

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
EQUIPMENT AND PROCUREMENT DIVISION
BID INVITATION**

Bid Number: Contract No. H-14-249J

BID OPENING LOCATION:
AHTD Equipment and
Procurement Division
11302 W. Baseline Road
Little Rock, AR 72209

MAIL TO:
AHTD Equipment and
Procurement Division
P.O. Box 2261
Little Rock, AR 72203

DELIVER TO:
AHTD Equipment and
Procurement Division
11302 W. Baseline Road
Little Rock, AR 72209

Bid Opening Date: August 20, 2013 Time: 11:00 a.m.

Sealed bids for furnishing the commodities and/or services described below, subject to the Conditions on page 2 of this Bid Invitation will be received at the above-noted mail and delivery locations until the above-noted bid opening date and time, and then publicly opened at the above-noted bid opening location. **Bids must be submitted on this form, with attachments when appropriate, or bids will be rejected. Late bids and unsigned bids will not be considered.**

In compliance with this Bid Invitation and subject to all the Conditions thereof, the undersigned offers and agrees to furnish any and all items upon which prices are quoted, at the price set opposite each item.

Company Name: _____

Name (Type or Print): _____

Address: _____

Title: _____

Phone: _____ Fax: _____

City: _____ State: _____ Zip: _____

E-mail Address: _____

Federal Tax ID or Social Security No.: _____

Signature: _____

Signature must be legible, original (not photocopied) and in ink.
Unsigned bids will be rejected.

Description	Quantity	Unit	Unit Price	Amount
<p>The Arkansas State Highway and Transportation Department (hereinafter called the Department) will receive sealed bids for furnishing requirements of LIQUID MAGNESIUM CHLORIDE (corrosion inhibited liquids) as specified herein with prices firm as set forth on the Bid Forms for the period from October 1, 2013 through March 31, 2014.</p> <p>Materials furnished must meet the Standard Specifications for Highway Construction, Edition of 2003 and the Arkansas State Highway and Transportation Department Specifications attached to and made a part of this contract. It shall be understood that the Bid Invitation, General Conditions, Bidder Information, Bid Forms, Bid Information and Specifications are an integral part of this bid and by this reference are incorporated herein as fully and effectively as if set forth in detail and; that by submission of bid, bidder agrees to these conditions and that all things shall be governed by the Laws of the State of Arkansas.</p> <p>FOB: Statewide as noted on Bid Forms.</p> <p>Should there be a conflict between conditions printed on page 2 of Invitation to Bid and other conditions stated with Bid Information and Specifications, the latter shall prevail.</p> <p>Pricing proposed shall be on a per-ton or per-gallon basis FOB – the specified delivery points. See Condition 9 on Page 2.</p> <p>Descriptive literature and detailed specifications of materials proposed should be submitted with bid. The information supplied must include a material safety data sheet as required by OSHA – 29 CFR 1910.1200. Samples may be required per Condition 10 on page 2.</p> <p>Bidder shall make deliveries in accordance with individual orders placed by the Department within ten (10) days after receipt of order. See Conditions 12 and 13 on page 2. Payment will be made on each individual order as promptly as possible after receipt of invoice from supplier.</p> <p>Bid Bond in the amount of \$500.00 required of all bidders at time of bid opening or bid will be rejected. <u>Personal and company checks are not acceptable as Bid Bonds.</u> See Condition 3 on page 2 of this Bid Invitation. Performance Bond in an amount not to exceed \$2,000.00 will be required of successful bidder prior to providing goods/services. <u>Personal and company checks are not acceptable as Performance Bonds.</u> See Condition 3 on page 2 of this Bid Invitation.</p> <p>Bids and Specifications are available on-line by going to the AHTD Web Site – www.arkansashighways.com and clicking on “Commodities and Services Bids/Contracts Information”. Tabulations will also be available at this site within 72 hours after bid opening. If you have any questions, call this office at 501-569-2667.</p> <p>TWO SIGNED COPIES OF BID INVITATION, BID FORMS AND BIDDER INFORMATION MUST BE SUBMITTED.</p>				

STANDARD BID CONDITIONS

H-14-249J

1. **ACCEPTANCE AND REJECTION:** The Arkansas State Highway and Transportation Department (AHTD) reserves the right to reject any or all bids, to accept bids in whole or in part (unless otherwise indicated by bidder), to waive any informalities in bids received, to accept bids on materials or equipment with variations from specifications where efficiency of operation will not be impaired, and to award bids to best serve the interest of the State.
2. **PRICES:** Unless otherwise stated in the Bid Invitation, the following will apply: (1) unit prices shall be bid, (2) prices should be stated in units of quantity specified (feet, each, lbs., etc.), (3) prices must be F.O.B. destination specified in bid, (4) prices must be firm and not subject to escalation, (5) bid must be firm for acceptance for 30 days from bid opening date. In case of errors in extension, unit prices shall govern. Discounts from bid price will not be considered in making awards.
3. **BID BONDS AND PERFORMANCE BONDS:** If required, a **Bid Bond** in the form of a cashier's check, certified check, or surety bond issued by a surety company, in an amount stated in the Bid Invitation, must accompany bid. **Personal and company checks are not acceptable as Bid Bonds.** Failure to submit a Bid Bond as required will cause a bid to be rejected. The Bid Bond will be forfeited as liquidated damages if the successful bidder fails to provide a required Performance Bond within the period stipulated by AHTD or fails to honor their bid. Cashier's checks and certified checks submitted as Bid Bonds will be returned to unsuccessful bidders; surety bonds will be retained. The successful bidder will be required to furnish a **Performance Bond** in an amount stated in the Bid Invitation and in the form of a cashier's check, certified check, or surety bond issued by a surety company, unless otherwise stated in the Bid Invitation, as a guarantee of delivery of goods/services in accordance with the specifications and within the time established in the bid. **Personal and company checks are not acceptable as Performance Bonds.** In some cases, a cashier's check or certified check submitted as a Bid Bond will be held as the Performance Bond of the successful bidder. Cashier's checks or certified checks submitted as Performance Bonds will be refunded shortly after payment has been made to the successful bidder for completion of all terms of the bid; surety bonds will be retained. Surety bonds must be issued by a surety company authorized to do business in Arkansas, and must be signed by a Resident Local Agent licensed by the Arkansas State Insurance Commissioner to represent that surety company. Resident Agent's Power-of-Attorney must accompany the surety bond. Certain bids involving labor will require Performance Bonds in the form of surety bonds only (no checks of any kind allowed). In such cases, the company issuing the surety bond must comply with all stipulations herein and must be named in the U. S. Treasury listing of companies holding Certificates of Authority as acceptable sureties on Federal Bonds and as acceptable reinsuring companies. Any excess between the face amount of the bond and the underwriting limitation of the bonding company shall be protected by reinsurance provided by an acceptable reinsuring company. Annual Bid and Performance Bonds on file with E & P Division must have sufficient unencumbered funds to meet current bonding requirements, or the bid will be rejected, unless the balance is submitted as set forth above, prior to bid opening.
4. **TAXES:** The AHTD is not exempt from Arkansas State Sales and Use Taxes, or local option city/county sales taxes, when applicable, and bidders are responsible to the State Revenue Department for such taxes. These taxes should not be included in bid prices, but where required by law, will be paid by the AHTD as an addition thereto, and should be added to the billing to the AHTD. The AHTD is exempt from Federal Excise Taxes on all commodities except motor fuels; and excise taxes should not be included in bid prices except for motor fuels. Where applicable, tax exemption certificates will be furnished by the AHTD.
5. **"ALL OR NONE" BIDS:** Bidders who wish to bid "All or None" on two or more items shall so stipulate on the face of bid sheet; otherwise, bid may be awarded on an individual item basis.
6. **SPECIFICATIONS:** Complete specifications should be attached for any substitution or alternate offered, or where amplification is necessary. Bidder's name must be placed on all attachments to the bid.
7. **EXCEPTIONS TO SPECIFICATIONS:** Any exceptions to the bid specifications must be stated in the bid. Any exceptions to manufacturer's published literature must be stated in the bid, or it will be assumed that bidder is bidding exactly as stated in the literature.
8. **BRAND NAME REFERENCES:** All brand name references in bid specifications refer to that commodity or its equivalent, unless otherwise stated in Bid Invitation. Bidder should state brand or trade name of item being bid, if such name exists.
9. **FREIGHT:** All freight charges should be included in bid price. Any change in common carrier rates authorized by the Interstate Commerce Commission will be adjusted if such change occurs after the bid opening date. Receipted common carrier bills that reflect ICC authorized rate changes must be furnished.
10. **SAMPLES, LITERATURE, DEMONSTRATIONS:** Samples and technical literature must be provided free of any charge within 14 days of AHTD request, and free demonstrations within 30 days, unless AHTD extends time. Failure to provide as requested within this period may cause bid to be rejected. Samples, literature and demonstrations must be substantially the same as the item(s) being bid, unless otherwise agreed to by AHTD. Samples that are not destroyed will be returned upon request at bidder's expense. Samples from successful bidders may be retained for comparison with items actually furnished.
11. **GUARANTY:** Unless otherwise indicated in Bid Invitation, it is understood and agreed that any item offered or shipped on this bid shall be newly manufactured, latest model and design, and in first class condition; and that all containers shall be new, suitable for storage or shipment and in compliance with all applicable laws relating to construction, packaging, labeling and registration.
12. **BACKORDERS OR DELAY IN DELIVERY:** Backorders or failure to deliver within the time required may constitute default. Vendor must give written notice to the AHTD, as soon as possible, of the reason for any delay and the expected delivery date. The AHTD has the right to extend delivery if reasons appear valid. If reason or delivery date is not acceptable, vendor is in default.
13. **DEFAULT:** All commodities furnished will be subject to inspection and acceptance by AHTD after delivery. Default in promised delivery or failure to meet specifications authorizes the AHTD to cancel award or any portion of same, to reasonably purchase commodities or services elsewhere and to charge full increase, if any, in cost and handling to defaulting vendor. Applicable bonds may be forfeited.
14. **ETHICS:** *"It shall be a breach of ethical standards for a person to be retained, or to retain a person, to solicit or secure a State contract upon an agreement of understanding for a commission, percentage, brokerage, or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies maintained by the contractor for the purpose of securing business."* (Arkansas Code, Annotated, Section 19-11-708).

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

NOTICE OF NONDISCRIMINATION

The Arkansas State Highway and Transportation Department (Department) complies with all civil rights provisions of federal statutes and related authorities that prohibit discrimination in programs and activities receiving federal financial assistance. Therefore, the Department does not discriminate on the basis of race, sex, color, age, national origin, religion or disability, in the admission, access to and treatment in the Department's programs and activities, as well as the Department's hiring or employment practices. Complaints of alleged discrimination and inquiries regarding the Department's nondiscrimination policies may be directed to Joanna P. McFadden Section Head - EEO/DBE (ADA/504/Title VI Coordinator), P. O. Box 2261, Little Rock, AR 72203, (501) 569-2298, (Voice/TTY 711), or the following email address:

Joanna.Mcfadden@arkansashighways.com.

This notice is available from the ADA/504/Title VI Coordinator in large print, on audiotape and in Braille.

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
SUPPLY CONTRACT NO. H-14-249J
LIQUID MAGNESIUM CHLORIDE**

BIDDER INFORMATION

BIDDER _____

The following materials are used by the Department as a part of the Snow and Ice Control Program. Bidders are requested to note the information needed by filling in the blanks noted below.

Item No. - Material _____ Shipping/Delivery Information _____

1. LIQUID MAGNESIUM CHLORIDE Minimum Tanker Load _____ Gallons
Liquid Magnesium Chloride shall be delivered by TANKER
TRUCK WITH PUMP to unload into Department Tanks.

Product Proposed: _____ Producer: _____

TERMS: PRICING PROPOSED SUBJECT TO DISCOUNT OF _____% - _____ DAYS.

Bidders are requested to note contact person and telephone number (WATS line if available) and "fax" number to place orders.

- (1) Company Name _____ Contact _____
Address _____ Telephone _____
_____ "Fax" _____

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
SUPPLY CONTRACT NO. H-14-249J
LIQUID MAGNESIUM CHLORIDE**

BID INFORMATION

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1. The Arkansas State Highway and Transportation Department (hereinafter called the Department) will receive sealed bids for furnishing requirements of Snow and Ice Control Materials as noted in the attached bid.
2. Bids shall be submitted on the form furnished herewith and must include descriptive literature, etc. requested on the Bid Invitation. Bid envelope shall be sealed and marked so as to clearly indicate to contents and will be received at the locations as noted on the Bid Invitation. Bids received after date and hour set for opening will be returned unopened to the bidder.
3. A bid may be withdrawn, modified, or corrected by the bidder after it has been submitted, provided written request to do so is filed with Equipment and Procurement Division prior to the hour set for opening bids. Telegrams or letters received before hour set for opening bids will be accepted and attached to the unopened bid, and the bid will be considered withdrawn, modified and corrected accordingly. No bid may be withdrawn, modified, corrected, or otherwise changed after the hour set for opening bids.
4. By submission of bid, bidder agrees to all conditions contained herein and if bid is found acceptable, either in whole or in part, by the Highway Department, shall consider this bid a contract agreement bound under these Conditions; and further, the parties hereto agree that this contract in all things shall be governed by the Laws of the State of Arkansas.
5. A bidder whose bid is found acceptable shall properly execute a Performance Bond as may be required to Equipment and Procurement Division of the Department within fourteen (14) days after notice of award. No bid shall be considered binding upon the Department until the contract has been awarded, and until the successful bidder(s) have executed and filed a satisfactory bond. Failure to execute and file the bond within fourteen (14) days shall be cause for the annulment of the award.
6. Materials proposed and furnished must meet the specifications as set forth, and it shall be understood that the material will be furnished on individual orders as needed during the period of the contract. The Department is not obligated to purchase any specific quantities or to make purchase at any specific time.

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
SUPPLY CONTRACT NO. H-14-249J
LIQUID MAGNESIUM CHLORIDE**

BID INFORMATION

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7. The successful bidder(s) shall make all deliveries in accordance with individual orders placed by stockroom supervisors of each district within ten (10) days after notice by telephone.
8. In the event the successful bidder finds that he will be unable to supply all items noted on an individual order within 10 days, he shall immediately notify the Stockroom Supervisor, and in such event the Department shall have the right to purchase the item (or items) under separate purchasing procedures with the option of holding the contract vendor responsible for any excess cost of the item(s).
9. Invoicing information noted on the Bid Forms is intended to aid the supplier and the Department. Payment will be made on each individual order as promptly as possible after receipt of invoice. Invoices mailed to the Central Office location in Little Rock will cause delay.
10. In the event of unsatisfactory delivery and/or material furnished, the Department reserves the right to cancel this contract upon giving to the vendor fifteen (15) days notice of its intention to terminate the contract. Upon the giving of such notice, the contract shall automatically terminate as of the date in said notice. Otherwise, the prices bid shall remain in effect for the contract period.
11. Cooperative Purchasing: Procedures are being developed to permit other tax-supported entities* in Arkansas (cities, counties, state agencies, school districts, etc.) to purchase from this Contract on an individual basis under the same specifications and conditions, and at the pricing set forth by each vendor, all at the discretion of each vendor in each case. Prices could be reduced by a vendor for minor alterations in conditions (changing minimum order quantities, etc.) as agreed by both parties, but could not be raised above the contract bid price under any circumstances. Vendors would not be required to sell to any such entity under this Contract, and those entities would not be obligated to purchase from the Contract.

Should these procedures be approved during the term of this contract, each entity wishing to purchase from the Contract would make contact directly with the appropriate vendor(s). The Highway Department would remain "out of the loop" for such transactions: all contact, orders, invoices, payments, etc. regarding such transactions must take place exclusively between the tax-supported entity and the vendor. The Department would be held harmless of any and all liability arising from such transactions.

*Tax-supported entities are defined as those receiving more than half of total funding from appropriated tax funds.

Rev. 9/2/03

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIAL SPECIFICATION
FOR
DE-ICER / ANTI-ICER (MAGNESIUM CHLORIDE)**

Page 1 of 4

1. **Description.** This specification describes an effective and environmentally safe liquid de-icer/anti-icer to be provided to the Arkansas Highway and Transportation Department. The material provided must comply with all requirements of this specification.
2. **Chemical and Physical Composition.** Magnesium Chloride-based, corrosion-inhibiting material shall conform to the following specifications:

Chemical Properties

Magnesium Chloride Concentration	26 to 30%
Total Phosphates*, "Standard Methods for the examination of Water and Waste Water," APHA-AWWA-WPCF.	25 ppm max.
Cyanide	0.20 ppm max.
Chromium	0.5 ppm max.
Cadmium	0.15 ppm max.
Calcium	100 ppm max.
Sulfate	0.5 % max.

*Except a 1% solution will be used. To prepare a 1% solution place 10 ml of sample into 500 ml distilled or DI water contained in a 1 L volumetric flask to which 2.5 ml 1 + 1 sulfuric acid has been added. Swirl the contents and make up to 1000 ml with distilled water.

Physical Properties

pH, ASTM E 70-90*	6-9
Specific Gravity	1.24-1.30
Corrosive Property, Test Method AHTD TM910	65% less corrosive than NaCl
Settleable Solids and Solidification, Test Method AHTD TM911	No accumulation

*Except a dilution must be made of 1 part deicer to 4 parts distilled/deionized water before reading.

The material supplied shall have no constituents which would cause residual waste to meet the definition of a hazardous waste, as found in 40 CFR 261.

Rev. 9/2/03

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIAL SPECIFICATION
FOR
DE-ICER / ANTI-ICER (MAGNESIUM CHLORIDE)**

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3. **Bidding.** If a manufacturer/vendor/supplier receives a request for bid, that manufacturer/vendor/supplier shall provide test reports from an independent laboratory within fourteen days of the bid submittal, certifying production sample compliance with AHTD specifications and identifying all the chemical and physical properties stated herein for Liquid Magnesium Chloride. If the sample meets all specifications as outlined herein, the manufacturer/vendor/ supplier 's bid will be qualified.

Appropriate industry-accepted methods of wet titration and instrumental testing will be allowed for chemical analysis unless otherwise specified. The test report shall be included with the sample.

4. **Random Sampling and Testing.** Sampling of the Magnesium Chloride will be as directed by the Engineer. Samples may be taken at the point of manufacture, from intermediate storage, from the truck at delivery, or from the Department's receiving tank, if it was empty before delivery.

If a sample fails to comply with the requirements stated herein, all deliveries shall cease until such time as the Engineer determines that the required specifications are being met and that adequate quality control has been re-established.

5. **Documentation.** The material supplied shall include the following documentation:
- a) A current, clearly legible Material Safety Data Sheet (MSDS).
 - b) Clear documentation of its percentage of concentration of Magnesium Chloride.
 - c) An application rate table that clearly states the manufacturer/vendor/supplier recommended rate for the various conditions of use at the place of delivery.
 - d) Information on how low temperatures will affect storage of liquid material.
 - e) Clear documentation on proper storage.

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIAL SPECIFICATION
FOR
DE-ICER / ANTI-ICER (MAGNESIUM CHLORIDE)**

6. Delivery and Equipment.

- a) Vendor shall assure delivery and complete transfer of the material through properly calibrated metered pumps for liquids or certified scales for solids.
- b) Vendor shall be responsible for all necessary equipment to transfer the material to existing storage facilities.

7. Packaging/Labeling. Material shall be packaged as stated in the bid invitation. Packaging shall permit safe dispensing under a variety of storage and weather conditions. A bill of lading shall accompany each shipment, and shall contain the following information:

- a) Name of product.
- b) Supplier and manufacturer of product.
- c) Destination of product.
- d) Unit of measurement and number of units being delivered.
- e) Total weight of delivery (certified scale ticket).
- f) Lot number of products being delivered. This number must enable purchaser to track a delivered product back to its manufacture point, date of manufacture, and specific batch.
- g) Shipper information, including the name of the shipping company, tank, trailer, or rail car number, point and date of origin.

8. Basis for Award. The basis for award will be determined by the following formula:

$$\frac{\text{Delivered Price}}{\text{concentration \%}} \quad = \quad \text{price per unit of deicer/anti-icer chemical}$$

(as a whole number)

For example:

- a. $\frac{\$60.00}{25} = \2.40 per unit of deicer chemical.
- b. $\frac{\$65.00}{30} = \2.17 per unit of deicer chemical.

Based on the calculations above, the bid would be awarded to “b”.

Rev. 9/2/03

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIAL SPECIFICATION
FOR
DE-ICER / ANTI-ICER (MAGNESIUM CHLORIDE)**

Page 4 of 4

9. **Measurement.** The deicer/anti-icer shall be measured and delivered to the designated locations as directed on the invitation to bid.

10. **Payment.** The accepted quantities of de-icer/anti-icer material, measured as provided under “Measurement,” will be paid for at the unit bid price. This price shall be full compensation for furnishing all materials, labor, certifications, samples, testing, and delivery of the product to the designated location(s).

**METHOD OF TEST FOR DETERMINATION
OF
SETTLEABLE SOLIDS AND SOLIDIFICATION
(Liquid Anti-icers/Deicers)**

1. SCOPE

1.1 This test method is used to determine the amount of total settleable solids and the percent solids passing a 2.00 mm (No.10) sieve that are generated from a liquid deicer product when stored at a cold temperature without agitation.

2. APPARATUS

2.1 Imhoff cone with holder.

2.2 Watch glass to cover Imhoff cone.

2.3 Freezer, calibrated at the correct temperature range for 168 hours.

2.4 A 2.00 mm(No.10) sieve.

2.5 Rubber police.

3. SAMPLES

3.1 Samples for sieve analysis shall be obtained from transport tankers.

4. PREPARATION AND TESTING OF SAMPLE

4.1 The following describes the determination of settleable solids and solidification.

4.1.1 Shake the de-icer/anti-icer sample bottle well.

4.1.2 Pour 1L of the mixed sample into an Imhoff cone.

4.1.3 Cover the cone with a watch glass.

4.1.4 Place the cone and its holder in the freezer at -18°C (0°F) for 168 hours.

4.1.5 Remove the cone from the freezer and gently stir the sides of the cone with a stirring rod.

4.1.6 Allow the sample to stand for 5 minutes to complete settling.

Note: *If the settled matter contains pockets of liquid between large settled particles, estimate the volume of these and subtract them from the volume of settled solids. Where a separation of settleable and floating materials occurs, do not estimate the floating material as settleable matter.*

4.1.7 Measure the amount of settleable solids by using the calibrated gradation on the cone

4.1.8 Report settleable solids as a percent volume to volume ratio (V/V).

4.2 The following describes the procedure for determining the Percent Solids Passing a 2.00 mm (No.10) Sieve.

4.2.1 Immediately after determining the total settleable solids remove the tip from the cone and pour the sample through a 2.00 mm(No.10) sieve.

Note: *Pour the sample through one-quarter section of the sieve if possible to reduce the surface area from which the sample must be retrieved. Do not rinse the sample on the sieve or push it through the sieve by any means.*

4.2.2 Use a rubber police to transfer any material not flowing through the sieve into a graduated cylinder. Measure the volume.

Note: *Material that is trapped in the mesh of the sieve and does not come loose on the face of the sieve is considered passing and is not included.*

4.2.3 Subtract this volume from the total volume of the sample to calculate the sample volume passing.

4.2.4 Report the solids passing the 2.00 mm(No.10) sieve in percent based upon the volume to volume (V/V) ratio of sample volume passing to the initial sample size.

5. REPORT

5.1 Report settleable solids as a percent volume to volume ratio (V/V). Report to the nearest whole number.

5.2 Report the solids passing the 2.00 mm(No.10) sieve in percent based upon the volume to volume (V/V) ratio of sample volume passing to the initial sample size. Report to the nearest percent (%).

6. REFERENCE

Texas Test Method Tex-625-J

**METHOD OF TEST FOR CORROSION TEST
OF
DE-ICERS AND ANTI-ICERS**

1. SCOPE

- 1.1 This method determines the percent corrosion of anti-icers and de-icers on steel washers as compared to corrosion using sodium chloride.

2. APPARATUS

- 2.1 Ungalvanized washers in conformance with ASTM F436; hardened to RC 38-45
- 2.2 A 3% solution of anti-icer or de-icer
- 2.3 A 500 mL Erlenmeyer flask with a rubber stopper that has been drilled to allow a line to run through the middle.
- 2.4 Corrosion test apparatus: a mechanism by which washers are automatically lowered and raised into solutions for the specified amount of time.
- 2.5 Concentrated Hydrochloric Acid.
- 2.6 Deionized water.
- 2.7 Sodium Chloride, reagent grade.
- 2.8 Stannous Chloride.
- 2.9 Antimony Trioxide.
- 2.10 Cloth to clean washers.
- 2.11 Trichloroethylene.
- 2.12 Analytical Balance.

3. SAMPLES

- 3.1 Field samples of de-icer and anti-icer samples for corrosion test shall be obtained from transport tankers.

4. PREPARATION AND TESTING OF SAMPLE

- 4.1 The following describes steps to prepare washers.

NOTE: *All washers used are to be of the same batch to assure accuracy in test results. Use three washers for each de-icer/anti-icer solution (to include NaCl) and for the deionized water control tests.*

- 4.1.1 Wash washers with concentrated hydrochloric acid to remove any type of residue, and rinse with deionized water.
- 4.1.2 Using a micrometer, measure the dimensions of each washer to the nearest 0.001 in., and calculate the surface area and volume as follows:

$$A = \frac{3.1416(D^2 - d^2)}{2} + 3.1416(t)(D) + 3.1416(t)(d)$$

$$V = \left(3.1416 \left(\frac{D}{2} \right)^2 - 3.1416 \left(\frac{d}{2} \right)^2 \right) (6.387)$$

Where:

A = surface area, in²

V = volume, cm³

D = outside diameter, in.

d = inside diameter, in.

t = thickness, in.

4.1.3 Rinse the washers with trichloroethylene.

4.1.4 Air-dry the washers.

4.1.5 Weigh the washers to the nearest 0.001 g using an analytical balance.

4.1.6 Calculate specimen density as follows:

$$S = \frac{I}{V}$$

Where:

S = specimen density, g/cm³

I = test specimen initial weight, g

V = volume, cm³

NOTE: Typical values for steel washer are approximately 7.85 g/cm³.

4.2 The following describes the preparation of the 3% solutions.

4.2.1 In an Erlenmeyer flask mix 3 parts de-icer/anti-icer to 97 parts deionized water, by volume.

4.2.2 Prepare a 3% NaCl solution (by weight).

4.2.3 Thoroughly mix solutions to ensure solubility.

4.3 The following describes the preparation of the cleaning solution.

4.3.1 Add 50 g stannous chloride and 20 g antimony trioxide to 4 L of concentrated hydrochloric acid.

4.3.2 Mix the solutions thoroughly.

NOTE: The two salts are added to the concentrated hydrochloric acid to stop the reaction of the acid with the steel once the rust or corrosion is removed.

4.4 The following describes the corrosion test

4.4.1 Pour 300 mL of each solution (de-icer/anti-icer, NaCl and deionized water) into separate 500 mL Erlenmeyer flasks.

4.4.2 Label each flask appropriately.

4.4.3 Place three washers in each flask. Cover flasks.

4.4.4 Set up the corrosion test apparatus to alternately lower the washers in the solution for 10 minutes and raise them to air dry for 50 minutes. Run for 72 hours.

4.4.5 Immediately remove washers from the solutions after the 72-hour cycle.

4.5 The following describes steps for cleaning the washers.

4.5.1 Place washers into a glass beaker containing the cleaning solution.

4.5.2 After 15 minutes remove the washers, rinse them with deionized water, and wipe them with a cloth to clean any deposit from the washers.

4.5.3 Return washers to the cleaning solution and repeat Steps 1 and 2.

4.5.4 Rinse washers with trichloroethylene, air dry, and weigh each washer to the nearest 0.001 g.

5 REPORT

5.1 The following describes the procedure for the evaluation and reporting of corrosion.

5.1.1 Determine the weight loss by using the following formula:

$$W = (I - F) \times 1000$$

Where:

W = test specimen weight lost, mg

I = test specimen initial weight, g

F = test specimen final weight, g

5.1.2 Determine the corrosion rate of each washer by using the following formula:

$$CR = \frac{KW}{ATS}$$

Where:

CR = corrosion rate, mils per year (mpy)

K = 534

W = weight lost, mg

A = specimen area, in.²

T = time, hr

S = specimen density, g/cm³

5.1.3 Subtract the mils per year of water from the mils per year of the de-icer/anti-icer and of the NaCl. Report this Corrosion Rate to the nearest mils per year (mpy).

6. REFERENCE

Texas Test Method Tex-624-J

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 BID FORM - LIQUID MAGNESIUM CHLORIDE**

BIDDER _____

SUPPLY CONTRACT NO. H-14-249J
 for period from October 1, 2013 thru March 31, 2014

DISTRICT ONE LOCATIONS		
Invoicing Information: District 1 Headquarters P.O. Box 278, Wynne, Arkansas 72396 Phone - (870) 238-8144		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(1-1) District Headquarters Hwy. 64 West, Wynne 72396	Cross	
(1-2) Area Headquarters on North Frontage Rd. West Memphis 72301	Crittenden	
(1-3) Area Headquarters Hwy. 70, Lehi 72301	Crittenden	
(1-4) Area Headquarters Hwy. 70, Brinkley 72021	Monroe	
(1-5) Area Headquarters Hwy. 49 (Walnut Corner) 72355	Phillips	
(1-6) Area Headquarters Hwy. 70, Forrest City 72335	St. Francis	

DISTRICT TWO LOCATIONS		
Invoicing Information: District 2 Headquarters P.O. Box 6836, Pine Bluff, Arkansas 71611 Phone - (870) 534-1612		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(2-1) District Headquarters Hwy. 65 S, Pine Bluff 71611	Jefferson	

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 BID FORM - LIQUID MAGNESIUM CHLORIDE**

BIDDER _____

SUPPLY CONTRACT NO. H-14-249JP

for period from October 1, 2013 thru March 31, 2014

DISTRICT THREE LOCATIONS		
Invoicing Information: District 3 Headquarters P.O. Box 490, Hope, Arkansas 71802 Phone - (870) 777-3457		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS		COUNTY
(3-1) Area Headquarters Hwy. 237, Texarkana 71854		Miller

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
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DISTRICT FOUR LOCATIONS		
Invoicing Information: District 4 Headquarters P.O. Box 11170, Fort Smith, Arkansas 72917 Phone - (479) 484-5306		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(4-1) District Headquarters 808 Frontier Road, Barling 72923	Sebastian	
(4-2) Area Headquarters Hwy. 10, Greenwood 72936	Sebastian	
(4-3) Area Headquarters Hwy. 64, Alma 72956	Crawford	
(4-4) Area Headquarters Hwy. 540 & Dollard Rd. Mountainburg 72946	Crawford	
(4-5) Area Headquarters Hwy. 23, Ozark 72949	Franklin	
(4-6) Area Headquarters Hwy. 22, Paris 72855	Logan	
(4-7) Area Headquarters Hwy. 71, Mena 72953	Polk	
(4-8) Area Headquarters Hwy. 71B, Waldron 72958	Scott	
(4-9) Area Headquarters Hwy. 62, Lincoln 72744	Washington	
(4-10) Area Headquarters Hwy.112 Fayetteville 72704	Washington	

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
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DISTRICT FIVE LOCATIONS		
Invoicing Information: District 5 Headquarters P.O. Box 2376, Batesville, Arkansas 72503 Phone - (870) 251-2374		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(5-1) District Headquarters Hwy. 167, Batesville 73501	Independence	

DISTRICT SIX LOCATIONS		
Invoicing Information: District 6 Headquarters P.O. Box 190296, Little Rock, Arkansas 72219 Phone - (501) 569-2266		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(6-1) District Headquarters 8900 Mabelvale Pike Little Rock 72209	Pulaski	
(6-2) Area Headquarters Eureka Garden Road North Little Rock 72117	Pulaski	
(6-3) Area Headquarters Dixon Rd., Little Rock 72206	Pulaski	
(6-4) Area Headquarters Hwy. 70, Hot Springs 71901	Garland	
(6-5) Area Headquarters Hwy. 270, Malvern 72104	Hot Spring	
(6-6) Area Headquarters Hwy. 31, Lonoke 72086	Lonoke	
(6-7) Area Headquarters Hwy. 70, Hazen 72064	Prairie	
(6-8) Area Headquarters Hwy. 67, Benton 72015	Saline	

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
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DISTRICT SEVEN LOCATIONS		
Invoicing Information: District 7 Headquarters P.O. Box 897, Camden, Arkansas 71711-0897 Phone - (870) 836-6401		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(7-1) Area Headquarters 3155 Hollywood Rd., Arkadelphia 71923	Clark	
(7-2) District Headquarters 2245 California Ave., Camden 71701	Ouachita	

DISTRICT EIGHT LOCATIONS		
Invoicing Information: District 8 Headquarters P.O. Box 70, Russellville, Arkansas 72811 Phone - (479) 968-2286		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(8-1) Area Headquarters Hwy. 27, Danville 72833	Yell	
(8-2) Area Headquarters Hwy. 331 & I-40, Russellville 72801	Pope	
(8-3) Area Headquarters Hwy. 95, Clinton 72031	Van Buren	
(8-4) Area Headquarters Hwy. 64 West, Morrilton 72110	Conway	
(8-5) Area Headquarters Hwy. 64 East, Conway 72032	Faulker	
(8-6) Area Headquarters Hwy. 64 West, Clarksville 72830	Johnson	
(8-7) Area Headquarters Hwy. 60, Perryville 72126	Perry	
(8-8) Area Headquarters Hwy. 27, Danville 72833	Yell	

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DISTRICT NINE LOCATIONS		
Invoicing Information: District 9 Headquarters P.O. Box 610, Harrison, Arkansas 72602 Phone - (870) 743-2100		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(9-1) District Headquarters Hwy. 65, Harrison 72601	Boone	
(9-2) Area Headquarters Airport Rd., Harrison 72601	Boone	
(9-3) Area Headquarters Hwy. 62 E., Mt. Home 72653	Baxter	
(9-4) Area Headquarters Jct. Hwy. 62 & 72, Garfield 72732	Benton	
(9-5) Area Headquarters Hwy. 59, Gentry 72734	Benton	
(9-6) Area Headquarters Hwy. 62, Berryville 72616	Carroll	
(9-7) Area Headquarters Hwy. 412, Huntsville 72740	Madison	
(9-8) Area Headquarters Hwy. 62, Yellville 72687	Marion	
(9-9) Area Headquarters Hwy. 74, Jasper 72641	Newton	
(9-10) Area Headquarters Hwy. 27, Marshall 72650	Searcy	
(9-11) Area Headquarters I-540, Exit 83 SH94 @ Champion Dr., Rogers 72756	Benton	

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
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DISTRICT TEN LOCATIONS		
Invoicing Information: District 10 Headquarters P.O. Box 98, Paragould, Arkansas 72451 Phone - (870) 239-9511		MAGNESIUM CHLORIDE
		PER GALLON LIQUID
LOCATIONS	COUNTY	
(10-1) Area Headquarters Hwy. 18 & 63, Jonesboro 72401	Craighead	
(10-2) Area Headquarters Hwy. 18, Blytheville 72315	Mississippi	