MATERIAL SPECIFICATION FOR MAGNESIUM CHLORIDE SOLID AND MAGNESIUM CHLORIDE SOLUTION

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2503.01 SCOPE

This specification covers the requirements for magnesium chloride solid and magnesium chloride solution for use as dust suppressant and de-icer.

2503.01.01 Specification Significance and Use

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

2503.01.02 Appendices Significance and Use

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

2503.02 REFERENCES

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

This specification refers to the following standards, specifications, or publications:

ASTM International

D1293-18 Standard Test Methods for pH of Water

American Public Health Association - American Water Works Association - Water Environment Federation

3500-Mg, Atomic Absorption Spectrometric Method Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998

Pacific Northwest Snowfighters (PNS)

Test Method B Corrosion Rate as Conducted from the NACE Standard TM0169-95 (1995 Revision) and as Modified by the Pacific Northwest States*

Test Method C Percent Total Settleable Solids and Percent Solids Passing on a No. 10 Sieve*

* [Part of 2008 Pacific Northwest Snowfighters Snow and Ice Control Chemical Products Specifications and Test Protocols]

U.S. Environmental Protection Agency - National Environmental Publications Information System

EPA-600/R-94/111 May 1994 Methods for the Determination of Metals in Environmental Samples, Supplement 1, Method No. 200.7 - Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma - Atomic Emission Spectrometry

2503.05 MATERIALS

2503.05.01 Magnesium Chloride Solid

Magnesium chloride solid shall be in the form of loose dry flakes or pellets, be magnesium dichloride hexahydrate ($MgCl_2.6H_2O$), and meet the requirements of Table 1.

2503.05.02 Magnesium Chloride Solution

Magnesium chloride solution used as dust suppressant shall contain a minimum 30% by mass of pure magnesium chloride and shall meet the requirements of Table 1.

Magnesium chloride solution used as de-icer shall:

a) Contain a minimum of either 22 or 30% by mass of pure magnesium chloride as specified in the Contract Documents or purchasing order.

b) Contain a corrosion control inhibitor when specified in the Contract Documents or purchasing order.

c) Meet the requirements of Table 1.

2503.07 PRODUCTION

2503.07.01 Packaging and Delivery

Magnesium chloride solid shall be delivered in moisture-proof 22.6 or 1,000 kg bags. Magnesium chloride solution shall be delivered by railway tank car or truck tank.

2503.07.02 Marking

Each container shall be legibly marked with the following information:

a) Manufacturer's or supplier's name.

b) Date packaged (i.e., yyyy-mm-dd).

c) Words "Magnesium Chloride Hexahydrate”.

d) Concentration of pure magnesium chloride.

e) Unit size (mass or volume).

When bulk shipping is provided, the shipping manifest shall include the same information.

2503.08 QUALITY ASSURANCE

2503.08.01 Sampling and Testing

Magnesium chloride solid and magnesium chloride solution may be subject to sampling and testing for conformity to the specified requirements. All materials that fail to meet the specified requirements shall be rejected.

2503.08.01.01 Sampling Magnesium Chloride Solid

A minimum of 3 samples shall be selected by the Owner at random from the shipment. Samples shall be taken by the Owner by scraping aside the top layer of material to a depth of approximately 25 mm and taking a 0.5 kg representative sample by means of a sampling tube or other method. Precautions shall be taken during the sampling operation to avoid exposing the samples unduly to atmospheric moisture. The individual samples shall be mixed thoroughly and immediately to form a composite sample of material and then be stored and sealed in a suitable glass or plastic container.

2503.08.01.02 Sampling Magnesium Chloride Solution

A minimum of three samples from each tank of each shipment shall be taken by the Owner. Each sample shall be representative of the contents of the tank. Precautions shall be taken during the sampling operation to avoid exposing the samples unduly to atmospheric moisture. Immediately after collecting the three samples, the individual samples shall be mixed thoroughly to form a composite sample of material and then be stored and sealed in a suitable glass or plastic container.

2503.08.02 Certificate

Upon request, a manufacturer's certificate shall be provided stating that an independent laboratory has tested the product and found it to be in complete conformance with this specification.

2503.09 OWNER PURCHASE OF MATERIAL

2503.09.01 Measurement and Payment

Measurement of magnesium chloride solid shall be by mass in kilograms. Weighing shall be as specified in the purchasing order.

Measurement of magnesium chloride solution, at the concentration specified, shall be by one of the following methods:

a) Mass of solution in tonnes.

   When shipped by railway tank car or when weighed at the source of supply, the mass of solution shall be substantiated by bills of lading in as many copies as the Owner may require. Railway scales shall be as specified in the purchasing order.

   When weighing by truck tank, the mass of solution shall be determined as specified in the purchasing order.

b) Volume of solution in litres.

   The volume of solution in litres shall be measured by means of a metering device as specified in the purchasing order.

   When volumetric measurement is used, the Owner shall be provided with an invoice for each tank load of solution delivered. The invoice shall contain a note signed by the delivery person, as the official representative of the supplier of solution, indicating the total volume in litres of the delivery tanker and certifying the actual volume of solution in litres delivered in each tank load.

When magnesium chloride solution is used as dust suppressant, the mass of solution in tonnes may be converted to a mass of equivalent solid in kg. In converting the mass of solution to an equivalent mass in solid, a conversion factor for a 30% magnesium chloride solution of 1 tonne of solution to 639 kg of solid shall be used.

The volume in litres of solution may be converted to an equivalent mass of solution in tonnes. In converting the volume of solution to an equivalent mass of solution, the following conversion factors shall be used:

a) 1.29 kg/litre shall be used for a minimum 30% solution.

b) 1.21 kg/litre shall be used for a minimum 22% solution.

Payment at the price specified in the purchasing order shall be for the supply of the magnesium chloride solid or magnesium chloride solution delivered to the destination on the date and time specified.

The cost of all testing, except that performed in the Owner's laboratory, shall be included in the price.

TABLE 1
Material Properties

Material/Property	Magnesium Chloride Solution			Magnesium Chloride Solid	Test Procedure
	Dust Suppressant	De-icing			
Magnesium Chloride ($MgCl_2$) % Minimum	30.0	30.0	22.0	46.0	3500-Mg, Magnesium Atomic Absorption Spectrometric Method
Potassium (K) % Maximum	0.5	0.5	0.4	--	EPA-600/R-94/111
Sodium (Na) % Maximum	0.7	0.7	0.6	--	
Calcium Chloride ($CaCl_2$) %	--	--	--	2.0 - 3.0	
Potassium Chloride (KCl) %	--	--	--	0.5 - 1.0	
Sodium Chloride (NaCl) %	--	--	--	0.5 - 1.0	
Total Settleable Solids	--	<1% (Note 1)		--	PNS Test Method C
Corrosion Inhibitor	--	Minimum 70% less corrosive than Sodium Chloride		--	PNS Test Method B
pH (Note 2)	6 to 9			--	ASTM D1293

Notes:

1. 99% of the solids passing through a 2.00 mm sieve after being stored for 168 hours at -17.8 °C ± 1 °C.

2. Dilute 1 part product to 4 parts distilled water before attempting a reading.

Appendix 2503-A, November 2023
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS

Note: This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

Designer Action/Considerations

The designer should specify the following in the Contract Documents or purchasing order:

- Concentration of de-icer. (2503.05.02)

The designer should determine if the following is required and, if so, specify it in the Contract Documents or purchasing order:

- Corrosion inhibitor. (2503.05.02)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

Related Ontario Provincial Standard Drawings

No information provided here.