Study of Engineering Behaviour of Expansive Soil

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Introduction
For any land-based structure, the foundation is very important and has to be strong to support the entire structure. In order for the foundation to be strong, the soil around it plays a very critical role. So, to work with soils, we need to have proper knowledge about their properties and factors which affect their behavior. The process of soil stabilization helps to achieve the required properties in a soil needed for the construction work. The main objective of this study is to conduct various experiments to determine various soil properties

Literature Review
Singh, 2016, they collected clayey soil sample with Inorganic clay of low plasticity (CL) and added waste plastic bottles fibers to clayey soil in different sizes (25*5) mm, (35*10) mm, and (50*15) mm by weight of the dry soil sample with percentages (2%, 4% and 6%) of waste plastic bottles material by weight of the dry soil sample, to improve its engineering properties. They found that, the optimum moisture content (OMC) increased and Maximum Dry Density (MDD) decreased in addition of waste plastic bottles strips. The CBR is found to increase with the increase in the percentage of plastic bottles strips content. Where, 6% plastic fibers by weight of dimensions of (25*5) mm is the specific value, where the CBR got improvement of 27.33 % compared to plain soil. They found that, this can noticeably reduce the total thickness of the pavement and hence the total cost. So that, from this study it is clear that the higher percentage was better and the best dimensions were (25*5) mm. and they highly recommended 6 % with size of (25*5) mm.

Vinoth, et. al, 2018, in this study they added waste plastic bottles fibers to soil with percentages of 0.25%, 0.50%, 0.75% and 1% with dimensions of (20*3*0.5) mm. where, they found that addition of fibers can increase the CBR of soil and also increases the stability of soil.

Methodology
Soil samples is collected from Jabalpur Engineering college campus Ground Jabalpur Madhya Pradesh and tested for their geotechnical properties and strength characteristics. Before the digging Top soil layer was removed. Because it contains natural vegetation. The soil was taken at a depth of 1.5 meter for the research work. To know the natural moisture content soil was sealed in a polythene bag.

Experimental Testing Program
Experiments were performed as per IS codes specified in the table below:

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Property of soil</th>
<th>Method</th>
<th>IS code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Moisture Content</td>
<td>Oven drying method</td>
<td>IS 2720 (part 3) : 1962</td>
</tr>
<tr>
<td>2.</td>
<td>Specific Gravity</td>
<td>Pycnometer Method</td>
<td>IS 2720 (part 3) : 1980</td>
</tr>
<tr>
<td>3.</td>
<td>Particle Size Distribution</td>
<td>Sieve Analysis</td>
<td>IS 460 : 1962</td>
</tr>
<tr>
<td>4.</td>
<td>Atterberg Limit (Liquid limit, Plastic limit)</td>
<td>Casagrande Apparatus</td>
<td>IS 2720 (part 5)</td>
</tr>
<tr>
<td>6.</td>
<td>California Bearing Ratio</td>
<td>CBR Test</td>
<td>IS 2720 (part 16 ) :1987</td>
</tr>
<tr>
<td>7.</td>
<td>Shear strength</td>
<td>UCS test</td>
<td>IS 2720 (part 10) :1991</td>
</tr>
</tbody>
</table>

Results
The following results came after the experiments:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Property of Soil</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Natural Moisture Content</td>
<td>13.75 %</td>
</tr>
<tr>
<td></td>
<td>Test Parameter</td>
<td>Result</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>2</td>
<td>Liquid Limit (LL)</td>
<td>68.35 %</td>
</tr>
<tr>
<td>3</td>
<td>Plastic Limit (PL)</td>
<td>31.19 %</td>
</tr>
<tr>
<td>4</td>
<td>Plasticity index (PI)</td>
<td>37.16 %</td>
</tr>
<tr>
<td>5</td>
<td>Specific Gravity (G)</td>
<td>2.53</td>
</tr>
<tr>
<td>6</td>
<td>Differential free swell (DFS)</td>
<td>58 %</td>
</tr>
<tr>
<td>7</td>
<td>Optimum moisture content (OMC)</td>
<td>18.84 %</td>
</tr>
<tr>
<td>8</td>
<td>Maximum dry density (MDD)</td>
<td>1.68 kN/m²</td>
</tr>
<tr>
<td>9</td>
<td>California bearing ratio (CBR)</td>
<td>1.82</td>
</tr>
<tr>
<td>10</td>
<td>UCS</td>
<td>115 kN/m²</td>
</tr>
</tbody>
</table>

References
