Aggregates comprise a significant proportion of all materials used in the many different construction processes, so it is important to determine the properties of different types of aggregates through effective testing and measurement.

The required properties will vary from project to project, for example, resistance to polishing will be unimportant in a pavement base course but will be crucial in a wearing course. However, the key criteria throughout are accurate and repeatable test procedures, and our range of aggregates testing equipment has therefore been designed to help you determine a wide range of factors. These include: particle size, shape and texture; relative, bulk and compacted densities; soundness and resistance to chemical attack; and mechanical properties.

Sampling and Preparation of Aggregates

Sampling and preparation of aggregates and fillers is necessary for a variety of reasons including research, design and quality control. The main aim of sampling is to obtain a sample representative of the average quality. Sampling techniques and procedures are described in various Standards including BS 812:Part 101 and 102 and ASTM D75. Individual items of equipment necessary for sampling and preparation are described in the Soils Section of the catalogue.

Drying and Weighing

EN 932-2

Most test techniques involve the use of drying ovens and balances. A comprehensive range of equipment is described in the Laboratory Equipment Section of the catalogue.

Moisture Content

The moisture content of aggregate is of importance e.g. when batching concrete or when compacting unbound materials to achieve a specified density. Accurate means of determining moisture content are specified in various Standards and include methods suitable for use in the laboratory or on the construction site. Individual items of equipment necessary for determining moisture content are described in the Soils Section and the Laboratory Equipment Section of the catalogue.

Particle Size and Shape

Among many of the applications to which aggregate lends itself is its use in economical concrete mixes, impervious, durable asphalts, macadams and road bases. Particle size, shape and texture can have considerable effects on various design properties and are generally specified within certain limits. Rounded aggregate can lead to instability in a bituminous mixture yet be ideal as a concrete aggregate where good workability of the mix is essential for placing and compaction.

Determination of Particle Size

EN933-1, BS 812; ASTM C136

A comprehensive range of sieves, sieve shakers and ancillary equipment will be found in the Laboratory Equipment Section of the catalogue. The range of sieves offered includes ISO 3310, BS 410 and ASTM E11 mesh sizes and frames.

Determination of Sand Equivalent Value

ASTM D2419; AASHTO T176

The test is used to determine the relative proportions of clay-like or plastic fines and dusts in aggregate used for construction purposes.

For Sand Equivalent Apparatus see Section 24.

Sample Reduction

Riffling or quartering are the two methods most often used to reduce a bulk sample to a representative size suitable for testing.

A Riffling, normally used for reducing material which is in a surface dry condition.

B Quartering can be used to reduce damp material down to a quantity which can be further prepared, e.g. by drying and then riffling.

Flatten the main sample

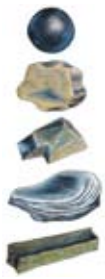
Divide into quarters

Discard two opposite quarters

Remix remainder and quarter again

Continue process until a sample of the required size is obtained

Description of Aggregates

Shape	
	**Rounded**- Water worn or shaped by attrition
	Irregular- Naturally irregular or partly shaped
	Angular- Well-defined
	Flaky- Thickness is small relative to other two dimensions
	Elongated- Length is larger relative to other two dimensions

Texture	
Glassy Conchoidal fracture	**Rough** Thickness is small relative to other two dimensions
Smooth Water worn or smooth due to fracture	**Crystalline** Easily visible grains
Granular Uniform rounded grains	**Honeycombed** Visible pores and cavities

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Determination of Flakiness and Elongation

Aggregates which are flaky and/or elongated will often lower the workability of a concrete mix and may also affect long term durability. In bituminous mixtures flaky aggregate makes for a harsh mix and may also crack and break up during compaction by rolling.

Flakiness Sieves and Gauges
BS 812

Ordering Information

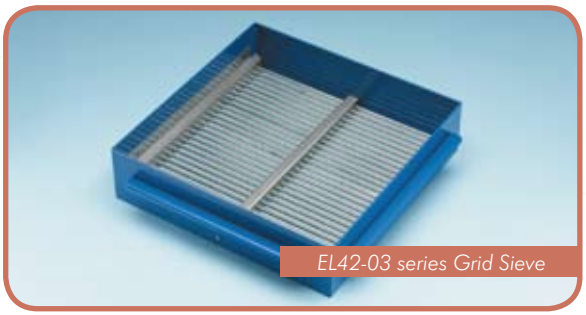
EL42-0410 Flakiness Gauge constructed of heavy gauge sheet steel to the dimensions specified in BS 812. Weight 60 g.

EL42-0600 Set of Flakiness Sieves comprising 1 each, 4.9 mm, 7.2 mm, 10.2 mm, 14.4 mm,19.7 mm, 26.3 mm and 33.9 mm.

Grid Sieves
EN 933-3

A series of grid sieves formed from 5 mm diameter steel parallel bars securely fixed in a metal frame.

Model Number	Slot Width	Passing Size	Retained Size
EL42-0326	40 mm	80 mm	63 mm
EL42-0324	31.5 mm	63 mm	50 mm
EL42-0322	25 mm	50 mm	40 mm
EL42-0320	20 mm	40 mm	31.5 mm
EL42-0318	16 mm	31.5 mm	25 mm
EL42-0316	12.5 mm	25 mm	20 mm
EL42-0314	10 mm	20 mm	16 mm
EL42-0310	8 mm	16 mm	12.5 mm
EL42-0308	6.3 mm	12.5 mm	10 mm
EL42-0306	5.0 mm	10 mm	8 mm
EL42-0304	4.0 mm	8 mm	6.3 mm
EL42-0302	3.15 mm	6.3 mm	5 mm
EL42-0300	2.5 mm	5 mm	4 mm


EL42-03 series Grid Sieve


EL42-0600 Set of Flakiness Sieves

Elongation Index
BS 812

This method classifies aggregate elongation by measuring the length of individual particles. The test is not applicable to material retained on a 63.0 mm BS test sieve.

Ordering Information

EL42-0820 Length Gauge manufactured to the dimensions specified in BS 812. Weight 700 g.

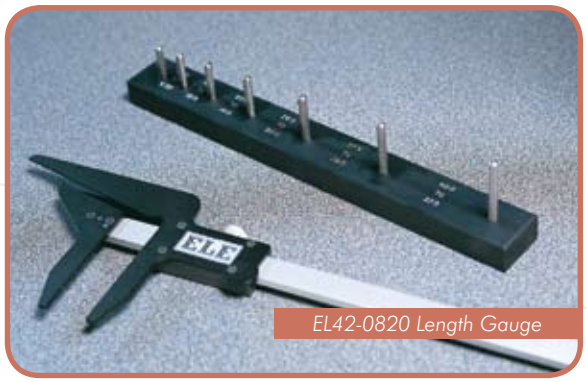
Determination of the Shape Index

This method described in EN933-4 measures the ratio of length to width of individual aggregate particles using a vernier calliper and a specially designed 3:1 length gauge.

Ordering Information

EL42-0821 3:1 Shape Index Calliper. Weight 1 kg.

Vernier Calliper see Laboratory Equipment Section.


EL42-0820 Length Gauge

Density, Voids and Bulking

As with any porous material, the value obtained for the particle density of an aggregate will depend on the method of test and apparatus used. Different particle sizes within a sample often have different particle densities. The term particle density expressed in Mg/m³ is numerically equal to the specific gravity. Various methods, depending upon the type and size of material to be tested, are specified in Standards for testing aggregate.

Particle Density (specific gravity) and Water Absorption

EN 1097-6, 12697-6, BS 812; ASTM C127; AASHTO T85

Method for aggregate between 63 mm and 5 mm.

EL42-1000/01 Buoyancy Balance

Buoyancy Balance 6000 g

The buoyancy balance system developed by ELE consists of a rigid support frame, incorporating a water tank mounted on a platform.

A mechanical lifting device is used to raise the water tank through the frame height immersing the specimen suspended below the balance.

The balance supplied may also be used as a standard weighing device, thus providing a versatile and comprehensive weighing system in the laboratory.

Ordering Information

EL42-1000/01 Bouyancy Balance. 6000 g x 0.1 g supplied with frame, water tank and suspension hook. For 220 – 240 V AC, 50 – 60 Hz, 1 ph.

Accessory

EL42-1005 Wire Basket with handle for BS 812 Relative Density. 200 mm diameter x 190 mm deep, 1.70 mm wire mesh.

Particle Density (specific gravity) and Water Absorption

BS 812; ASTM C128; AASHTO T84

Method for aggregate 20 mm and smaller
The gas jar method described in BS 812 is suitable for all aggregates smaller than 20 mm in size and is particularly suited to friable aggregates. The pyknometer method described in ASTM C128 is suitable for determining the particle density of samples of fine aggregates. The particle density of fillers can be determined using the density bottle method specified for testing cement.

Ordering Information

EL42-1700 Sand Absorption Cone made of brass to the dimensions given in BS 812, ASTM C128 and AASHTO T84. Weight 250 g.

EL42-1720 Tamping Rod for use with cone. Tamping face is 25 mm diameter and complies with BS 812, ASTM C128 and AASHTO T84. Weight 400 g.

Bulk Density Measures

Manufactured from heavy gauge steel these bulk density measures comply with the requirements of either BS 812 or ASTM C-29. Other than the 3 litre size, all measures incorporate carrying handles as standard.

EL42-1995 Set of two measures	Capacity	Standard
	3 litre 7 litre	BS 812; ASTM C29 BS 812
EL34-2800 Set of three measures	**Capacity**	**Standard**
	10 litre 15 litre 30 litre	BS 812-2, 3797, EN 1097-3 12350-6, ASTM C138 BS 812; ASTM C138 BS 812; ASTM C138

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Soundness and Chemical Tests

The presence of organic matter and certain chemicals can have a considerable influence on the strength and durability of concrete. The ability of aggregates to resist excessive change in volume (soundness) due to physical changes in the environment is also of importance. Knowledge of these potentially harmful factors will ensure that precautions can be taken at the mix design stage of a project.

Chloride Content: Rapid method

Quantab chloride titrators can be used for estimating the chloride content of aqueous solutions. They are suitable for site testing and quality control of aggregates requiring less than 30 minutes to obtain a result.

Ordering Information

EL42-2950 Quantab Chloride Titrator Strips. Type 1175 titration range 0.005% to 0.1% (30 to 600 ppm) NaCl. Pack of 50. Weight 10 g.

EL42-2952 Quantab Chloride Titrator Strips. Type 1176 titration range 0.05% to 1% (300 to 6000 ppm) NaCl. Pack of 40. Weight 10 g.

EL42-2950 Quantab Chloride Titrator Strips

Sulphate Content: Rapid method

A qualitative or semi-quantitative test is recommended for determining sulphate ions in aqueous solutions. Sulphate test strips are convenient measuring devices for preliminary assessment of sulphate content.

Ordering Information

EL42-2958 Sulphate Test Strips. Detection range 200 to 900 mg/l. Pack of 100. Weight 10 g

Soundness of Aggregates

BS 812; ASTM C88; AASHTO T104; EN 1367-2

The soundness of aggregates to physical changes caused by the environment is important to the long-term durability characteristics of concrete. Excessive changes in volume can be caused by freezing and thawing, thermal changes at temperatures greater than freezing, and cycles of wetting and drying.

Hydrometers and Wire Baskets see Laboratory Equipment Section.

Organic Impurities in Fine Aggregate

ASTM C40

If aggregate contains organic impurities it may not be suitable for inclusion in concrete. Organic impurities, usually tannic acid and its derivatives, may interfere with the chemical reactions of hydration. Impurities are more likely to be found in fine (sand) aggregate.

Ordering Information

EL42-3000 Glass Bottle. 12 ounce (300 ml approx) capacity, graduated at 2 1/2, 4 1/2 and 7 ounce positions. Complete with screw cap. Weight 340 g.

EL42-3040 Colour Standard with five organic colour transparencies mounted in a holder.

Special Note:

Sodium Hydroxide pellets are required but not supplied by ELE.

EL42-3040 Colour Standard

Mechanical Properties

The diverse range of aggregates available to the engineer makes it essential to select a material that is adequate for a given application. The following equipment is designed to determine various mechanical characteristics that need to be known in order to select the most suitable and economic type of aggregate.

Aggregate Impact Value (AIV)

BS 812-112

The apparatus has been designed in a particularly heavy duty form, with specially hardened steel surfaces for minimum wear. The assembly is heavily plated to ensure corrosion resistance and forms a rigid frame around the quick-release trigger mechanism which ensures an effective free fall of the hammer when released.

A built-in counter automatically indicates the number of blows delivered.

The apparatus is supplied complete with cylindrical measure 75 mm diameter x 50 mm deep, and a steel tamping rod 16 mm diameter x 600 mm long.

Ordering Information

EL42-4000 Aggregate Impact Value Apparatus

EL42-4000 Aggregate Impact Value Apparatus

Aggregate Crushing Value (ACV) and Ten Percent Fines Value (TFV)

BS 812-110, 111

These tests are a measure of the crushing properties of aggregate and use the same basic equipment. The ACV test requires a standard load of 400 kN to be applied over a period of 10 minutes while the TFV test measures the force required to produce a specified depth of plunger penetration.

ACV/TFV Standard Test

Ordering Information

EL42-4300 Aggregate Crushing Value Apparatus comprising 150 mm nominal diameter steel cylinder, plunger and base plate supplied complete with metal measure and tamping rod. Weight 16.6 kg.

Spare

Tamping Rod see EL34-0130

ACV/TFV Test for Aggregate Smaller than 10 mm

Ordering Information

EL42-4500 Aggregate Crushing Value Apparatus comprising 75 mm nominal diameter steel cylinder, plunger and base plate supplied complete with metal measure and tamping rod. Weight 3.5 kg.

Spare

EL42-4580 Tamping Rod. 8 mm diameter x 300 mm long with rounded end. Weight 350 g.

EL42-4500 & EL42-4300 Aggregate Crushing Value Apparatus

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Los Angeles Abrasion Machine

EN 1097-2, ASTM C131, C535

- *European and ASTM methods*
- *Revolution counter*
- *Safety cut-out*
- *Full width cover*

The Los Angeles Machine comprises a heavy steel cylinder, rotated about its horizontal axis.

The cylinder incorporates a removable internal shelf, as specified in the ASTM and EN test methods.

The ELE Los Angeles Machine's heavy duty steel cylinder is manufactured from structural steel plate conforming to S275 of EN 10025:1993.

The filling aperture is provided with a cover and a safety stop button is prominently positioned. The machine is fitted with a revolution counter and steel tray for specimen unloading. Supplied without abrasive charges which should be ordered separately.

EL42-5305/01 Los Angeles Abrasion Machine

EL42-5310/01 Los Angeles Abrasion Machine with CE Safety Cabinet

Ordering Information

EL42-5305/01 Los Angeles Abrasion Machine. Less charges. For 220 – 240 V AC, 50 Hz, 1ph.

EL42-5310/01 Los Angeles Abrasion Machine with CE Safety Cabinet. Fitted with microswitches. Less charges. For 220 – 240 V AC, 50 Hz, 1 ph.

Accessories

EL42-5300/10 Set of Abrasive Charges (ASTM)

EL42-5305/10 Set of Abrasive Charges (EN)