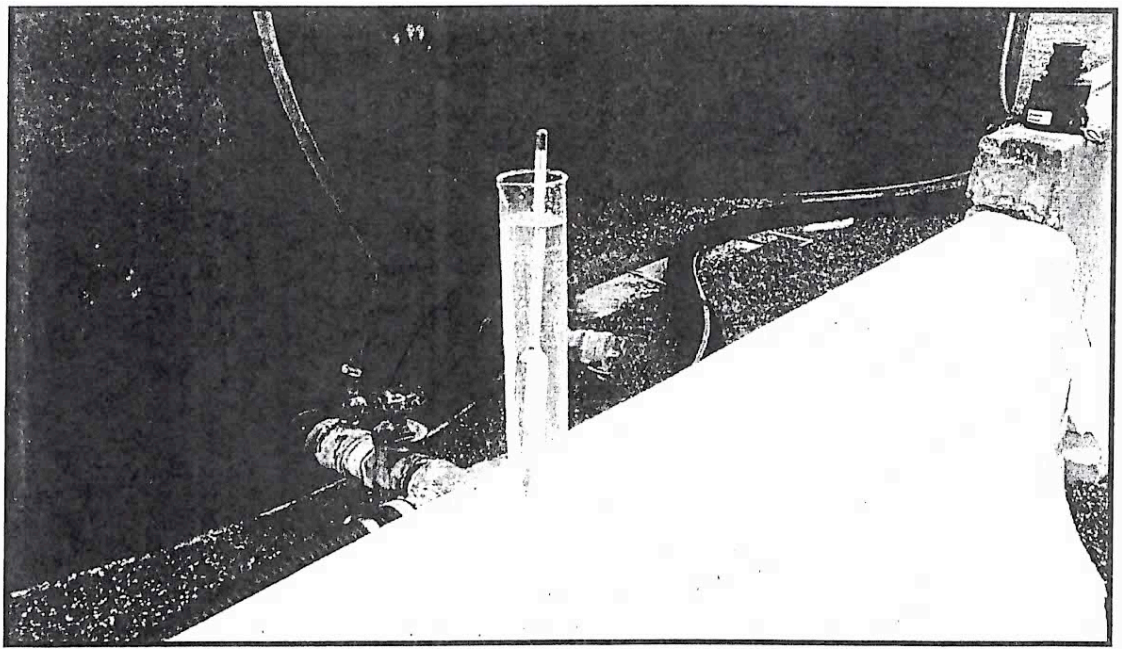
CDOT DE-ICER SAMPLING PROGRAM

De-icer Sampling

This procedure sets forth the method to be followed when obtaining liquid de-icer samples for quality assurance testing.

Prior to obtaining the sample, the load should be checked for proper specific gravity. A clean, dry container – not the one to be used for the quality assurance testing – should be used to transfer a sufficient amount of the material to allow for testing with an appropriate hydrometer capable of measuring specific gravity in a $1/1000^{th}$ scale. An initial sample should be pulled and tested for specific gravity. The reading obtained should be compared with the appropriate specific gravity chart for that product. If the sample is found to indicate that the material may be 2% or lower in concentration than specified, the sample should be placed in a garage area to allow the material to come to $60^{O}F$ before performing a final test for the specific gravity. Such readings should be shared with the local crews so that they will know the exact mag chloride percentage for application rates. All liquid samples found to be 2% or lower in concentration of specific gravity of material ordered shall have a sterile sample collected from the delivery vehicle and submitted for testing as well.



The sample for laboratory Quality Assurance (QA) testing is to be collected into the sterile sample container, either gallon or half gallon in size, provided by CDOT Staff Maintenance and Operations Branch.

The sample is to travel directly from the tanker truck delivery hose into the sample container and is to be sampled by the CDOT Representative. Do not use any device such as a funnel or bucket in the transfer. Such devices are not sterile and could have contaminants that could skew the results. If such devices are used, the test results are useless for purposes of assessing penalties per the purchase specifications. In-line valves designed to draw samples from the delivery hose are recommended.

After the tanker has emptied approximately 1/3 of the Magnesium Chloride Product into the CDOT storage tanks, the pumping is to be stopped and the same delivery hose is to be used to fill 1/2 of the sample container.

After the tanker has pumped approximately 2/3 of the load into the CDOT storage tanks, then the pumping is to be stopped again and the second half of the sample is to be transferred from the tanker and hose directly into the sample container (the liquid is not to be filled into the neck of the container).

A clean paper towel should be used to wipe the threads of the sample container, being careful not to contaminate the contents of the sample container.

The lid of the sample container is to be closed securely.

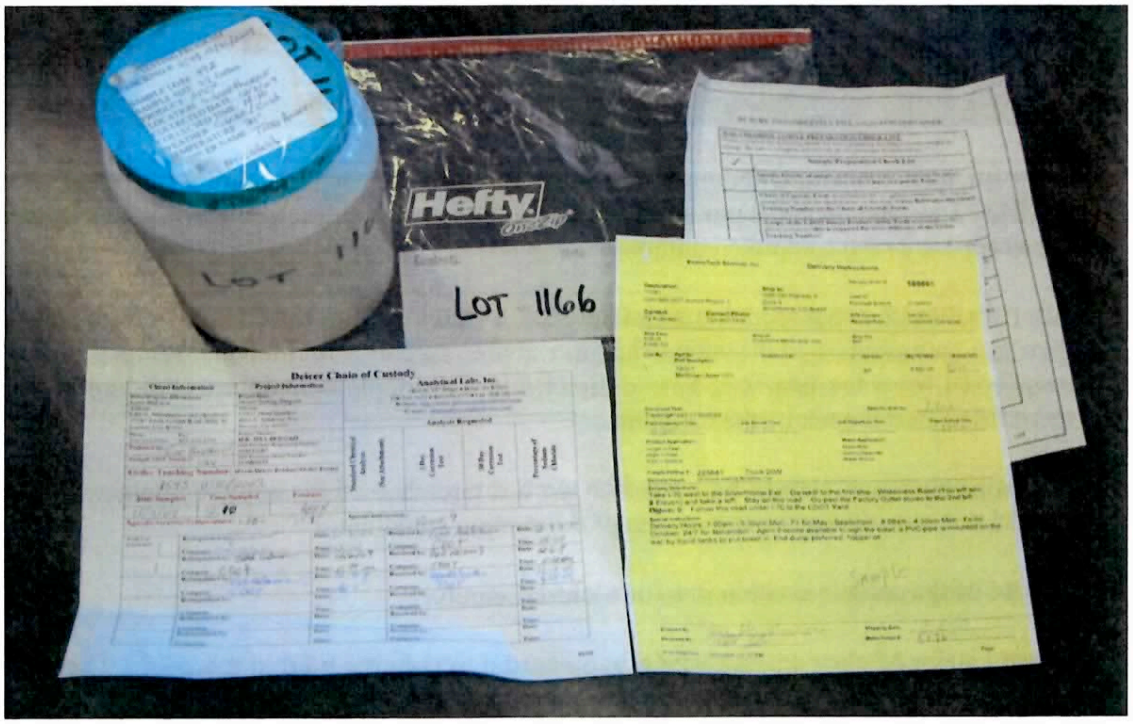
Several strips of clear sealing tape are to be used to secure the lid to the bottle. The top of the tape is then signed and dated by the sample-taker, with a pen.

The tanker can now pump the last of its load into the CDOT storage tanks.

The container label placed on the container lid is to be filled out with the following information: lot number of the sample, type of material (product name), specific gravity, date the sample was collected and the sample takers name (signature) must be on the lid (stick on labels are preferred for this). The Staff M&O Branch has pre-printed labels or the sample taker can simply use a blank one and enter the required information.
The Chain of Custody Form is to be completed by the sample-taker and the form must accompany the sample to the laboratory. It must contain the same information as entered on the label that has been placed on the lid of the sample container: lot number of the sample, type of material (proper name), specific gravity, date and time the sample was collected and the sample takers name (signature).
The Vendor Delivery Order Number and CDOT Order Tracking Number for the load are to be written on the Chain of Custody Form along with the Lot Sample Number.

The tanker driver must supply the CDOT representative with the MSDS Sheet for the Magnesium Chloride Product that he hauled. The CDOT rep should ensure that this is received.

Be sure to obtain the delivery meter ticket and Delivery Order Sheet or Bill of Lading from the driver.



NOTE: The web link below will display the most recent versions for the Deicer Chain of Custody, Sample Preparation Check List and Jar Labels:
http://internal/MaintEng/deicer-info.cfm

NOTE:
The sample-taker is to sign the Chain of Custody Form where it says "RELINQUISHED BY" and the person getting the sample from the sample-taker is to sign where it says "RECEIVED BY". All persons involved in the transfer of the sample to the laboratory must sign the Chain of Custody Form. Any time someone passes the sample to another individual, they must sign in the "RELINQUISHED BY/RECEIVED BY" portion of the form. Dates and Time must also be included whenever the sample is transferred to another individual.

FY 10 Deicer Chain of Custody

Client Information	Project Information	Analytical Labs, Inc.
Deicer Program Administrator: Lynn McEwen	Project Name: Deicer Testing Program	1804 N. 33rd Street • Boise, ID 83703 208-342-5515 • 800-574-5773• Fax: 208-342-5591 Website: http://www.analyticallaboratories.com E-mail: ali@analyticallaboratories.com
Address: CDOT, Maintenance and Operations 15285 South Golden Road, Bldg. 45 Golden, CO 80401	Address: CDOT Head Quarters 4201 E. Arkansas Ave. Denver, Co. 80222	
Phone: 303-512-5504 Fax: 303-512-5555	Project Number: IFB: HAA 08-032AH	Analysis Requested
Sampled by:	SAP Purchase Requisition Number: 110185608	
Sample LOT Number:	SAP Purchase Order Number: 211007967	

Order Tracking Number: (From Deicer Product Order Form)

Patrol No.:	Patrol Location:		Standard Chemical Analysis (See Attachment)	3 Day Corrosion Test	30 Day Corrosion Test	Percentage of Sodium Chloride
Date Sampled	Time Sampled	Product				

Specific Gravity/Temperature:

Special Instructions:

Total # of ½ Gallon Containers	Relinquished by: / Company:	Date: / Time:	Received by: / Company:	Date: / Time:
	Relinquished by: / Company:	Date: / Time:	Received by: / Company:	Date: / Time:
	Relinquished by: / Company:	Date: / Time:	Received by: / Company:	Date: / Time:
	Relinquished by: / Company:	Date: / Time:	Received by: / Company:	Date: / Time:
	Relinquished by: / Company:	Date: / Time:	Received by: / Company:	Date: / Time:
	Relinquished by: / Company:	Date: / Time:	Received by: / Company:	Date: / Time:
	Relinquished by: / Company:	Date: / Time:	Received by: / Company:	Date: / Time:

Deicer Chain of Custody

Client Information	Project Information	Analytical Labs, Inc.
Deicer Program Administrator: Lynn Mebawen	Project Name: Deicer Testing Program	1801 N. 33rd Street • Boise, ID 83703 208-342-5515 • 800-574-5773• Fax: 208-342-5591 Website: http://www.analyticallaboratories.com E-mail. ali@analyticallaboratories.com
Address: CDOT, Maintenance and Operations 15285 South Golden Road, Bldg. 45 Golden, CO 80401	Address: CDOT Head Quarters 4201 E. Arkansas Ave. Denver, Co. 80222	
Phone: 303-512-5504 Fax: 303-512-5555	Project Number: IFB: HAA 08-032AH	
Sampled by: Todd Anderson	SAP Purchase Requisition Number: 110123287	
Sample CDOT Number: 1166	SAP Purchase Order Number: 2110005835	

Order Tracking Number: (From Deicer Product Order Form)

1543 - 11/30/2009

Date Sampled	Time Sampled	Product	Standard Chemical Analysis (See Attachment)	3 Day Corrosion Test	30 Day Corrosion Test	Percentage of Sodium Chloride
12/3/09	12:10	APEX	X	X		

Specific Gravity/Temperature: 1.30 - 27°

Special Instructions: Zone 9 TEST RESULTS INCLUDED

Total # of Containers	Relinquished by:	Date:	Time:	Received by:	Date:	Time:
1	Relinquished by: Todd Anderson Company: CDOT	Date: 12/6/09	Time: 11:30 am	Received by: Bob Adams Company: CDOT	Date: 12-6-9	Time: 11:30am
	Relinquished by: Bob Adams Company: CDOT	Date: 12-7-9	Time: 4:15	Received by: Company: CDOT	Date: 12-7-09	Time: 4:15 09
	Relinquished by: Company: Fedex	Date: 12-7-09	Time: 1654	Received by: Company: TO ANALYTICAL LABS FOR TEST	Date:	Time:
	Relinquished by: Company:	Date:	Time:	Received by: Company:	Date:	Time:
	Relinquished by: Company:	Date:	Time:	Received by: Company:	Date:	Time:

01-09

NOTE: Properly sealed and labeled sample container and all associated forms (Chain of Custody, MSDS Sheet, Delivery meter ticket and Delivery Order Sheet or Bill of Lading) must be delivered to Staff Maintenance and Operations office. Staff Maintenance and Operations will then review sample and required forms for accuracy. Once conformation is made for accuracy the form below is filled out requesting specific tests and the sample is sent to testing facility.

Order Tracking #	
Sample Lot #	
Delivery Order #	
Sample Type/Vendor	
Date/Time Collected	

To:	From:
Analytical Laboratories, Inc. 1804 North 33rd Street Boise, Idaho 83703-5814 Phone: 208-342-5515 Fax: 208-342-5591	Deicer Testing Program Colorado Department of Transportation Maintenance and Operations 15285 South Golden Road, Building #45 Golden, Colorado 80401 Phone: 303-512-5504 Fax: 303-512-5555
CONTACT: James Hibbs	CONTACT: Lynn McEwen

For this sample, please run the following list of test per Invitation for Bid Document HAA 08-032AH, SAP Purchase Order Number: 211007967 (Purchase Requisition Number: 110185608), renew contract thru 8/17/2010, price quote on August 2008 with The Colorado Department of Transportation.

Check test to be conducted. Add additional comments.

☑ 1.	Arsenic
☒ 2.	Barium
☑ 3.	Cadmium
☒ 4.	Chromium
☒ 5.	Lead
☑ 6.	Mercury
☒ 7.	Copper
☑ 8.	Zinc
☐ 9.	Molybdenum
☒ 10.	Selenium
☒ 11.	Cyanide
☐ 12.	Total Phosphorous
☒ 13.	Ammonia
☐ 14.	Percent Concentration of Active Ingredient – Magnesium Chloride
☐ 15.	3-Day Corrosion Test

10/09

ENVIROTECH SERVICES, INC.

MeltDown AP Magnesium Chloride With Shield AP

Concentration and Freezing Points

01/01/2008

Concentration wt % $MgCl_{12}$	Freezing Temperatures		Density	
	F°	C°	Specific Gravity	lb./gal.
5	26	-3	1.04	8.67
6	25	-4	1.05	8.76
7	23	-5	1.06	8.84
8	21	-6	1.07	8.93
9	19	-7	1.08	9.01
10	17	-8	1.09	9.10
11	15	-9	1.10	9.17
12	10	-12	1.11	9.26
13	7	-14	1.12	9.34
14	5	-15	1.13	9.43
15	2	-17	1.14	9.51
16	-2	-19	1.15	9.60
17	-6	-21	1.16	9.67
18	-12	-24	1.17	9.77
19	-16	-27	1.18	9.84
20	-22	-30	1.19	9.94
21	-23	-31	1.20	10.01
22	-26	-32	1.21	10.11
23	-19	-28	1.22	10.17
24	-15	-26	1.23	10.28
25	-14	-26	1.24	10.34
26	-12	-24	1.25	10.46
27	-9	-23	1.26	10.51
28	-2	-19	1.27	10.63
29	0	-18	1.28	10.68
30	1	-17	1.29	10.80
31	4	-16	1.30	10.84
32	8	-13	1.31	10.97
33	12	-13	1.33	11.09
34	24	-4	1.34	11.14
35	57*	14	1.35	11.26
36	*	*	1.36	11.31

910 54th Avenue, • Greeley, CO 80634 • (970) 346-3900 • (970) 346-3969 Fax

Analytical Laboratories, Inc.
1604 N. 33rd Street
Boise, Idaho 83703
Phone (208)342-5515

GMCO - FreezGard Zero CCI

Analytical Lab Sample Number: 0923681

Percentages of Original Sample	Specific Gravity (g/mL)	Freezing Point (°C)	Freezing Point (°F)
5%	1.0570	-4	24.8
6%	1.0684	-5	23
7%	1.0791	-6	21.2
8%	1.0901	-7.5	18.5
9%	1.1010	-9	15.8
10%	1.1114	-11	12.2
11%	1.1209	-13	8.6
12%	1.1320	-15	5
13%	1.1426	-17	1.4
14%	1.1529	-19.5	-3.1
15%	1.1640	-23	-9.4
16%	1.1737	-26	-14.8
17%	1.1840	-29	-20.2
18%	1.1933	-33	-27.4
19%	1.2036	-34	-29.2
20%	1.2132	-30	-22
21%	1.2237	-28.5	-19.3
22%	1.2339	-26	-14.8
23%	1.2419	-24.5	-12.1
24%	1.2526	-22.5	-8.5
25%	1.2622	-21.5	-6.7
26%	1.2732	-20	-4
27%	1.2822	-19.5	-3.1
28%	1.2919	-19	-2.2
29%	1.3016	-18.5	-1.3
29.7%	1.3083	-18.5	-1.3

Thank you for choosing Analytical Laboratories for your testing needs. If you have any questions about this report, or any future analytical needs, please contact: **James Hibbs**

GLACIAL TECHNOLOGIES
www.anti-icers.com

CALIBER M1000

Typical Physical Properties

% DS	% $MgCl_2$	Spec. Grav	Density (lbs/gal)	Freeze Pt. (F)	Freeze Pt. (C)
5	4	1.032	8.61	27	-3
6	5	1.04	8.67	26	-3
7	6	1.049	8.75	25	-4
8	7	1.057	8.82	23	-5
9	7	1.066	8.89	22	-6
10	8	1.074	8.96	20	-7
11	9	1.084	9.04	18	-8
12	10	1.093	9.12	16	-9
13	11	1.101	9.18	14	-10
14	11	1.11	9.26	11	-12
15	12	1.118	9.32	8	-13
16	13	1.126	9.39	5	-15
17	14	1.134	9.46	2	-17
18	15	1.142	9.52	-2	-19
19	16	1.15	9.59	-6	-21
20	16	1.159	9.67	-11	-24
21	17	1.166	9.72	-17	-27
22	18	1.176	9.81	-23	-31
23	19	1.185	9.88	-29	-34
24	20	1.195	9.97	-35	-37
25	20	1.206	10.06	-42	-41
26	21	1.216	10.14	-49	-45
27	22	1.226	10.24	-56	-49
28	23	1.238	10.32	-63	-53
29	24	1.249	10.42	-71	-57
30	25	1.262	10.53	-79	-62
31	25	1.276	10.64	-82	-63
32	26	1.29	10.76	-85	-65
33	27	1.301	10.93	*	*
34	28	1.312	11.02	*	*
35	29	1.323	11.11	*	*
36	29	1.334	11.13	*	*
37	30	1.345	11.3	*	*

*Note: Product reaches freeze point (-85F) before exceeding a solubility limit.

**Note. The recelpient of this document should be aware that while Glacial Technologies has prepared and provided the above information, Glacial Technologies does not manufacture the Caliber M1000 or M2000 products. Glacial Technologies supplies a concentrated formula of Caliber which is blended with MgCl2 by our authorized distributors to produce Caliber M-1000 and M-2000 according to the specifications provided by Glacial Technologies.

Physical Data
Meltdown Apex

% Solids	Spec. Grav.	Freeze Point (F)
4	1.03	28
5	1.04	26
6	1.05	24
7	1.06	22
8	1.07	20
9	1.08	16
10	1.09	14
11	1.10	9
12	1.11	4
13	1.12	0
14	1.13	-5
15	1.14	-8
16	1.15	-12
17	1.16	-15
18	1.17	-20
19	1.18	-26
20	1.19	-32
21	1.20	-38
22	1.21	-45
23	1.22	-53
24	1.23	-61
25	1.24	-69
26	1.25	-77
27	1.26	-76
28	1.27	-74
29	1.28	-72
30	1.29	-70

Analytical Laboratories, Inc.
1804 N. 33rd Street
Boise, Idaho 83703
Phone (208)342-5515

GMCO - Ice Ban 305

Analytical Lab Sample Number: 0923682

Percentages of Original Sample	Specific Gravity (g/mL)	Freezing Point (°C)	Freezing Point (°F)
5%	1.0557	-4	24.8
6%	1.0664	-4.5	23.9
7%	1.0768	-6	21.2
8%	1.0874	-7	19.4
9%	1.0973	-9	15.8
10%	1.1082	-10.5	13.1
11%	1.1187	-12	10.4
12%	1.1294	-14	6.8
13%	1.1386	-16	3.2
14%	1.1484	-18.5	-1.3
15%	1.1590	-21	-5.8
16%	1.1682	-25	-13
17%	1.1780	-26.5	-15.7
18%	1.1907	-31.5	-24.7
19%	1.1988	-34	-29.2
20%	1.2070	-33.5	-28.3
21%	1.2190	-29.5	-21.1
22%	1.2273	-27.5	-17.5
23%	1.2375	-26	-14.8
24%	1.2458	-23.5	-10.3
25%	1.2545	-22	-7.6
26%	1.2643	-20.5	-4.9
27%	1.2747	-19	-2.2
27.5%	1.2785	-18.5	-1.3

Thank you for choosing Analytical Laboratories for your testing needs. If you have any questions about this report, or any future analytical needs, please contact James Hibbs

EarthFriendlyChemicals

Technical Data Sheet

ICE BAN® 305

Specific Gravity Chart			
% $MgCl_2$	Freeze Point (°C)	Freeze Point (°F)	Specific Gravity
5	-7.0	19.4	1.051
6	-8.0	17.6	1.061
7	-10.0	14.0	1.072
8	-9.5	14.9	1.082
9	-9.0	15.5	1.092
10	-10.0	14.0	1.101
11	-11.0	12.2	1.111
12	-12.5	9.5	1.119
13	-15.0	5.0	1.130
14	-17.0	1.4	1.139
15	-20.0	-4.0	1.149
16	-22.5	-8.5	1.158
17	-25.0	-13.0	1.167
18	-26.5	-15.7	1.178
19	-31.0	-23.8	1.184
20	-34.0	-29.2	1.192
21	-37.0	-34.6	1.199
22	-43.0	-45.4	1.213
23	-47.0	-52.6	1.219
24	-53.5	-64.3	1.231
25	-55.0	-67.0	1.238
26	-55.0	-67.0	1.245
27	-53.0	-63.4	1.255
28	-51.0	-59.8	1.262
29	-44.0	-47.2	1.276

EARTH FRIENDLY CHEMICALS, INC.
977 Centervilla Turnpike S-B 202 Virginia Beach, VA 23463
Tel (757) 226-2760 • Fax (757) 226-2752 • www.EFChem.com

Order Placement and Field Delivery of Products

The following provides information regarding order placement and delivery of liquid and granular de-icer products. The web link below will display the current contract requirements and forms for ordering and receiving product.

http://internal/MaintEng/deicer-info.cfm

The following is a summary of the order procedure placed by fax or email. This procedure is described in detail within the Contract requirements at the web link above.

1. The CDOT unit placing orders will assign an order tracking number and submit the order to the vendor using the "CDOT De-icer Product Order Form". The fax transmission sheet should be retained or a Read Receipt requested for orders placed by email to document the time and date of order placement.

2. The vendor will acknowledge and confirm conditions of the order placed (product quantity and delivery date) by completing and returning the "CDOT De-icer Product Order Form" as per the instructions described in the above link.

3. The CDOT unit placing the order will accept or reject the conditions of the order confirmation from the vendor.

4. The CDOT location receiving the order will sign the CDOT De-icer Product Order Form including date and time of delivery(s). Also note that a test sample was taken if applicable. For details of proper sampling procedures, see the section covering "CDOT De-icer Sampling Program" as found earlier in this guide.

5. Make a copy of all documents for local file.

6. Send all originals to supervisor for payment.

7. Notify Staff Maintenance of any late deliveries by sending a copy of supporting documentation including the completed "CDOT De-icer Product Order Form", invoice and/or payment information.

8. Staff Maintenance will deduct the late delivery fee assessment from the payment of the invoice.

Appendix C

MEMORANDUM

DEPARTMENT OF TRANSPORTATION
Maintenance and Operations Branch
15285 South Golden Road, Bldg 45
Golden, Colorado 80401
(303) 273-1840 - Voice
(303) 273-1854 - Fax

POLICY MEMORANDUM

DATE: July 5, 2004

TO: Maintenance Personnel

FROM: Johnny Olson, Maintenance & Operations Branch Manager

SUBJECT: **Snow Removal Policy during Extended Hours of Operation**

BACKGROUND:

On April 22, 2004 the Executive Safety Committee (ESC) adopted a snow removal policy for extended hours of operation. Because the Colorado Department of Transportation values the safety of our employees and the traveling public, driver alertness is essential. Therefore, the following policy is mandatory for all Transportation Maintenance employees operating CDOT equipment for snow removal as outlined below.

SNOW REMOVAL HOURS OF OPERATION POLICY:

The normal schedule for snow removal is a work schedule of 12 hours on-duty followed by 12 hours off-duty. However, during conditions that employees are required to operate CDOT equipment longer than a 12-hour shift, they shall take a mandatory 2-hour rest period after each 15-hour work interval. In other words, a normal 12 hour shift may be extended for 3 hours at the end of which the employee is required to return to a CDOT facility for a minimum rest period of 2 hours before being allowed to resume any further snow removal activities.

Each maintenance facility will supply cots, folding mats or an equivalent makeshift sleep area for employees to utilize during the rest period.

EXCEPTIONS: There are to be no exceptions made to this policy.

MEMORANDUM

DEPARTMENT OF TRANSPORTATION
Maintenance and Operations Branch
15285 South Golden Road Building 45
Golden, Colorado 80401
(303) 512-5500
(303) 512-5555 FAX

Date: November 30, 2009

To: Region Maintenance Superintendents

From: David C. Wieder, P.E.
Maintenance and Operations Branch Manager

Subject: Consistency in reporting

At the request of the Superintendents team, the CDOT Snow and Ice Committee was established and given the task to develop methods to establish a base line of consistency in managing material usage for snow and ice removal. The first step identified was to establish consistency for reporting of snow and ice related activities. The following items were identified as areas needing clarification to establish consistency. Step two will involve modifications to the SOG and PD 1055.2 to establish further consistency in managing material usage.

- **Plow blades**
  Cost for plow blades will be charged to MPA 400

- **Equipment repairs (plow, wing, sander, liquid unit, AVL)**
  All repair cost including parts to carrier unit will be reported to 458, attachments repair cost including parts will be charged to 458 or 701 indicated by allied number assigned to the attachment.

- **Calibration of sander and liquid units**
  Full compliance to have each sander and liquid unit calibrated prior to winter season or any time repairs to the carrier unit, sander or liquid unit is completed that could affect calibration

- **Tire Chains**
  Cost for tire chains will be charged to MPA 400

- **Transport of equipment**

Equipment being transported of snow removal operations will be carried in MPA 400. Equipment transported with mechanical failures occurring during snow removal operations will be charged to MPA 400.

- **Snow watch**
  If an employee is on duty performing snow watch and precipitation is occurring requiring employees attention employee will charge to MPA 400 with TAPER LOG documentation. If no precipitation occurs employee will perform essential activities and charge to proper activity performed.

- **New hire 40 hour and 8 hour refresher snow removal training**
  Classroom and hands on training will be reported to 103. Comments in the NOTES will indicate training topic.

- **Avalanche control training**
  Classroom and hands on training will be reported to 103. Comments in the NOTES will indicate training topic.

- **Cleaning MTCE Shop during winter:**
  After equipment melt off gravel and chloride deposit cleaning will be charged to 460.

- **Preventive maintenance of snow removal equipment:**
  Equipment inspections should be charged to MPA 400 with acronym ISP. All repairs or adjustments made will be charged to 458 or 701 to reflect the MTCE cost for each.

- **Post cleaning of snow removal equipment:**
  Cleaning of equipment after a storm will be charged to MPA 400 with CLN acronym.

- **Maintenance and repair of Liquid de-icer storage tanks:**
  All repairs to facility such as pump set up, hose, fittings, valves, and electrical will be charged to 460.

- **Cost for electronics (AVL units, surface/air temperature gauges):**
  We are interested in having this electronic equipment available as an option when ordering new equipment. At this time the AVL and temperature gauges are purchased unit specific and should be charged to the unit using 458 or 701.

The Snow and Ice Committee recommends immediate implementation of these reporting methodologies for Snow and Ice activities.

Snow and Ice Committee Members:

Phillip Anderle. _____ Toby Brown. TB Paul DeJulio. _____

Ken DePinto. _____ Gregory Hayes. _____ Kandace Lukow. _____

Adam Padilla. _____ James Pitkin. JWP David Wieder _____

Signature: _____ Date: 12/9/2009

David C. Wieder, P.E. - Maintenance and Operations Branch Manager

COLORADO DEPARTMENT OF TRANSPORTATION	☐ POLICY DIRECTIVE ■ PROCEDURAL DIRECTIVE	
Subject PRIORITIES AND LEVEL OF SERVICE FOR SNOW AND ICE CONTROL		Number 1055.2
Effective 10/5/2009	Supersedes 6/27/96	Originating office Staff Maintenance

PURPOSE:

To guide state maintenance crews in the effort to provide reasonable protection, safety and mobility for the traveling public by removing snow and ice from roadways as allotted resources allow.

AUTHORITY:

Colorado Department of Transportation (CDOT) Chief Engineer for Maintenance and Operations.

DEFINITIONS:

1. WINTER STORM shall mean: A) Any winter storm, whether it is falling precipitation, blowing snow or both, that will cause other than dry roadway surface conditions. B) Includes a condition when roads are closed as a result of a winter storm.

2. AADT – Annual Average Daily Traffic – Total annual traffic volume divided by 365.

3. SOG shall mean the Standard Operating Guide for winter maintenance operations

4. ANTI ICING shall mean preventing ice and snow from bonding to the roadway surface.

5. DEICING shall mean to melt off bonded snow and ice once it has formed on the roadway surface with deicer products.

6. ABRASIVES shall mean the grit material applied to icy and snow packed roadways to assist vehicles with traction.

7. ABRASIVES WITH MELTING AGENTS shall mean grit material and deicing agents applied to icy and snow packed roadways to provide traction.

8. WINTER DRIVING CONDITION shall mean a driving condition

that includes snowpack and/or icy roadways that may have been treated with abrasives, abrasives with melting agents, deicing and/or anti icing agents.

9. CLEANUP OF ROADWAY SURFACE shall mean the effort required to remove snowpack and ice back to bare roads.

10. WIDENING shall mean the effort required to remove snow from the beyond the traveled lanes to allow for snow storage.

11. 14 HOUR COVERAGE shall mean from 0500 to 1900

12. HIGHWAY MAINTENANCE SUPERVISOR shall mean Transportation Maintenance Worker III, LTC OPS I or II, or any Highway Maintenance Superintendent.

13 CTMC/TOC shall mean Colorado Traffic Management Center/Traffic Operations Center located in Golden.

14. HLT shall mean the Hanging Lakes Tunnel.

15. EJMT shall mean the Eisenhower/Johnson Memorial Tunnels.

16. CSP shall mean the Colorado State Patrol.

17. AS DEEMED NECESSARY BY THE HIGHWAY MAINTENANCE SUPERVISOR shall mean the area Highway Maintenance Supervisor or maintenance worker designee in charge, who is knowledgeable of the area, will determine when conditions warrant more abrasives or agents be applied in areas other than this directive specifies.

18. SNOW REMOVAL HOURS OF OPERATION – The normal schedule for snow removal is a work schedule of 12 hours on-duty followed by 12 hours off-duty. However, during conditions that employees are required to operate CDOT equipment longer than a 12-hour shift, they shall take a mandatory 2-hour rest period after each 15-hour work interval. In other words, a normal 12 hour shift may be extended for 3 hours at the end of which employee is required to return to a CDOT facility for a minimum rest period of 2 hours before being allowed to resume any further snow removal activities.

19. MAINTENANCE LEVELS OF SERVICE (MLOS) – CDOT's performance based Maintenance budget system that establishes targeted Level of Service (LOS) and expenditures necessary to

achieve those targets. There are nine (9) Maintenance Program Areas (MPAs) within the MLOS budget including Snow and Ice MPA (Winter Maintenance, and related snow removal performance measurement criteria for each highway category).

PROCEDURE:

The Colorado Department of Transportation region maintenance forces will maintain all highways in accordance with the MLOS targeted LOS established by CDOT management and approved by the Transportation Commission during its annual budget approval process. Snow removal shall be performed according to the MLOS performance measure criteria established for each highway category.

The application of abrasives, abrasives with melting agents, or the direct application of deicing or anti icing agents applied to roadways in controlled quantities as may be mandated by (CDOT) supervisors to conform to local environmental laws, standard operating guidelines and/or recommendations.

Roads will be closed when it is apparent to the Highway Maintenance Supervisor that the roadway will become impassable due to limited visibility, major accumulation of snow, drifting snow, avalanches, accidents, or stranded vehicles. The maintenance crews will make every effort to open all state highways to traffic as soon as safely possible. This will include the use of contractors' equipment when state personnel and equipment are not available, or the snow accumulation exceeds the capacity of state equipment.

PRIORITIES:

1. Safety
    - In rural areas, or when CDOT plows and snow removal personnel are the only apparent source of help, plow drivers or Highway Maintenance Supervisors should attempt to check all stranded vehicles, identify if occupied and provide appropriate assistance.
    - Routes can be closed under extremely adverse conditions as determined by the Highway Maintenance Supervisor. Adverse conditions may include low visibility, blowing snow or dust, accidents or avalanche hazards. Any road closures will be relayed immediately. This shall be accomplished via radio or phone contact with your local

dispatch center (HLT, EJMT or CSP) to ensure CSP and CTMC/TOC are aware of the closure. CTMC/TOC will make proper public notification.

- In avalanche prone areas provide a proactive hazard mitigation to minimize road closures and hazards.

2. Mobility
   - Open Road - Open all blocked or closed routes as soon as safely possible. Clear all school bus and mail routes as soon as practical.
   - Maintain mobility as economically as possible using CDOT's best management practices and SOG to maintain the targeted levels of service during prevailing winter operations.
3. Environmental
   - Judicious product usage and application with continuing efforts to reduce impacts to the environment with chlorides, sediment and associated costs.

LEVEL OF SERVICE BY HIGHWAY CLASSIFICATION:

Traveled Way Condition: Painted Edge Line to Painted Edge Line
Condition Indicator: Presence of bare pavement in travel way using indicators from chart.
End of Event Indicator: A cessation of precipitation for two hours with clearing skies.
Outcome Measurement: Elapsed time from the end of precipitation to 95% Bare Pavement in traveled way.

Elapsed Time to Regain Bare Pavement:

Category 1	Category 2	Category 3	Category 4	Category 5
Interstate > 75,000 ADT	**Interstate 15,000-75,000ADT**	**Interstate < 15,000 ADT**	**NHS>75,00 ADT**	**NHS 15,000-75,00 ADT**
A Bare Pavement	**A** Bare Pavement	**A** < 2 Hours	**A** Bare Pavement	**A** < 2 Hour
B < 1 Hour	**B** < 2 Hours	**B** < 4 Hours	**B** < 2 Hours	**B** < 4 Hours
C < 2 Hours	**C** < 4 Hours	**C** < 6 Hours	**C** < 4 Hours	**C** < 6 Hours
D < 3 Hours	**D** < 6 Hours	**D** < 8 Hours	**D** < 6 Hours	**D** < 8 Hours
F > 3 Hours	**F** > 6 Hours	**F** > 8 Hours	**F** > 6 Hours	**F** > 8 Hours

Category 6	Category 7	Category 8	Category 9	Category 10
NHS <15,000ADT	**Other >50,000 ADT**	**Other 5,000 -50,000 ADT**	**Other < 5,000 ADT**	**MTN Passes (Non-Interstate)**

A < 4 Hours	**A** < 2 Hours	**A** < 4 Hours	**A** < 6 Hours
A < 8 Hours			
B < 6 Hours	**B** < 4 Hours	**B** < 6 Hours	**B** < 8 Hours
B < 24 Hours			
C < 12 Hours	**C** < 6 Hours	**C** < 12 Hours	**C** < 16 Hours
C < 48 Hours			
D < 16 Hours	**D** < 8 Hours	**D** < 16 Hours	**D** < 24 Hours
D < 72 Hours			
F > 16 Hours	**F** > 8 Hours	**F** > 16 Hours	**F** > 24 2 Hours
F > 72 Hours			
Category 11 – Seasonal Highways (Mt. Evans and Independence Pass)			
"<" means "less than"		">" means "greater than"	

FISCAL IMPACT:

The funding to implement this directive exists within current budgets.

IMPLEMENTATION:

This procedural directive shall be effective immediately and implemented by the Colorado Department of Transportation Maintenance Sections statewide.

SUNSET DATE:

This procedural directive shall sunset in July, 2015.

(signature on file)
Chief Engineer, Highway Operations & Maintenance
Date

(signature on file)
Executive Director
Date