ g - 53{,}1\ g}{53{,}9\ g - 53{,}1\ g}\right) \times 100\% = 75\%$$

Derajat kejenuhan DP 42 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{93{,}7\ g - 92{,}5\ g}{93{,}9\ g - 92{,}5\ g}\right) \times 100\% = 85{,}714\%$$

Derajat kejenuhan DP 43 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{45{,}3\ g - 44{,}8\ g}{45{,}5\ g - 44{,}8\ g}\right) \times 100\% = 71{,}429\%$$

Derajat kejenuhan DP 44 =

$$\left(\frac{W_n - W_o}{W_w - W_o}\right) \times 100\% = \left(\frac{115{,}1\ g - 113{,}6\ g}{115{,}3\ g - 113{,}6\ g}\right) \times 100\% = 88{,}235\%$$

E. Porositas (n)

Perhitungan nilai porositas menggunakan Persamaan 2.9 diuraikan sebagai berikut.

Porositas DP 21 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{43{,}8\ g - 43{,}4\ g}{43{,}8\ g - 29\ g}\right) \times 100\% = \left(\frac{0{,}4\ g}{14{,}8\ g}\right) \times 100\% = 2{,}703\%$$

Porositas DP 22 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{76{,}2\ g - 75{,}5\ g}{76{,}2\ g - 49{,}8\ g}\right) \times 100\% = \left(\frac{0{,}7\ g}{26{,}5\ g}\right) \times 100\% = 2{,}652\%$$

Porositas DP 23 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{71{,}5\ g - 70{,}8\ g}{71{,}5\ g - 46{,}6\ g}\right) \times 100\% = \left(\frac{0{,}7\ g}{24{,}9\ g}\right) \times 100\% = 2{,}811\%$$

Porositas DP 24 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{68{,}8\ g - 68{,}2\ g}{68{,}8\ g - 44{,}9\ g}\right) \times 100\% = \left(\frac{0{,}6\ g}{23{,}9\ g}\right) \times 100\% = 2{,}510\%$$

Porositas DP 31 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{108{,}4\ g - 107{,}2\ g}{108{,}4\ g - 69{,}1\ g}\right) \times 100\% = \left(\frac{1{,}2\ g}{39{,}3\ g}\right) \times 100\% = 3{,}053\%$$

Porositas DP 32 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{117{,}8\ g - 116{,}6\ g}{117{,}8\ g - 75{,}7\ g}\right) \times 100\% = \left(\frac{1{,}2\ g}{42{,}1\ g}\right) \times 100\% = 2{,}850\%$$

Porositas DP 33 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{75{,}5\ g - 74{,}7\ g}{75{,}5\ g - 48{,}1\ g}\right) \times 100\% = \left(\frac{0{,}8\ g}{27{,}4\ g}\right) \times 100\% = 2{,}920\%$$

Porositas DP 34 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{46{,}7\ g - 46{,}2\ g}{46{,}7\ g - 29{,}7\ g}\right) \times 100\% = \left(\frac{0{,}5\ g}{17\ g}\right) \times 100\% = 2{,}941\%$$

Porositas DP 41 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{53{,}9\ g - 53{,}1\ g}{53{,}9\ g - 33{,}8\ g}\right) \times 100\% = \left(\frac{0{,}8\ g}{20{,}1\ g}\right) \times 100\% = 3{,}980\%$$

Porositas DP 42 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{93{,}9\ g - 92{,}5\ g}{93{,}9\ g - 59{,}1\ g}\right) \times 100\% = \left(\frac{1{,}4\ g}{34{,}8\ g}\right) \times 100\% = 4{,}023\%$$

Porositas DP 43 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{45{,}5\ g - 44{,}8\ g}{45{,}5\ g - 28{,}4\ g}\right) \times 100\% = \left(\frac{0{,}7\ g}{17{,}1\ g}\right) \times 100\% = 4{,}094\%$$

Porositas DP 44 =

$$\left(\frac{W_w - W_o}{W_w - W_s}\right) \times 100\% = \left(\frac{115{,}3\ g - 113{,}6\ g}{115{,}3\ g - 72{,}1\ g}\right) \times 100\% = \left(\frac{1{,}7\ g}{43{,}2\ g}\right) \times 100\% = 3{,}935\%$$

F. Nisbah pori (e)

Perhitungan nilai nisbah pori dengan menggunakan Persamaan 2.10 diuraikan sebagai berikut.

Nisbah pori DP 21 =

$$\frac{n}{1-n} = \frac{0{,}027}{(1-0{,}027)} = 0{,}028$$

Nisbah pori DP 22 =

$$\frac{n}{1-n} = \frac{0{,}026}{1-0{,}026} = 0{,}027$$

Nisbah pori DP 23 =

$$\frac{n}{1-n} = \frac{0{,}028}{1-0{,}028} = 0{,}029$$

Nisbah pori DP 24 =

$$\frac{n}{1-n} = \frac{0{,}025}{(1-0{,}025)} = 0{,}026$$

Nisbah pori DP 31 =

$$\frac{n}{1-n} = \frac{0{,}03}{1-0{,}03} = 0{,}031$$

Nisbah pori DP 32 =

$$\frac{n}{1-n} = \frac{0{,}029}{1-0{,}029} = 0{,}029$$

Nisbah pori DP 33 =

$$\frac{\mathrm{n}}{1-\mathrm{n}} = \frac{0{,}029}{(1-0{,}029)} = 0{,}030$$

Nisbah pori DP 34 =

$$\frac{\mathrm{n}}{1-\mathrm{n}} = \frac{0{,}029}{1-0{,}029} = 0{,}030$$

Nisbah pori DP 41 =

$$\frac{\mathrm{n}}{1-\mathrm{n}} = \frac{0{,}039}{1-0{,}039} = 0{,}041$$

Nisbah pori DP 42 =

$$\frac{\mathrm{n}}{1-\mathrm{n}} = \frac{0{,}04}{(1-0{,}04)} = 0{,}042$$

Nisbah pori DP 43 =

$$\frac{\mathrm{n}}{1-\mathrm{n}} = \frac{0{,}041}{1-0{,}041} = 0{,}043$$

Nisbah pori DP 44 =

$$\frac{\mathrm{n}}{1-\mathrm{n}} = \frac{0{,}039}{1-0{,}039} = 0{,}041$$

G. Hasil Perhitungan Nilai Sifat Fisik Batuan

Tabel G.1 Hasil Perhitungan Nilai Sifat Fisik Batuan

Kondisi sampel	Kode	ρ_n (gr/cm3)	ρ_d (gr/cm3)	ρ_s (gr/cm3)	w_n (%)	w_s (%)	S	n	e
Derajat Pelapukan II	DP 21	2,946	2,932	2,959	0,461	0,922	50,000	2,703	0,028
	DP 22	2,871	2,860	2,886	0,397	0,927	42,857	2,652	0,027
	DP 23	2,855	2,843	2,871	0,424	0,989	42,857	2,811	0,029
	DP 24	2,866	2,854	2,879	0,440	0,880	50,000	2,510	0,026
Derajat Pelapukan III	DP 31	2,746	2,728	2,758	0,653	1,119	58,333	3,053	0,031
	DP 32	2,786	2,770	2,798	0,600	1,029	58,333	2,850	0,029
	DP 33	2,745	2,726	2,755	0,669	1,071	62,500	2,920	0,030
	DP 34	2,735	2,718	2,747	0,649	1,082	60,000	2,941	0,030
Derajat Pelapukan IV	DP 41	2,672	2,642	2,682	1,130	1,507	75,000	3,980	0,041
	DP 42	2,693	2,658	2,698	1,297	1,514	85,714	4,023	0,042
	DP 43	2,649	2,620	2,661	1,116	1,563	71,429	4,094	0,043
	DP 44	2,664	2,630	2,669	1,320	1,496	88,235	3,935	0,041

Keterangan

W_n = Berat normal (gram)
W_w = Berat jenuh (gram)
W_s = Berat gantung (gram)
W_o = Berat kering (gram)
ρ_n = Bobot isi natural (gram/cm^3)
ρ_s = Bobot isi jenuh (gram/cm^3)
ρ_d = Bobot isi kering (gram/cm^3)
γ_t = Berat jenis asli
γ_a = Berat jenis semu
w_n = Kadar air asli (%)
w_s = Kadar air jenuh (%)
S = Derajat kejenuhan (%)
n = Porositas (%)
e = Nisbah pori

LAMPIRAN G

HASIL UJI KUAT TEKAN UNIAKSIAL

A. Hasil pengukuran tinggi dan diameter sampel batuan uji

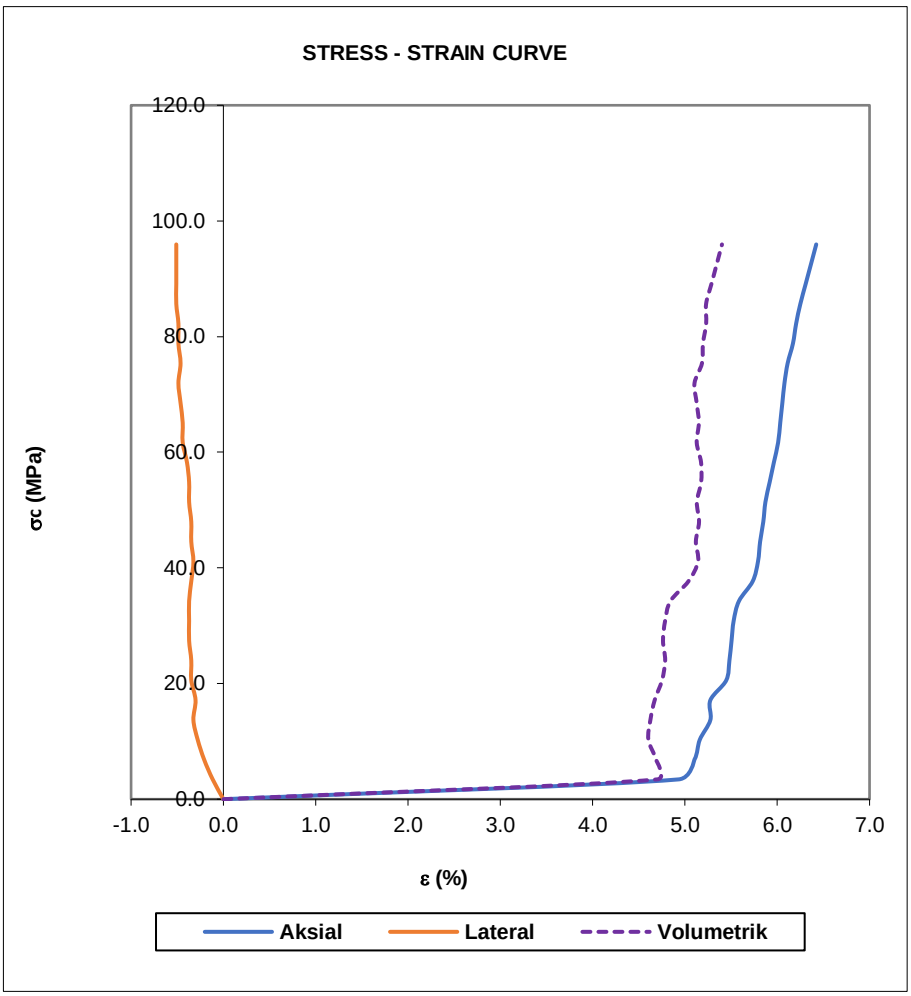
No.	Kode	Litologi	Length (mm)				Diameter (mm)				L/D	Luas penaMPang (mm2)	2D/L
			1	2	3	Rata-rata	1	2	3	Rata-rata			
1	DP 21	Basal	87,19	87,26	87,14	87,20	43,12	42,08	43,09	43,10	2,02	1459,32	0,99
2	DP 22	Basal	87,33	87,35	87,4	87,36	43,1	43,5	43,59	43,40	2,01	1479,71	0,99
3	DP 23	Basal	86,63	86,6	86,63	86,62	43,12	43,23	43,1	43,15	2,01	1462,94	1,00
4	DP 24	Basal	87,41	87,55	87,42	87,46	43,26	43,12	43,09	43,16	2,03	1463,39	0,99
5	DP 31	Basal	86,54	86,57	86,38	86,50	43,12	43,09	43,1	43,10	2,01	1459,78	1,00
6	DP 32	Basal	86,34	86,37	86,41	86,37	43,12	43,13	43,12	43,12	2,00	1461,13	1,00
7	DP 33	Basal	87,16	87,15	87,18	87,16	43,1	43,12	43,15	43,12	2,02	1461,13	0,99
8	DP 34	Basal	86,89	86,95	86,8	86,88	43,19	43,13	43,15	43,16	2,01	1463,39	0,99
9	DP 41	Basal	86,71	86,72	86,65	86,69	43,12	43,1	43,13	43,12	2,01	1460,68	0,99
10	DP 42	Basal	86,04	86,06	86,12	86,07	43,07	43,08	43,06	43,07	2,00	1457,52	1,00
11	DP 43	Basal	86,56	86,64	86,56	86,59	43,01	43,09	43,1	43,07	2,01	1457,29	0,99
12	DP 44	Basal	87,21	87,29	87,1	87,20	43,16	43,21	43,19	43,19	2,02	1465,43	0,99

B. Sampel DP 21

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 21

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	430	130	-135	3,42	4,93	-0,11	4,69
10	445	145	-154	6,85	5,10	-0,20	4,68
15	450	150	-162	10,27	5,16	-0,27	4,60
20	460	151	-165	13,70	5,27	-0,32	4,62
25	460	156	-169	17,13	5,27	-0,30	4,67
30	475	158	-173	20,55	5,44	-0,34	4,75
35	478	190	-205	23,98	5,48	-0,34	4,78
40	480	190	-206	27,40	5,50	-0,37	4,76
45	482	192	-208	30,83	5,52	-0,37	4,78
50	487	194	-210	34,26	5,58	-0,37	4,84
55	500	195	-210	37,68	5,73	-0,34	5,03
60	505	196	-210	41,11	5,79	-0,32	5,14
65	507	196	-211	44,54	5,81	-0,34	5,11
70	510	196	-211	47,96	5,84	-0,34	5,15
75	512	197	-213	51,39	5,87	-0,37	5,12
80	516	197	-213	54,81	5,91	-0,37	5,17
85	520	197	-214	58,24	5,96	-0,39	5,17
90	524	197	-216	61,67	6,00	-0,44	5,12
95	526	198	-217	65,09	6,03	-0,44	5,15
100	528	198	-218	68,52	6,05	-0,46	5,12
105	530	198	-219	71,95	6,07	-0,48	5,10
110	533	199	-219	75,37	6,11	-0,46	5,18
115	538	199	-220	78,80	6,16	-0,48	5,19
120	541	199	-220	82,22	6,20	-0,48	5,22
125	545	200	-222	85,65	6,25	-0,51	5,22
130	550	200	-222	89,08	6,30	-0,51	5,28
135	555	200	-222	92,51	6,36	-0,51	5,34
140	560	200	-222	95,93	6,42	-0,51	5,40

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 21



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 95,93 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{95{,}934\ \text{MPa} - 37{,}688\ \text{MPa}}{6{,}422\% - 5{,}734\ \%} = \frac{58{,}246\text{MPa}}{0{,}00688} = 8.464{,}78\ \text{MPa}$$

c. Nisbah Poisson (υ)

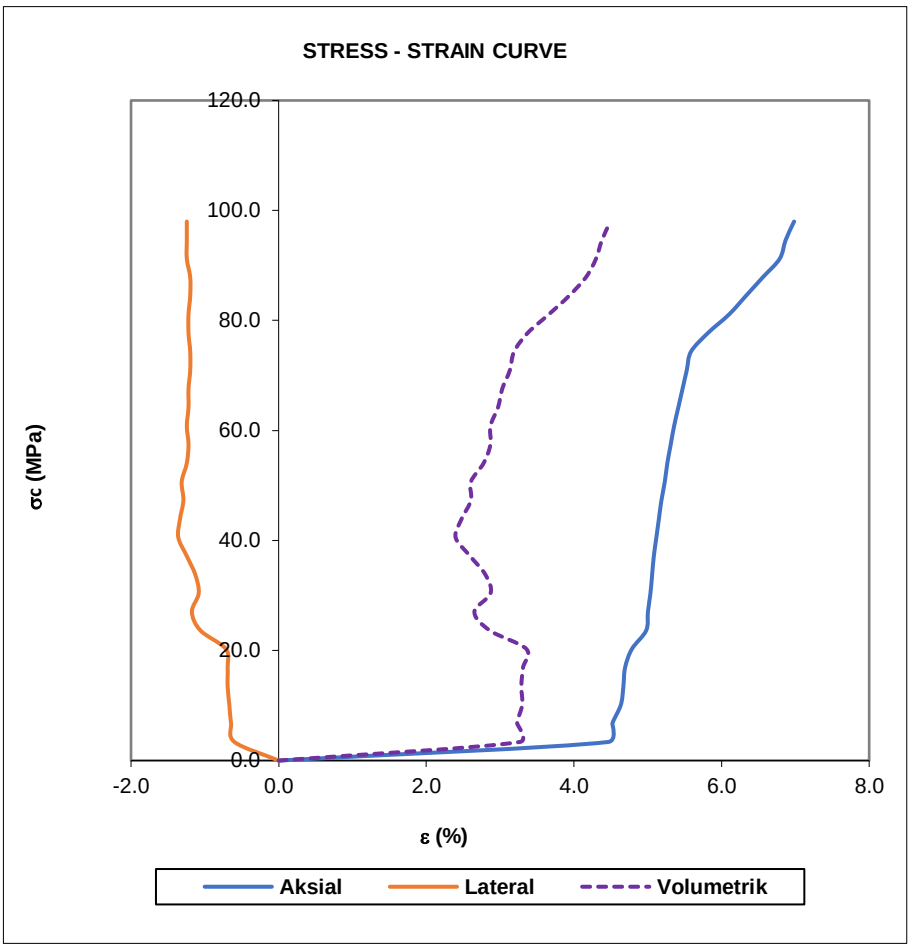
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}53)\% - (-0{,}33)\%}{4{,}35\% - 3{,}26\ \%}\right) = -\left(\frac{-0{,}0020}{0{,}0109}\right) = 0{,}24$$

C. Sampel DP 22

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 22

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	390	132	-106	3,379	4,464	-0,599	3,266
10	395	135	-107	6,758	4,521	-0,645	3,231
15	405	137	-108	10,137	4,635	-0,668	3,299
20	408	139	-109	13,516	4,670	-0,691	3,287
25	410	140	-110	16,895	4,693	-0,691	3,310
30	418	143	-112	20,274	4,784	-0,714	3,356
35	435	170	-124	23,653	4,979	-1,059	2,859
40	437	175	-124	27,032	5,002	-1,175	2,651
45	440	178	-131	30,411	5,036	-1,083	2,870
50	442	180	-131	33,790	5,059	-1,129	2,801
55	444	185	-131	37,169	5,082	-1,244	2,593
60	447	190	-131	40,548	5,116	-1,359	2,397
65	450	191	-133	43,927	5,151	-1,336	2,478
70	453	192	-136	47,306	5,185	-1,290	2,604
75	457	193	-136	50,685	5,231	-1,313	2,604
80	460	193	-139	54,064	5,265	-1,244	2,776
85	464	193	-140	57,443	5,311	-1,221	2,868
90	468	194	-140	60,822	5,357	-1,244	2,868
95	473	194	-141	64,201	5,414	-1,221	2,971
100	478	194	-141	67,580	5,471	-1,221	3,029
105	483	194	-142	70,959	5,528	-1,198	3,132
110	488	194	-142	74,338	5,586	-1,198	3,189
115	508	195	-142	77,717	5,815	-1,221	3,372
120	533	195	-142	81,096	6,101	-1,221	3,658
125	553	196	-144	84,475	6,330	-1,198	3,933
130	573	196	-144	87,854	6,559	-1,198	4,162
135	593	198	-144	91,233	6,788	-1,244	4,299
140	600	198	-144	94,612	6,868	-1,244	4,379
145	610	198	-144	97,991	6,982	-1,244	4,493

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 24



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 97,99 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{74{,}338\ \text{MPa} - 23{,}653\ \text{MPa}}{5{,}586\% - 4{,}979\ \%} = \frac{50{,}685\text{MPa}}{0{,}00607} = 8.354{,}50\ \text{MPa}$$

c. Nisbah Poisson (υ)

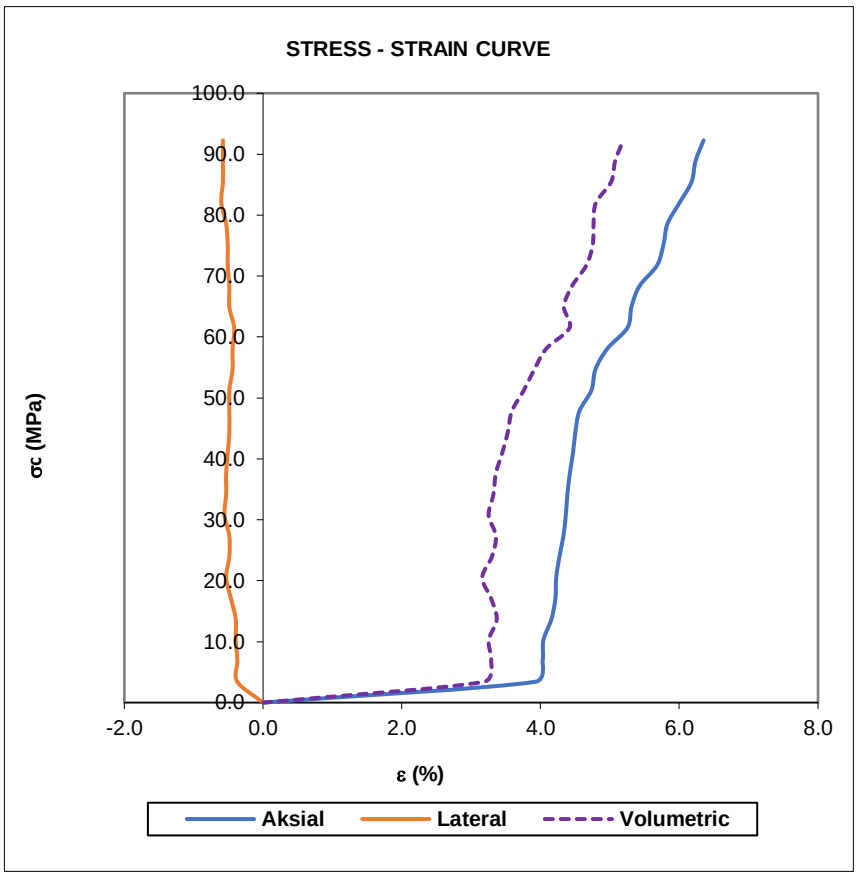
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-1{,}198)\% - (-1{,}059)\%}{5{,}586\% - 4{,}979\ \%}\right) = -\left(\frac{-0{,}00138}{0{,}00607}\right) = 0{,}23$$

D. Sampel DP 23

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 23

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	340	80	-64	3,417	3,925	-0,370	3,183
10	349	80	-64	6,835	4,029	-0,370	3,287
15	350	81	-64	10,253	4,040	-0,393	3,252
20	360	82	-65	13,671	4,156	-0,393	3,368
25	365	85	-65	17,088	4,213	-0,463	3,286
30	366	89	-66	20,506	4,225	-0,533	3,159
35	370	90	-69	23,924	4,271	-0,486	3,298
40	375	91	-70	27,342	4,329	-0,486	3,355
45	378	95	-71	30,759	4,363	-0,556	3,251
50	380	95	-72	34,177	4,386	-0,533	3,320
55	383	96	-73	37,595	4,421	-0,533	3,355
60	387	96	-74	41,013	4,467	-0,509	3,448
65	390	97	-76	44,431	4,502	-0,486	3,529
70	395	97	-76	47,848	4,560	-0,486	3,586
75	410	99	-78	51,266	4,733	-0,486	3,759
80	415	99	-80	54,684	4,791	-0,440	3,910
85	430	99	-80	58,102	4,964	-0,440	4,083
90	455	100	-82	61,519	5,252	-0,417	4,418
95	460	104	-83	64,937	5,310	-0,486	4,337
100	470	104	-83	68,355	5,425	-0,486	4,452
105	492	105	-83	71,773	5,679	-0,509	4,660
110	500	106	-84	75,191	5,772	-0,509	4,752
115	505	107	-84	78,608	5,830	-0,533	4,764
120	520	110	-84	82,026	6,003	-0,602	4,798
125	535	110	-85	85,444	6,176	-0,579	5,017
130	540	110	-85	88,862	6,234	-0,579	5,075
135	550	110	-85	92,279	6,349	-0,579	5,190

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 23



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

d. Kuat tekan uniaksial (σ_c) = 92,28 MPa

e. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{47{,}848\ \text{MPa} - 13{,}671\ \text{MPa}}{4{,}560\% - 4{,}156\ \%} = \frac{34{,}177\text{MPa}}{0{,}00404} = 8.458{,}51\ \text{MPa}$$

f. Nisbah Poisson (υ)

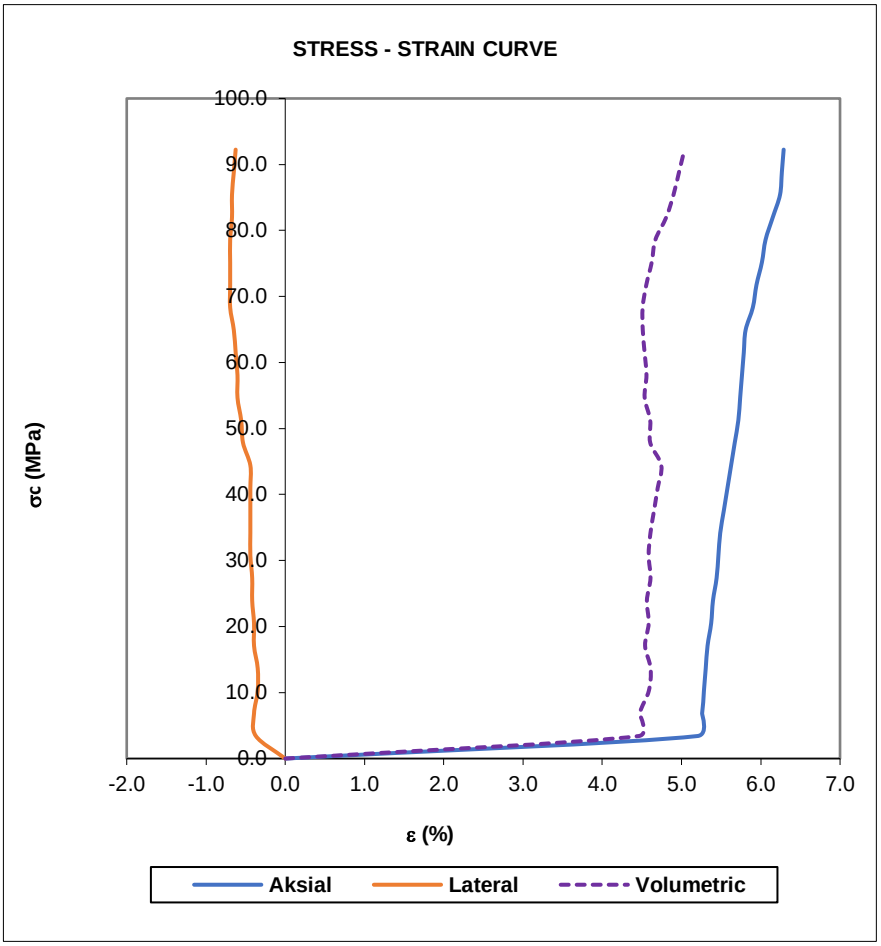
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}486)\% - (-0{,}393)\%}{4{,}560\% - 4.156\ \%}\right) = -\left(\frac{-0{,}00093}{0{,}00404}\right) = 0{,}23$$

E. Sampel DP 24

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 21

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	455	40	-24	3,416	5,202	-0,370	4,460
10	460	41	-24	6,833	5,259	-0,393	4,471
15	462	41	-26	10,250	5,282	-0,347	4,587
20	464	41	-26	13,666	5,305	-0,347	4,610
25	466	44	-27	17,083	5,328	-0,393	4,540
30	470	45	-28	20,500	5,373	-0,393	4,586
35	472	47	-29	23,917	5,396	-0,417	4,562
40	476	48	-30	27,333	5,442	-0,417	4,608
45	478	50	-31	30,750	5,465	-0,440	4,584
50	480	51	-32	34,167	5,488	-0,440	4,607
55	484	52	-33	37,583	5,533	-0,440	4,653
60	488	52	-33	41,000	5,579	-0,440	4,699
65	492	54	-35	44,417	5,625	-0,440	4,744
70	496	59	-36	47,834	5,671	-0,532	4,605
75	500	60	-36	51,250	5,716	-0,556	4,604
80	502	62	-36	54,667	5,739	-0,602	4,534
85	504	62	-36	58,084	5,762	-0,602	4,557
90	506	63	-36	61,500	5,785	-0,625	4,534
95	508	65	-37	64,917	5,808	-0,648	4,510
100	516	67	-37	68,334	5,899	-0,695	4,509
105	520	67	-37	71,751	5,945	-0,695	4,555
110	526	68	-38	75,167	6,014	-0,695	4,623
115	530	69	-39	78,584	6,059	-0,695	4,669
120	538	69	-40	82,001	6,151	-0,671	4,807
125	546	70	-41	85,418	6,242	-0,671	4,898
130	548	70	-42	88,834	6,265	-0,648	4,968
135	550	70	-43	92,251	6,288	-0,625	5,037

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 24



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 92,25 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{92{,}251\ \text{MPa} - 6{,}833\ \text{MPa}}{6{,}288\% - 5{,}259\ \%} = \frac{85{,}418\text{MPa}}{0{,}01029} = 8.300{,}73\ \text{MPa}$$

c. Nisbah Poisson (υ)

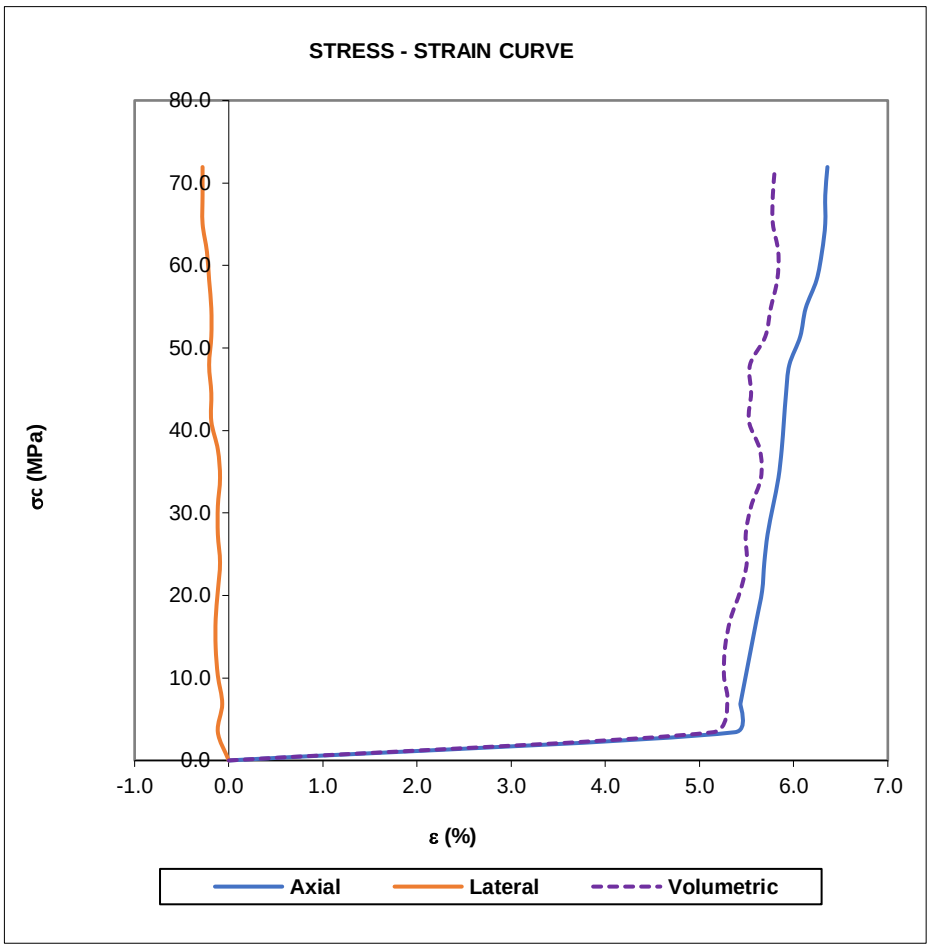
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}625)\% - (-0{,}393)\%}{6{,}288\% - 5{,}259\ \%}\right) = -\left(\frac{-0{,}00232}{0{,}01029}\right) = 0{,}23$$

F. Sampel DP 31

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 31

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	465	80	-75	3,425	5,375	-0,116	5,143
10	470	81	-78	6,850	5,433	-0,069	5,294
15	475	85	-80	10,275	5,491	-0,116	5,259
20	480	90	-84	13,700	5,549	-0,139	5,270
25	485	91	-85	17,125	5,607	-0,139	5,328
30	490	91	-86	20,551	5,664	-0,116	5,432
35	492	91	-87	23,976	5,688	-0,092	5,502
40	495	93	-88	27,401	5,722	-0,116	5,490
45	500	94	-89	30,826	5,780	-0,116	5,548
50	505	95	-91	34,251	5,838	-0,092	5,652
55	508	96	-91	37,677	5,873	-0,116	5,641
60	510	100	-92	41,102	5,896	-0,185	5,524
65	512	102	-94	44,527	5,919	-0,185	5,548
70	515	105	-96	47,952	5,953	-0,208	5,536
75	525	105	-97	51,377	6,069	-0,185	5,698
80	530	106	-98	54,802	6,127	-0,185	5,756
85	540	107	-98	58,228	6,243	-0,208	5,825
90	545	108	-98	61,653	6,300	-0,232	5,836
95	548	110	-98	65,078	6,335	-0,278	5,778
100	548	110	-98	68,503	6,335	-0,278	5,778
105	550	110	-98	71,928	6,358	-0,278	5,801
110	552	112	-99	75,354	6,381	-0,301	5,778
115	552	112	-99	78,779	6,381	-0,301	5,778

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 31



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 78,78 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{78{,}779\ \text{MPa} - 6{,}850\ \text{MPa}}{6{,}381\% - 5{,}433\%} = \frac{71{,}929\ \text{MPa}}{0{,}00948} = 7.587{,}32\ \text{MPa}$$

c. Nisbah Poisson (υ)

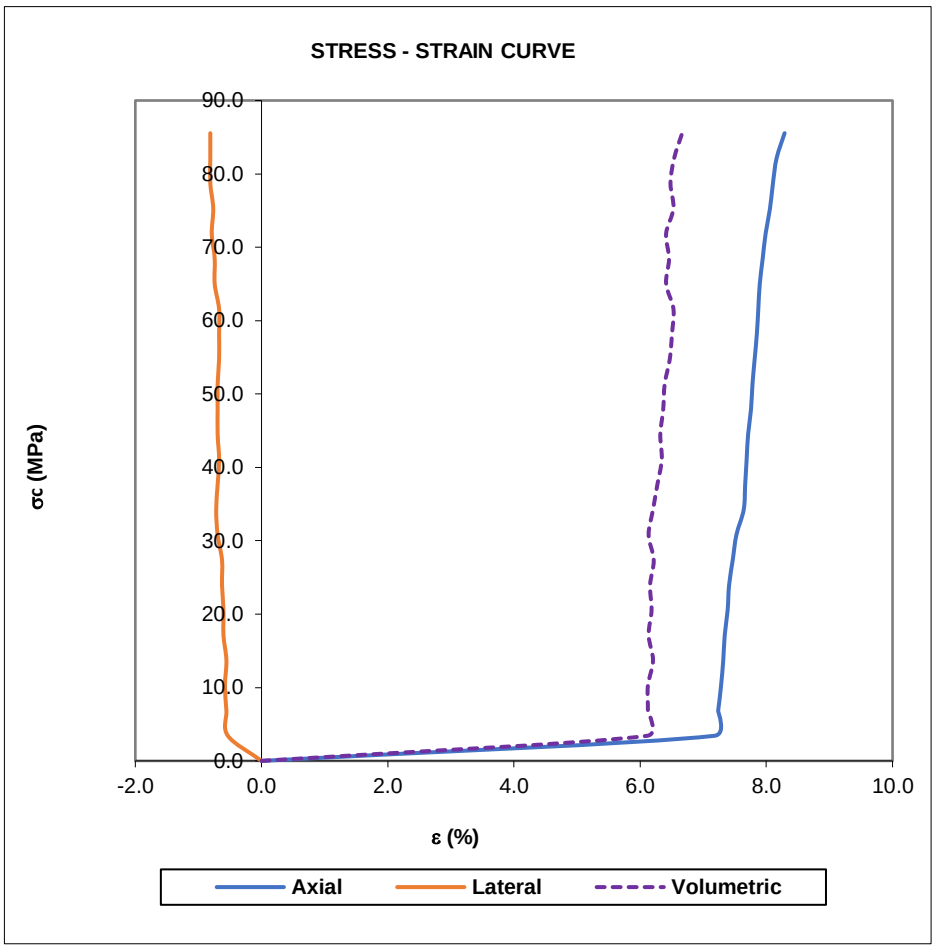
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}301)\% - (-0{,}069)\%}{6{,}381\% - 5{,}433\ \%}\right) = -\left(\frac{-0{,}00232}{0{,}00948}\right) = 0{,}24$$

G. Sampel DP 32

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 32

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	620	38	-15	3,422	7,178	-0,533	6,111
10	625	39	-15	6,844	7,236	-0,556	6,122
15	629	40	-15	10,266	7,282	-0,579	6,122
20	632	40	-16	13,688	7,317	-0,556	6,203
25	634	43	-17	17,110	7,340	-0,602	6,134
30	638	44	-18	20,532	7,386	-0,602	6,180
35	640	45	-18	23,954	7,409	-0,626	6,157
40	645	46	-19	27,376	7,467	-0,626	6,215
45	650	50	-20	30,798	7,525	-0,695	6,134
50	660	51	-20	34,220	7,641	-0,718	6,203
55	662	52	-22	37,642	7,664	-0,695	6,273
60	664	53	-24	41,064	7,687	-0,672	6,342
65	666	54	-24	44,486	7,710	-0,695	6,319
70	670	55	-25	47,908	7,757	-0,695	6,365
75	672	55	-25	51,330	7,780	-0,695	6,388
80	675	55	-26	54,752	7,814	-0,672	6,469
85	678	56	-27	58,174	7,849	-0,672	6,504
90	680	57	-28	61,596	7,872	-0,672	6,527
95	682	60	-28	65,018	7,895	-0,742	6,411
100	686	62	-30	68,440	7,942	-0,742	6,458
105	690	64	-30	71,862	7,988	-0,788	6,411
110	696	64	-31	75,284	8,058	-0,765	6,527
115	700	66	-31	78,706	8,104	-0,811	6,481
120	705	66	-31	82,128	8,162	-0,811	6,538
125	716	66	-31	85,550	8,289	-0,811	6,666

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 32



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

d. Kuat tekan uniaksial (σ_c) = 85,55 MPa

e. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{85{,}550\ \text{MPa} - 3{,}422\ \text{MPa}}{8{,}289\% - 7{,}178\ \%} = \frac{82{,}128\text{MPa}}{0{,}0111} = 7.389{,}25\ \text{MPa}$$

f. Nisbah Poisson (υ)

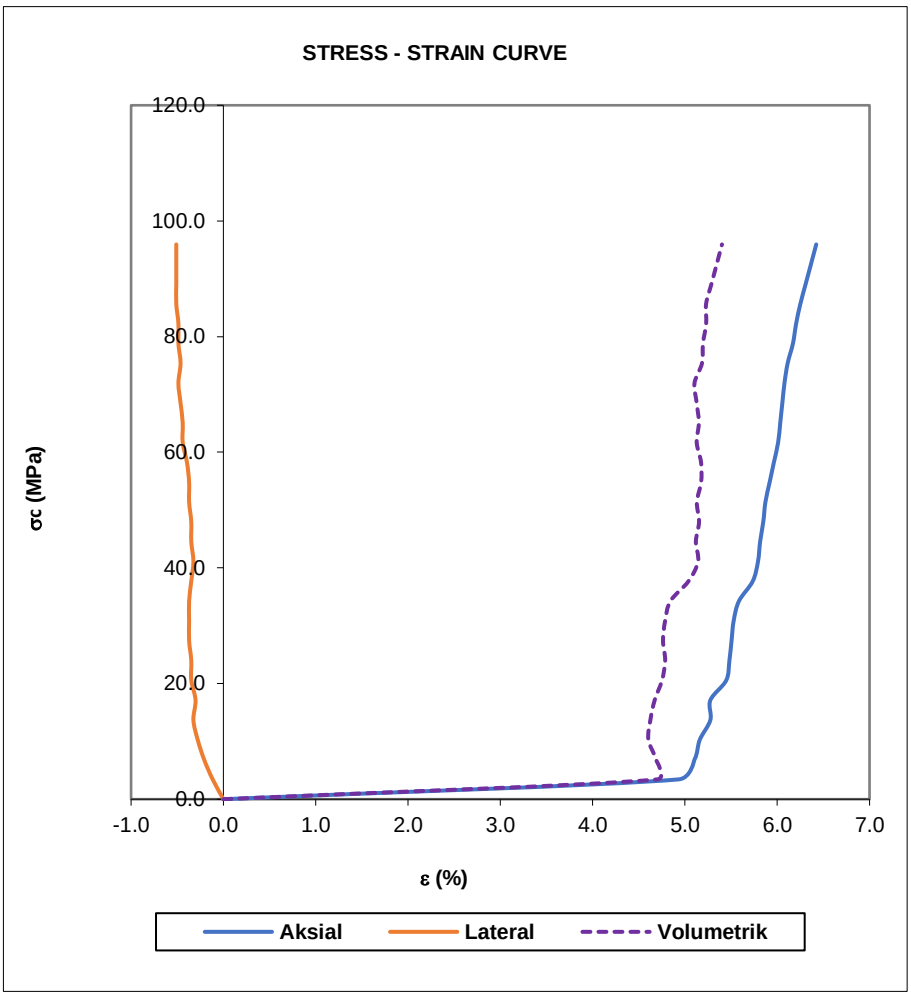
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}811)\% - (-0{,}533)\%}{8{,}289\% - 7{,}178\%}\right) = -\left(\frac{-0{,}00278}{0{,}0111}\right) = 0{,}25$$

H. Sampel DP 33

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 33

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	454	121	-98	3,422	5,208	-0,533	4,141
10	460	121	-97	6,844	5,277	-0,556	4,164
15	468	125	-99	10,266	5,369	-0,602	4,163
20	472	125	-100	13,688	5,415	-0,579	4,255
25	475	125	-100	17,110	5,449	-0,579	4,290
30	480	125	-101	20,532	5,506	-0,556	4,393
35	484	126	-101	23,954	5,552	-0,579	4,393
40	488	127	-101	27,376	5,598	-0,602	4,392
45	490	128	-102	30,798	5,621	-0,602	4,415
50	495	128	-104	34,220	5,678	-0,556	4,565
55	510	132	-105	37,642	5,851	-0,626	4,598
60	512	132	-105	41,064	5,874	-0,626	4,621
65	515	134	-106	44,486	5,908	-0,649	4,609
70	520	135	-106	47,908	5,965	-0,672	4,620
75	522	135	-107	51,330	5,988	-0,649	4,690
80	530	140	-108	54,752	6,080	-0,742	4,596
85	535	140	-108	58,174	6,137	-0,742	4,653
90	540	140	-109	61,596	6,195	-0,718	4,757
95	542	141	-109	65,018	6,218	-0,742	4,734
100	544	142	-109	68,440	6,241	-0,765	4,710
105	548	142	-109	71,862	6,287	-0,765	4,756
110	555	143	-110	75,284	6,367	-0,765	4,836
115	560	143	-110	78,706	6,424	-0,765	4,894

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 33



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

g. Kuat tekan uniaksial (σ_c) = 78,71 MPa

h. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{78{,}706\ \text{MPa} - 37{,}642\ \text{MPa}}{6{,}424\% - 5{,}851\ \%} = \frac{41{,}064\text{MPa}}{0{,}00573} = 7.158{,}56\ \text{MPa}$$

i. Nisbah Poisson (υ)

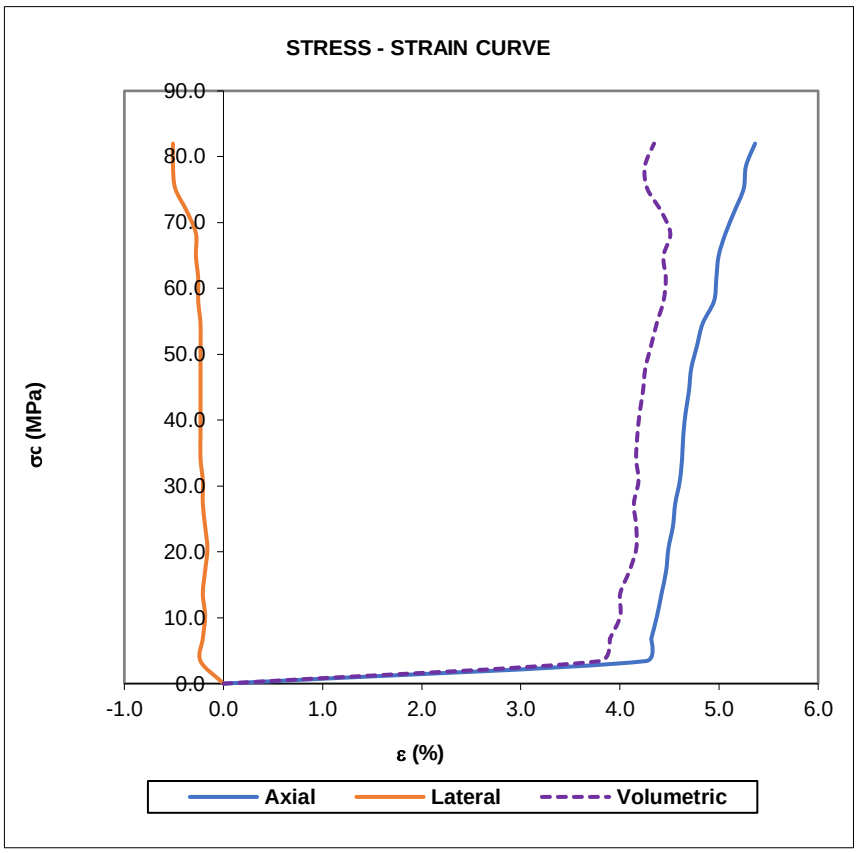
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}765)\% - (-0{,}626)\%}{6{,}424\% - 5{,}851\ \%}\right) = -\left(\frac{-0{,}00139}{0{,}00573}\right) = 0{,}24$$

I. Sampel DP 34

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 34

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	370	48	-38	3,416	4,258	-0,231	3,795
10	375	48	-39	6,833	4,316	-0,208	3,899
15	380	48	-40	10,250	4,373	-0,185	4,003
20	384	49	-40	13,666	4,419	-0,208	4,002
25	388	49	-41	17,083	4,465	-0,185	4,095
30	390	49	-42	20,500	4,488	-0,162	4,164
35	394	51	-43	23,917	4,534	-0,185	4,164
40	396	53	-44	27,333	4,558	-0,208	4,140
45	400	54	-45	30,750	4,604	-0,208	4,186
50	402	55	-45	34,167	4,627	-0,231	4,163
55	403	55	-45	37,583	4,638	-0,231	4,175
60	405	55	-45	41,000	4,661	-0,231	4,198
65	408	55	-45	44,417	4,696	-0,231	4,232
70	410	56	-46	47,834	4,719	-0,231	4,255
75	415	57	-47	51,250	4,776	-0,231	4,313
80	420	57	-47	54,667	4,834	-0,231	4,370
85	430	58	-47	58,084	4,949	-0,254	4,439
90	432	59	-48	61,500	4,972	-0,254	4,462
95	434	60	-48	64,917	4,995	-0,278	4,439
100	440	60	-48	68,334	5,064	-0,278	4,508
105	448	60	-44	71,751	5,156	-0,370	4,415
110	456	65	-44	75,167	5,248	-0,486	4,275
115	458	66	-44	78,584	5,271	-0,509	4,252
120	466	66	-44	82,001	5,363	-0,509	4,344

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 34



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 82 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{82{,}001\ \text{MPa} - 3{,}416\ \text{MPa}}{5{,}363\% - 4{,}258\ \%} = \frac{78{,}585\text{MPa}}{0{,}01105} = 7.111{,}91\ \text{MPa}$$

c. Nisbah Poisson (υ)

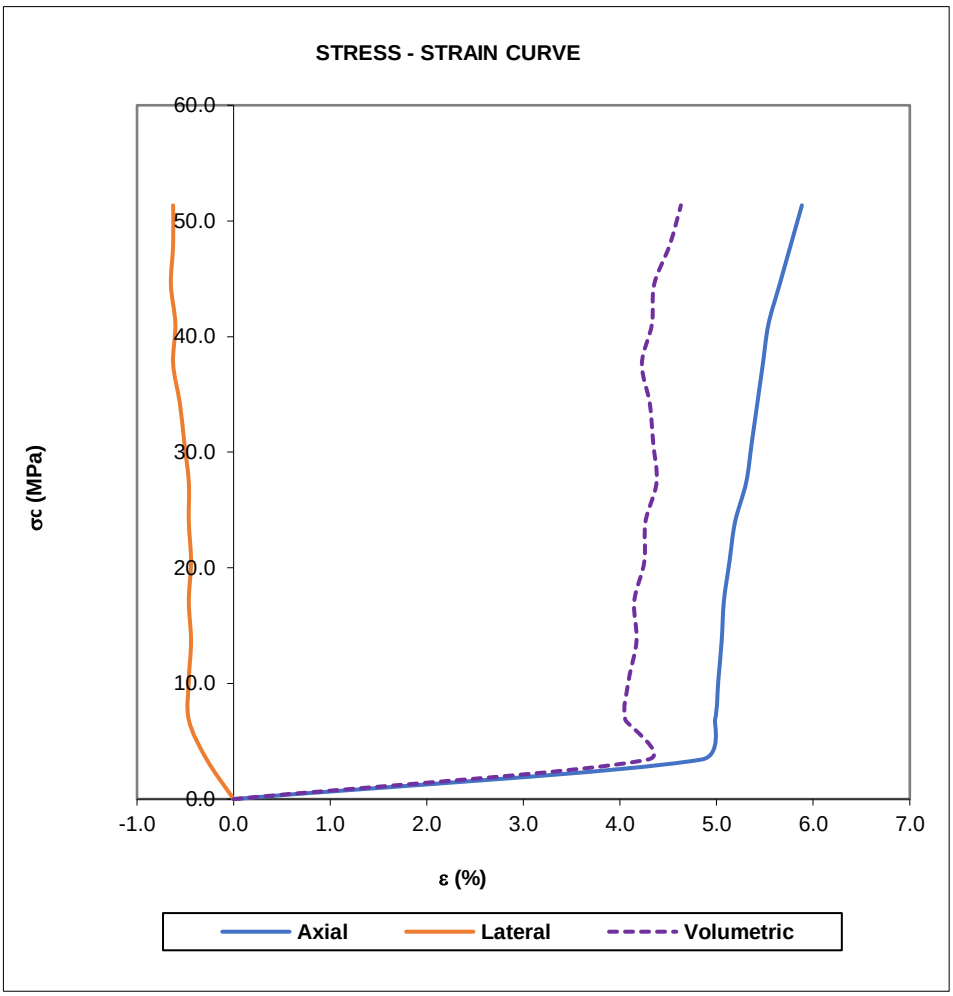
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}509)\% - (-0{,}231)\%}{5{,}363\% - 4{,}258\ \%}\right) = -\left(\frac{-0{,}0027}{0{,}01105}\right) = 0{,}25$$

J. Sampel DP 41

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 41

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	420	60	-48	3,423	4,844	-0,278	4,288
10	432	68	-48	6,846	4,983	-0,463	4,055
15	435	69	-49	10,269	5,017	-0,463	4,089
20	438	70	-51	13,692	5,052	-0,440	4,170
25	440	71	-51	17,115	5,075	-0,463	4,147
30	445	72	-53	20,538	5,133	-0,440	4,251
35	450	74	-54	23,961	5,190	-0,463	4,262
40	460	75	-55	27,384	5,306	-0,463	4,378
45	465	78	-56	30,807	5,363	-0,510	4,343
50	470	80	-56	34,230	5,421	-0,556	4,308
55	475	83	-56	37,653	5,479	-0,626	4,226
60	480	84	-58	41,076	5,536	-0,603	4,330
65	490	86	-58	44,499	5,652	-0,649	4,353
70	500	86	-59	47,922	5,767	-0,626	4,515
75	510	88	-61	51,345	5,882	-0,626	4,630

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 41



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 51,35 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{51{,}345\ \text{MPa} - 3{,}423\ \text{MPa}}{5{,}882\% - 4{,}844\ \%} = \frac{58{,}246\text{MPa}}{0{,}00688} = 4.616{,}22\ \text{MPa}$$

c. Nisbah Poisson (υ)

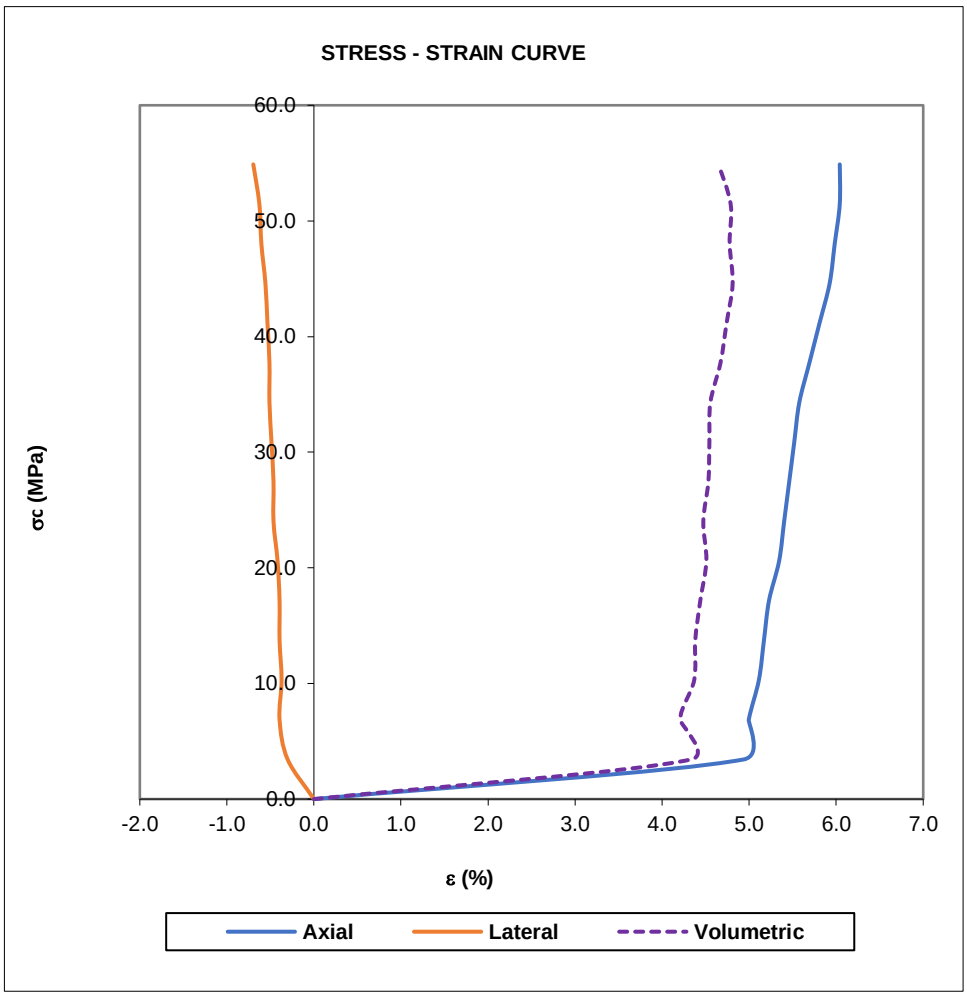
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}4844)\% - (-0{,}278)\%}{5{,}882\% - 4{,}844\%}\right) = -\left(\frac{-0{,}0020}{0{,}0109}\right) = 0{,}34$$

K. Sampel DP 42

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 42

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	425	143	-130	3,430	4,937	-0,301	4,333
10	430	149	-132	6,860	4,995	-0,394	4,206
15	440	149	-133	10,291	5,111	-0,371	4,368
20	445	150	-133	13,721	5,170	-0,394	4,380
25	450	151	-134	17,152	5,228	-0,394	4,438
30	460	152	-134	20,582	5,344	-0,417	4,508
35	465	155	-135	24,013	5,402	-0,464	4,473
40	470	156	-136	27,443	5,460	-0,464	4,531
45	475	157	-136	30,874	5,518	-0,487	4,543
50	480	159	-137	34,304	5,576	-0,510	4,555
55	490	160	-138	37,735	5,692	-0,510	4,671
60	500	162	-139	41,165	5,809	-0,534	4,740
65	510	163	-139	44,596	5,925	-0,557	4,810
70	515	165	-139	48,026	5,983	-0,603	4,775
75	520	167	-140	51,457	6,041	-0,626	4,787
80	520	170	-140	54,887	6,0413	-0,696	4,648

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 42



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 54,89 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{54{,}887\ \text{MPa} - 10{,}291\ \text{MPa}}{6{,}041\ \% - 5{,}111\ \%} = \frac{44{,}596\ \text{MPa}}{0{,}0093} = 4.798{,}19\ \text{MPa}$$

c. Nisbah Poisson (υ)

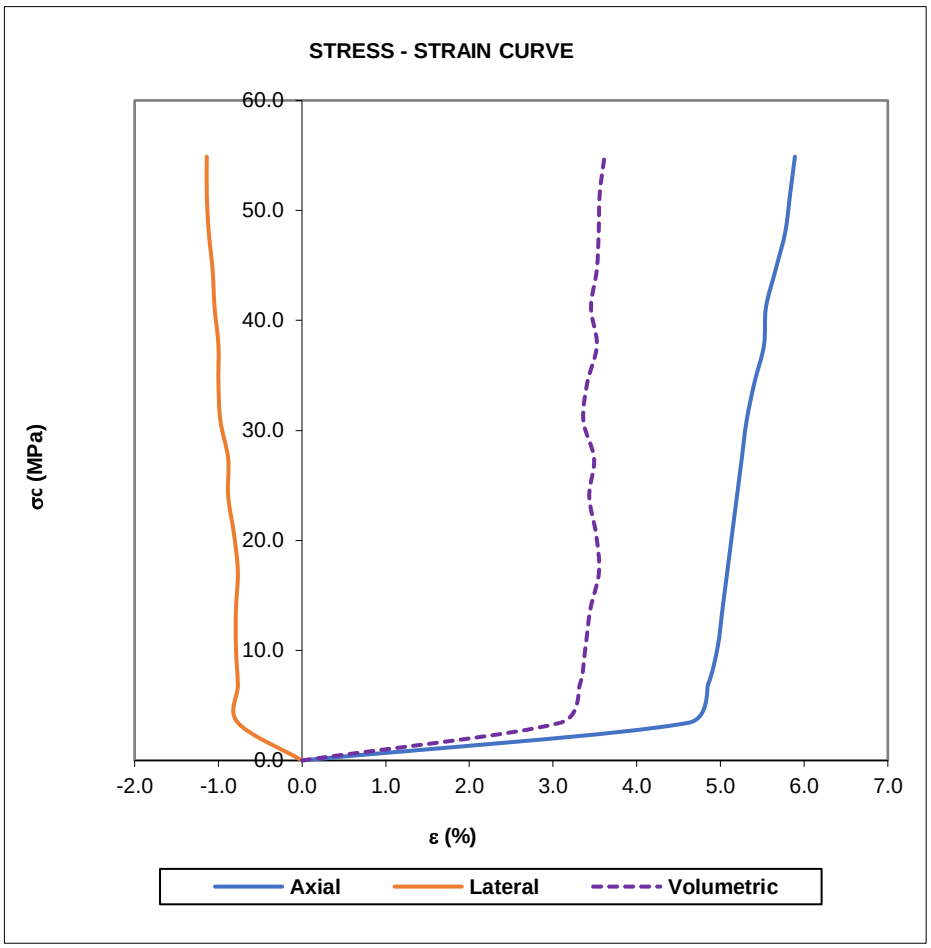
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}696)\% - (-0{,}371)\%}{6{,}041\% - 5{,}111\ \%}\right) = -\left(\frac{-0{,}00325}{0{,}0093}\right) = 0{,}36$$

L. Sampel DP 43

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 43

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	400	78	-45	3,431	4,619	-0,766	3,087
10	420	78	-45	6,862	4,850	-0,766	3,318
15	430	80	-46	10,293	4,966	-0,789	3,387
20	435	80	-46	13,724	5,023	-0,789	3,444
25	440	80	-47	17,155	5,081	-0,766	3,549
30	445	82	-47	20,586	5,139	-0,812	3,513
35	450	86	-48	24,017	5,197	-0,882	3,432
40	455	86	-48	27,448	5,254	-0,882	3,490
45	460	90	-48	30,879	5,312	-0,975	3,362
50	468	92	-49	34,310	5,404	-0,998	3,408
55	478	92	-49	37,741	5,520	-0,998	3,523
60	480	94	-49	41,172	5,543	-1,044	3,453
65	490	96	-50	44,603	5,659	-1,068	3,522
70	500	98	-50	48,034	5,774	-1,114	3,545
75	505	100	-51	51,465	5,832	-1,137	3,556
80	510	100	-51	54,896	5,890	-1,137	3,614

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 43



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

a. Kuat tekan uniaksial (σ_c) = 54,90 MPa

b. Modulus Young (E)

$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{54{,}896\ \text{MPa} - 6{,}862\ \text{MPa}}{5{,}890\ \% - 4{,}850\ \%} = \frac{48{,}034\text{MPa}}{0{,}0104} = 4.621{,}25\ \text{MPa}$$

c. Nisbah Poisson (υ)

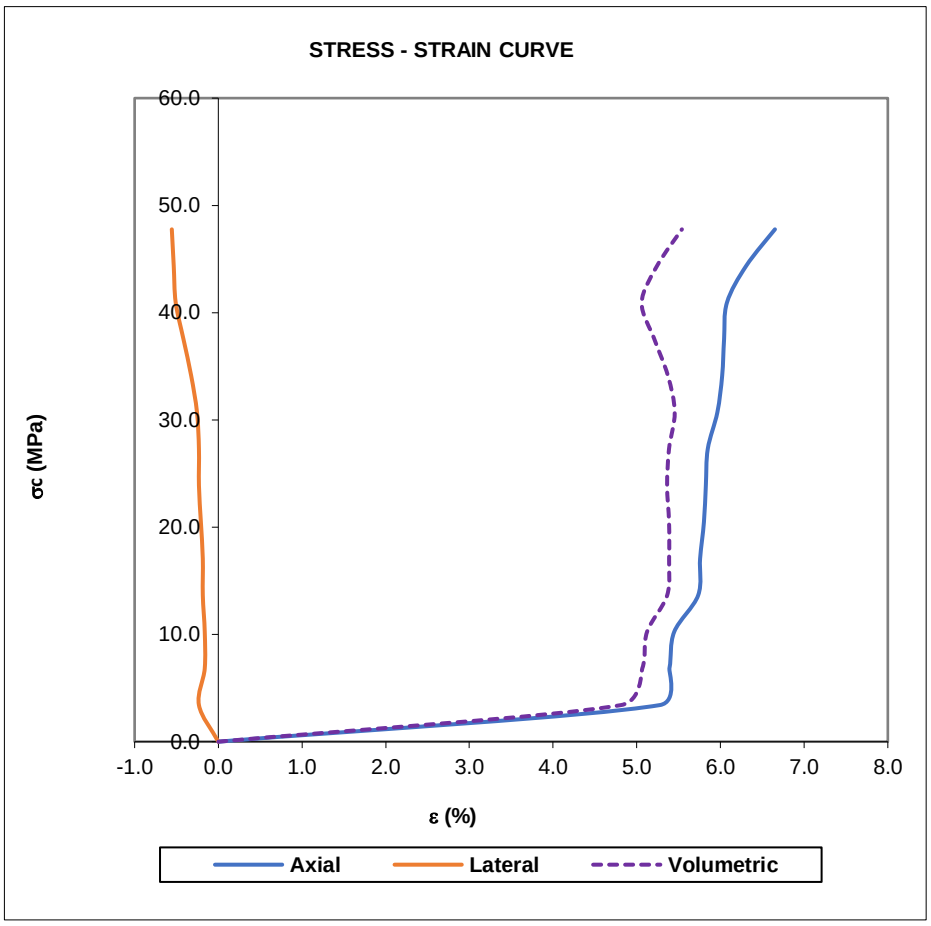
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-1{,}137)\% - (-0{,}766)\%}{5{,}890\% - 4{,}850\%}\right) = -\left(\frac{-0{,}00371}{0{,}0104}\right) = 0{,}36$$

M. Sampel DP 44

1. Tabel hasil pengukuran deformasi dan pengolahan data sampel DP 44

Gaya Tekan (kN)	Aksial	Lateral 1	Lateral 2	σ_C (MPa)	ε Aksial (%)	ε Lateral (%)	ε Volumetrik (%)
0	0	0	0	0,00	0,00	0,00	0,00
5	460	15	-25	3,411	5,275	-0,231	4,812
10	470	20	-27	6,823	5,389	-0,162	5,065
15	475	22	-29	10,235	5,447	-0,162	5,123
20	500	24	-32	13,647	5,733	-0,185	5,363
25	502	26	-34	17,059	5,756	-0,185	5,386
30	506	29	-38	20,471	5,802	-0,208	5,385
35	508	30	-40	23,883	5,825	-0,231	5,362
40	510	33	-43	27,295	5,848	-0,231	5,385
45	520	35	-46	30,707	5,963	-0,254	5,453
50	525	35	-49	34,119	6,020	-0,324	5,372
55	527	35	-53	37,531	6,043	-0,416	5,209
60	530	35	-57	40,943	6,077	-0,509	5,059
65	550	35	-58	44,355	6,307	-0,532	5,242
70	580	35	-59	47,767	6,651	-0,555	5,539

2. Kurva tegangan-regangan hasil uji kuat tekan sampel DP 44



Berdasarkan kurva tegangan-regangan di atas, dapat ditentukan nilai kuat tekan, modulus Young, dan nisbah Poisson sebagai berikut.

d. Kuat tekan uniaksial (σ_c) = 47,77 MPa

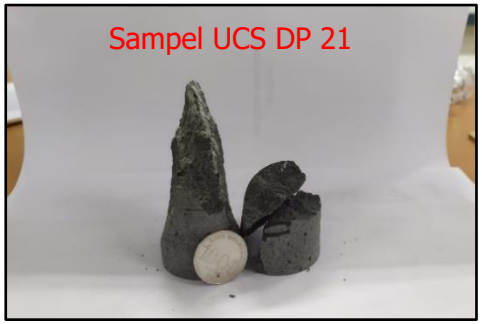
e. Modulus Young (E)

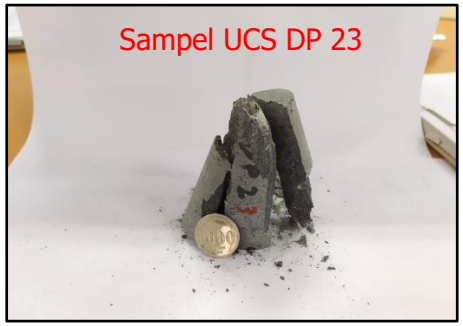
$$E = \frac{\Delta\sigma}{\Delta\varepsilon_a} = \frac{40{,}943\ \text{MPa} - 3{,}411\ \text{MPa}}{6{,}077\% - 5{,}275\%} = \frac{37{,}532\text{MPa}}{0{,}00802} = 4.675{,}38\ \text{MPa}$$

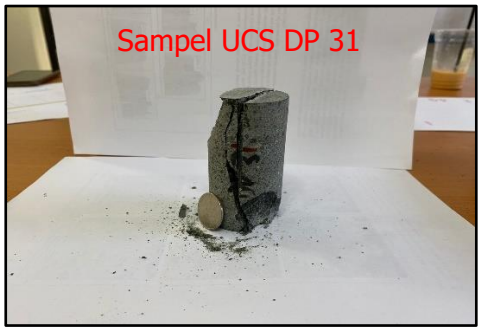
f. Nisbah Poisson (υ)

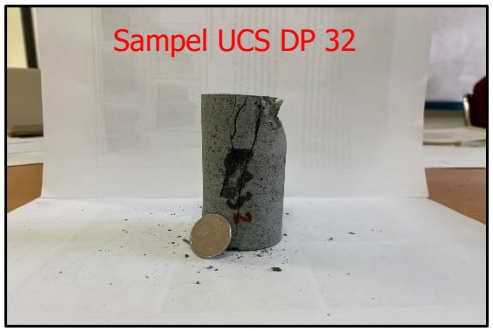
$$\upsilon = -\frac{\varepsilon_{\text{lateral}}}{\varepsilon_{\text{aksial}}} = -\left(\frac{(-0{,}509)\% - (-0{,}231)\%}{6{,}077\% - 5{,}275\%}\right) = -\left(\frac{-0{,}00278}{0{,}00802}\right) = 0{,}35$$

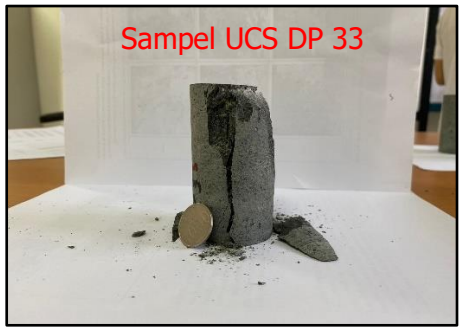
N. Foto Hasil Pengujian UCS

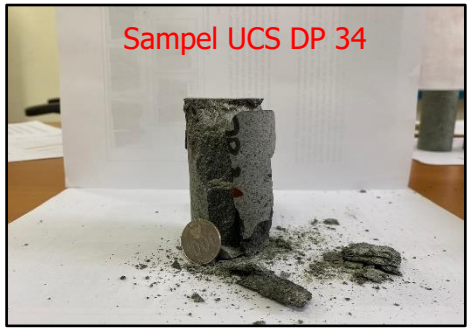


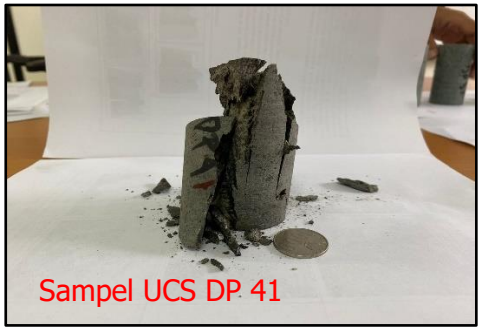


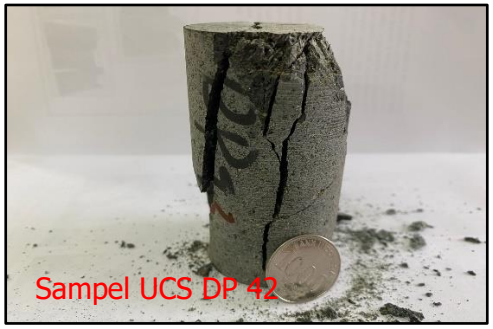


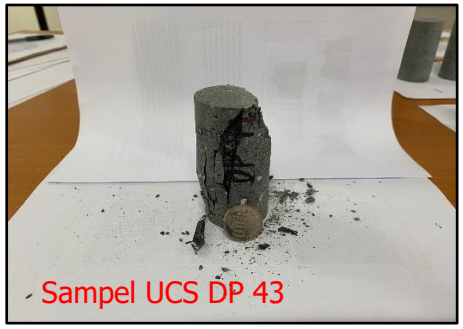


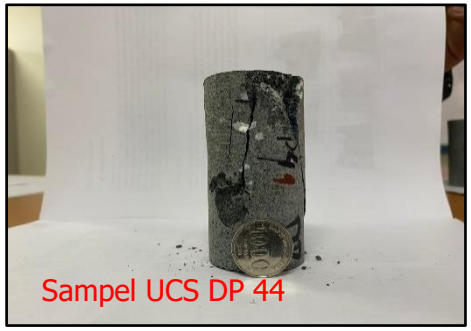












LAMPIRAN H

HASIL ANALISIS REGRESI LINEAR

A. Regresi linear Nilai UCS terhadap nilai pantil *Schmidt Hammer*

Summary Output

Regression Statistics	
Multiple R	0,96287592
R Square	0,927130037
Adjusted R Square	0,91984304
Standard Error	5,294988296
Observations	12

ANNOVA

	df	***SS***	***MS***	***F***	***Significance F***
Regression	1	3567,156056	3567,156056	127,2307538	5,21754E-07
Residual	10	280,3690105	28,03690105		
Total	11	3847,525067			

	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***	***Lower 95,0%***	***Upper 95,0%***
Intercept	39,46523746	3,584222016	11,01082391	6,53229E-07	31,47909313	47,45138179	31,47909313	47,45138179
X	1,147834555	0,10176144	11,27966107	5,21754E-07	0,921095937	1,374573174	0,921095937	1,374573174

LAMPIRAN I

VALIDASI DATA

Validasi data menggunakan metode MAPE ((*Mean Absolute Percentage Error)*

Derajat Pelapukan	STASIUN	ANALISIS REGRESI		STASIUN	MAPE MODEL					
		Nilai pantul *Schmidt Hammer*	Nilai Kuat Tekan Uniaksial (MPa)		Nilai pantul *Schmidt Hammer*	Nilai Kuat Tekan Uniaksial Prediksi (MPa)	Kesalahan Mutlak (%)	Total Kesalahan Mutlak	Total Pengamatan	MAPE (%)
Derajat Pelapukan II	DP 2A	47,4	95,93	DP 2E	48,2	94,79	1,189450641	9,927267144	4	2,481816786
	DP 2B	51,9	97,99				3,266700684			
	DP 2C	52,8	92,28				2,718855657			
	DP2D	46,5	92,25				2,752260163			
Derajat Pelapukan III	DP 3A	34,1	78,78	DP 3E	31,5	75,62	4,010281797	27,32125917	4	6,830314794
	DP 3B	30,9	85,55				11,60642899			
	DP 3C	33,4	78,71				3,924914242			
	DP 3D	32,5	82				7,779634146			
Derajat Pelapukan IV	DP 4A	12,1	51,35	DP 4E	12,4	53,70	4,571996105	21,34294339	4	5,335735849
	DP 4B	13,7	54,89				2,17212607			
	DP 4C	12,5	54,9				2,189945355			
	DP 4D	14,4	47,77				12,40887586			

PERSAMAAN REGRESI	UCS= 1,1478*SCH +39,465

LAMPIRAN J

KARTU KONSULTASI TUGAS AKHIR

Lampiran B 10

Kartu Konsultasi Tugas Akhir

JUDUL: Analisis kekuatan batuan menggunakan Nilai Kuat tekan UCS terhadap Nilai Pantul Schmidt Hammer berdasarkan Derajat Pelapukan pada Batuan Basal.

(Konsultasi minimal 8 kali)

TANGGAL	MATERI KONSULTASI	PARAF DOSEN
03/09/22	- Latar belakang - Perbaikan penulisan	
09/04/22	- Rumusan Masalah - Tujuan penelitian - Perbaikan Penulisan	
21/05/22	- Flowchart perbaikan - Perbaikan penulisan	
22/06/22	- Tambahkan penelitian terkait - Format Penulisan	
09/08/22	- BAB II Tambahkan Pembahasan - METODE penelitian	

TANGGAL	MATERI KONSULTASI	PARAF DOSEN
02/11/22	Analisis XRD	
11/1/23	- Lator belakang - Kata pergantar - Bab IV	
19/1/23	- ARTIKEL - POSTER	