

## ATTACHMENT C - GENERAL SPECIFICATIONS

Products being submitted for evaluation during a bidding opportunity must be accompanied by two (2) one-gallon containers of the product along with the chemical, biological, and physical analyses performed by an independent laboratory with American Association for Laboratory Accreditation (ISO 17025).

All submitted products will be tested to the standard limits contained within these specifications (see Table 1) in order to assess the products' potential to cause a decrease in the public safety. Analytical results of all constituents for which limits have been set by these General Specifications must reflect testing to the specified limit or below. For example, the specified limit for Cadmium is 0.20 ppm – therefore, a submitted value for Cadmium of *“less than 1.00 ppm”* is not acceptable. Any product that fails to meet the standard limits as specified will be disqualified. The State has the right to accept or reject products based on the materials used to produce the product.

Solid products are to be diluted to a 25% (weight/volume) concentration and then tested as if the material was a liquid sample. Report only the values derived from the 25% solution for all of the standard limits. Do not back calculate the concentration of the parameters to the dry weight of the material.

All products being submitted for evaluation shall be unadulterated and in their finished form, as the products are designed to be applied. Any products purchased in the future will be expected to meet specifications as established in the bid process. All test data that is submitted with each product sample is subject to verification by the State laboratory. Results of testing from the State laboratory shall be verifiable and final.

All samples must be marked with an easily distinguishable name and the associated paperwork must be clearly marked so that the samples and the submitted product information can be easily identified and matched up. Failure to supply the required samples and complete product information will be cause for disqualification.

Specific gravity chart (liquid products only) with correlating weight percentage and freeze point information presented in 1% increments beginning with a five percent solution. The chart must contain information up to, including, and exceeding-by-5% (or the solubility limits of your product) the concentration being submitted for evaluations.

Bids shall be accompanied with the most recent detailed product specification sheet, Safety Data Sheet (SDS) including the SDS of the inhibitor, and the Product Sample Checklist.

All bids and samples shall be delivered by the time and date of the bid opening. Bids and samples that are received late will be disqualified. Mark all samples submitted to the Laboratory in large black lettering as *“BID SAMPLES-TIME CRITICAL”*.

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The bidder shall furnish analyses of their product, performed by an independent laboratory with American Association for Laboratory Accreditation (ISO 17025), for the following constituents and attributes:

Constituents & Attributes	Standard Limits (or test result)	Test Method
Percent Concentration of Active Ingredient in the Liquid	Sample measurement as determined by an independent lab	Atomic absorption or inductively coupled plasma spectrophotometry as described in "Standard Methods for the Examination of Water and Waste Water", APHA/WWA-WPCF is acceptable. "Test Method A" in Appendix A of the Clear Roads Snow & Ice Control Chemical Products Specifications and Test Protocols ( <a href="https://clearroads.org/wp-content/uploads/12-10-Final-CR-SPECS-wCategory4.pdf">https://clearroads.org/wp-content/uploads/12-10-Final-CR-SPECS-wCategory4.pdf</a> ) is used to determine percent concentration of calcium chloride or magnesium chloride by atomic absorption.
Weight (lbs) per Gallon (liquid products only)	Sample measurement as determined by an independent lab	Specific gravity by ASTM D1429 Test Method A – Pycnometer at 20°C (+/- 1°C).
Corrosion Control Inhibitor Presence and Concentration	Sample measurement as determined by an independent lab	The laboratory may use the test procedures provided by the bidder or manufacturer for testing quantitative concentrations of additives. These same tests can then be used to verify that materials being delivered are the same as those previously tested and approved in the bid process.
pH (liquid products only)	6.0 – 10.0	ASTM D1293, except a dilution shall be made of one part chemical product to four parts distilled water before attempting a reading.
Corrosion Rate (corrosion inhibited products only)	≥ 70% less corrosive than NaCl	NACE Standard TM0169-95 (1995 Revision) as modified by Clear Roads. This procedure is listed as "Test Method B" in Appendix A of the Clear Roads Snow & Ice Control Chemical Products Specifications and Test Protocols ( <a href="https://clearroads.org/wp-content/uploads/12-10-Final-CR-SPECS-wCategory4.pdf">https://clearroads.org/wp-content/uploads/12-10-Final-CR-SPECS-wCategory4.pdf</a> ).
Total Settleable Solids	≤ 1.0%	This procedure is listed as Test Method "C" in Appendix A of the Clear Roads Snow & Ice Control Chemical Products Specifications and Test Protocols ( <a href="https://clearroads.org/wp-content/uploads/12-10-Final-CR-SPECS-wCategory4.pdf">https://clearroads.org/wp-content/uploads/12-10-Final-CR-SPECS-wCategory4.pdf</a> ).
Solids Passing #10 Sieve	≥ 99.0%	
Phosphorus	≤ 2500.00 ppm	Atomic absorption spectrophotometry or plasma emission spectroscopy, as described in "Standard Methods for the examination of Water and Waste Water", APHA-AWWA-WPCF.
Cyanide	≤ 0.20 ppm	
Arsenic	≤ 5.00 ppm	
Barium	≤ 100.00 ppm	
Cadmium	≤ 0.20 ppm	
Chromium	≤ 1.00 ppm	
Copper	≤ 1.00 ppm	
Lead	≤ 1.00 ppm	
Selenium	≤ 5.00 ppm	
Zinc	≤ 10.00 ppm	
Mercury	≤ 0.05 ppm	Cold vapor atomic absorption spectrophotometry, as described in "Standard Methods for the examination of Water and Waste Water", APHA-AWWA-WPCF.

Table 1

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<b>Constituents &amp; Attributes</b>	<b>Standard Limits (or test result)</b>	<b>Test Method</b>
Milliequivalents or "meq"	Sample measurement as determined by an independent lab	This is a measure of the amount of unreacted base in the product. "Meq" means milliequivalents or the milligrams of acetic acid to neutralize 1 gram of unreacted base. Method for measuring unreacted base is a standard acid/base titration procedure. A fixed volume of acid (30ml of 0.1 N HCl) is added to a 1g sample of CMA. The excess acid is titrated with a standard base (0.1 N NaOH) to phenolphthalein endpoint, pH of 8.6.
Moisture Content of Solid Chemical Products	Sample measurement as determined by an independent lab	ASTM E534
Gradation (solid products only)	Sample measurement as determined by an independent lab	ASTM D632
Toxicity	Sample measurement as determined by an independent lab	According to "Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms", Third Edition, EPA-600/4- 91/002.
Ammonia - Nitrogen	Sample measurement as determined by an independent lab	As described in "Standard Methods for the examination of Water and Waste Water", APHA-AWWA-WPCF.
Total Kjeldahl Nitrogen		
NO <sub>3</sub> <sup>-</sup> & NO <sub>2</sub> <sup>-</sup> as Nitrogen		
Bio. Oxygen Demand		
Chem. Oxygen Demand		
Frictional Analysis (liquid products only)	Sample measurement as determined by an independent lab	Frictional analysis shall be conducted on products that have been applied at the prescribed application rate to a pavement surface within a sealed and controlled humidity chamber. The frictional coefficient shall be measured on pavement surface as the humidity in the chamber is lowered and raised over the course of time. The data shall show a plot of the humidity curve and a plot of the coefficient of friction curve over time. The device that measures the frictional coefficient shall be calibrated and certified prior to use on the sample analysis.
Insoluble Material	Sample measurement as determined by an independent lab	ASTM E534 "Standard Test Methods for Chemical Analysis of Sodium Chloride". The method shall be modified by dissolving 100g of the sodium chloride sample into the prescribed volume and filtering the entire solution through a Whatman No. 541 (or equal), 125mm diameter filter paper seated in a Büchner funnel.
Chloride	Sample measurement as determined by an independent lab	ASTM D632
Sucrose	Sample measurement as determined by an independent lab	High-performance liquid chromatography, via AOAC 982.14C.

Table 1 (cont.)