BAB IV
HASIL PENELITIAN DAN PEMBAHASAN

4.1. Hasil Pengujian Sifat Geoteknik Tanah

Tanah lempung yang memiliki tingkat plastisitas tinggi atau tergolong tanah CH (clay-high plasticity) berdasarkan klasifikasi USCS (United Soil Classification System) ini dilakukan pengujian di laboratorium sebelum digunakan untuk penelitian. Hasil dari pengujian laboratorium dapat dilihat pada Tabel 4.1 dibawah ini.

<table>
<thead>
<tr>
<th>Pengujian</th>
<th>Hasil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berat jenis</td>
<td>2,67</td>
</tr>
<tr>
<td>Batas cair, LL (liquid limit)</td>
<td>65,6%</td>
</tr>
<tr>
<td>Batas Plastis, PL (plasticity limit)</td>
<td>33,5%</td>
</tr>
<tr>
<td>Indeks Plastisitas, PI (plasticity index)</td>
<td>32,1%</td>
</tr>
<tr>
<td>Berat volume kering maksimum, MDD</td>
<td>13,05 Kn/m³</td>
</tr>
<tr>
<td>Kadar air optimum, OMC</td>
<td>32,5%</td>
</tr>
</tbody>
</table>

Ukuran partikel tanah

<table>
<thead>
<tr>
<th>Partikel tanah</th>
<th>Persentase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lempung</td>
<td>9%</td>
</tr>
<tr>
<td>Lanau</td>
<td>76%</td>
</tr>
<tr>
<td>Pasir</td>
<td>15%</td>
</tr>
</tbody>
</table>

Adapun nilai ODM (Optimum Dry Moisture content), dan nilai OWM (Optimum Wet Moisture content), didapatkan dari 95% nilai MDD (Maximum Dry Density) yaitu masing-masing sebesar 25%, dan 39,8%. Kurva pemadatan dari tanah lempung dapat dilihat pada Gambar 4.1 di bawah ini.
4.2. Hasil Penguji Light Weight Deflectometer (LWD)

Alat Light Weight Deflectometer (LWD), digunakan untuk menganalisis kondisi suatu perkerasan dengan nilai modulus elasitisas. Pada penelitian menggunakan level 1, 2 dan level 3 karena apabila menggunakan level yang tinggi maka nilai tinggi jatuhnya akan semakin besar dan pada alat secara otomatis akan menginformasikan bahwa beban yang digunakan harus diturunkan. Level 1 mempunyai beban sebesar 1234 Kg dan tinggi jatuh 0,23 m, level 2 mempunyai beban sebesar 1744 Kg dan tinggi jatuh 0,33 m, dan beban untuk level 3 sebesar 1909 Kg dan tinggi jatuh 0,53 m. Hasil pengujiian LWD dapat dilihat pada Tabel 4.2 untuk pengujian 0 hari, sedangkan untuk pengujian hari ke-3 dan ke-7 (terlampir).
<table>
<thead>
<tr>
<th>Titik</th>
<th>d₀</th>
<th>d₁</th>
<th>d₂</th>
<th>E(_{\text{LWD}}) (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1207</td>
<td>169,7</td>
<td>24,2</td>
<td>38</td>
</tr>
<tr>
<td>1</td>
<td>1248,5</td>
<td>186,7</td>
<td>24,8</td>
<td>37</td>
</tr>
<tr>
<td>1</td>
<td>1417,4</td>
<td>221</td>
<td>22,6</td>
<td>33</td>
</tr>
<tr>
<td>1</td>
<td>1011,1</td>
<td>244,7</td>
<td>16,3</td>
<td>46</td>
</tr>
<tr>
<td>1</td>
<td>1095,7</td>
<td>249,2</td>
<td>23,2</td>
<td>42</td>
</tr>
<tr>
<td>1</td>
<td>1299</td>
<td>858,3</td>
<td>100,9</td>
<td>36</td>
</tr>
<tr>
<td>1</td>
<td>263,2</td>
<td>75,9</td>
<td>11,6</td>
<td>37</td>
</tr>
<tr>
<td>2</td>
<td>446,2</td>
<td>92,7</td>
<td>13</td>
<td>57</td>
</tr>
<tr>
<td>2</td>
<td>430,7</td>
<td>101,9</td>
<td>17,2</td>
<td>44</td>
</tr>
<tr>
<td>2</td>
<td>426,5</td>
<td>129,6</td>
<td>12,1</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>805,6</td>
<td>97,8</td>
<td>15,4</td>
<td>57</td>
</tr>
<tr>
<td>2</td>
<td>697</td>
<td>100,5</td>
<td>19,3</td>
<td>66</td>
</tr>
<tr>
<td>3</td>
<td>1046,6</td>
<td>128,4</td>
<td>14</td>
<td>44</td>
</tr>
<tr>
<td>3</td>
<td>819,4</td>
<td>120,8</td>
<td>23,1</td>
<td>57</td>
</tr>
<tr>
<td>3</td>
<td>1105,9</td>
<td>143,9</td>
<td>15,8</td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>1050,6</td>
<td>607,9</td>
<td>44,4</td>
<td>44</td>
</tr>
<tr>
<td>3</td>
<td>1090,8</td>
<td>185,1</td>
<td>19</td>
<td>42</td>
</tr>
<tr>
<td>4</td>
<td>1105,6</td>
<td>181,5</td>
<td>20,2</td>
<td>42</td>
</tr>
<tr>
<td>4</td>
<td>1195,2</td>
<td>213,8</td>
<td>20</td>
<td>39</td>
</tr>
<tr>
<td>4</td>
<td>1065,2</td>
<td>245,3</td>
<td>22,6</td>
<td>43</td>
</tr>
<tr>
<td>4</td>
<td>1339,9</td>
<td>807,9</td>
<td>72,5</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>754,3</td>
<td>314,1</td>
<td>17,5</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td>583,3</td>
<td>379,7</td>
<td>24,5</td>
<td>79</td>
</tr>
<tr>
<td>5</td>
<td>803,2</td>
<td>399,7</td>
<td>22,4</td>
<td>58</td>
</tr>
<tr>
<td>5</td>
<td>821,3</td>
<td>414,5</td>
<td>22</td>
<td>56</td>
</tr>
<tr>
<td>5</td>
<td>1238,3</td>
<td>1075,5</td>
<td>104</td>
<td>37</td>
</tr>
<tr>
<td>5</td>
<td>1123</td>
<td>347,4</td>
<td>17,1</td>
<td>41</td>
</tr>
<tr>
<td>6</td>
<td>1071,1</td>
<td>310,7</td>
<td>19,3</td>
<td>43</td>
</tr>
<tr>
<td>6</td>
<td>1217,5</td>
<td>383,1</td>
<td>17,2</td>
<td>38</td>
</tr>
<tr>
<td>6</td>
<td>1258,7</td>
<td>458,3</td>
<td>18,6</td>
<td>37</td>
</tr>
<tr>
<td>6</td>
<td>1121,7</td>
<td>1142,9</td>
<td>56,3</td>
<td>41</td>
</tr>
<tr>
<td>6</td>
<td>991,7</td>
<td>90,4</td>
<td>15,9</td>
<td>47</td>
</tr>
<tr>
<td>7</td>
<td>844</td>
<td>114</td>
<td>19,2</td>
<td>55</td>
</tr>
<tr>
<td>7</td>
<td>789,1</td>
<td>136,3</td>
<td>17,9</td>
<td>59</td>
</tr>
<tr>
<td>7</td>
<td>788</td>
<td>151</td>
<td>17,5</td>
<td>59</td>
</tr>
<tr>
<td>Titik</td>
<td>$d_0$</td>
<td>$d_1$</td>
<td>$d_2$</td>
<td>$E_{LWD}$</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Mpa)</td>
</tr>
<tr>
<td>8</td>
<td>803</td>
<td>80,1</td>
<td>14</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>569,4</td>
<td>97,1</td>
<td>18,7</td>
<td>81</td>
</tr>
<tr>
<td>7</td>
<td>667,3</td>
<td>90,9</td>
<td>12,7</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>729,1</td>
<td>83,6</td>
<td>11,8</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>596,9</td>
<td>93,5</td>
<td>19,6</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>762,8</td>
<td>192,2</td>
<td>17,7</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>705,4</td>
<td>183</td>
<td>15</td>
<td>66</td>
</tr>
<tr>
<td>9</td>
<td>693,3</td>
<td>200,2</td>
<td>15,3</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>628</td>
<td>160</td>
<td>25,9</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>537,3</td>
<td>142,8</td>
<td>29,5</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>1208,5</td>
<td>960,4</td>
<td>78,3</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>1191,9</td>
<td>122,7</td>
<td>13,2</td>
<td>39</td>
</tr>
<tr>
<td>10</td>
<td>1275</td>
<td>127,2</td>
<td>14,2</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>1287,8</td>
<td>150,4</td>
<td>16,1</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>1373,3</td>
<td>128,9</td>
<td>20,5</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>1437,9</td>
<td>515,6</td>
<td>64,2</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>1247,7</td>
<td>166,6</td>
<td>16,2</td>
<td>37</td>
</tr>
<tr>
<td>11</td>
<td>1079,4</td>
<td>161,2</td>
<td>15,8</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>1234,4</td>
<td>137,4</td>
<td>17,7</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>1454,2</td>
<td>143,1</td>
<td>15,9</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>1648</td>
<td>476,2</td>
<td>33,1</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>633,1</td>
<td>201,2</td>
<td>19,3</td>
<td>73</td>
</tr>
<tr>
<td>12</td>
<td>367,9</td>
<td>216,8</td>
<td>19,2</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>411,6</td>
<td>252,3</td>
<td>19,4</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>478</td>
<td>294,8</td>
<td>41,8</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>1123,4</td>
<td>698,7</td>
<td>65,3</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>1338,3</td>
<td>154,9</td>
<td>11,6</td>
<td>35</td>
</tr>
<tr>
<td>13</td>
<td>1433</td>
<td>166,5</td>
<td>16,5</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>1063,7</td>
<td>171,8</td>
<td>18,1</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>1380,4</td>
<td>151,6</td>
<td>15,7</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>1169,4</td>
<td>777,1</td>
<td>59,8</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>1521,8</td>
<td>167,8</td>
<td>11,2</td>
<td>30</td>
</tr>
<tr>
<td>14</td>
<td>1179,4</td>
<td>150,1</td>
<td>16,3</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>1153,2</td>
<td>155,3</td>
<td>15,9</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>1312,3</td>
<td>174,7</td>
<td>15,3</td>
<td>35</td>
</tr>
</tbody>
</table>
Berikut ini dapat dilihat hasil LWD pada pengujian 0 hari untuk pengujian menggunakan level 2, dari Tabel 4.3.

<table>
<thead>
<tr>
<th>Titik</th>
<th>d₀</th>
<th>d₁</th>
<th>d₂</th>
<th>E_{LWD} (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1180,1</td>
<td>274,9</td>
<td>26</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>1022,4</td>
<td>574,7</td>
<td>37,1</td>
<td>64</td>
</tr>
<tr>
<td>2</td>
<td>687,7</td>
<td>538,3</td>
<td>53,4</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>673,3</td>
<td>465,5</td>
<td>67,9</td>
<td>97</td>
</tr>
<tr>
<td>3</td>
<td>853,4</td>
<td>741,5</td>
<td>42</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>1253,8</td>
<td>825</td>
<td>37</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>1033,9</td>
<td>637,9</td>
<td>51,4</td>
<td>63</td>
</tr>
</tbody>
</table>

Nilai minimal 28  
Nilai maksimal 86  
Nilai rata-rata 47,5125  
Standar deviasi 14,20732005  
Koefisien variasi 0,299022785
<table>
<thead>
<tr>
<th>Titik</th>
<th>(d_0) (Mikrometer)</th>
<th>(d_1) (Mikrometer)</th>
<th>(d_2) (Mikrometer)</th>
<th>(E_{LWD}) (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1343,9</td>
<td>252,8</td>
<td>22,3</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>1279,6</td>
<td>500</td>
<td>43,2</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>1320,8</td>
<td>499,3</td>
<td>57,3</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>1232,3</td>
<td>504,4</td>
<td>42,1</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>1498,3</td>
<td>649,4</td>
<td>50,9</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>569,7</td>
<td>464,1</td>
<td>25,5</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>768,7</td>
<td>629</td>
<td>40,9</td>
<td>85</td>
</tr>
<tr>
<td>5</td>
<td>624</td>
<td>737</td>
<td>46</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>828,9</td>
<td>707,3</td>
<td>52,2</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>824,5</td>
<td>990,9</td>
<td>46,1</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>1222,7</td>
<td>383,7</td>
<td>18,9</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>995,5</td>
<td>837,3</td>
<td>67,1</td>
<td>65</td>
</tr>
<tr>
<td>6</td>
<td>1197,5</td>
<td>818,4</td>
<td>44,6</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>946,5</td>
<td>931,4</td>
<td>55,4</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>1319,3</td>
<td>941,4</td>
<td>47,2</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>776,4</td>
<td>158,4</td>
<td>16,4</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>808,6</td>
<td>350,9</td>
<td>46,7</td>
<td>80</td>
</tr>
<tr>
<td>7</td>
<td>873,3</td>
<td>444,4</td>
<td>44</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>608,9</td>
<td>362,6</td>
<td>58,4</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>748</td>
<td>588,2</td>
<td>39,5</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>1012,1</td>
<td>314,3</td>
<td>36,5</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>1142,8</td>
<td>332,3</td>
<td>46,8</td>
<td>57</td>
</tr>
<tr>
<td>8</td>
<td>1260,8</td>
<td>414</td>
<td>39,7</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>988,7</td>
<td>538,5</td>
<td>39</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>1273,2</td>
<td>547,4</td>
<td>39,9</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>696,2</td>
<td>202</td>
<td>14,6</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>822</td>
<td>560,8</td>
<td>36,5</td>
<td>79</td>
</tr>
<tr>
<td>9</td>
<td>794,2</td>
<td>573,6</td>
<td>33,9</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>958,1</td>
<td>677,4</td>
<td>46,3</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>1005,5</td>
<td>690,9</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>1266</td>
<td>146</td>
<td>15,1</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>493,9</td>
<td>344,3</td>
<td>40,7</td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>420,4</td>
<td>299</td>
<td>43,6</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>1102,2</td>
<td>354,6</td>
<td>41</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>1120,5</td>
<td>413,2</td>
<td>52,1</td>
<td>58</td>
</tr>
</tbody>
</table>
## Tabel 4.3 Lanjutan

<table>
<thead>
<tr>
<th>Titik</th>
<th>( d_0 )</th>
<th>( d_1 )</th>
<th>( d_2 )</th>
<th>( E_{LWD} )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td>(MPa)</td>
</tr>
<tr>
<td>11</td>
<td>1186,6</td>
<td>165,3</td>
<td>19,5</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>990,3</td>
<td>208,5</td>
<td>38,2</td>
<td>66</td>
</tr>
<tr>
<td>12</td>
<td>1301,3</td>
<td>459</td>
<td>37,2</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1286,8</td>
<td>517,4</td>
<td>43,4</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1217,8</td>
<td>519,8</td>
<td>41,6</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>1056,2</td>
<td>249,4</td>
<td>19,7</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>1298,5</td>
<td>565</td>
<td>30,8</td>
<td>50</td>
</tr>
<tr>
<td>13</td>
<td>1287,1</td>
<td>587,3</td>
<td>32,4</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1208,6</td>
<td>601</td>
<td>35,2</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>1227</td>
<td>600,7</td>
<td>33,9</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>1096,9</td>
<td>158,9</td>
<td>15,6</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>1438,5</td>
<td>490</td>
<td>23,8</td>
<td>45</td>
</tr>
<tr>
<td>14</td>
<td>1243</td>
<td>553,9</td>
<td>30,1</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>1246,4</td>
<td>620,1</td>
<td>28</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>1225,3</td>
<td>649,4</td>
<td>34,2</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>1053,7</td>
<td>187,6</td>
<td>17,9</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>953,8</td>
<td>377,2</td>
<td>29</td>
<td>68</td>
</tr>
<tr>
<td>15</td>
<td>702</td>
<td>337,7</td>
<td>36,6</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>1006,2</td>
<td>369,2</td>
<td>39</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>1041,2</td>
<td>426,6</td>
<td>27,3</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>840</td>
<td>282,5</td>
<td>27,7</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>685,3</td>
<td>677,1</td>
<td>60,6</td>
<td>95</td>
</tr>
<tr>
<td>16</td>
<td>950,7</td>
<td>753,8</td>
<td>66,7</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>763,9</td>
<td>694,4</td>
<td>65,2</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>934,8</td>
<td>649,7</td>
<td>86,8</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>998,1</td>
<td>169,4</td>
<td>22,1</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>581,4</td>
<td>359</td>
<td>59,7</td>
<td>72</td>
</tr>
<tr>
<td>17</td>
<td>901,8</td>
<td>473,5</td>
<td>40,4</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>1201,8</td>
<td>431,9</td>
<td>38,1</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>1471,6</td>
<td>420,9</td>
<td>48,7</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nilai minimal</td>
<td></td>
<td></td>
<td></td>
<td>43</td>
</tr>
<tr>
<td>Nilai maksimal</td>
<td></td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>Nilai rata-rata</td>
<td></td>
<td></td>
<td></td>
<td>65,5875</td>
</tr>
<tr>
<td>Standar deviasi</td>
<td></td>
<td></td>
<td></td>
<td>14,07953981</td>
</tr>
<tr>
<td>Koefisien variasi</td>
<td></td>
<td></td>
<td></td>
<td>0.214660809</td>
</tr>
</tbody>
</table>
Berikut adalah hasil dari pengujian LWD pada pengujian 0 hari menggunakan level 3 yang dapat dilihat pada Tabel 4.4.

<table>
<thead>
<tr>
<th>Titik</th>
<th>$d_0$</th>
<th>$d_1$</th>
<th>$d_2$</th>
<th>$E_{LWD}$ (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1458,1</td>
<td>688,3</td>
<td>58,3</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>1386,1</td>
<td>732,9</td>
<td>70,7</td>
<td>51</td>
</tr>
<tr>
<td>2</td>
<td>972,3</td>
<td>741,3</td>
<td>98,7</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>1378,1</td>
<td>722,8</td>
<td>92,5</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>1236,6</td>
<td>705,8</td>
<td>106,3</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>813,1</td>
<td>553,1</td>
<td>60,8</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>918,9</td>
<td>836,4</td>
<td>85,4</td>
<td>77</td>
</tr>
<tr>
<td>3</td>
<td>835,8</td>
<td>679,3</td>
<td>85,7</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>1243,7</td>
<td>832,3</td>
<td>89,4</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>1255,1</td>
<td>798,3</td>
<td>107</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>1108,8</td>
<td>726,9</td>
<td>45,6</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>1104,1</td>
<td>884,6</td>
<td>63,1</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>1276,6</td>
<td>943,4</td>
<td>63,2</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>1287,3</td>
<td>970,6</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>1254</td>
<td>818,4</td>
<td>42,3</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>1439,7</td>
<td>439,8</td>
<td>46</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>1682</td>
<td>748,2</td>
<td>69,4</td>
<td>42</td>
</tr>
<tr>
<td>5</td>
<td>1432,5</td>
<td>679,6</td>
<td>70,2</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1387,5</td>
<td>705,1</td>
<td>78,3</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>1269</td>
<td>677</td>
<td>122</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>996</td>
<td>968,5</td>
<td>66</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>1126,3</td>
<td>1076,9</td>
<td>98,3</td>
<td>63</td>
</tr>
<tr>
<td>6</td>
<td>1090,3</td>
<td>1097</td>
<td>97,8</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>948</td>
<td>948,9</td>
<td>95,3</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>1147,1</td>
<td>1213,3</td>
<td>71,7</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>1035,1</td>
<td>885,9</td>
<td>67,1</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>1029,2</td>
<td>932,4</td>
<td>89,4</td>
<td>69</td>
</tr>
<tr>
<td>7</td>
<td>1136,7</td>
<td>1088,4</td>
<td>66,7</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>1283</td>
<td>1249</td>
<td>57,3</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>1269,3</td>
<td>1233,2</td>
<td>57,7</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>857,8</td>
<td>654,5</td>
<td>45</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>775,5</td>
<td>895,5</td>
<td>60</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>797,5</td>
<td>1026</td>
<td>72,2</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>1023,5</td>
<td>1064</td>
<td>70,4</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>847,6</td>
<td>835,6</td>
<td>65,3</td>
<td>84</td>
</tr>
<tr>
<td>Titik</td>
<td>d₀</td>
<td>d₁</td>
<td>d₂</td>
<td>E_{LWD}</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td>(MPa)</td>
</tr>
<tr>
<td>8</td>
<td>818,7</td>
<td>476,2</td>
<td>39,7</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>681</td>
<td>708,2</td>
<td>54</td>
<td>104</td>
</tr>
<tr>
<td>9</td>
<td>1050,8</td>
<td>830</td>
<td>60,1</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>1224,9</td>
<td>806</td>
<td>44,8</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>1105</td>
<td>905,3</td>
<td>82,2</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>844,4</td>
<td>683,6</td>
<td>36,2</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>1497</td>
<td>912,6</td>
<td>58,1</td>
<td>48</td>
</tr>
<tr>
<td>10</td>
<td>1263,1</td>
<td>938,4</td>
<td>70,5</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>1427</td>
<td>984</td>
<td>75,7</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1283,8</td>
<td>1080,4</td>
<td>55,6</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>687,4</td>
<td>429</td>
<td>58,6</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>1068</td>
<td>464,1</td>
<td>71,8</td>
<td>67</td>
</tr>
<tr>
<td>11</td>
<td>1123,3</td>
<td>612,2</td>
<td>48,1</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>1258,1</td>
<td>443,8</td>
<td>68,7</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>1205</td>
<td>573,8</td>
<td>85,2</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>953,8</td>
<td>523,9</td>
<td>37,8</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>1328,6</td>
<td>594,6</td>
<td>45,8</td>
<td>54</td>
</tr>
<tr>
<td>12</td>
<td>1326,2</td>
<td>193,9</td>
<td>40,6</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>1522,6</td>
<td>317,9</td>
<td>60,1</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>1486</td>
<td>270,9</td>
<td>52,6</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>1181</td>
<td>520,6</td>
<td>32,8</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>1082</td>
<td>740,7</td>
<td>49,6</td>
<td>66</td>
</tr>
<tr>
<td>13</td>
<td>777</td>
<td>931,1</td>
<td>56,7</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>871,2</td>
<td>1002,8</td>
<td>74</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>1077</td>
<td>956,1</td>
<td>47,6</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>834,8</td>
<td>666,3</td>
<td>34,2</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>852,6</td>
<td>652,2</td>
<td>68,7</td>
<td>83</td>
</tr>
<tr>
<td>14</td>
<td>1454</td>
<td>791,1</td>
<td>50,5</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>1228,6</td>
<td>837,2</td>
<td>53,9</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>1160</td>
<td>823</td>
<td>54,9</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>715,4</td>
<td>323,2</td>
<td>57,3</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>935,4</td>
<td>476,9</td>
<td>49,8</td>
<td>76</td>
</tr>
<tr>
<td>15</td>
<td>1471,5</td>
<td>477,1</td>
<td>39,6</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>981,7</td>
<td>531,6</td>
<td>74,1</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>1190,7</td>
<td>630,8</td>
<td>68</td>
<td>60</td>
</tr>
</tbody>
</table>
Tabel 4.4 Lanjutan

<table>
<thead>
<tr>
<th>Titik</th>
<th>( d_0 )</th>
<th>( d_1 )</th>
<th>( d_2 )</th>
<th>( E_{LWD} )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mikrometer</td>
<td>(MPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>838,8</td>
<td>668,5</td>
<td>65,8</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>1299,3</td>
<td>808,4</td>
<td>99,4</td>
<td>55</td>
</tr>
<tr>
<td>16</td>
<td>1152,2</td>
<td>759,8</td>
<td>86,7</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>904,9</td>
<td>846,2</td>
<td>84,9</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>1267,1</td>
<td>629,6</td>
<td>124,1</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>1178,8</td>
<td>573,2</td>
<td>31,1</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>1317,9</td>
<td>522,6</td>
<td>53</td>
<td>54</td>
</tr>
<tr>
<td>15</td>
<td>1500</td>
<td>801,1</td>
<td>52,7</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>882,5</td>
<td>991,9</td>
<td>59,1</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>1257,6</td>
<td>1011,5</td>
<td>50,2</td>
<td>57</td>
</tr>
<tr>
<td>Nilai Minimal</td>
<td></td>
<td></td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Nilai Maksimal</td>
<td></td>
<td></td>
<td></td>
<td>104</td>
</tr>
<tr>
<td>Nilai Rata-Rata</td>
<td></td>
<td></td>
<td></td>
<td>65,5625</td>
</tr>
<tr>
<td>Standar Deviasi</td>
<td></td>
<td></td>
<td></td>
<td>14,57746114</td>
</tr>
<tr>
<td>Koefisien Variasi</td>
<td></td>
<td></td>
<td></td>
<td>0,222344498</td>
</tr>
</tbody>
</table>

Pada hasil pengujian hari ke-0 dapat disimpulkan bahwa semakin besar nilai tinggi jatuh pada setiap levelnya, maka semakin naik pula nilai modulus elastitisasnya, hal itu dapat dibuktikan pada Gambar 4.2 yaitu pada level 1 dapat dilihat nilai modulus elastisitasnya paling kecil, berikutnya level 2, dan nilai paling tinggi terletak pada level 3. Akan tetapi ada beberapa titik yang level 1 lebih besar daripada level 2 dan level 2 lebih besar dari level 3, hal itu disebabkan oleh beberapa faktor antara lain kurang meratanya penghamparan benda uji, dan pada saat pemadatan benda uji dilakukan dengan kurang maksimal. Hasil dari beberapa titik nilai rata-rata presentase kenaikan modulus elastisitas yang dihasilkan antara level 1 dengan level 2 adalah sebesar 44,25%, dan beberapa titik yang mengalami penurunan sebesar 12,38%. Sama dengan hasil presentase antara level 2 dengan level 3 sesudah dihitung yaitu memiliki beberapa titik yang mengalami kenaikan dan beberapa titik yang mengalami penurunan. Nilai presentase dari kenaikan antara level 2 dengan level 3 sebesar 12,94% sedangkan untuk penurunannya sebesar 19,32% pada setiap titik.
Selanjutnya, untuk pengujian pada hari ke-3 maupun hari ke-7 nilai modulus elastisitasnya juga ada beberapa titik yang nilainya semakin naik sama seperti pengujian hari ke-0 dan ada juga yang nilai modulus elastisitasnya mengalami penurunan. Hal itu dapat dilihat pada Gambar 4.3 dan Gambar 4.4.

Gambar 4.3 Modulus Elastisitas Pada Pengujian 3 hari

Gambar 4.4 Modulus Elastisitas Pada Pengujian 7 hari
Gambar 4.4 Modulus Elastisitas Pada Pengujian 7 hari


Pada pengujian ini, besar nilai tinggi jatuh juga berpengaruh dengan nilai lendutan yang didapatkan, karena semakin besar nilai tinggi jatuh pada setiap level, maka semakin besar pula nilai lendutan yang dihasilkan pada alat LWD tersebut. Nilai terkecil ada pada level 1 dan nilai yang terbesar ada pada level 3. Akan tetapi pada saat pengujian terdapat beberapa nilai lendutan yang tidak sesuai dikarenakan nilai tertinggi lendutan tidak terdapat pada nilai tinggi jatuh terbesar atau pada level 3, hal itu disebabkan karena tanah yang diuji pada saat dipadatkan kurang maksimal. Hasil lendutan dapat dilihat pada Gambar 4.5 sampai Gambar 4.7 di bawah ini.
Gambar 4.5 Lendutan Pengujian 0 hari

Gambar 4.6 Lendutan Pengujian 3 hari
4.3. Analisis Perhitungan Modulus Elastisitas LWD ($E_{\text{LWD}}$)

Perhitungan analisis $E_{\text{LWD}}$ dengan menggunakan metode Boussineq, untuk data primer dapat dilihat lendutan dari alat LWD yang dihasilkan pada setiap titiknya. Cara menganalisis data lendutan LWD yang pertama adalah menghitung gaya terapan dengan rumus:

$$F = \sqrt{2 \times m \times g \times h \times C}$$.........................(4.1)

Dimana :

Contoh hitungan pada Level 1 Titik 1 percobaan ke-1 pada hari ke-0

Massa beban jatuh = 12 Kg

Percepatan karena gravitasi = 9,81 m/s$^2$

Tinggi drop : $h_1$ = 0,23 m (untuk level 1)

$h_2$ = 0,33 m (untuk level 2)

$h_3$ = 0,53 m (untuk level 3)

$d_0$ = 1207 mikrometer

$\mu$ = 0,35 (Rassio Poisson)

jari-jari plat (a) = 15 mm
Nilai poisson rasio yang dipakai pada perhitungan adalah sebesar 0,35 dikarenakan pengujian ini dilakukan pada lapisan perkerasan. Nilai konstanta material (C) berpedoman pada SNI 3966:2012, nilai yang dipakai sesuai dengan material tersebut yang berupa bantalan karet.

Konstanta kekuatan material = \(449 \times 10^8\) N/m

\[
F = \sqrt{2 \times 12 \times 9,81 \times 0,23 \times 449 \times 10^8}
\]

\[= 1586982,561\) KN

\[
\sigma_0 = \frac{F}{A},
\]

\[= \frac{1586982,561}{3,14 \times 15^2} = 2246,26\) MPa

\[
E_{LWD} = \frac{3,14}{2} \times \frac{(1-\mu^2)\times\sigma_0\times\alpha}{d_0}
\]

\[...........................(4.2)
\]

\[
E_{LWD} = \frac{3,14}{2} \times \frac{(1-0,35^2)\times2246,26\times15}{1207}
\]

\[= 38,458\) MPa

Hasil analisa \(E_{LWD}\) yang telah dihitung dengan rumus Boussineq dapat dilihat pada Tabel 4.5 untuk pengujian hari ke-0, hasil yang didapatkan pada perhitungan analisis nilainya hampir sama dengan hasil yang didapatkan pada saat pengujian itu artinya nilai modulus elastisitas yang dihasilkan pada alat Light Weigh Deflectometer (LWD) dapat dipertanggungjawabkan.

<table>
<thead>
<tr>
<th>Titik</th>
<th>(d_0)</th>
<th>(d_1)</th>
<th>(d_2)</th>
<th>(E_{LWD}) (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1207</td>
<td>169,7</td>
<td>24,2</td>
<td>38,458</td>
</tr>
<tr>
<td></td>
<td>1248,5</td>
<td>186,7</td>
<td>24,8</td>
<td>37,180</td>
</tr>
<tr>
<td>2</td>
<td>1417,4</td>
<td>221</td>
<td>22,6</td>
<td>32,750</td>
</tr>
<tr>
<td></td>
<td>1011,1</td>
<td>244,7</td>
<td>16,3</td>
<td>45,910</td>
</tr>
<tr>
<td></td>
<td>1095,7</td>
<td>249,2</td>
<td>23,2</td>
<td>42,365</td>
</tr>
<tr>
<td></td>
<td>1299</td>
<td>858,3</td>
<td>100,9</td>
<td>35,735</td>
</tr>
<tr>
<td></td>
<td>263,2</td>
<td>75,9</td>
<td>11,6</td>
<td>37,365</td>
</tr>
<tr>
<td></td>
<td>446,2</td>
<td>92,7</td>
<td>13</td>
<td>57,032</td>
</tr>
<tr>
<td>Titik</td>
<td>d₀</td>
<td>d₁</td>
<td>d₂</td>
<td>E_{LWD} (MPa)</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>430,7</td>
<td>101,9</td>
<td>17,2</td>
<td>44,776</td>
</tr>
<tr>
<td></td>
<td>426,5</td>
<td>129,6</td>
<td>12,1</td>
<td>43,837</td>
</tr>
<tr>
<td></td>
<td>805,6</td>
<td>97,8</td>
<td>15,4</td>
<td>57,621</td>
</tr>
<tr>
<td></td>
<td>697</td>
<td>100,5</td>
<td>19,3</td>
<td>66,599</td>
</tr>
<tr>
<td>4</td>
<td>1046,6</td>
<td>128,4</td>
<td>14</td>
<td>44,352</td>
</tr>
<tr>
<td></td>
<td>819,4</td>
<td>120,8</td>
<td>23,1</td>
<td>56,650</td>
</tr>
<tr>
<td></td>
<td>1105,9</td>
<td>143,9</td>
<td>15,8</td>
<td>41,974</td>
</tr>
<tr>
<td></td>
<td>1050,6</td>
<td>607,9</td>
<td>44,4</td>
<td>44,184</td>
</tr>
<tr>
<td></td>
<td>1090,8</td>
<td>185,1</td>
<td>19</td>
<td>42,555</td>
</tr>
<tr>
<td>5</td>
<td>1105,6</td>
<td>181,5</td>
<td>20,2</td>
<td>41,986</td>
</tr>
<tr>
<td></td>
<td>1195,2</td>
<td>213,8</td>
<td>20</td>
<td>38,838</td>
</tr>
<tr>
<td></td>
<td>1065,2</td>
<td>245,3</td>
<td>22,6</td>
<td>43,578</td>
</tr>
<tr>
<td></td>
<td>1339,9</td>
<td>807,9</td>
<td>72,5</td>
<td>34,644</td>
</tr>
<tr>
<td></td>
<td>754,3</td>
<td>314,1</td>
<td>17,5</td>
<td>61,539</td>
</tr>
<tr>
<td>6</td>
<td>583,3</td>
<td>379,7</td>
<td>24,5</td>
<td>79,580</td>
</tr>
<tr>
<td></td>
<td>803,2</td>
<td>399,7</td>
<td>22,4</td>
<td>57,793</td>
</tr>
<tr>
<td></td>
<td>821,3</td>
<td>414,5</td>
<td>22</td>
<td>56,519</td>
</tr>
<tr>
<td></td>
<td>1238,3</td>
<td>1075,5</td>
<td>104</td>
<td>37,486</td>
</tr>
<tr>
<td></td>
<td>1123</td>
<td>347,4</td>
<td>17,1</td>
<td>41,335</td>
</tr>
<tr>
<td>7</td>
<td>1071,1</td>
<td>310,7</td>
<td>19,3</td>
<td>43,338</td>
</tr>
<tr>
<td></td>
<td>1217,5</td>
<td>383,1</td>
<td>17,2</td>
<td>38,127</td>
</tr>
<tr>
<td></td>
<td>1258,7</td>
<td>458,3</td>
<td>18,6</td>
<td>36,879</td>
</tr>
<tr>
<td></td>
<td>1121,7</td>
<td>1142,9</td>
<td>56,3</td>
<td>41,383</td>
</tr>
<tr>
<td></td>
<td>991,7</td>
<td>90,4</td>
<td>15,9</td>
<td>46,808</td>
</tr>
<tr>
<td>8</td>
<td>844</td>
<td>114</td>
<td>19,2</td>
<td>54,999</td>
</tr>
<tr>
<td></td>
<td>789,1</td>
<td>136,3</td>
<td>17,9</td>
<td>58,826</td>
</tr>
<tr>
<td></td>
<td>788</td>
<td>151</td>
<td>17,5</td>
<td>58,908</td>
</tr>
<tr>
<td></td>
<td>803</td>
<td>80,1</td>
<td>14</td>
<td>57,807</td>
</tr>
<tr>
<td></td>
<td>569,4</td>
<td>97,1</td>
<td>18,7</td>
<td>81,523</td>
</tr>
<tr>
<td>9</td>
<td>667,3</td>
<td>90,9</td>
<td>12,7</td>
<td>69,563</td>
</tr>
<tr>
<td></td>
<td>729,1</td>
<td>83,6</td>
<td>11,8</td>
<td>63,666</td>
</tr>
<tr>
<td></td>
<td>596,9</td>
<td>93,5</td>
<td>19,6</td>
<td>77,767</td>
</tr>
<tr>
<td></td>
<td>762,8</td>
<td>192,2</td>
<td>17,7</td>
<td>60,854</td>
</tr>
<tr>
<td></td>
<td>705,4</td>
<td>183</td>
<td>15</td>
<td>65,806</td>
</tr>
<tr>
<td></td>
<td>693,3</td>
<td>200,2</td>
<td>15,3</td>
<td>66,954</td>
</tr>
<tr>
<td></td>
<td>628</td>
<td>160</td>
<td>25,9</td>
<td>73,916</td>
</tr>
<tr>
<td></td>
<td>537,3</td>
<td>142,8</td>
<td>29,5</td>
<td>86,394</td>
</tr>
<tr>
<td>Titik</td>
<td>$d_0$ (Mikrometer)</td>
<td>$d_1$</td>
<td>$d_2$</td>
<td>$E_{LWD}$ (MPa)</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------</td>
<td>-------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>10</td>
<td>1208,5</td>
<td>960,4</td>
<td>78,3</td>
<td>38,411</td>
</tr>
<tr>
<td></td>
<td>1191,9</td>
<td>122,7</td>
<td>13,2</td>
<td>38,946</td>
</tr>
<tr>
<td></td>
<td>1275</td>
<td>127,2</td>
<td>14,2</td>
<td>36,407</td>
</tr>
<tr>
<td></td>
<td>1287,8</td>
<td>150,4</td>
<td>16,1</td>
<td>36,045</td>
</tr>
<tr>
<td></td>
<td>1373,3</td>
<td>128,9</td>
<td>20,5</td>
<td>33,801</td>
</tr>
<tr>
<td></td>
<td>1437,9</td>
<td>515,6</td>
<td>64,2</td>
<td>32,283</td>
</tr>
<tr>
<td></td>
<td>1247,7</td>
<td>166,6</td>
<td>16,2</td>
<td>37,204</td>
</tr>
<tr>
<td>11</td>
<td>1079,4</td>
<td>161,2</td>
<td>15,8</td>
<td>43,005</td>
</tr>
<tr>
<td></td>
<td>1234,4</td>
<td>137,4</td>
<td>17,7</td>
<td>37,605</td>
</tr>
<tr>
<td></td>
<td>1454,2</td>
<td>143,1</td>
<td>15,9</td>
<td>31,921</td>
</tr>
<tr>
<td></td>
<td>1648</td>
<td>476,2</td>
<td>33,1</td>
<td>28,167</td>
</tr>
<tr>
<td></td>
<td>633,1</td>
<td>201,2</td>
<td>19,3</td>
<td>73,321</td>
</tr>
<tr>
<td>12</td>
<td>367,9</td>
<td>216,8</td>
<td>19,2</td>
<td>43,174</td>
</tr>
<tr>
<td></td>
<td>411,6</td>
<td>252,3</td>
<td>19,4</td>
<td>33,778</td>
</tr>
<tr>
<td></td>
<td>478</td>
<td>294,8</td>
<td>41,8</td>
<td>97,111</td>
</tr>
<tr>
<td></td>
<td>1123,4</td>
<td>698,7</td>
<td>65,3</td>
<td>41,320</td>
</tr>
<tr>
<td></td>
<td>1338,3</td>
<td>154,9</td>
<td>11,6</td>
<td>34,685</td>
</tr>
<tr>
<td>13</td>
<td>1433</td>
<td>166,5</td>
<td>16,5</td>
<td>32,393</td>
</tr>
<tr>
<td></td>
<td>1063,7</td>
<td>171,8</td>
<td>18,1</td>
<td>43,639</td>
</tr>
<tr>
<td></td>
<td>1380,4</td>
<td>151,6</td>
<td>15,7</td>
<td>33,627</td>
</tr>
<tr>
<td></td>
<td>1169,4</td>
<td>777,1</td>
<td>59,8</td>
<td>39,695</td>
</tr>
<tr>
<td></td>
<td>1521,8</td>
<td>167,8</td>
<td>11,2</td>
<td>30,503</td>
</tr>
<tr>
<td>14</td>
<td>1179,4</td>
<td>150,1</td>
<td>16,3</td>
<td>39,358</td>
</tr>
<tr>
<td></td>
<td>1153,2</td>
<td>155,3</td>
<td>15,9</td>
<td>40,253</td>
</tr>
<tr>
<td></td>
<td>1312,3</td>
<td>174,7</td>
<td>15,3</td>
<td>35,372</td>
</tr>
<tr>
<td></td>
<td>1341</td>
<td>553,5</td>
<td>64,4</td>
<td>34,615</td>
</tr>
<tr>
<td></td>
<td>736,8</td>
<td>211,5</td>
<td>33,4</td>
<td>63,001</td>
</tr>
<tr>
<td>15</td>
<td>742,1</td>
<td>299,5</td>
<td>41,9</td>
<td>62,551</td>
</tr>
<tr>
<td></td>
<td>784,4</td>
<td>318,8</td>
<td>44,4</td>
<td>59,178</td>
</tr>
<tr>
<td></td>
<td>564,1</td>
<td>374,9</td>
<td>44,4</td>
<td>82,289</td>
</tr>
</tbody>
</table>
### Tabel 4.5 Lanjutan

<table>
<thead>
<tr>
<th>Titik</th>
<th>$d_0$</th>
<th>$d_1$</th>
<th>$d_2$</th>
<th>$E_{LWD}$ (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1235,8</td>
<td>629,9</td>
<td>101,1</td>
<td></td>
<td>37,562</td>
</tr>
<tr>
<td>1035,9</td>
<td>180,4</td>
<td>18,1</td>
<td></td>
<td>44,810</td>
</tr>
<tr>
<td>1008,8</td>
<td>145,5</td>
<td>16,4</td>
<td></td>
<td>46,014</td>
</tr>
<tr>
<td>995,7</td>
<td>175,8</td>
<td>20</td>
<td></td>
<td>46,619</td>
</tr>
<tr>
<td>1239,1</td>
<td>173,7</td>
<td>13,1</td>
<td></td>
<td>37,462</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nilai minimal: 28,167  
Nilai maksimal: 86,364  
Nilai rata-rata: 47,555  
Standar deviasi: 14,199  
Koefisien variasi: 0,298

### Tabel 4.6 Hasil Analisis Pengujian LWD Level 2 Pengujian 0 hari

<table>
<thead>
<tr>
<th>Titik</th>
<th>$d_0$</th>
<th>$d_1$</th>
<th>$d_2$</th>
<th>$E_{LWD}$ (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1180,1</td>
<td>274,9</td>
<td>26</td>
<td></td>
<td>55,809</td>
</tr>
<tr>
<td>1022,4</td>
<td>574,7</td>
<td>37,1</td>
<td></td>
<td>64,418</td>
</tr>
<tr>
<td>1</td>
<td>962</td>
<td>533,6</td>
<td>63,6</td>
<td>68,463</td>
</tr>
<tr>
<td>1240,2</td>
<td>637,4</td>
<td>48,9</td>
<td></td>
<td>53,105</td>
</tr>
<tr>
<td>1239,2</td>
<td>663,3</td>
<td>50,6</td>
<td></td>
<td>53,148</td>
</tr>
<tr>
<td>237,3</td>
<td>87,9</td>
<td>21,1</td>
<td></td>
<td>74,543</td>
</tr>
<tr>
<td>837,5</td>
<td>318,3</td>
<td>39,4</td>
<td></td>
<td>78,640</td>
</tr>
<tr>
<td>2</td>
<td>687,7</td>
<td>538,3</td>
<td>53,4</td>
<td>95,770</td>
</tr>
<tr>
<td>673,3</td>
<td>465,5</td>
<td>67,9</td>
<td></td>
<td>97,818</td>
</tr>
<tr>
<td>785,9</td>
<td>549,6</td>
<td>57,6</td>
<td></td>
<td>83,803</td>
</tr>
<tr>
<td>764,4</td>
<td>121,6</td>
<td>26,1</td>
<td></td>
<td>86,160</td>
</tr>
<tr>
<td>812,3</td>
<td>565,2</td>
<td>49,1</td>
<td></td>
<td>81,079</td>
</tr>
<tr>
<td>3</td>
<td>853,4</td>
<td>741,5</td>
<td>42</td>
<td>77,175</td>
</tr>
<tr>
<td>1253,8</td>
<td>825</td>
<td>37</td>
<td></td>
<td>52,529</td>
</tr>
<tr>
<td>1033,9</td>
<td>637,9</td>
<td>51,4</td>
<td></td>
<td>63,702</td>
</tr>
<tr>
<td>1343,9</td>
<td>252,8</td>
<td>22,3</td>
<td></td>
<td>49,007</td>
</tr>
<tr>
<td>1279,6</td>
<td>500</td>
<td>43,2</td>
<td></td>
<td>51,470</td>
</tr>
<tr>
<td>4</td>
<td>1320,8</td>
<td>499,3</td>
<td>57,3</td>
<td>49,865</td>
</tr>
<tr>
<td>1232,3</td>
<td>504,4</td>
<td>42,1</td>
<td></td>
<td>53,446</td>
</tr>
<tr>
<td>1498,3</td>
<td>649,4</td>
<td>50,9</td>
<td></td>
<td>43,958</td>
</tr>
<tr>
<td>5</td>
<td>569,7</td>
<td>464,1</td>
<td>25,5</td>
<td>81,607</td>
</tr>
<tr>
<td>5</td>
<td>768,7</td>
<td>629</td>
<td>40,9</td>
<td>85,679</td>
</tr>
<tr>
<td>Titik</td>
<td>$d_0$</td>
<td>$d_1$</td>
<td>$d_2$</td>
<td>$E_{LWD}$ (MPa)</td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>624</td>
<td>737</td>
<td>46</td>
<td>105,546</td>
</tr>
<tr>
<td></td>
<td>828,9</td>
<td>707,3</td>
<td>52,2</td>
<td>79,456</td>
</tr>
<tr>
<td></td>
<td>824,5</td>
<td>990,9</td>
<td>46,1</td>
<td>79,880</td>
</tr>
<tr>
<td></td>
<td>1222,7</td>
<td>383,7</td>
<td>18,9</td>
<td>53,865</td>
</tr>
<tr>
<td></td>
<td>995,5</td>
<td>837,3</td>
<td>67,1</td>
<td>66,159</td>
</tr>
<tr>
<td>7</td>
<td>1197,5</td>
<td>818,4</td>
<td>44,6</td>
<td>54,999</td>
</tr>
<tr>
<td></td>
<td>946,5</td>
<td>931,4</td>
<td>55,4</td>
<td>69,584</td>
</tr>
<tr>
<td></td>
<td>1319,3</td>
<td>941,4</td>
<td>47,2</td>
<td>49,921</td>
</tr>
<tr>
<td></td>
<td>776,4</td>
<td>158,4</td>
<td>16,4</td>
<td>84,829</td>
</tr>
<tr>
<td></td>
<td>808,6</td>
<td>350,9</td>
<td>46,7</td>
<td>81,451</td>
</tr>
<tr>
<td>8</td>
<td>1260,8</td>
<td>414</td>
<td>39,7</td>
<td>52,238</td>
</tr>
<tr>
<td></td>
<td>988,7</td>
<td>538,5</td>
<td>39</td>
<td>66,614</td>
</tr>
<tr>
<td></td>
<td>1273,2</td>
<td>547,4</td>
<td>39,9</td>
<td>51,729</td>
</tr>
<tr>
<td></td>
<td>696,2</td>
<td>202</td>
<td>14,6</td>
<td>94,601</td>
</tr>
<tr>
<td></td>
<td>822</td>
<td>560,8</td>
<td>36,5</td>
<td>80,123</td>
</tr>
<tr>
<td>9</td>
<td>794,2</td>
<td>573,6</td>
<td>33,9</td>
<td>82,928</td>
</tr>
<tr>
<td></td>
<td>958,1</td>
<td>677,4</td>
<td>46,3</td>
<td>68,741</td>
</tr>
<tr>
<td></td>
<td>1005,5</td>
<td>690,9</td>
<td>35</td>
<td>65,501</td>
</tr>
<tr>
<td></td>
<td>1266</td>
<td>146</td>
<td>15,1</td>
<td>52,023</td>
</tr>
<tr>
<td></td>
<td>493,9</td>
<td>344,3</td>
<td>40,7</td>
<td>133,349</td>
</tr>
<tr>
<td>10</td>
<td>420,4</td>
<td>299</td>
<td>43,6</td>
<td>156,663</td>
</tr>
<tr>
<td></td>
<td>1102,2</td>
<td>354,6</td>
<td>41</td>
<td>59,754</td>
</tr>
<tr>
<td></td>
<td>1120,5</td>
<td>413,2</td>
<td>52,1</td>
<td>58,778</td>
</tr>
<tr>
<td></td>
<td>1186,6</td>
<td>165,3</td>
<td>19,5</td>
<td>55,504</td>
</tr>
<tr>
<td></td>
<td>990,3</td>
<td>208,5</td>
<td>38,2</td>
<td>66,506</td>
</tr>
<tr>
<td>11</td>
<td>1301,3</td>
<td>459</td>
<td>37,2</td>
<td>50,612</td>
</tr>
<tr>
<td></td>
<td>1286,8</td>
<td>517,4</td>
<td>43,4</td>
<td>51,182</td>
</tr>
<tr>
<td></td>
<td>1217,8</td>
<td>519,8</td>
<td>41,6</td>
<td>54,082</td>
</tr>
<tr>
<td></td>
<td>1056,2</td>
<td>249,4</td>
<td>19,7</td>
<td>62,357</td>
</tr>
<tr>
<td>12</td>
<td>1298,5</td>
<td>565</td>
<td>30,8</td>
<td>50,721</td>
</tr>
<tr>
<td></td>
<td>1287,1</td>
<td>587,3</td>
<td>32,4</td>
<td>51,170</td>
</tr>
<tr>
<td></td>
<td>1208,6</td>
<td>601</td>
<td>35,2</td>
<td>54,494</td>
</tr>
</tbody>
</table>
Tabel 4.6 Lanjutan

<table>
<thead>
<tr>
<th>Titik</th>
<th>$d_0$</th>
<th>$d_1$</th>
<th>$d_2$</th>
<th>$E_{LWD}$ (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1227</td>
<td>600,7</td>
<td>33,9</td>
<td>53,677</td>
<td></td>
</tr>
<tr>
<td>1096,9</td>
<td>158,9</td>
<td>15,6</td>
<td>60,043</td>
<td></td>
</tr>
<tr>
<td>1438,5</td>
<td>490</td>
<td>23,8</td>
<td>45,785</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>1243</td>
<td>553,9</td>
<td>30,1</td>
<td>52,986</td>
</tr>
<tr>
<td>1246,4</td>
<td>620,1</td>
<td>28</td>
<td>52,841</td>
<td></td>
</tr>
<tr>
<td>1225,3</td>
<td>649,4</td>
<td>34,2</td>
<td>53,751</td>
<td></td>
</tr>
<tr>
<td>1053,7</td>
<td>187,6</td>
<td>17,9</td>
<td>62,505</td>
<td></td>
</tr>
<tr>
<td>953,8</td>
<td>377,2</td>
<td>29</td>
<td>69,051</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>702</td>
<td>337,7</td>
<td>36,6</td>
<td>93,819</td>
</tr>
<tr>
<td>1006,2</td>
<td>369,2</td>
<td>39</td>
<td>65,455</td>
<td></td>
</tr>
<tr>
<td>1041,2</td>
<td>426,6</td>
<td>27,3</td>
<td>63,255</td>
<td></td>
</tr>
<tr>
<td>840</td>
<td>282,5</td>
<td>27,7</td>
<td>78,406</td>
<td></td>
</tr>
<tr>
<td>685,3</td>
<td>677,1</td>
<td>60,6</td>
<td>96,105</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>950,7</td>
<td>753,8</td>
<td>66,7</td>
<td>69,276</td>
</tr>
<tr>
<td>763,9</td>
<td>694,4</td>
<td>65,2</td>
<td>86,217</td>
<td></td>
</tr>
<tr>
<td>934,8</td>
<td>649,7</td>
<td>86,8</td>
<td>70,455</td>
<td></td>
</tr>
<tr>
<td>998,1</td>
<td>169,4</td>
<td>22,1</td>
<td>65,986</td>
<td></td>
</tr>
<tr>
<td>581,4</td>
<td>359</td>
<td>59,7</td>
<td>72,280</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>901,8</td>
<td>473,5</td>
<td>40,4</td>
<td>73,032</td>
</tr>
<tr>
<td>1201,8</td>
<td>431,9</td>
<td>38,1</td>
<td>54,802</td>
<td></td>
</tr>
<tr>
<td>1471,6</td>
<td>420,9</td>
<td>48,7</td>
<td>44,754</td>
<td></td>
</tr>
<tr>
<td>Nilai minimal</td>
<td>43,957</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nilai maksimal</td>
<td>97,543</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nilai rata-rata</td>
<td>65,542</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standar deviasi</td>
<td>14,249</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koefisien variasi</td>
<td>0,211</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tabel 4.7 Hasil Analisis Pengujian LWD Level 3 Pengujian 0 hari

<table>
<thead>
<tr>
<th>Titik</th>
<th>$d_0$</th>
<th>$d_1$</th>
<th>$d_2$</th>
<th>$E_{LWD}$ (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1458,1</td>
<td>688,3</td>
<td>58,3</td>
<td>49,359</td>
<td></td>
</tr>
<tr>
<td>1386,1</td>
<td>732,9</td>
<td>70,7</td>
<td>51,923</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>972,3</td>
<td>741,3</td>
<td>98,7</td>
<td>74,021</td>
</tr>
<tr>
<td>1378,1</td>
<td>722,8</td>
<td>92,5</td>
<td>52,224</td>
<td></td>
</tr>
<tr>
<td>1236,6</td>
<td>705,8</td>
<td>106,3</td>
<td>58,200</td>
<td></td>
</tr>
<tr>
<td>Titik</td>
<td>$d_0$</td>
<td>$d_1$</td>
<td>$d_2$</td>
<td>$E_{LWD}$ (MPa)</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>813,1</td>
<td>553,1</td>
<td>60,8</td>
<td>88,513</td>
</tr>
<tr>
<td></td>
<td>918,9</td>
<td>836,4</td>
<td>85,4</td>
<td>78,322</td>
</tr>
<tr>
<td>2</td>
<td>835,8</td>
<td>679,3</td>
<td>85,7</td>
<td>86,109</td>
</tr>
<tr>
<td></td>
<td>1243,7</td>
<td>832,3</td>
<td>89,4</td>
<td>57,868</td>
</tr>
<tr>
<td></td>
<td>1255,1</td>
<td>798,3</td>
<td>107</td>
<td>57,342</td>
</tr>
<tr>
<td></td>
<td>1108,8</td>
<td>726,9</td>
<td>45,6</td>
<td>64,908</td>
</tr>
<tr>
<td></td>
<td>1104,1</td>
<td>884,6</td>
<td>63,1</td>
<td>65,185</td>
</tr>
<tr>
<td>3</td>
<td>1276,6</td>
<td>943,4</td>
<td>63,2</td>
<td>56,376</td>
</tr>
<tr>
<td></td>
<td>1287,3</td>
<td>970,6</td>
<td>59</td>
<td>55,908</td>
</tr>
<tr>
<td></td>
<td>1254</td>
<td>818,4</td>
<td>42,3</td>
<td>57,393</td>
</tr>
<tr>
<td></td>
<td>1439,7</td>
<td>439,8</td>
<td>46</td>
<td>49,989</td>
</tr>
<tr>
<td></td>
<td>1682</td>
<td>748,2</td>
<td>69,4</td>
<td>42,788</td>
</tr>
<tr>
<td>4</td>
<td>1432,5</td>
<td>679,6</td>
<td>70,2</td>
<td>50,241</td>
</tr>
<tr>
<td></td>
<td>1387,5</td>
<td>705,1</td>
<td>78,3</td>
<td>51,870</td>
</tr>
<tr>
<td></td>
<td>1269</td>
<td>677</td>
<td>122</td>
<td>56,714</td>
</tr>
<tr>
<td></td>
<td>996</td>
<td>968,5</td>
<td>66</td>
<td>72,259</td>
</tr>
<tr>
<td></td>
<td>1126,3</td>
<td>1076,9</td>
<td>98,3</td>
<td>63,899</td>
</tr>
<tr>
<td>5</td>
<td>1090,3</td>
<td>1097</td>
<td>97,8</td>
<td>66,009</td>
</tr>
<tr>
<td></td>
<td>948</td>
<td>948,9</td>
<td>95,3</td>
<td>75,918</td>
</tr>
<tr>
<td></td>
<td>1147,1</td>
<td>1213,3</td>
<td>71,7</td>
<td>62,741</td>
</tr>
<tr>
<td></td>
<td>1035,1</td>
<td>885,9</td>
<td>67,1</td>
<td>69,529</td>
</tr>
<tr>
<td></td>
<td>1029,2</td>
<td>932,4</td>
<td>89,4</td>
<td>69,928</td>
</tr>
<tr>
<td>6</td>
<td>1136,7</td>
<td>1088,4</td>
<td>66,7</td>
<td>63,315</td>
</tr>
<tr>
<td></td>
<td>1283</td>
<td>1249</td>
<td>57,3</td>
<td>56,095</td>
</tr>
<tr>
<td></td>
<td>1269,3</td>
<td>1233,2</td>
<td>57,7</td>
<td>56,701</td>
</tr>
<tr>
<td></td>
<td>857,8</td>
<td>654,5</td>
<td>45</td>
<td>83,901</td>
</tr>
<tr>
<td></td>
<td>775,5</td>
<td>895,5</td>
<td>60</td>
<td>92,805</td>
</tr>
<tr>
<td>7</td>
<td>797,5</td>
<td>1026</td>
<td>72,2</td>
<td>90,245</td>
</tr>
<tr>
<td></td>
<td>1023,5</td>
<td>1064</td>
<td>70,4</td>
<td>70,318</td>
</tr>
<tr>
<td></td>
<td>847,6</td>
<td>835,6</td>
<td>65,3</td>
<td>84,911</td>
</tr>
<tr>
<td></td>
<td>818,7</td>
<td>476,2</td>
<td>39,7</td>
<td>87,908</td>
</tr>
<tr>
<td></td>
<td>681</td>
<td>708,2</td>
<td>54</td>
<td>105,683</td>
</tr>
<tr>
<td>8</td>
<td>1050,8</td>
<td>830</td>
<td>60,1</td>
<td>68,491</td>
</tr>
<tr>
<td></td>
<td>1224,9</td>
<td>806</td>
<td>44,8</td>
<td>58,756</td>
</tr>
<tr>
<td></td>
<td>1105</td>
<td>905,3</td>
<td>82,2</td>
<td>65,131</td>
</tr>
<tr>
<td>Titik</td>
<td>$d_0$</td>
<td>$d_1$</td>
<td>$d_2$</td>
<td>$E_{LWD}$ (MPa)</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>Mikrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>844,4</td>
<td>683,6</td>
<td>36,2</td>
<td></td>
<td>85,232</td>
</tr>
<tr>
<td>1497</td>
<td>912,6</td>
<td>58,1</td>
<td></td>
<td>48,077</td>
</tr>
<tr>
<td>1263,1</td>
<td>938,4</td>
<td>70,5</td>
<td></td>
<td>56,979</td>
</tr>
<tr>
<td>1427</td>
<td>984</td>
<td>75,7</td>
<td></td>
<td>50,435</td>
</tr>
<tr>
<td>1283,8</td>
<td>1080,4</td>
<td>55,6</td>
<td></td>
<td>56,063</td>
</tr>
<tr>
<td>687,4</td>
<td>429</td>
<td>58,6</td>
<td></td>
<td>104,699</td>
</tr>
<tr>
<td>1068</td>
<td>464,1</td>
<td>71,8</td>
<td></td>
<td>67,388</td>
</tr>
<tr>
<td>1123,3</td>
<td>612,2</td>
<td>48,1</td>
<td></td>
<td>64,070</td>
</tr>
<tr>
<td>1258,1</td>
<td>443,8</td>
<td>68,7</td>
<td></td>
<td>57,205</td>
</tr>
<tr>
<td>1205</td>
<td>573,8</td>
<td>85,2</td>
<td></td>
<td>59,726</td>
</tr>
<tr>
<td>953,8</td>
<td>523,9</td>
<td>37,8</td>
<td></td>
<td>75,456</td>
</tr>
<tr>
<td>1328,6</td>
<td>594,6</td>
<td>45,8</td>
<td></td>
<td>54,169</td>
</tr>
<tr>
<td>1326,2</td>
<td>193,9</td>
<td>40,6</td>
<td></td>
<td>54,268</td>
</tr>
<tr>
<td>1522,6</td>
<td>317,9</td>
<td>60,1</td>
<td></td>
<td>47,268</td>
</tr>
<tr>
<td>1486</td>
<td>270,9</td>
<td>52,6</td>
<td></td>
<td>48,432</td>
</tr>
<tr>
<td>1181</td>
<td>520,6</td>
<td>32,8</td>
<td></td>
<td>60,940</td>
</tr>
<tr>
<td>1082</td>
<td>740,7</td>
<td>49,6</td>
<td></td>
<td>66,516</td>
</tr>
<tr>
<td>777</td>
<td>931,1</td>
<td>56,7</td>
<td></td>
<td>92,626</td>
</tr>
<tr>
<td>871,2</td>
<td>1002,8</td>
<td>74</td>
<td></td>
<td>82,610</td>
</tr>
<tr>
<td>1077</td>
<td>956,1</td>
<td>47,6</td>
<td></td>
<td>66,825</td>
</tr>
<tr>
<td>834,8</td>
<td>666,3</td>
<td>34,2</td>
<td></td>
<td>86,213</td>
</tr>
<tr>
<td>852,6</td>
<td>652,2</td>
<td>68,7</td>
<td></td>
<td>84,413</td>
</tr>
<tr>
<td>1454</td>
<td>791,1</td>
<td>50,5</td>
<td></td>
<td>49,498</td>
</tr>
<tr>
<td>1228,6</td>
<td>837,2</td>
<td>53,9</td>
<td></td>
<td>58,579</td>
</tr>
<tr>
<td>1160</td>
<td>823</td>
<td>54,9</td>
<td></td>
<td>62,043</td>
</tr>
<tr>
<td>715,4</td>
<td>323,2</td>
<td>57,3</td>
<td></td>
<td>100,601</td>
</tr>
<tr>
<td>935,4</td>
<td>476,9</td>
<td>49,8</td>
<td></td>
<td>76,941</td>
</tr>
<tr>
<td>1471,5</td>
<td>477,1</td>
<td>39,6</td>
<td></td>
<td>48,909</td>
</tr>
<tr>
<td>981,7</td>
<td>531,6</td>
<td>74,1</td>
<td></td>
<td>73,312</td>
</tr>
<tr>
<td>1190,7</td>
<td>630,8</td>
<td>68</td>
<td></td>
<td>60,444</td>
</tr>
<tr>
<td>838,8</td>
<td>668,5</td>
<td>65,8</td>
<td></td>
<td>85,801</td>
</tr>
<tr>
<td>1299,3</td>
<td>808,4</td>
<td>99,4</td>
<td></td>
<td>55,392</td>
</tr>
<tr>
<td>1152,2</td>
<td>759,8</td>
<td>86,7</td>
<td></td>
<td>62,463</td>
</tr>
<tr>
<td>904,9</td>
<td>846,2</td>
<td>84,9</td>
<td></td>
<td>79,534</td>
</tr>
<tr>
<td>1267,1</td>
<td>629,6</td>
<td>124,1</td>
<td></td>
<td>56,799</td>
</tr>
</tbody>
</table>
Tabel 4.7 Lanjutan

<table>
<thead>
<tr>
<th>Titik</th>
<th>( d_0 )</th>
<th>( d_1 )</th>
<th>( d_2 )</th>
<th>( E_{LWD} ) (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>1500</td>
<td>901,1</td>
<td>52,7</td>
<td>47,980</td>
</tr>
<tr>
<td></td>
<td>882,5</td>
<td>991,9</td>
<td>59,1</td>
<td>81,553</td>
</tr>
<tr>
<td></td>
<td>1257,6</td>
<td>1011,5</td>
<td>50,2</td>
<td>57,228</td>
</tr>
</tbody>
</table>

Nilai minimal 42,788
Nilai maksimal 105,683
Nilai rata-rata 66,402
Standar deviasi 14,759
Koefisien variasi 0,222

Tabel hasil analisis perhitungan untuk pengujian pada hari ke-3 dan hari ke-7 terlampir. Perbandingan nilai modulus elastisitas yang dihasilkan pada saat pengujian dengan nilai modulus elastisitas analisis dapat dilihat pada Gambar 4.8 untuk pengujian hari ke-0, Gambar 4.9 untuk pengujian hari ke-3, dan Gambar 4.10 untuk pengujian hari ke-7.

\[
y = 1.0428x - 1.9013 \quad R^2 = 0.9935
\]

\[
y = 0.9894x - 0.1597 \quad R^2 = 1
\]

\[
y = 0.9919x - 0.3039 \quad R^2 = 0.9989
\]

Gambar 4.8 Perbandingan Modulus Elastisitas Analisis dan Alat Pengujian 0 hari
Gambar 4.9 Perbandingan Modulus Elastisitas Analisis dan Alat Pengujian 3 hari

Gambar 4.10 Perbandingan Modulus Elastisitas Analisis dan Alat Pengujian 7 hari
4.2.1 Pengujian Validitas dan Realibilitas

Pengujian validitas adalah pengujian untuk mengukur ketepatan/valid tidaknya suatu data yang akan digunakan dalam suatu penelitian. Suatu data dikatakan mempunyai validitas yang tinggi apabila data tersebut memberikan hasil ukur yang tepat dan akurat. Selain itu pengujian validitas juga dapat berfungsi untuk mendeteksi kecermatan pengukuran suatu data. Kecermatan disini diartikan untuk mendeteksi perbedaan-perbedaan kecil yang ada pada suatu data tersebut.

Dalam melakukan uji validitas menggunakan program SPSS yang mana teknik pengujianannya menggunakan korelasi *Bivariate Pearson* atau dengan cara mengkorelasikan masing-masing data dengan total data, yang disebut dengan total data adalah penjumlahan dari keseluruhan data yang akan diuji validasinya.

Dari hasil pengujian validitas hasil yang didapatkan dari data modulus elastisitas baik yang analisis maupun alat dapat dilihat pada nilai Sig (2-tailed) sebesar 0.000, yang artinya hasil dari data tersebut adalah valid. Hasil untuk pengujian hari ke-0, hari ke-3, dan hari ke-7 dapat dilihat pada Tabel 4.8 sampai Tabel 4.10 di bawah ini.

<table>
<thead>
<tr>
<th>Hari</th>
<th>$E_{LWD}$ alat Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>$E_{LWD}$ analisis Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>.995**</td>
<td>.000</td>
<td>.995**</td>
<td>.000</td>
<td>240</td>
</tr>
<tr>
<td>3</td>
<td>.996**</td>
<td>.000</td>
<td>.996**</td>
<td>.000</td>
<td>240</td>
</tr>
<tr>
<td>7</td>
<td>.999**</td>
<td>.000</td>
<td>.999**</td>
<td>.000</td>
<td>240</td>
</tr>
</tbody>
</table>

Pengujian realibilitas adalah pengujian untuk menunjukkan sejauh mana tingkat kepercayaan suatu data yang dihasilkan dalam suatu penelitian. Dengan kata lain, realibilitas adalah pengujian tingkat konsistensi atau kemantapan suatu data. Dalam suatu penelitian dapat dikatakan konsisten apabila memberikan hasil yang sama atau stabil. Tinggi rendahnya realibilitas secara empirik ditunjukkan dengan suatu angka yang disebut koefisien realibilitas.

Dari penelitian ini realibilitas yang dihasilkan dari data modulus elastisitas dapat dilihat pada Tabel 4.9 di bawah ini.
Pengujian validitas dan realibilitas dari data hasil nilai dapat diambil kesimpulan bahwa data dari hasil penelitian tersebut valid karena dari pengujian validitas menunjukkan angka yang mendekati nilai 1 yang artinya tingkat kevalidan hampir 100%, dan data hasil penelitian tersebut juga dapat dipercaya dikarenakan dari uji realibilitas menggunakan SPSS mendapatkan hasil mendekati nilai 1 yang artinya juga hasil dapat dipercaya 100%.

4.4. Modulus Elastisitas DCP (Dynamic Cone Penetrometer)

4.3.1 Hasil Pengujian DCP (Dynamic Cone Penetrometer)

Pengujian alat DCP (Dynamic Cone Penetrometer) pada penelitian ini adalah dengan melakukan tumbukan pada setiap titik yang sama pada saat pengujian sebelumnya dengan alat Light Weight Deflectometer (LWD) tujuannya adalah untuk membandingkan hasil yang didapatkan dari kedua alat tersebut. Hasil dari pengujian dapat dilihat pada Tabel 4.10 untuk pengujian 0 hari.

Tabel 4.9 Hasil Pengujian Realibility hari ke-0

<table>
<thead>
<tr>
<th>Hari</th>
<th>Realibility Statistic</th>
<th>Cronbach's Alpha</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>.997</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.998</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1.000</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Tabel 4.10 Hasil Pengujian DCP (Dynamic Cone Penetrometer) Pengujian 0 hari

<table>
<thead>
<tr>
<th>Titik</th>
<th>Komulatif tumbukan</th>
<th>Penetrasi (cm)</th>
<th>Komulatif Penetrasi (mm)</th>
<th>DCPI (mm/tumbukan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2,5</td>
<td>2,5</td>
<td>2,5</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>4,3</td>
<td>6,8</td>
<td>1,8</td>
</tr>
<tr>
<td>3</td>
<td>6,4</td>
<td>13,2</td>
<td>2,1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3,8</td>
<td>5,8</td>
<td>1,8</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5,6</td>
<td>11,4</td>
<td>1,8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Titik</td>
<td>Komulatif tumbukan</td>
<td>Penetrasi (cm)</td>
<td>Komulatif Penetrasi (mm)</td>
<td>DCPI (mm/tumbukan)</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------</td>
<td>---------------</td>
<td>--------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>2</td>
<td>5,5</td>
<td>8,5</td>
<td>2,5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6,5</td>
<td>15</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Tabel 4.10 Lanjutan

<table>
<thead>
<tr>
<th>Titik</th>
<th>Komulatif tumbukan</th>
<th>Penetrasi (cm)</th>
<th>Komulatif Penetrasi (mm)</th>
<th>DCPI (mm/tumbukan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3,5</td>
<td>4,9</td>
<td>2,1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>9,9</td>
<td>1,5</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>4,5</td>
<td>6,5</td>
<td>2,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>6</td>
<td>12,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1,5</td>
<td>1,5</td>
<td>1,5</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>3,4</td>
<td>4,9</td>
<td>1,9</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5</td>
<td>9,9</td>
<td>1,6</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1,5</td>
<td>1,5</td>
<td>1,5</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>4</td>
<td>5,5</td>
<td>2,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5</td>
<td>10,5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>3,5</td>
<td>5,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4,8</td>
<td>10,3</td>
<td>1,3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>3,5</td>
<td>5,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5,2</td>
<td>10,7</td>
<td>1,7</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>4,5</td>
<td>7,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>6</td>
<td>13,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>2,5</td>
<td>3,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>7,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>3,5</td>
<td>5,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>7,4</td>
<td>12,9</td>
<td>3,9</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2,5</td>
<td>2,5</td>
<td>2,5</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>4</td>
<td>6,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5,5</td>
<td>12</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>3,5</td>
<td>5,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5</td>
<td>10,5</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2,5</td>
<td>2,5</td>
<td>2,5</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>3,8</td>
<td>6,3</td>
<td>1,3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>6</td>
<td>12,3</td>
<td>2,2</td>
</tr>
</tbody>
</table>
1.3.2 Perhitungan Nilai CBR (%)

Setelah menghitung nilai DCPI dari pengujian Dynamic Cone Penetrometer (DCP), maka dengan nilai DCPI yang didapatkan selanjutnya adalah menghitung nilai CBR (%). Nilai DCPI berdasarkan ASTM D6951 didapat dari:

\[
\text{DCPI} = \frac{\text{Penetrasii between reading}}{\text{number of blows}} \times 1 \tag{4.4}
\]

Contoh Perhitungan pada titik 1 pengujian 0 hari

\[
\text{DCPI} = \frac{\text{Penetrasii between reading}}{\text{number of blows}} \times 1 = \frac{13.2}{6.4} \times 1 = 4.4 \text{ cm/blow}
\]

Untuk rumus CBR (%) berdasarkan ASTM D6951 sebagai berikut:

\[
\log (\text{CBR}) = \frac{292}{\text{DCPI}^{1.12}} \tag{4.5}
\]

Contoh Perhitungan pada titik 1 pengujian 0 hari

\[
\log (\text{CBR}) = \frac{292}{\text{DCPI}^{1.12}} = \frac{292}{4.4^{1.12}} = 55.55 \%
\]

Hasil nilai DCPI pada pengujian dapat dilihat pada Tabel 4.11, dan untuk hasil perhitungan nilai CBR dapat dilihat pada Tabel 4.12.

<table>
<thead>
<tr>
<th>Titik</th>
<th>DCPI</th>
<th>0 hari</th>
<th>3 hari</th>
<th>7 hari</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4,4</td>
<td>3,75</td>
<td>2,834</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2,334</td>
<td>3</td>
<td>3,167</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3,8</td>
<td>3,5</td>
<td>2,834</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4,167</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3,3</td>
<td>3,167</td>
<td>4,067</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4,167</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3,3</td>
<td>1,875</td>
<td>2,067</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3,5</td>
<td>3,25</td>
<td>4,234</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3,434</td>
<td>3</td>
<td>2,5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>3,567</td>
<td>2,175</td>
<td>4,167</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4,5</td>
<td>2,567</td>
<td>3,1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2,5</td>
<td>3,25</td>
<td>3,034</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>4,3</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>4,2</td>
<td>2,834</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>3,5</td>
<td>4,5</td>
<td>2,834</td>
<td></td>
</tr>
</tbody>
</table>
1.3.3 Perhitungan Nilai CBR Desain

Nilai CBR desain didapatkan dengan melakukan pengujian laboratorium dengan menggunakan alat CBR yang tersedia. Data yang didapatkan pada saat pengujian 0 hari dapat dilihat pada Gambar 4.11.

<table>
<thead>
<tr>
<th>Titik</th>
<th>Nilai CBR (%)</th>
<th>0 hari</th>
<th>3 hari</th>
<th>7 hari</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>55,555</td>
<td>66,446</td>
<td>90,928</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>113,009</td>
<td>85,312</td>
<td>80,29</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>65,468</td>
<td>71,784</td>
<td>90,928</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>48,144</td>
<td>85,312</td>
<td>59,045</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>76,674</td>
<td>80,29</td>
<td>60,674</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>59,045</td>
<td>85,312</td>
<td>85,312</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>76,674</td>
<td>144,419</td>
<td>129,48</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>71,784</td>
<td>77,997</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>73,331</td>
<td>85,312</td>
<td>104,639</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>70,276</td>
<td>122,301</td>
<td>59,045</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>54,174</td>
<td>101,585</td>
<td>82,236</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>104,639</td>
<td>77,997</td>
<td>84,242</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>57,004</td>
<td>61,813</td>
<td>61,813</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>61,813</td>
<td>58,526</td>
<td>90,928</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>71,784</td>
<td>54,174</td>
<td>90,928</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>60,127</td>
<td>69,555</td>
<td>75,799</td>
<td></td>
</tr>
</tbody>
</table>

Gambar 4.11 CBR Subgrade Pengujian 0 hari dengan Kadar Kapur 2%
Dilihat dari gambar, dapat disimpulkan bahwa nilai CBR pada hari ke-0 nilainya semakin naik. Pengujian hari ke-3 dan hari ke-7 nilainya juga semakin tinggi, dapat dilihat pada Gambar 4.12 pengujian hari ke-7 adalah pengujian CBR yang menghasilkan nilai tekanan paling tinggi.

Gambar 4.12 CBR Subgrade dengan Kadar Kapur 2%.

4.5. Perbandingan Alat LWD dan DCP

4.5.1 Perbandingan Nilai $E_{LWD}$ Dengan Nilai DCPI

Nilai modulus elastisitas yang dihasilkan pada alat LWD dengan nilai DCPI yang dihasilkan pada saat pengujian dengan menggunakan alat DCP hasilnya lebih besar nilai DCPI. Hal itu mungkin disebabkan karena alat LWD menggunakan sensor otomatis yang dapat mendeteksi secara detail, sedangkan alat DCP masih menggunakan tenaga manual manusia sehingga setiap tumbukan menghasilkan nilai yang berbeda. Perbandingan tersebut dapat dilihat pada Gambar 4.13 grafik hubungan antara nilai modulus elastisitas dari alat LWD dengan nilai DCPI dari pengujian alat DCP.
Gambar 4.13 Hubungan $E_{LWD}$ dengan $E_{DCP}$ pengujian 0 hari

Gambar 4.14 Korelasi Nilai $E_{LWD}$ dengan $E_{DCP}$ pengujian 0 hari
Gambar 4.15 Hubungan $E_{LWD}$ dengan $E_{DCP}$ pengujian 3 hari

\[ y = 1.0023x - 10.867 \]
\[ R^2 = 0.9656 \]

Gambar 4.16 Korelasi Nilai $E_{LWD}$ dengan $E_{DCP}$ pengujian 3 hari
4.5.2 Perbandingan Nilai $E_{LWD}$ dan $E_{DCP}$ Dilihat dari Hari Pengujian

Pengujian *Light Weight Defelctometer* (LWD) dilakukan selama 3 kali dalam waktu 7 hari dengan tujuan untuk mengetahui hubungan antara nilai modulus elastisitas yang dihasilkan dengan waktu pengujian. Dapat dilihat dari gambar 4.19 bahwa hubungan antara hasil nilai modulus elastisitas yang didapatkan dari hari ke-0 sampai hari ke-7 mengalami kenaikan.
Gambar 4.19 Pengaruh Hari dengan Nilai $E_{LWD}$

Selanjutnya untuk pengujian *Dynamic Cone Penetrometer* (DCP), sama halnya dengan LWD, pengujian ini juga dilakukan 3 kali dalam kurun waktu 7 hari yaitu pada hari ke-0, hari ke-3 dan hari ke-7. Hasil dari pengujian yang didapatkan juga mengalami kenaikan hingga hari terakhir pengujian dapat dilihat pada Gambar 4.20 di bawah ini.

Gambar 4.20 Pengaruh Hari dengan Nilai $E_{DCP}$