

## DENSITY OF MATERIALS

The mass of over 300 different 'dry' materials are listed below. While the data is useful for the design and selection of bulk materials handling plant, bulk transport and packaging, individual samples will differ. Moisture content will have a marked influence.

As 1000kg of pure water = 1 cubic metre, those materials under 1000kg/cu.m will float; more dense will sink ie. those materials with a specific gravity more than 1.

Pure water was chosen as the 'base line' for specific gravity and given the value of 1. The specific gravity of all other materials are compared to water as a fraction heavier or lighter density. For example, ammonium nitrate has a specific gravity (sg) of 0.73 while dry ammonium sulphate has a sg of 1.13 (1130 kilograms/cubic metre) (see table below)

As specific gravity is just a comparison, it can be applied across any units. The density of pure water is also 62.4 lbs/cu.ft (pounds per cubic foot) and if we know that ammonium nitrate has a sg of 0.73 then we can calculate that its density is  $0.73 \times 62.4 = 45.552$  lbs/cu.ft.

Note, kg/cu.m divided by 16.02 = lbs/cu.ft

Material - powder, ore, solids, etc.	kg/cu.m.	Material - powder, ore, solids, etc.	kg/cu.m.
Alfalfa, ground	256	Beeswax	961
Alum, lumpy	881	Beets	721
Alum, pulverized	753	Bentonite	593
Alumina	961	Bicarbonate of soda	689
Aluminum, oxide	1522	Bismuth	9787
Ammonia gas	0.77	Bones, pulverized	881
Ammonium Nitrate	730	Borax, fine	849
Ammonium Sulphate - dry	1130	Bran	256
Ammonium Sulphate - wet	1290	Brewers grain	432
Andesite, solid	2771	Brick, common red	1922
Antimony, cast	6696	Brick, fire clay	2403
Apples	641	Brick, silica	2050
Arsenic	5671	Brick, chrome	2803
Asbestos - shredded	320- 400	Brick, magnesia	2563
Asbestos rock	1600	Buckwheat	657
Ashes - wet	730- 890	Butter	865
Ashes - dry	570- 650	Cadmium	8650
Asphalt, crushed	721	Calcium carbide	1201
Babbitt	7272	Caliche	1442
Bagasse	120	Carbon, solid	2146
Bakelite, solid	1362	Carbon, powdered	80
Baking powder	721	Carbon dioxide	1.98
Barium	3780	Carbon monoxide	1.25
Bark, wood refuse	240	Cardboard	689
Barley	609	Cement - clinker	1290-1540
Barite, crushed	2883	Cement, Portland	1506
Basalt, broken	1954	Cement, mortar	2162
Basalt, solid	3011	Cement, slurry	1442
Bauxite, crushed	1281	Chalk, solid	2499
Beans, castor	577	Chalk, lumpy	1442
Beans, cocoa	593	Chalk, fine	1121
Beans, navy	801	Charcoal	208
Beans, soy	721	Chloroform	1522

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Material - powder, ore, solids, etc.	kg/cu.m.	Material - powder, ore, solids, etc.	kg/cu.m.
Chocolate, powder	641	Dolomite, pulverized	737
Chromic acid, flake	1201	Dolomite, lumpy	1522
Chromium	6856	Earth, loam, dry, excavated	1249
Chromium ore	2162	Earth, moist, excavated	1442
Cinders, furnace	913	Earth, wet, excavated	1602
Cinders, Coal, ash	641	Earth, dense	2002
Clay, dry excavated	1089	Earth, soft loose mud	1730
Clay, wet excavated	1826	Earth, packed	1522
Clay, dry lump	1073	Earth, Fullers, raw	673
Clay, fire	1362	Emery	4005
Clay, wet lump	1602	Ether	737
Clay, compacted	1746	Feldspar, solid	2563
Clover seed	769	Feldspar, pulverized	1233
Coal, Anthracite, solid	1506	Fertilizer, acid phosphate	961
Coal, Anthracite, broken	1105	Fish, scrap	721
Coal, Bituminous, solid	1346	Fish, meal	593
Coal, Bituminous, broken	833	Flaxseed, whole	721
Cobaltite ( cobolt ore )	6295	Flint - silica	1390
Coconut, meal	513	Flour, wheat	593
Coconut, shredded	352	Flue dust	1450-2020
Coffee, fresh beans	561	Fluorspar, solid	3204
Coffee, roast beans	432	Fluorspar, lumps	1602
Coke	570- 650	Fluorspar, pulverized	1442
Concrete, Asphalt	2243	Fullers Earth - raw or burnt	570- 730
Concrete, Gravel	2403	Galena ( lead ore )	7400 - 7600
Concrete, Limestone with Portland	2371	Garbage, household rubbish	481
Copper ore	1940-2590	Glass - broken or cullet	1290-1940
Copper sulfate, ground	3604	Glass, window	2579
Copra, medium size	529	Glue, animal, flaked	561
Copra, meal, ground	641	Glue, vegetable, powdered	641
Copra, expeller cake ground	513	Gluten, meal	625
Copra, expeller cake chopped	465	Gneiss, bed in place	2867
Cork, solid	240	Gneiss, broken	1858
Cork, ground	160	Granite, solid	2691
Corn, on the cob	721	Granite, broken	1650
Corn, shelled	721	Graphite, flake	641
Corn, grits	673	Grain - Maize	760
Cottonseed, dry, de-linted	561	Grain - Barley	600
Cottonseed, dry, not de-linted	320	Grain - Millet	760- 800
Cottonseed, cake, lumpy	673	Grain - Wheat	780- 800
Cottonseed, hulls	192	Gravel, loose, dry	1522
Cottonseed, meal	593	Gravel, with sand, natural	1922
Cottonseed, meats	641	Gravel, dry 1/4 to 2 inch	1682
Cottonwood	416	Gravel, wet 1/4 to 2 inch	2002
Cryolite	1602	Gummite ( uranium ore )	3890 - 6400
Cullet	1602	Gypsum, solid	2787
Culm	753	Gypsum, broken	1290-1600
Dolomite, solid	2899	Gypsum, crushed	1602

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#### Material - powder, ore, solids, etc. kg/cu.m.

Gypsum, pulverized	1121
Halite (salt), solid	2323
Halite (salt), broken	1506
Hematite ( iron ore )	5095 - 5205
Hemimorphite ( zinc ore )	3395 - 3490
Hydrochloric acid 40%	1201
Ice, solid	919
Ice, crushed	593
Ilmenite	2307
Iridium	22154
Iron ore - crushed - see metals table	
2100-2900	
Iron oxide pigment	400
Iron Pyrites	2400
Iron sulphate - pickling tank - dry	1200
Iron sulphate - pickling tank - wet	1290
Ivory	1842
Kaolin, green crushed	1025
Kaolin, pulverized	352
Lead, rolled - see metals table	11389
Lead, red	3684
Lead, white pigment	4085
Leather	945
Lignite, dry	801
Lime, quick, lump	849
Lime, quick, fine	1201
Lime, stone, large	2691
Lime, stone, lump	1538
Lime, hydrated	481
Lime, wet or mortar	1540
Limonite, solid	3796
Limonite, broken	2467
Limestone, solid	2611
Limestone, broken	1554
Limestone, pulverized	1394
Linseed, whole	753
Linseed, meal	513
Locust, dry	705
Magnesite, solid	3011
Magnesium oxide	1940
Magnesium sulphate, crystal	1121
Magnetite, solid ( iron ore )	5046
Magnetite, broken	3284
Malachite ( copper ore )	3750 - 3960
Malt	336
Manganese, solid	7609
Manganese oxide	1922
Manure	400

#### Material - powder, ore, solids, etc. kg/cu.m.

Marble, solid	2563
Marble, broken	1570
Marl, wet, excavated	2243
Mica, solid	2883
Mica, broken	1602
Mica - flake	520
Mica - powder	986
Milk, powdered	449
Molybdenum ore	1600
Mortar, wet	2403
Mud, packed	1906
Mud, fluid	1730
Nickel ore	1600
Nickel, rolled	8666
Nickel silver	8442
Nitric acid, 91%	1506
Nitrogen	1.26
Oak, red	705
Oats	432
Oats, rolled	304
Oil cake	785
Oil, linseed	942
Oil, petroleum	881
Oxygen	1.43
Oyster shells, ground	849
Paper, standard	1201
Peanuts, shelled	641
Peanuts, not shelled	272
Peat, dry	400
Peat, moist	801
Peat, wet	1121
Pecan wood	753
Phosphate rock, broken	1762
Phosphorus	2339
Pitch	1153
Plaster	849
Platinum ore	2600
Porcelain	2403
Porphyry, solid	2547
Porphyry, broken	1650
Potash	1281
Potassium chloride	2002
Potatoes, white	769
Pumice, stone	641
Pyrite (fool's gold)	2400 - 5015
Quartz, solid	2643
Quartz, lump	1554
Quartz sand	1201

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<b>Material - powder, ore, solids, etc.</b>	<b>kg/cu.m.</b>
Resin, synthetic, crushed	561
Rice, hulled	753
Rice, rough	577
Rice grits	689
Rip-Rap	1602
Rock - soft - excavated with shovel	1600-1780
Rosin	1073
Rubber, caoutchouc	945
Rubber, manufactured	1522
Rubber, ground scrap	481
Rye	705
Salt cake	1442
Salt, course	801
Salt, fine	1201
Salt peter	1201
Sand, wet	1922
Sand, wet, packed	2082
Sand, dry	1602
Sand, loose	1442
Sand, rammed	1682
Sand, water filled	1922
Sand with Gravel, dry	1650
Sand with Gravel, wet	2020
Sandstone, solid	2323
Sandstone, broken	1370-1450
Sawdust	210
Sewage, sludge	721
Shale, solid	2675
Shale, broken	1586
Shells - oyster	800
Sinter	1600-2180
Slag, solid	2114
Slag, broken	1762
Slag, crushed, 1/4 inch	1185
Slag, furn. granulated	961
Slate, solid	2691
Slate, broken	1290-1450
Slate, pulverized	1362
Smithsonite ( zinc ore )	4300
Snow, freshly fallen	160
Snow, compacted	481
Soap, solid	801
Soap, chips	160
Soap, flakes	160
Soap, powdered	368
Soapstone talc	2400
Soda Ash, heavy	1080
Soda Ash, light	432

<b>Material - powder, ore, solids, etc.</b>	<b>kg/cu.m.</b>
Sodium	977
Sodium Aluminate, ground	1153
Sodium Nitrate, ground	1201
Soy beans, whole	753
Starch, powdered	561
Stone, crushed	1602
Stone (common, generic)	2515
Sugar, brown	721
Sugar, powdered	801
Sugar, granulated	849
Sugar, raw cane	961
Sugarbeet pulp, dry	208
Sugarbeet pulp, wet	561
Sugarcane	272
Sulphur, solid	2002
Sulphur, lump	1314
Sulphur, pulverized	961
Taconite	2803
Talc, solid	2691
Talc, broken	1746
Tanbark, ground	881
Tankage	961
Tar	1153
Tobacco	320
Trap rock, solid	2883
Trap rock, broken	1746
Turf	400
Turpentine	865
Walnut, black, dry	609
Water, pure	1000
Water, sea (see liquids table)	1026
Wheat	769
Wheat, cracked	673
Wood chips - dry - see wood table	240- 520
Wool	1314
Zinc oxide	400