

✚ Data mengenai penelitian tentang tanah ekspansif

- Pengujian Kadar Air

Tabel 2.6 Pengujian Kadar Air (Ratna Dwi, dkk., 2012)

| Sampel | 1 | 2 | 3 |
|----------------------------|--------|--------|--------|
| berat cawan | 5.7 | 5.7 | 4.2 |
| berat cawan + tanah basah | 25.9 | 38.4 | 28.4 |
| berat cawan + tanah kering | 20.3 | 28.9 | 21.2 |
| berat air | 5.6 | 9.5 | 7.2 |
| berat tanah kering | 14.6 | 23.2 | 17 |
| kadar air | 38.356 | 40.948 | 42.353 |
| Kadar air rata-rata | 40.552 | | |

- Pengujian Berat Jenis Tanah

Tabel 2.7 Pengujian Berat Jenis Tanah (Ratna Dwi, dkk., 2012)

| Uraian | Keterangan | Perhitungan | | | | |
|--------------------------------|--|-------------|---------|---------|---------|---------|
| Berat Labu Ukur | dari hasil percobaan | 56.2 | | | | |
| Berat Tanah kering (Ws) | diketahui | 20 | | | | |
| Berat Labu Ukur+Air+Tanah (W1) | dari hasil percobaan | 170.000 | 170.700 | 171.900 | 172.200 | 172.500 |
| Suhu (°C) | dari hasil percobaan | 66 | 55 | 40 | 34 | 30 |
| Berat Labu Ukur+Air (W2) | $(-0.058 \cdot T) + 161,5$ | 157.672 | 158.310 | 159.180 | 159.528 | 159.760 |
| Berat Jenis Air (G1) | diketahui | 0.980 | 0.986 | 0.992 | 0.994 | 0.996 |
| Berat Jenis Tanah (GS) | $(Ws \cdot G1) / (Ws \cdot (W1 - W2))$ | 2.555 | 2.591 | 2.726 | 2.714 | 2.743 |
| Rata-rata Berat Jenis | $\Sigma GS / 8$ | 2.693 | | | | |

| Uraian | Keterangan | Perhitungan | | | |
|--------------------------------|--|-------------|---------|---------|---------|
| Berat Labu Ukur | dari hasil percobaan | 59.100 | | | |
| Berat Tanah kering (Ws) | diketahui | 20.000 | | | |
| Berat Labu Ukur+Air+Tanah (W1) | dari hasil percobaan | 168.400 | 169.800 | 170.000 | 170.200 |
| Suhu (°C) | dari hasil percobaan | 63 | 35 | 31 | 28 |
| Berat Labu Ukur+Air (W2) | $(-0.055 \cdot T) + 159,3$ | 155.835 | 157.375 | 157.595 | 157.760 |
| Berat Jenis Air (G1) | diketahui | 0.982 | 0.994 | 0.995 | 0.996 |
| Berat Jenis Tanah (GS) | $(Ws \cdot G1) / (Ws \cdot (W1 - W2))$ | 2.641 | 2.625 | 2.621 | 2.636 |
| Rata-rata Berat Jenis | $\Sigma GS / 8$ | 2.627 | | | |

- Pengujian Berat Isi dan Porositas Tanah

Tabel 2.8 Pengujian Berat Isi dan Porositas Tanah (Ratna Dwi, dkk., 2012)

| Titik No./Kedalaman | satuan | 1 | 2 |
|---|--------------------|-------|-------|
| Tinggi Ring | cm | 2.60 | 2.60 |
| Diameter Ring (tabung) | cm | 2.30 | 2.30 |
| 1 Berat Ring | gr | 18.60 | 18.60 |
| 2 Berat Ring + Tanah Basah | gr | 36.20 | 36.10 |
| 3 Berat Tanah (2) - (1) | gr | 17.60 | 17.50 |
| 4 Volume Tanah (Volume Ring) | cm ³ | 10.80 | 10.80 |
| 5 Berat Isi Tanah (3)/(4) | gr/cm ³ | 1.63 | 1.62 |
| 6 Berat Ring + Tanah Kering | gr | 30.80 | 30.40 |
| 7 Berat Tanah Kering (6) - (1) | gr | 12.20 | 11.80 |
| 8 Berat Air (3) - (7) | gr | 5.40 | 5.70 |
| 9 Kadar Air (8)/(7)*100% | % | 44.26 | 48.31 |
| 10 $\gamma (7) / (4)$ | gr/cm ³ | 1.13 | 1.09 |
| Yrata-rata | gr/cm ³ | 1.11 | |
| 11 Berat Jenis (Gs) | | 2.66 | |
| 12 Volume Tanah Kering (7)/(Gs)* γ_w | cm ³ | 4.59 | 4.44 |
| 13 Isi Pori (4) - (12) | | 6.22 | 6.37 |
| 14 Derajat Kejenuhan Sr = (8)/(13)*100% | % | 86.87 | 89.53 |
| 15 Porositas (13)/(4)*100% | % | 57.55 | 58.94 |
| 16 Rata-rata Porositas | % | 58.24 | |

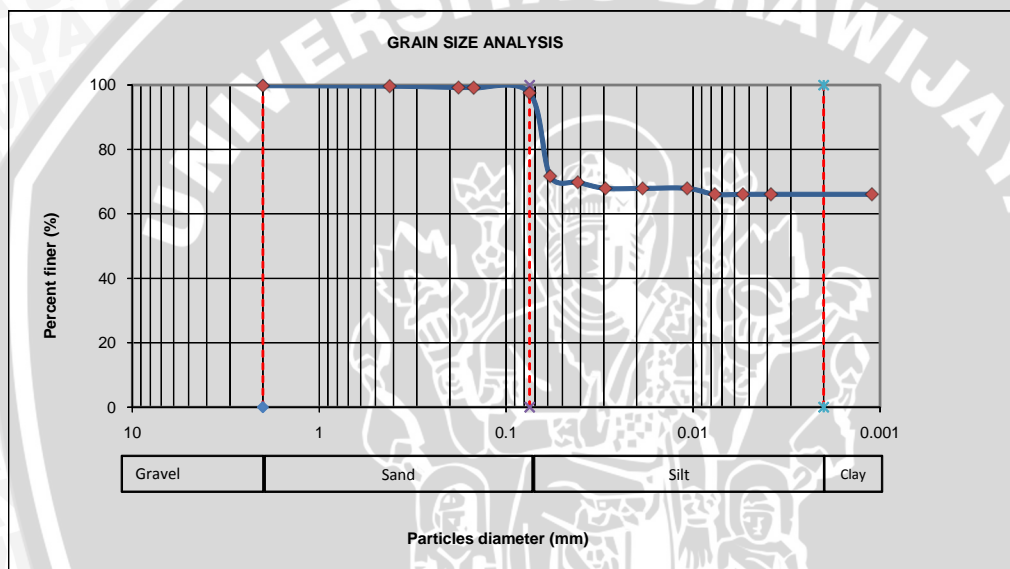
- Pengujian Analisis Saringan

Tabel 2.9 Hasil Pengujian Analisis Saringan Tanah Lempung (Ratna Dwi, dkk., 2012)

| No Saringan | Diameter Saringan (mm) | Berat tertahan (gr) | | | |
|-------------|--------------------------|-----------------------|-----------------|-----------------------|--------------------|
| | | | Jumlah Tertahan | Presentase Tertahan % | Presentasi Lolos % |
| No. 10 | 2 | 0.80 | 0.8 | 0.20 | 99.8 |
| No. 40 | 0.42 | 0.80 | 1.60 | 0.40 | 99.60 |
| No. 80 | 0.18 | 1.50 | 3.10 | 0.78 | 99.23 |
| No. 100 | 0.149 | 0.40 | 3.50 | 0.88 | 99.13 |
| No. 200 | 0.075 | 6.30 | 9.80 | 2.45 | 97.55 |
| PAN | | 390.20 | 400.00 | | |

Tabel 2.10 Hasil Pengujian Analisis Hidrometer Tanah Lempung (Ratna Dwi, dkk., 2012)

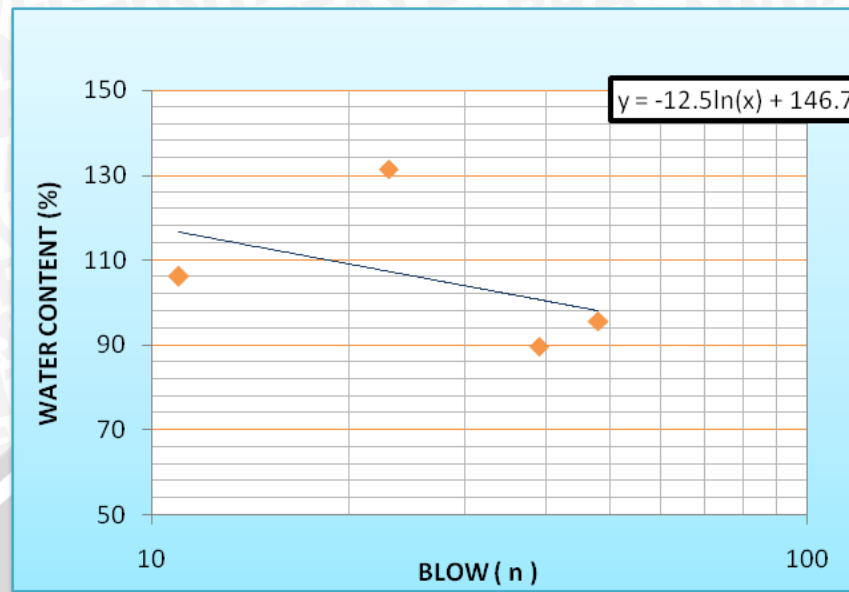
| Waktu T (menit) | Pembacaan Hydrometer Ra | Meniscus Correction | Pembacaan Hydrometer teroreksi R | Temperatur (C) | Kedalaman L (cm) | Konstanta K | Diameter Butiran D (mm) | Berat Lebih Kecil P % |
|-----------------|-------------------------|---------------------|----------------------------------|----------------|------------------|-------------|-------------------------|-----------------------|
| 0.5 | 1.02500 | 0.006 | 1.01900 | 31 | 9.7 | 0.01321 | 0.05813 | 71.713 |
| 1 | 1.02450 | 0.006 | 1.01850 | 30 | 9.8 | 0.01321 | 0.04138 | 69.825 |
| 2 | 1.02400 | 0.006 | 1.01800 | 30 | 10.0 | 0.01321 | 0.02946 | 67.938 |
| 5 | 1.02400 | 0.006 | 1.01800 | 30 | 10.0 | 0.01321 | 0.01863 | 67.938 |
| 15 | 1.02400 | 0.006 | 1.01800 | 30 | 10.0 | 0.01321 | 0.01076 | 67.938 |
| 30 | 1.02350 | 0.006 | 1.01750 | 30 | 10.1 | 0.01321 | 0.00766 | 66.051 |
| 60 | 1.02350 | 0.006 | 1.01750 | 30 | 10.1 | 0.01321 | 0.00541 | 66.051 |
| 120 | 1.02350 | 0.006 | 1.01750 | 30 | 10.1 | 0.01321 | 0.00383 | 66.051 |
| 1440 | 1.02350 | 0.006 | 1.01750 | 28 | 10.1 | 0.01321 | 0.00111 | 66.051 |



| | | | |
|------------|---------|------------------------------------|--|
| Finer #200 | 97,55% | D10 (mm) | |
| Gravel | 0% | D30 (mm) | |
| Sand | 2,25% | D60 (mm) | |
| Silt | 31,5% | Cu = D60/D10 | |
| Clay | 66,051% | Cc = D30 ² /[(D10xD60)] | |
| | | D50 (mm) | |

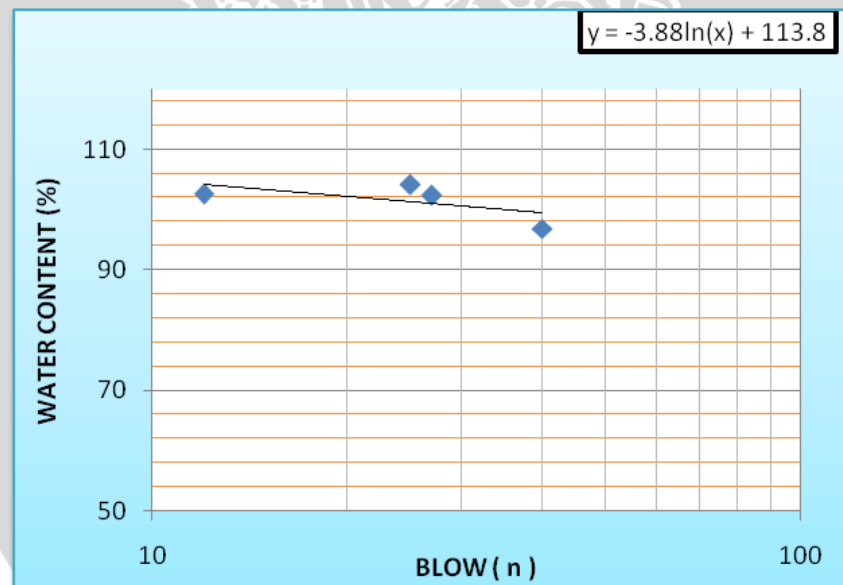
Gambar 2.15 Grafik Analisis Butiran (Sumber: Ratna Dwi, dkk., 2012)

- Pengujian Batas Cair (*Liquid Limit*)



Gambar 2.16 Grafik Hubungan antara Pukulan dengan Kadar Air Sampel 1

(Sumber: Ratna Dwi, dkk., 2012)



Gambar 2.17 Grafik Hubungan antara Pukulan dengan Kadar Air Sampel 2

(Sumber: Ratna Dwi, dkk., 2012)

- Pengujian Batas Plastis (*Plastic Limit*) dan Indeks Plastis

Tabel 2.11 Pengujian Batas Plastis sampel 1 (Ratna Dwi, dkk., 2012)

| | | |
|-------------------------|----|--------|
| Banyaknya pukulan | | |
| No. cawan | | 1 |
| Berat cawan | gr | 4.2 |
| Berat cawan + t. basah | gr | 10.8 |
| Berat cawan + t. kering | gr | 8.7 |
| Berat air | gr | 2.1 |
| Berat tanah kering | gr | 4.5 |
| Kadar air | % | 46.667 |

Tabel 2.12 Pengujian Batas Plastis sampel 2 (Ratna Dwi, dkk., 2012)

| | | |
|-------------------------|----|--------|
| Banyaknya pukulan | | |
| No. cawan | | 2 |
| Berat cawan | gr | 5.6 |
| Berat cawan + t. basah | gr | 10.2 |
| Berat cawan + t. kering | gr | 8.7 |
| Berat air | gr | 1.5 |
| Berat tanah kering | gr | 3.1 |
| Kadar air | % | 48.387 |

- Pengujian Batas Susut (*Shrinkage Limit*)

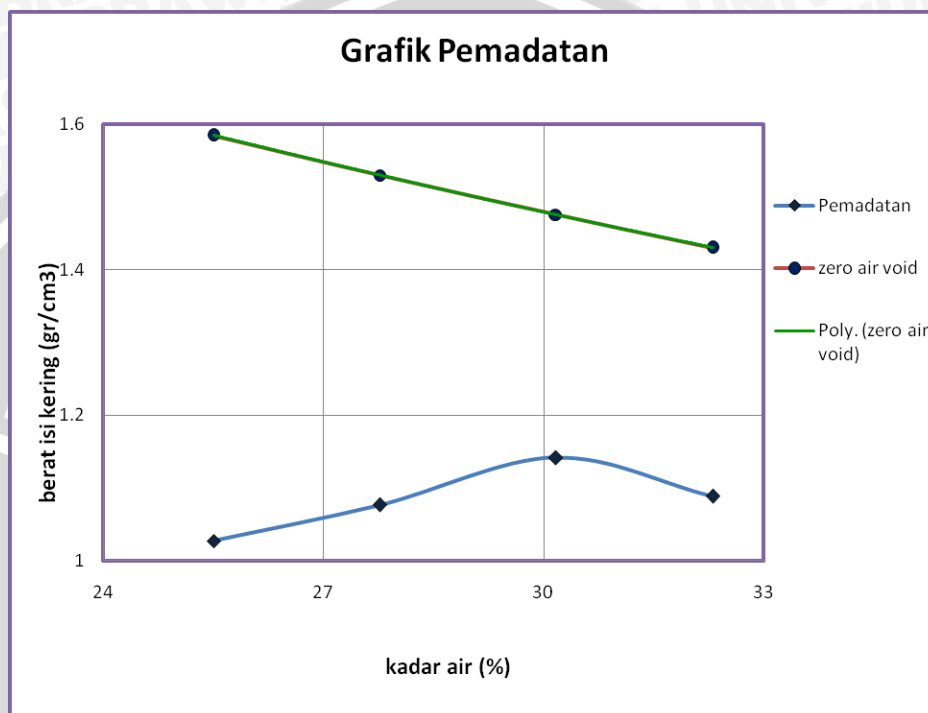
Tabel 2.13 Pengujian Batas Susut (Ratna Dwi, dkk., 2012)

| no. cetakan | 1 | 2 | 3 | 4 |
|------------------------------|---------|---------|---------|---------|
| berat cetakan | 14.8 | 14.6 | 30.1 | 16.6 |
| berat cetakan + tanah basah | 52.4 | 50.1 | 48.1 | 50.9 |
| berat cetakan + tanah kering | 33.2 | 32 | 38.9 | 33.3 |
| berat tanah basah | 37.6 | 35.5 | 18 | 34.3 |
| berat tanah kering | 18.4 | 17.4 | 8.8 | 16.7 |
| berat air | 19.2 | 18.1 | 9.2 | 17.6 |
| isi tanah basah | 27.5 | 26.5 | 13.5 | 25 |
| isi tanah kering | 10 | 10 | 5 | 9 |
| kadar air | 104.348 | 104.023 | 104.545 | 105.389 |
| SL | 9.239 | 9.195 | 7.955 | 9.581 |
| SL rata2 | 8.992 | | | |

- Pengujian Pemadatan Standar

Tabel 2.14 Hasil Pengujian Proctor Standar (Ratna Dwi, dkk., 2012)

| penambahan air | MI | 350 | 350 | 400 | 450 |
|--|--------------------|--------|--------|--------|--------|
| kadar air (w) | % | 25.507 | 27.768 | 30.169 | 32.923 |
| GS | gr/cm ³ | 2.592 | 2.592 | 2.592 | 2.592 |
| berat jenis air (γ_w) | gr/cm ³ | 1 | 1 | 1 | 1 |
| berat jenis zero air void (γ_{zav}) | gr/cm ³ | 1.560 | 1.507 | 1.455 | 1.399 |



Gambar 2.18 Grafik Hubungan antara Kadar Air dengan Berat Volume Tanah Kering (Sumber: Ratna Dwi, dkk., 2012)

- Pengujian Pengembangan

Tabel 2.15 Pengujian Free Swell (Ratna Dwi, dkk., 2012)

| Waktu (menit) | Volume Sampel 1 (ml) | Volume Sampel 2 (ml) |
|------------------|----------------------|----------------------|
| 0 | 10 | 10 |
| 5 | 27 | 30 |
| 10 | 27 | 30 |
| 20 | 27 | 30 |
| 30 | 27 | 30 |
| Rata-rata | 28,5 | |

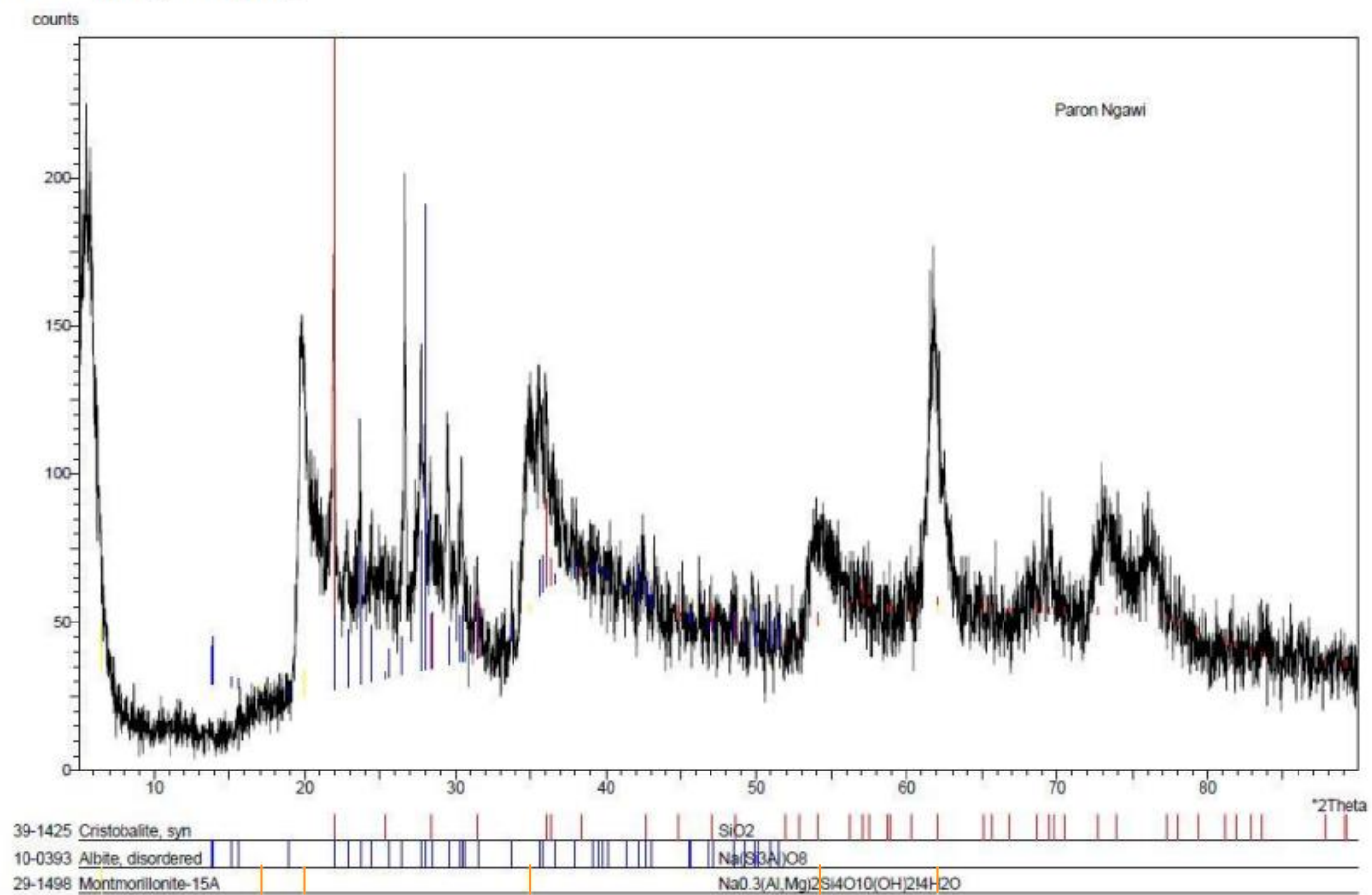
$$\text{Pengembangan Bebas} = \frac{\text{Volume Akhir} - \text{Volume Awal}}{\text{Volume Awal}} \times 100\%$$

$$= \frac{28,5 - 10}{10} \times 100\%$$

$$= 185 \%$$



Difraksi sinar – X (X-ray Difraktion)



Gambar 2.14 Grafik hasil analisis kualitatif dari difraksi sinar X
(Sumber: Edward Pambudi, 2012)

