

Specifications and analysis of Sand for Rapid Sand Filters

1. Scope and Application

Filter sand should be composed of hard, durable grains, free from clay, leam, and dry organic matter. With not more than one per cent of flat or calcareous particles. When the crushed and powdered sand, is digested for twenty-four hours in strong warm hydrochloric acid, at least ninety five per cent shall remain insoluble. The sand shall not contain more than one and one-half per cent of Calcium Carbonate and not more than two per cent shall be lost on ignition of the powdered sand. The diameter of sand grains shall be computed as the diameters of spheres of equal volumes, and all percentages shall be calculated by weight.

Especial care shall be taken in transporting and placing filter sand to prevent contamination of any sort and sand which may have become dirty, either, before or after placing in filters, shall be washed or removed and replaced by clean sand in a satisfactory manner. All sand contaminated by organic matter shall be rejected.

Filter sand placed in the filters shall be washed at least ten times with the washing devices connected with the filters, and fine sand appearing at the surface shall be removed by scraping. Sufficient sand shaould be placed in each filter to secure a layer of at least twenty - seven inches in depth, or according to the design of the filter.

2. Procedure

- 1. Sampling:** All samples taken for analysis must be representative. If taken from bulk, several portions should be taken from different parts of the pile, mixed thoroughly and quartered until the desired size sample is obtained. Samples from filter beds should be collected by a 2" pipe pushed through the bed after water is drained from sand.
- 2. Drying:** Samples should be placed in shallow porcelain dishes and dried for two hours at 100°C.
- 3. Quantity for analysis:** After sand is dried pour it through samples splitter until a sub-sample of about 100 grams is obtained. Carefully weight out on sand scales exactly 100 grams for sieve analysis, being sure it is a representative portion.
- 4. Sieves:** The following calibrated sieves should be nested, with the first mesh at the bottom: Pan(0.1, 0.71, 0.85, 1, 1.18, 1.4, 1.6, 2.0 mm, and cover. The size of clear opening of each of these sieves is stamped on the rim of the sieve.
- 5. Shaking:** The sample is poured into the top of the nest of sieves, the nest is clamped in the ro- top machine and shaken for 20 minutes.
- 6. Weighing Separation:** Start at the top of the nest and weigh to the nearest gram. Weigh cumulatively the sand retained on each of the sieves, recording results. If a 100-gm sample was taken, the cumulative weigh of sand retained by each sieve will equal the percentage retained. The percentage retained subtracted from 100 gives the percentage bassing.
- 7. Plotting Results:** Enter results in table on sand plotting paper, and plot percentage passing against the sieve openings, in millimeters. Draw curve by collecting plotted points by straight lines.

8. **Effective Size:** The effective size is that size of grain such that ten percent of the sand, by weight, is finer than it. It corresponds to the ten percent line on the plotting paper.

9. **Coefficient of Uniformity:** The uniformity coefficient is the ratio of the size of given sand at 60 % passed and size at 10 % passed.

$$C.U. = \text{size at 60\% passed} / \text{size at 10\% passed}$$

10. **Loss in acid:** This is the loss of weight after contact for twenty- four hours with a 20 % HCl acid solution. The figure must be less than 2 %.

11. **Bulk density in air:** Weight 100 gram of sand and pour into a measuring cylinder.

Let V be the volume read on the cylinder, and
The bulk density of the uncompacted sand is d_a

$$d_a = 100 / V$$

FILTER MEDIA ANALYSIS REPORT

Source : -

Date Sampled : -

Sampled By : -

Analyzed By : -

| Mesh Size | Weight | Cumulative | % Pass | Remarks |
|------------------|---------------|---------------------|-------------------------------|-----------------------------|
| 2 | X_1 | X_1 | $100 - X_1$ | Loss in weight by 20 % HCl: |
| 1.6 | X_2 | $X_1 + X_2$ | $100 - (X_1 + X_2)$ | Loss in weight by H_2O : |
| 1.4 | X_3 | $X_1 + X_2 + X_3$ | $100 - (X_1 \text{ to } X_3)$ | |
| 1.18 | X_4 | $X_1 + \dots + X_4$ | | |
| 1 | X_5 | $X_1 + \dots + X_5$ | | |
| 0.85 | X_6 | $X_1 + \dots + X_6$ | | |
| 0.71 | X_7 | $X_1 + \dots + X_7$ | | |
| Dust | X_8 | $X_1 + \dots + X_8$ | $100 - (X_1 \text{ to } X_8)$ | |
| Total | =100gram | 100 | 00 | |

Sample Description : -

Effective Size : -

Uniformity Coefficient: -

Remarks : -