



Vanderbilt Minerals, LLC

A Wholly Owned Subsidiary of R.T. Vanderbilt Holding Company, Inc.

Vanderbilt Minerals, LLC
30 Winfield Street, P.O. Box 5150
Norwalk, CT 06856-5150
(203) 295-2140 Fax: (203) 855-1220
E-Mail: mineralsales@vanderbiltminerals.com
www.vanderbiltminerals.com

DARVAN™ Superplasticizer Products
and Literature are available at:
<http://www.vanderbiltminerals.com>
Samples and Technical Data Sheets
are available on request.



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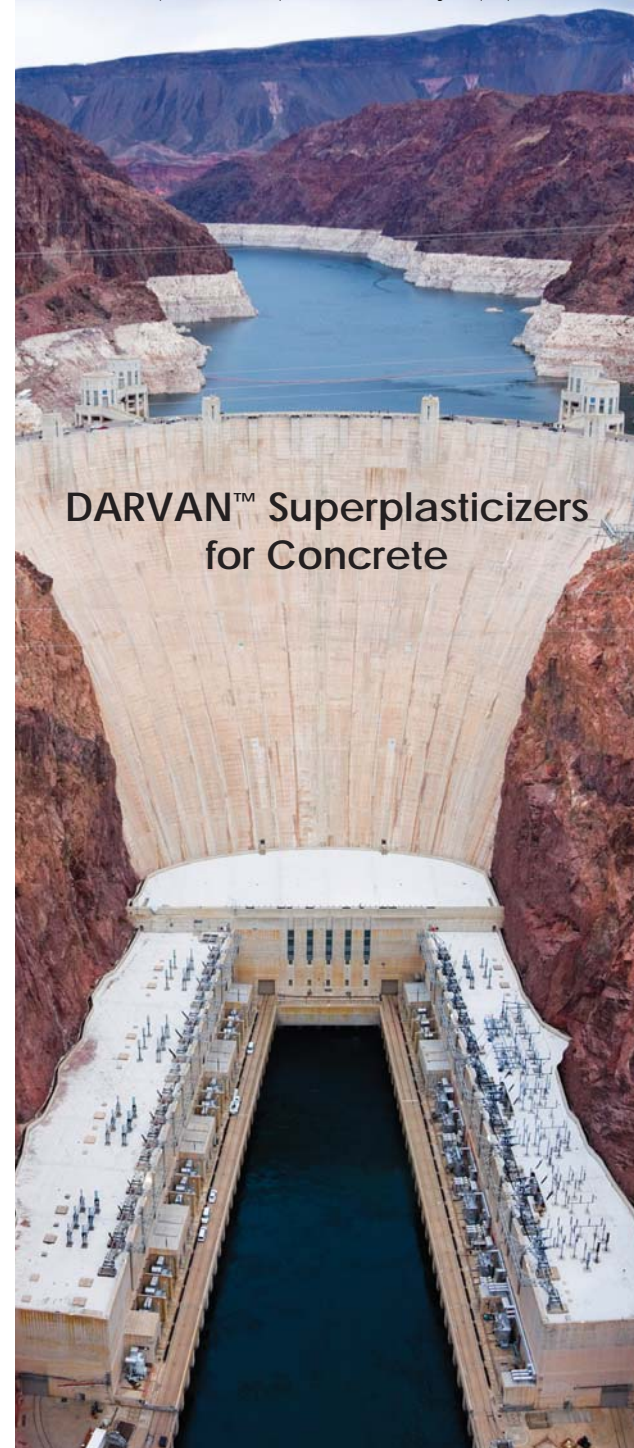
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**DARVAN™ Superplasticizers
for Concrete**



DARVAN™ Superplasticizers

Superplasticizers for use in concrete are one of many ingredients that are known as admixtures. Admixtures serve many functions in concrete production and come in a wide range of organic and inorganic chemicals. In addition to superplasticizers, products are added for air-entrainment, water-reduction, cure acceleration, cure retardation, corrosion inhibition, shrinkage reduction, etc. Admixtures are minor additives with major effect upon the concrete quality. Most admixtures are used at levels below 2% by weight of the cement with less than 0.25% active basis being typical. Dispersing admixtures make up about 75% of the sales.

Plasticizers and Superplasticizers fall into the general category of water-reducing admixtures. Plasticizers and Superplasticizers are dispersing agents. They aid in reducing the quantity of water necessary to produce concrete of the required slump resulting in higher solids concrete that is still workable and does not cure too quickly or too slowly.

Plasticizers are mid-range water-reducers. Plasticizers include lignosulfonates, hydroxylated carboxylic acids and carbohydrates. They function to allow water reduction in the concrete mix of 6 to 12 %. Typical dosages are in the range of 0.3 - 0.5% on cement weight.

Superplasticizers are high-range water-reducers. Superplasticizers include sulfonated melamine formaldehyde condensates, sulfonated naphthalene formaldehyde condensates, modified lignosulfonates and poly-carboxylates. The poly-carboxylates are the newest type of superplasticizer chemistry. Superplasticizers function to allow water reduction in the concrete mix to 12 to 30%. Flowability and workability are also improved. Significant reduction in bleed can also result from their use. Shrinkage can also be controlled through the use of the proper superplasticizer. Typical dosages are in the range of 0.7 to 1.5% on cement weight.

DARVAN™ SPC Superplasticizer Sodium Poly-Carboxylate

DARVAN SPC is a sodium poly-carboxylate (PCE) type superplasticizer for use in the production of concrete. **DARVAN SPC** contains a stable antifoaming agent. It is recommended for use in precast applications where high water reduction and high early strength are required. Other areas of use include high and ultra-high performance concrete, pumped concrete, marine and architectural concrete, etc. **DARVAN SPC** imparts very high strength, good workability and good durability to concrete. It is a potential high-range, mid-range and low-range water reducer for the ready-mix and precast markets. The water-to-cement ratio can be reduced to 0.3 to 1 or less with the use of **DARVAN SPC**. Concrete plasticized with **DARVAN SPC** remains workable for approximately 90 minutes at 68°F.

Typical Properties:	
Physical state	Amber aqueous solution
Chemistry	Sodium poly-methacrylate
Solids	38 - 40%
pH	3.5 - 5
Density at 25°C	1.06 - 1.12g/cc
Viscosity at 25°C	100 - 250 cps
Solubility	Dilutes rapidly in hard or soft water
Recommended dosage	1 - 10 fluid oz/100 lbs cement

DARVAN™ PNS-Na Superplasticizer Sodium Poly-Naphthalene Sulfonate

DARVAN PNS-Na is a sodium poly-naphthalene sulfonate (PNS) type superplasticizer for use in the production of concrete. **DARVAN PNS-Na** is a major ingredient in many different types of superplasticizer formulations. It is recommended for use in high and ultra-high performance concrete, pumped concrete, marine and architectural concrete, precast concrete, etc. **DARVAN PNS-Na** imparts very high strength, good workability and good durability to concrete. It is a potential high-range, mid-range and low-range water reducer for the ready-mix and precast markets. The water-to-cement ratio can be reduced to 0.3 to 1 or less with the use of **DARVAN PNS-Na**. Concrete plasticized with **DARVAN PNS-Na** remains workable for approximately 90 minutes at 68°F.

Typical Properties:	
Physical state	Dark brown aqueous solution
Chemistry	Sodium poly-naphthalene sulfonate
Solids	40 - 42%
pH	7 - 9
Density at 25°C	1.19 - 1.24 g/cc
Solubility	Dilutes rapidly in hard or soft water
Recommended dosage	6 - 30 fluid oz/100 lbs cement
Freeze/thaw stability	If frozen, rewarm to 85°F (30°C) and mix well

DARVAN™ PMS Superplasticizer Sodium Poly-Melamine Sulfonate

DARVAN PMS is a sodium poly-melamine sulfonate (PMS) type superplasticizer for use in the production of concrete. It is an effective dispersing agent, fluidizer and high range water reducing agent. It is recommended for use in high and ultra-high performance concrete, pumped concrete, marine and architectural concrete, precast concrete, etc. It may be used to increase the mechanical properties of concrete, especially flexural and compressive strengths. **DARVAN PMS** imparts very high strength, good workability and good durability to concrete. The water-to-cement ratio can be reduced to 0.3 to 1 or less with the use of **DARVAN PMS**. Concrete fluidized with **DARVAN PMS** remains workable for approximately 90 minutes at 68°F.

Typical Properties:	
Physical state	Amber aqueous solution
Chemistry	Sodium poly-melamine sulfonate
Solids	38 - 41%
pH	8 - 11.5
Density at 25°C	1.12 - 1.32g/cc
Sodium sulfate content	<2%
Solubility	Dilutes rapidly in hard or soft water
Recommended dosage	8 - 52 fluid oz/100 lbs of cement

DARVAN™ PNS-Ca Superplasticizer Calcium Poly-Naphthalene Sulfonate

DARVAN PNS-Ca is a calcium poly-naphthalene sulfonate (PNS) type superplasticizer for use in the production of concrete. It is non-alkaline with low sulfur content. **DARVAN PNS-Ca** is a major ingredient in many different types of superplasticizer formulations. It is recommended for use in high and ultra-high performance concrete, pumped concrete, marine and architectural concrete, precast concrete, etc. **DARVAN PNS-Ca** imparts very high strength, good workability and good durability to concrete. It is a potential high range and ultra-high range water reducer for the ready-mix and precast markets. The water-to-cement ratio can be reduced to 0.3 to 1 or less with the use of **DARVAN PNS-Ca**. Concrete fluidized with **DARVAN PNS-Ca** remains workable for approximately 90 minutes at 68°F.

Typical Properties:	
Physical state	Dark brown aqueous solution
Chemistry	Calcium poly-naphthalene sulfonate
Solids	40 - 42%
pH	6 - 8
Density at 25°C	1.18 - 1.23 g/cc
Sulfur content	<0.3%
Solubility	Dilutes rapidly in hard or soft water
Recommended dosage	8 - 30 fluid oz/100 lbs cement
Freeze/thaw stability	If frozen, rewarm to 85°F (30°C) and mix well