

# Chapter 5

## Experimental Analysis of Backfill Soils

### ABSTRACT

*In this chapter different types of backfill soils are investigated to select the most suitable type of soil that can be used to increase the underground ampacity by selecting the soils that limit the dry zones formation around the underground power cables. The tests carried out on the soils under study are:*

1. *Grain size analysis*
2. *Specific gravity*
3. *Thermal tests.*

### 5.1 SOIL SAMPLES UNDER TESTING

Several experiments are carried out on different types of natural soils to study the dry out zone formation under different loading condition. In this chapter eight types of natural and artificial soils are investigated and tested for determination of their properties. Tables from 1 until 9 give classification for the investigated soil types.

### 5.2 GRAIN SIZE DISTRIBUTION

Grain size distribution means the determination of various sizes of particles within the soil. The grading curve of soils represents this grain size distribution, most systems of soil classification depend to some extent up on the distribution of various-sized particles in soil. For the soils under study this distribution may be determined by sieve analysis and for finer particles it can be determined by hydrometer analysis.

#### 5.2.1 Sieve Analysis Test

A sieve analysis consists of shaking the soil through a stack wire screen of opening of known sizes. The experiment steps are carried out as follow:

DOI: 10.4018/978-1-4666-6509-5.ch005

## Experimental Analysis of Backfill Soils

Table 1. Soil sample 1: sand 1

Sieve	Sieve Size (mm)	Mass of Soil Retained-W <sub>n</sub> (g)	Percentage on Each Sieve R <sub>n</sub>	Cumulative Percent Retained ΣR <sub>n</sub>	Percent Finer 100- ΣR <sub>n</sub>
4	4.75	115.2	11.52	11.52	88.48
8	2.36	268.6	26.86	38.38	61.62
16	1.18	242.5	24.25	62.63	37.37
30	0.6	190.6	19.06	81.69	18.31
50	0.30	110.4	11.04	92.73	7.27
100	0.15	36.3	3.63	96.37	3.64
Pan	-	36.4	3.64	100	0

Table 2. Soil sample 2: sand 2

Sieve	Sieve Size (mm)	Mass of Soil Retained-W <sub>n</sub> (g)	Percentage on Each Sieve R <sub>n</sub>	Cumulative Percent Retained ΣR <sub>n</sub>	Percent Finer 100- ΣR <sub>n</sub>
4	4.75	15.1	1.51	1.51	98.49
8	2.36	34.4	3.44	4.95	95.05
16	1.18	109.2	10.92	15.87	84.13
30	0.6	628	62.8	78.67	21.33
50	0.30	172.2	17.22	95.89	4.11
100	0.15	37.9	3.79	99.68	0.32
Pan	-	3.2	0.32	100	0

Table 3. Sample 3: Lime

Sieve #	Sieve Size (mm)	Mass of Soil Retained-W <sub>n</sub> (g)	Percentage on Each Sieve R <sub>n</sub>	Cumulative Percent Retained ΣR <sub>n</sub>	Percent Finer 100- ΣR <sub>n</sub>
4	4.75	11.2	1.12	1.12	98.88
8	2.36	11.6	1.16	2.28	97.72
16	1.18	383.8	38.38	40.66	59.34
30	0.6	296.6	29.66	70.32	29.68
50	0.30	219	21.96	92.28	7.72
100	0.15	58.2	5.82	97.64	2.36
Pan	-	19	1.9	98.1	0

1. The soil is dried at 110 °c, and sieves are cleaned and weighed. 0.5 kg of the dried soil is passed through a set of standard sieves by using a mechanical shaker.
2. Each sieve and the pan of soil retained on them are weight. The weight of soil retained on each sieve is determined. It should be noted that the sum of these retained weights equals the original soil weight.

9 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

[www.igi-global.com/chapter/experimental-analysis-of-backfill-soils/143624](http://www.igi-global.com/chapter/experimental-analysis-of-backfill-soils/143624)

## Related Content

---

### Synergizing Edge Computing With Energy Storage and Grid Integration in Electric Vehicles

G. Shashibhushan, Krishnaiah Narukulla, H. Joseph Prabhakar Williams, G. Manjula, D. R. Ganeshand Sangeeta Singh (2024). *Solving Fundamental Challenges of Electric Vehicles* (pp. 384-414).

[www.irma-international.org/chapter/synergizing-edge-computing-with-energy-storage-and-grid-integration-in-electric-vehicles/353331](http://www.irma-international.org/chapter/synergizing-edge-computing-with-energy-storage-and-grid-integration-in-electric-vehicles/353331)

### Induction Machine Rotor and Stator Faults Detection by Applying the N-F Network

Souad Saadi Laribiand Azzedine Bendiabdellah (2019). *Advanced Condition Monitoring and Fault Diagnosis of Electric Machines* (pp. 205-221).

[www.irma-international.org/chapter/induction-machine-rotor-and-stator-faults-detection-by-applying-the-n-f-network/212313](http://www.irma-international.org/chapter/induction-machine-rotor-and-stator-faults-detection-by-applying-the-n-f-network/212313)

### Operation and Control of Microgrid

Maheswari M.and Gunasekharan S. (2022). *Research Anthology on Smart Grid and Microgrid Development* (pp. 1437-1458).

[www.irma-international.org/chapter/operation-and-control-of-microgrid/289941](http://www.irma-international.org/chapter/operation-and-control-of-microgrid/289941)

### Optimal Configuration and Reconfiguration of Electric Distribution Networks

Armin Ebrahimi Milaniand Mahmood Reza Haghifam (2012). *Innovation in Power, Control, and Optimization: Emerging Energy Technologies* (pp. 268-292).

[www.irma-international.org/chapter/optimal-configuration-reconfiguration-electric-distribution/58971](http://www.irma-international.org/chapter/optimal-configuration-reconfiguration-electric-distribution/58971)

### Correlating Electronic Nose and Field Olfactometer for Industrial Odor Concentration Measurement Using PLS and MLR

Sharvari Deshmukh, Nabarun Bhattacharyya, Arun Jana, Rajib Bandyopadhyayand R. A. Pandey (2018). *Electronic Nose Technologies and Advances in Machine Olfaction* (pp. 94-103).

[www.irma-international.org/chapter/correlating-electronic-nose-and-field-olfactometer-for-industrial-odor-concentration-measurement-using-pls-and-mlr/202707](http://www.irma-international.org/chapter/correlating-electronic-nose-and-field-olfactometer-for-industrial-odor-concentration-measurement-using-pls-and-mlr/202707)