

**CALCULATION SHEET**

CLIENT WISDOT-BHO

SUBJECT MIX RATIO FOR

Prepared by D.S Date 1/11/08

Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

PROJECT SALT STORAGE INSPECTIONS

5% SALT-SAND MIX

Approved by \_\_\_\_\_ Date \_\_\_\_\_

FROM MATERIAL BULK DENSITY LIST (SEE ATTACHED)

WET SAND:  $\frac{1,922 \text{ Kg}}{\text{m}^3} \times \frac{2.20462 \text{ lbs}}{\text{Kg}} \times \frac{1 \text{ m}^3}{35.3147 \text{ ft}^3} = 119.98 \text{ lbs/ft}^3 \Rightarrow$  USE 120 lbs/ft<sup>3</sup>

BULK ICE CONTROL SALT : 75 lbs/ft<sup>3</sup> TYPICAL; FROM CARGILL (SEE ATTACHED)

TOTAL WEIGHT OF STOCKPILE IF COMPOSITION OF STOCKPILE IS 5% SALT BY WEIGHT :

$75 \text{ lbs} = \text{TOTAL WT} (0.05) \Rightarrow \text{TOTAL WT.} = \frac{75 \text{ lbs}}{0.05} = 1,500 \text{ lbs}$

TOTAL WEIGHT OF SAND WHERE THE UNTREATED SAND ALONE IS 95% BY WEIGHT OF THE TOTAL WEIGHT OF THE STOCKPILE :

$\text{TOTAL WT. OF SAND} = 1,500 \text{ lbs} (0.95) = 1,425 \text{ lbs}$

TOTAL VOLUME OF SAND:  $\frac{1,425 \text{ lbs}}{120 \text{ lbs/ft}^3} = 11.875 \text{ ft}^3$

TOTAL VOLUME OF SALT:  $\frac{75 \text{ lbs}}{75 \text{ lbs/ft}^3} = 1 \text{ ft}^3$

∴ MIX RATIO TO EQUAL 5% SALT BY WEIGHT IS :

11.875 PARTS SAND TO 1 PART SALT

RULE OF THUMB :  
(FOR < 5% SALT BY WT.)

USE 12:1



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density of materials

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The mass of over 300 different 'dry' materials are listed below. [Liquids](#), [metals](#) and [woods](#) are on other pages and a site search facility is on the [home page](#). 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

[ [back to conversion home page](#) ] [ [density of liquids](#) ] [ [density of water](#) ] [ [density of metals](#) ] [ [density of woods](#) ]

Grain, Maize, Barley, Kaffir Corn, millet, Wheat, Iron ore, Iron Pyrites, Iron sulphate, Lead, steel, cast iron, Lignite, quick Lime, Limestone, Magnesium sulphate, Magnesium oxide, Marble, Mica, Molybdenum ore, Nickel ore, Peat, Peanuts, Phosphate, Platinum ore, Potash ore, Pyrites, Quartz, soft Rock, Salt, Sand and gravel, Sand, Sandstone, Sawdust, Shale, oyster Shells, Sinter, Slag, Slate, Soap, Soapstone talc, Soda ash, Soy beans, Sugar, Sulphur, Wood chips, Hard Wood, Soft Wood, Zinc ore.

<b>Material - powder, ore, solids, etc.</b>	<b>kg/cu.m.</b>
Alfalfa, ground	256
Alum, lumpy	881
Alum, pulverized	753
Alumina	961
Aluminum, oxide	1522
Ammonia gas	0.77
Ammonium Nitrate	730
Ammonium Sulphate - dry	1130
Ammonium Sulphate - wet	1290
Andesite, solid	2771
Antimony, cast	6696
Apples	641
Arsenic	5671
Asbestos - shredded	320- 400
Asbestos rock	1600
Ashes - wet	730- 890
Ashes - dry	570- 650
Asphalt, crushed	721
Babbitt	7272
Bagasse	120
Bakelite, solid	1362
Baking powder	721

A marketplace for those seeking or offering:  
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	<u>Kg/m<sup>3</sup></u>
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
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
Saltpeter	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

**DESCRIPTION:**

Bulk Ice Control Salt is a coarse screened, translucent to white crystalline solid obtained from underground bedded salt deposits by physical mining. The salt is exploited by drilling and blasting with explosives in a manner similar to that used in other types of mineral mining. The mined salt is then crushed, screened and hoisted to the surface where it is stockpiled awaiting distribution as a highway deicing product.

**COMPLIANCE:**

Bulk Ice Control Salt is not approved for human or animal consumption. It is intended for use only as a chemical deicer on roadways and thoroughfares. This salt complies fully with ASTM Specification D 632-99 Type 1, Grade 1.

**ADDITIVES:**

Bulk Ice Control Salt may contain Yellow Prussiate of Soda, which is added to improve caking resistance.

**APPLICATIONS:**

Bulk Ice Control Salt is intended for use as an ice and snow removal agent on highways and other roadways.

**PACKAGING AND SHIPPING:**

Bulk Ice Control Salt is available only in bulk form. Bulk quantities are shipped by rail or truck.

**METHODS OF ANALYSIS:**

Methods of analysis and product performance evaluation are taken from the ASTM designations D 632-99 and E 534-98.

**CHEMICAL ANALYSIS:**

Component	Units	Typical	Specification
Sodium Chloride (dry basis) <sup>1</sup>	%	95.8	95.0 min.
Calcium & Magnesium (as Ca) <sup>1</sup>	%	1.1	-
Sulfate (as SO <sub>4</sub> ) <sup>1</sup>	%	2.7	-
Water Insolubles <sup>1</sup>	%	0.4	2.0 max.
Surface Moisture <sup>2</sup>	%	0.1	1.0 max.
Yellow Prussiate of Soda <sup>3</sup>	ppm	50	100 max.

<sup>1</sup>By difference of impurities before conditioning.  
<sup>2</sup>110°C for 2 hours before conditioning.  
<sup>3</sup>Optional anticaking agent (sodium ferrocyanide decahydrate).

**SIEVE ANALYSIS:**

U.S.S. Mesh	Opening Inches	Opening Microns	Typical	Specification
1/2"	0.500	12500	100	100 min.
3/8"	0.375	9500	98	95 - 100
4	0.187	4750	71	20 - 90
8	0.0937	2360	39	10 - 60
30	0.0232	600	11	15 max.

Note: Sieve analysis is reported as percent passing.

**BULK DENSITY:**

Parameter	Typical	Specification
Pounds per Cubic Foot	75	71 - 79
Grams per Liter	1200	1135 - 1265

Note: Bulk density is reported as loose (uncompacted).

**PRODUCING LOCATION: CLEVELAND, OH**

**No. 4700 Revised February 2006**

**CARGILL SALT**  
 P.O. Box 5621  
 Minneapolis, MN  
 55440  
 1-888 385-7258

NOTICE: All of the above statements, recommendations, suggestions and data are based on our laboratory results, and we believe same to be reliable. Nevertheless, with the exception of data showing an express guaranty (such as in the case of products specifically designed for use as nutrient supplements), all such statements, recommendations, suggestions and data hereinabove presented are made without guaranty, warranty or responsibility of any kind on our part.