CALCIUM CHLORIDE MGS-92-06E

1.0 DESCRIPTION. This specification covers calcium chloride for use as a de-icer for maintenance purposes.

2.0 MATERIAL. Unless otherwise specified, calcium chloride may be furnished in either pellet or flake form. No adjustment in quantities will be made due to the form of material furnished.

2.1 Chemical Composition. The minimum percent calcium chloride ($CaCl_2$) shall be as follows, when tested in accordance with MoDOT Test Methods T48 and T26 included in Annex A of this specification:

Flake 77%
Pellet 90%

2.2 Gradation. The gradation shall conform to the following requirements, when tested in accordance with this specification.

Sieve Size	Percent Passing (by weight)
3/8 inch	100
No. 4	80 - 100
No. 30	0 - 10

3.0 PACKAGING AND MARKING.

3.1 The material shall be delivered in 50 - 60 pound moisture-proof bags on non-returnable pallets. Any pallet cost shall be included in the unit bid price.

3.2 The bags shall be plastic only and of a thickness suitable for the weight of the contents to avoid breakage under normal use, however not less than 5 mil plastic shall be used. Valve-fill bags are allowable, provided they meet the acceptance criteria.

3.3 The bags shall be legibly marked with:

(a) Name of the manufacturer.

(b) Name of the product.

(c) Net weight.

(d) Percentage of calcium chloride guaranteed by the manufacturer.

3.4 The pallets shall be shrink or stretch wrapped with plastic on the top and sides so that the pallet contents will completely shed water and are contained on the sides. No pallets will be acceptable if the wrapping is bonded to the contents.

4.0 TEST METHODS.

4.1 Gradation. Approximately 200 g, weighed to the nearest 0.1 g, shall be sieved in accordance with AASHTO T27, utilizing the 3/8-inch, No. 4, and No. 30 sieves together, with a bottom pan and a cover. Sieving shall be completed within a period of approximately one minute.

5.0 ACCEPTANCE.

5.1 A lot shall consist of that quantity of material delivered to one location at one time.

5.2 Acceptance of the material will be based on satisfactory compliance with this specification as determined by samples and inspection deemed necessary by the engineer at the delivery site.

5.3 The material will be rejected if valve- fill openings are not self sealed suitably to prevent it from leaking out when the bag is stored on it's flat side, or if heat-sealed openings are not completely sealed, or if, upon opening the bags, it is found to be caked or sticky.

5.4 If samples fail to meet the material requirements on the basis of an initial sample, two additional samples will be taken from the lot and tested. Both of the additional samples must meet the requirements, or the lot will be rejected.

ANNEX A
Test Method
MoDOT T48
DETERMINATION OF THE PURITY OF CALCIUM CHLORIDE

1.0 SCOPE

1.1 This method describes a procedure for determining the purity of Calcium Chloride intended for use in snow and ice removal.

2.0 REAGENTS AND APPARATUS

2.1 Reagents and Apparatus as described in MoDOT Test Method T26.

3.0 PROCEDURE

3.1 Weigh, to the nearest 0.1 mg, a sample of the material sufficient to contain 1.45 to 1.55 grams of anhydrous $CaCl_2$. Transfer to a 1000 ml volumetric flask and add 200 ml H_2O. Add a few drops of HCl, Specific Gravity 1.19, to clear the solution. Add by pipette, 25 ml of the $MgCl_2$ solution. Make just alkaline to Methyl Red with NH_4OH, and dilute to volume. Determine the calcium by titrating a 20 ml aliquot, using the method described in MoDOT Test Method T26 which is included in Annex B of these specifications.

4.0 CALCULATIONS

4.1 Calculate the percent Calcium Chloride as follows:

$$\% \ CaCl_2 = \frac{\text{ml of titration x Fca x 50 x 0.0495}}{\text{Wt. of Sample}}$$

Report as:

% Calcium Chloride ($CaCl_2$) to the nearest 0.1 percent

ANNEX A (continued)

Test Method
MoDOT T26
DETERMINATION OF CALCIUM CARBONATE
AND MAGNESIUM CARBONATE
IN LIME AND PIGMENT MATERIALS

1. SCOPE

This method describes a procedure for determining the percent Calcium Carbonate and percent Magnesium Carbonate in Agricultural Lime and Calcium Carbonate paint pigments.

2. REAGENTS AND APPARATUS

(a) Sargent - Malmstadt Automatic Spectro-Electro titrator, Model S-29700

(b) Hexaver Solution

Dissolve 65 gm Hexaver (Disodium Dihydrogen 1, 2, Cyclohexanediaminetetracetate) in 2.0 liters of H_2O

(c) Magnesium Chloride Solution

Dissolve 8.00 gm $MgCl_2.6H_2O$ Reagent Grade) in H_2O and dilute to 1 liter

(d) Calcon Indicator

Dissolve 0.30 gm Calcon in 50 ml of Methanol

(e) EBT Indicator

Dissolve 0.30 gm of Erichrome Black T in 50 ml of Methanol

(f) Potassium Hydroxide Solution

Dissolve 100 gm KOH (Reagent Grade) in 200 ml H_2O

3. STANDARDIZATION OF HEXAVER SOLUTION

(a) Weigh 0.5801 gm Calcium Carbonate (Primary Standard Grade) and transfer to a 500 ml volumetric flask. Slowly add 15 ml HCL (Sp.Gr. 1.19), and boil for a few minutes to expel CO_2. Add 2 gm NH_4CL (Reagent Grade) and 200 ml H_2O. Add with a pipette 10.00 ml of the $MgCl_2$ solution, and make alkaline to methyl red with NH_40H (Sp.Gr. 0.90). Cool to room temperature and dilute to volume.

(b) Turn on the power switch of the automatic titrator and allow to warm up for about 15 minutes. Set the controls as follows:

Function Switch - Spectro

Polarity Switch - No. 2

Wavelength Selector - 650

The Hupp Cadmium Sulfide photocell should be used.

Pipette 25.00 ml aliquots into two 100 ml tall form beakers. To one beaker add 3 ml KOH Solution, 10 ml H_2O, and 10 drops of Calcon indicator. Place the beaker on the titration platform and start the titrator. The burette should be adjusted so that the rate of delivery is about 45 seconds between the 35 ml mark and the 45 ml mark. When the titrator shuts off, record the burette reading as Tca. To the second beaker, add 10 ml NH_4OH and 8 drops of EBT Indicator. Titrate as described above, and record the burette reading as Tmg.

Calculate the Calcium and Magnesium equivalents of the Hexaver as follows:

$$\text{CaO Equiv. (Fca)} = \frac{65}{\text{Tca}}$$

$$\text{MgO Equiv. (Fmg)} = \frac{\text{Fca}}{1.391}$$

$$\text{K} = \text{Tmg} - \text{Tca}$$

4. PROCEDURE

Weigh 0.5000 gm sample of the material and transfer to a 250 ml beaker. Moisten with H_2O and add 10 ml HCL. Remove the insoluble matter, $Si0_2$, and R_2O_3 by the methods set forth in ASTM C25-72. Collect all the filtrates and washings from the R_20_3 filtration in a 500 ml volumetric flask. Pipette 10 ml $MgCl_2$ solution into the flask, cool and dilute to volume.

Tritrate 25 ml aliquots for calcium and magnesium as described above in Section 3. Record the burette readings as T_{ca} and T_{mg}

5. CALCULATIONS

Calculate the percent Calcium Carbonate and percent Magnesium Carbonate as follows:

$$\%\ CaCO_3 = F_{ca} \times T_{ca} \times 1.7848$$

$$\%\ MgCO_3 = F_{mg} \times (T_{mg} - T_{ca} - K) \times 2.0915$$

Report the results, to the nearest 0.1 percent, as follows:

% Calcium Carbonate ($CaCO_3$)

% Magnesium Carbonate ($MgCO_3$)