



# Standard Specification for Calcium Chloride<sup>1</sup>

This standard is issued under the fixed designation D 98; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope

1.1 This specification covers calcium chloride, technical grade, typically used for, but not limited to, dust control, stabilization, ice/snow removal, other road-conditioning purposes, acceleration of the set of concrete, and as a desiccant.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 For purposes of determining conformance to this specification, values for chemical analysis shall be rounded to the nearest 0.1 %, and values for grading shall be rounded to the nearest 1 %, in accordance with the rounding method in Practice E 29.

1.4 The text of this standard references notes and footnotes, which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

## 2. Referenced Documents

### 2.1 ASTM Standards:

D 345 Test Method for Sampling and Testing Calcium Chloride for Roads and Structural Applications<sup>2</sup>

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications<sup>3</sup>

E 449 Test Methods for Analysis of Calcium Chloride<sup>4</sup>

### 2.2 Federal Standards:<sup>5</sup>

UU-S-48 Sack, Shipping, Paper

PPP-B-35 Bag, Textile, Shipping, Burlap, Cotton, and Waterproof Laminated

PPP-C-186 Containers, Packaging and Packing for Drugs, Chemicals, and Pharmaceuticals

PPP-D-723 Drum, Fiber

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

### 2.3 Military Standards:<sup>5</sup>

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.03.

<sup>3</sup> Annual Book of ASTM Standards, Vol 14.02.

<sup>4</sup> Annual Book of ASTM Standards, Vol 15.05.

<sup>5</sup> Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

MIL-STD-129 Marking for Shipment and Storage

2.4 American Trucking Associations, Inc.:<sup>6</sup>

National Motor Freight Classification

2.5 Uniform Classification Committee:

Uniform Freight Classification<sup>7</sup>

## 3. Classification

3.1 *Type*—Two types of calcium chloride are covered as follows:

3.1.1 *Type S (Solid)*—Flake, pellet or granular calcium chloride (CaCl<sub>2</sub>) in varying concentrations.

3.1.2 *Type L (Liquid)*—Water solutions of calcium chloride in varying concentrations.

3.2 *Concentrations*—Concentrations of Type S and Type L calcium chloride shall be expressed as a percentage of the total. Type S shall be further expressed as Grades as in 3.3 and in accordance with the chemical requirements of this specification.

3.2.1 The concentrations of Type S (solid) calcium chloride are 77, 90, and 94 % minimum.

3.2.2 The concentrations of Type L (liquid) calcium chloride shall be specified by the purchaser (see Note 1).

NOTE 1—Typical concentrations vary from 30 to 45 %.

3.3 *Grades*—Type S (solid) calcium chloride is graded as follows:

3.3.1 *Grade 1*, is 77 % minimum calcium chloride concentration of either Class A—Flake, or Class B—Granular.

3.3.2 *Grade 2*, is 90 % minimum calcium chloride concentration of Class A—Flake, Class B—Pellet, Class C—Granular, or Class D—Powder.

3.3.3 *Grade 3* is 94 % minimum calcium chloride concentration of Class A—Flake, Class B—Pellet, Class C—Granular, or Class D—Powder.

## 4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 This specification designation and date of issue,

4.1.2 Type S (solid) or Type L (liquid) concentration, grade

<sup>6</sup> Available from American Trucking Association, Inc., 1616 P St., N. W., Washington DC 20036.

<sup>7</sup> Available from Uniform Classification Committee, 212 Union Station, Chicago, IL 60606.

and class of calcium chloride required (see Sections 3),

4.1.3 Quantity of calcium chloride required,

4.1.4 Whether special sampling for inspection is required (see Section 7), and

4.1.5 Whether special packaging and marking is required (see Section 10).

**5. Chemical Requirements**

5.1 The calcium chloride shall conform to the following requirements for chemical composition, except for the tolerances stated in 7.2.

5.1.1 CaCl<sub>2</sub> content, %—not less than the minimum concentration specified, nor greater than the maximum concentration specified (when a maximum is specified).

5.1.2 Impurities content (not including water)—composition on anhydrous CaCl<sub>2</sub> basis, with limits adjusted according to 5.2 for the specific assay:

Total alkali chlorides (as NaCl), max, %	8.0
Total magnesium as MgCl <sub>2</sub> , max, %	0.5
Other impurities (see 5.1.2.1), max, %	1.0

5.1.2.1 Other impurities are those compounds, other than water (H<sub>2</sub>O), not determined in the analysis of calcium chloride by Test Methods E 449.

5.2 Calculations for Allowable Impurities:

5.2.1 If the product assay shows 90.5 % or more CaCl<sub>2</sub> content, the impurities content in that product shall not exceed the limits shown in 5.1.

5.2.2 If the product assay shows less than 90.5 % CaCl<sub>2</sub> content, calculate the maximum allowable impurities concentration in that product as follows:

$$A = A_1 \left( \frac{B}{100 - C} \right) = A_1 \left( \frac{B}{90.5} \right) \quad (1)$$

where:

- A = impurity in assayed product, max % allowable,
- A<sub>1</sub> = impurity limit (on anhydrous basis) for that particular impurity as specified in 5.1, max, %,
- B = CaCl<sub>2</sub> content in assayed product, %, and
- C = total of all impurities permitted in anhydrous product, % (summation of maximum limits listed in 5.1).

5.2.3 Other impurities, % = 100.0 - (% CaCl<sub>2</sub> + % NaCl + % KCl + % MgCl<sub>2</sub> + % H<sub>2</sub>O + % Ca(OH)<sub>2</sub>).

**6. Physical Requirements**

6.1 The grading of solid form calcium chloride shall conform to the requirements of Table 1 for the grade and class

specified in the order.

**7. Sampling, Examination, and Testing**

7.1 Sampling, examining, and testing of calcium chloride shall be done in accordance with Test Method D 345 and E 449. When specified in the contract or purchase order, sampling for examination shall be performed in accordance with MIL-STD-105 at an acceptable quality level specified by the purchaser.

7.2 Every facility shall be provided to the purchaser's representative when the material is sampled at the plant. When the purchaser elects to sample the solid form material after delivery, a tolerance of three percentage points below the minimum CaCl<sub>2</sub> requirement shall apply. When the purchaser elects to sample the liquid form material after delivery, a tolerance of one percentage point below the minimum CaCl<sub>2</sub> requirement shall apply.

**8. Inspection**

8.1 Unless otherwise specified in the contract or purchase order, the supplier shall be responsible for the performance of all inspection requirements as specified herein.

8.2 Except as otherwise specified, the supplier shall use his own facilities or any commercial laboratory acceptable to the purchaser for analysis of material. The purchaser reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure that supplies and services conform to the prescribed requirements.

**9. Rejection**

9.1 The calcium chloride shall be subject to rejection if it fails to conform to any of the requirements of this specification or, in the case of the solid forms, if it has become caked or sticky in shipment.

**10. Packaging, Package Marking, and Shipping**

10.1 Unless otherwise specified in the contract or purchase order, the calcium chloride in solid form shall be delivered in moisture proof bags containing not more than 45 kg (100 lb) nominal capacity each, or in airtight drums weighing not more than 204 kg (450 lb) nominal capacity each, or in bulk in tank cars, covered hopper cars, or covered trucks; and the calcium chloride in liquid form shall be delivered in bulk in tank trucks, tank cars, or barges.

10.2 Unless otherwise specified in the contract or purchase order, the name of the manufacturer, name of the product, net

**TABLE 1 Sieve Analysis**

Sieve Size	Mass % Passing									
	Grade 1—77 % min CaCl <sub>2</sub>		Grade 2—90 % min CaCl <sub>2</sub>				Grade 3—94 % min CaCl <sub>2</sub>			
	Class A Flake	Class B Granular	Class A Flake	Class B Pellets	Class C Granular	Class D Powder	Class A Flake	Class B Pellets	Class C Granular	Class D Powder
31.5 mm 1¼ in.	...	...	...	...	100	...	...	...	100	...
9.5 mm ¾ in.	100	100	100	100	...	...	100	100	...	...
4.75 mm No. 4	80–100	0–80	80–100	80–100	0–5	100	80–100	80–100	0–5	100
2.36 mm No. 8	...	...	...	...	...	80–100	...	...	...	80–100
1.18 mm No. 16	...	...	...	...	...	...	...	...	...	...
850 µm No. 20	...	...	...	0–10	...	...	...	0–10	...	...
600 µm No. 30	0–5	0–5	0–5	0–5	...	0–65	0–5	0–5	...	0–65

weight, and percentage of calcium chloride guaranteed by the manufacturer shall be legibly marked on each container for package shipments, or on the invoice or shipping papers accompanying bulk shipments.

10.3 When specified in the contract or purchase order as for Federal Government procurement, calcium chloride shall be prepared for shipment in accordance with the provisions specified in 10.4-10.6.2.

10.4 *Packaging*—Packaging for Federal Government procurement shall be Level A or C as specified (see Section 4.1.5).

10.4.1 *Level A*:

10.4.1.1 *Unit Packaging*—Calcium chloride in solid form shall be packaged in 0.45 or 2.25-kg (1 or 5-lb) quantities, as specified (see Section 10.4), in glass bottles conforming to Group A, Class 1, Style 2, Closure A of PPP-C-186.

10.4.1.2 *Intermediate Packaging*—Calcium chloride unit, packaged in accordance with 10.4.1.1 shall be intermediately packaged in accordance with the Level A requirements of PPP-C-186.

10.4.2 *Level C*—Calcium chloride shall be packaged in the quantities specified (see Section 4.1.5), in accordance with supplier's standard practice.

10.5 *Packaging*—Packing for Federal Government Procurement shall be Level A, B, or C as specified (see Section 4.1.5).

10.5.1 *Level A*:

10.5.1.1 *For 0.45 or 2.25-kg (1 and 5-lb) Quantities*—Calcium chloride, packaged in accordance with 10.4.1.1 shall be packed in accordance with the Level A requirement of PPP-C-186.

10.5.1.2 *For 36 and 45-kg (80 and 100-lb) Quantities*—Calcium chloride, as specified (see 4.1.5), shall be packed in appropriate size sacks conforming to construction number 16X or 17X of UU-S-48, bags conforming to bag number P35B/A of PPP-B-35, or fiber drums conforming to Type III, Grade A, of PPP-D-723, as specified (see 4.1.5). Fiber drums shall be

provided with a polyethylene bag liner or other suitable water-vapor-proof liner or interior coating.

10.5.2 *Level B*:

10.5.2.1 *For 0.45 and 2.25-kg (1 and 5-lb) Quantities*—Calcium chloride, packaged in accordance with 10.4, shall be packed in accordance with the Level B requirements of PPP-C-186.

10.5.2.2 *For 36 and 45-kg (80 and 100-lb) Quantities*—Calcium chloride, as specified (see 4.1.5), shall be packed in appropriate size sacks conforming to construction number 8L/W or 14L/W of UU-S-48, bags conforming to bag number P35B of PPP-B-35, or fiber drums conforming to Type I, Grade A, of PPP-D-723, as specified (see 4.1.5). Fiber drums shall be provided with a polyethylene bag liner or other suitable water-vapor-proof lining or interior coating.

10.5.3 *Level C*—Calcium chloride shall be packed in quantities specified (see 4.1.5), in a manner which will ensure arrival at destination in satisfactory condition and be acceptable to the carrier at lowest rates. Containers and packing shall comply with the Uniform Freight Classification rules or National Motor Freight Classification rules.

10.6 *Marking* (see 4.1.5):

10.6.1 *Civil Agencies*—In addition to any special marking required by the contract or order, the interior packages and exterior shipping containers shall be marked in accordance with Fed. Std. No. 123.

10.6.2 *Military Activities*—In addition, to any special marking required by the contract or order, the interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

## 11. Keywords

11.1 calcium chloride; concrete accelerator; concrete admixture; deicing chemical; dessication; dust control; snow and ice removal; stabilization

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