10. REFERENCE MATERIAL

The following material is provided to support Spreadmark accredited companies:

- The Sieve Box

THE SIEVE BOX

1. PURPOSE:

The purpose of a sieve box is to get an objective measure of the distribution of particle sizes in a sample of fertiliser.

The distribution of particle sizes along with the bulk density – are important to fertiliser spreaders as these characteristics affect spreading performance. The mean particle size (expressed as a Size Guide Number – SGN), the range of particle sizes (expressed as a uniformity Index – UI) and the bulk density (BD) are the three most important physical characteristics for spreaders. For more information of these characteristics, see the Definitions part of this Code.

Sieve boxes work by separating the fertiliser into different size categories so that the SGN (average particles size) and UI (representing the range of particle sizes) can be estimated or calculated.

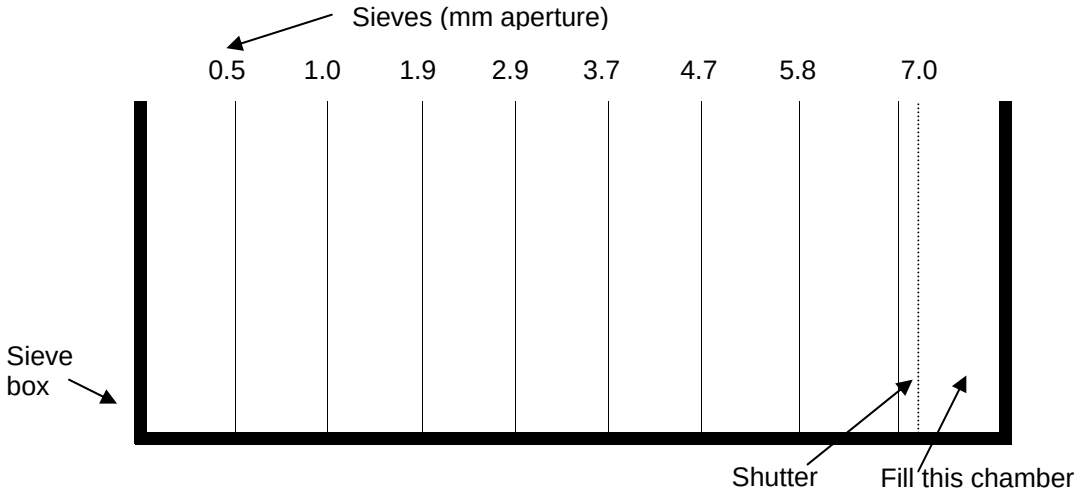
2. DESCRIPTION

The standard Fertiliser Quality Council sieve box has the following dimensions and sieve sizes:

- Inner Dimensions 155mm x 60mm x 25mm
- Sieve Sizes (mm, actual aperture) 0.5, 1.0, 1.9, 2.9, 3.7, 4.7, 5.8, 7.0.

3. USE OF THE SIEVE BOX

1. Make sure all sieve chambers are empty.
2. With the coarsest (7mm) screen to the right, place the shutter against the 7mm screen as shown, then fill the right hand column, tapping the box gently to settle the fertiliser. Screed off the surplus fertiliser, then withdraw the shutter.

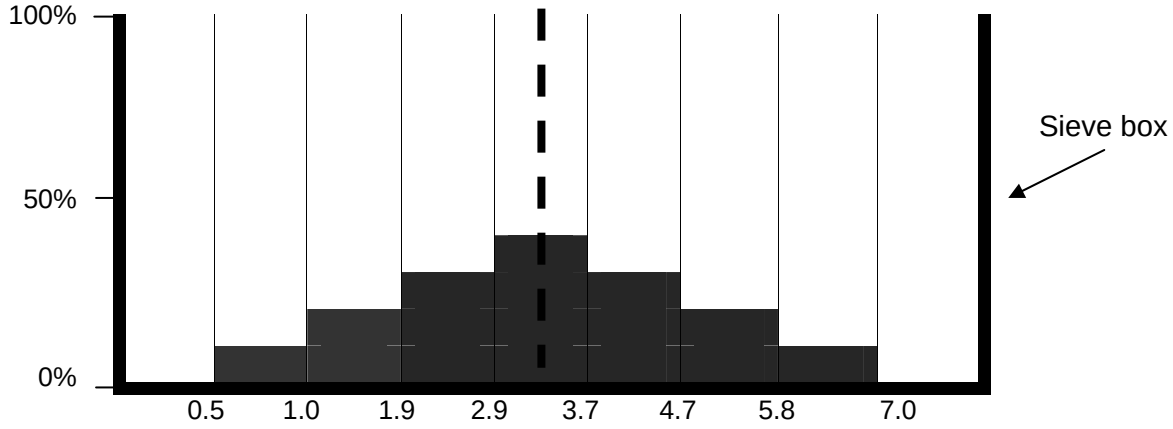


3. Put the top on the sieve box, then turn the box so the filled chamber is uppermost, and shake the sieve box gently for about 10 seconds.
4. Turn the sieve box upright again and gently tap it so the levels in each column are level.
5. Read off the % level in each column.
6. Estimate the SGN and UI values using the notes below.

4. ESTIMATING SGN AND UI

4.1 Estimating SGN

Estimating SGN from amounts retained in the sieve box.



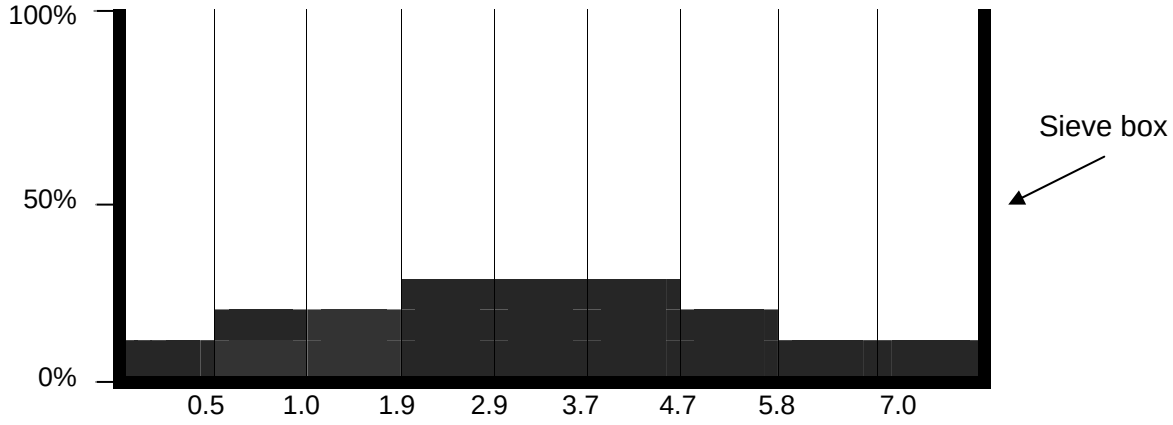
The diagram shows the amounts retained in each chamber after sieving. To estimate SGN the shaded area to the left of the imaginary dotted line must equal the shaded area to the right. In this case the line has been drawn so that these areas are equal, and the line meets the bottom scale at about 3.3. The SGN = 3.3 or 330

4.2 Estimating UI

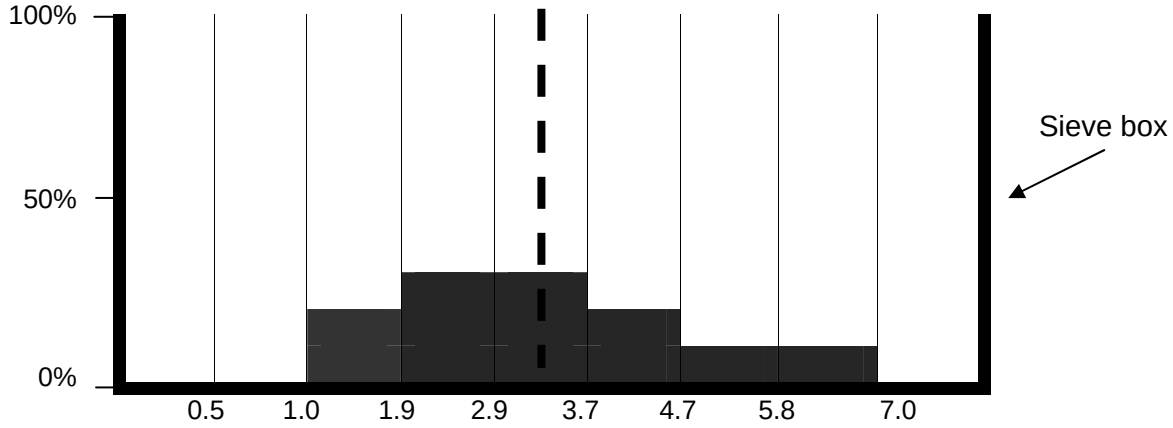
It is more difficult to estimate UI as accurately as SGN. The more chambers that have some material retained in them the lower the UI value will be. If for example, all the material is retained in only two chambers then the UI will be high – probably about 55 or 60. In the above example the UI is 18. There are some rough guides that can be used to help estimate UI. These include:

- If each chamber has more than 5% then the UI will be less than 20
- If any two adjacent chambers in the sieve box add to more than 70% then the UI will be greater than 30
- If any two chambers add to more than 80% then the UI will be more than 50.

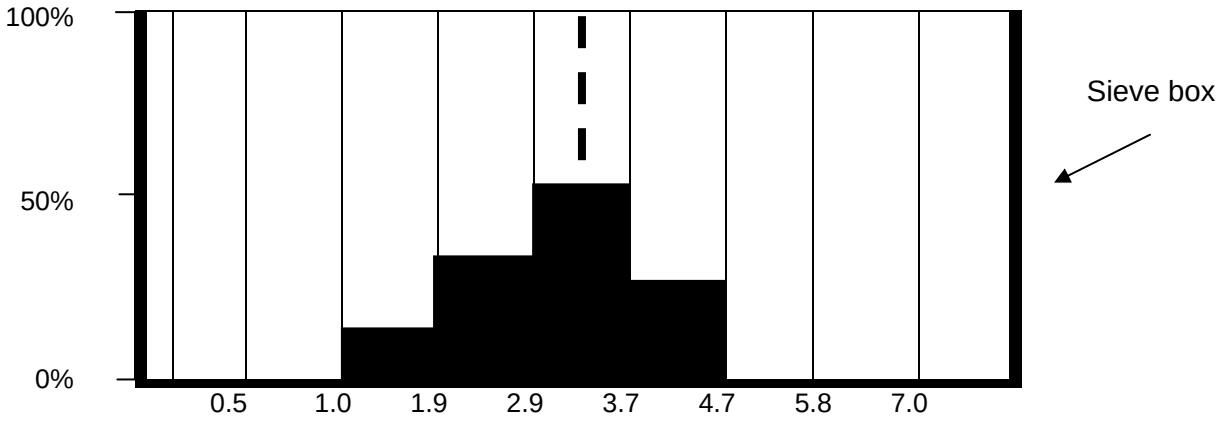
The figures below show three samples with the same SGN but different UI.



Sample A SGN = 300, UI = 11



Sample B SGN = 300, UI = 38



Sample C SGN = 300, UI = 56

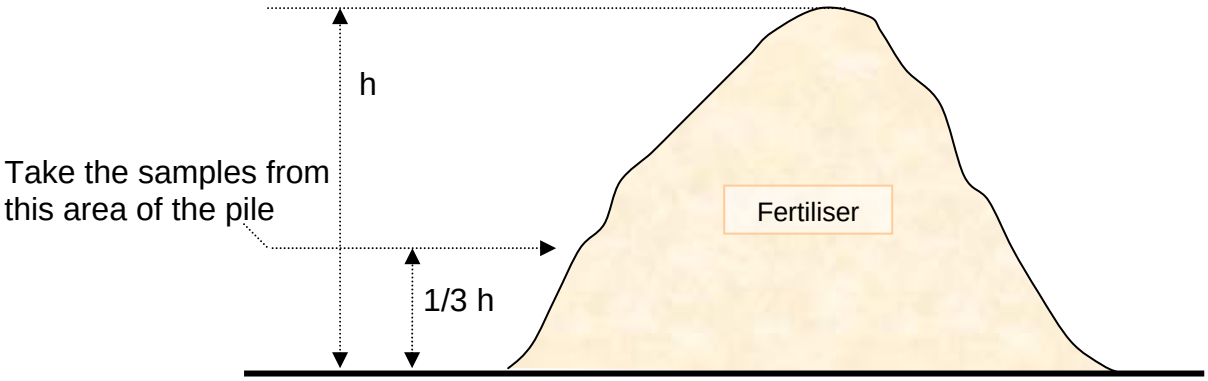
5. SAMPLING

Obtaining a representative sample of fertiliser is important when information on SGN and UI is being obtained. When fertiliser is tipped into a pile all the large particles tend to fall to the outside edge and bottom of the heap. A sample taken from that area would not be typical in terms of particle size or size range.

The best sampling method is to use a sampling spear. As this is pushed into the heap of fertiliser it collects and retains a sample of fertiliser that will more closely represent the whole heap. A sampling spear that retains a sample that is less than or equal to the volume required to fill the sieve box chamber should be used. If it is less than the sieve box chamber volume then repeated samples are taken until the sieve box chamber is full.

In all cases the sample should not be taken from the lower part of the pile of fertiliser – at least 1 metre from the bottom of the pile is a good guide.

- The best sampling procedure is to use the sampling spear and repeat the sample/sieve procedure three times. Drive the spear in horizontally.
- The next best option is to take one sample with the spear then use the sieve box.
- If a spear is not available, samples should be taken about one third up from the bottom of the pile as shown in the figure below. Dig into the pile a little to avoid taking material from the outside of the heap. Fill the sieve box chamber with several small handfuls. Do not use a shovel to take the sample then tip from the shovel onto the sieve box as this will give a biased sample because the large particles will flow into the box first.



6. USE OF SGN AND UI VALUES FOR EVEN SPREADING

NZ fertiliser products have a range of 95 – 475 for SGN values and 5 – 68 for UI values so there is a wide variation. Some simple guidelines are given here to help make use of SGN and UI data. In the past SGN and UI data have not routinely been obtained for NZ fertiliser products, so it is important to refine these guidelines for NZ conditions and equipment.

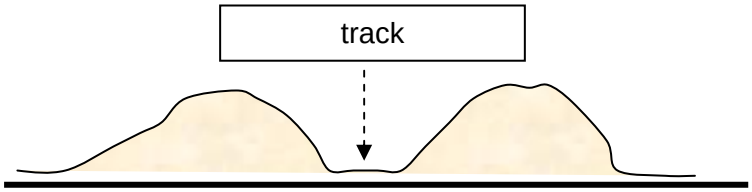
The actual test products used during Spreadmark Certification should be sampled and tested. The measurement of the particle size of the product and the spreading results from the distribution test will form a series of benchmarks of spreader performance. (The SGN and UI of the product will be given on the Spreadmark Certificate).

The three main guidelines are:

- If the SGN is lower than 150 and the UI less than 20 it will be more difficult to get an accurate distribution (Fine product).
- If the SGN is between 250 and 350 and the UI between 20 and 60 then even spreading can be achieved provided the spreader is set correctly. (Medium product).
- Where the SGN is 350+ and the UI is 50+ even spreading becomes more difficult and there is an increased risk of crop damage. (Coarse product).

These are guidelines only. The three categories given here could be seen as fine, medium and coarse in terms of SGN. Some generalisations are possible.

- Higher SGN values suggest wider swath widths are possible.
- High UI values, i.e., more uniform particle sizes (for any SGN) tend to give a "hollow" transverse spread pattern with many powered spreaders.



- Fine material can be spread evenly but it depends on the machine and the weather.
- Coarse material can also be spread evenly but it depends on machine design.
- An even spread with material classed as medium should be possible.

7. USE OF SGN AND UI VALUES FOR BLENDING FERTILISERS.

NZ fertiliser products have a wide range of physical properties and these properties affect the ease with which they can be blended and the degree to which they tend to segregate.

All spreading companies spread blends of fertiliser and some prepare their own blends. The information below is intended to indicate the degree to which blending is likely to be effective.

The compatibility of blend constituents depends on both SGN and UI. The available data suggests the following guidelines:

Difference between SGN or UI values	Compatibility for blending
Less than 10	Good compatibility
11 – 20	Moderate compatibility – some segregation likely
Greater than 20	Incompatible

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