INDIANAPOLIS NEW DEPARTMENT
OF TRANSPORTATION

Part III-B

County-Wide Snow and Ice Control Program—Practical Application of the Program

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CITIZENS DEMAND BETTER SNOW AND ICE REMOVAL

Citizens today are becoming more and more demanding in all of our communities for "bare pavement" type roads in the wintertime. The days are gone when we can salt, or sand the intersections and forget about the rest of the roads which create one large traffic hazard.

Today the public, motorist, taxpayer, citizen, and voter is less tolerant of failure in snow and ice control than any other area of maintenance.

People do not wish to prepare themselves for winter-time driving. They want to be able to drive on bald tires, not purchase snow tires, or put on chains; or really condition their cars for wintertime. They feel there is no winter; that we are the only ones with winter, and when I say "we," I'm speaking of the local government agency on snow and ice control.

TYPE OF STORM AND AREA SERVED DETERMINES METHOD OF REMOVAL

There is no way humanly possible to set forth one method of fighting all snow and ice storms. You will find dry snow, wet snow, blowing snow, glare ice, rind ice, sleet, freezing rain, and many other types of storms.

Each of these storms must be handled in a completely different fashion. Temperature differentials will also change the methods of combating any storm. Rural storms and city storms cannot be handled in the same manner during the same storm.

On January 1, 1970, we undertook one of the largest changes of

any city in the history of the United States. With Unigov our road mileage doubled with the complexity of 1373 intercity and 1,400 urban city rural miles. This means we are now confronted with many complex problems of snow and ice control. As an example, we can have blowing drifting snow in one area and no snow in another, or freezing rain in another.

SNOW AND ICE CONTROL PROGRAM SHOULD SEEK THE COOPERATION OF THE MOTORIST

All of us should develop at once, programs of education to the motorist and citizen on *where, when, why,* and *how,* snow and ice control requires their assistance. This program should not be one of pressing the panic button each time you have a storm. When this is done, many shoppers are frightened away from the downtown business district, many parents become concerned over the safety of their school children and whether the buses can, or cannot make it. We cannot force people to do anything against their will, they have to be sold to want to cooperate.

You should bear in mind when promoting cooperation and snow ordinance enforcement, to be effective, you must be able to serve a wide spread need. Cooperation must be equitable, realistic, flexible, concise, and its intent and purpose comprehensively disseminated to every avenue of communication available. *We know what we are doing, but the citizen does not.* We will never be able to satisfy all of the people, but if we project to the people our program and how it has to work, many more will appreciate our efforts.

INDIANAPOLIS BARE PAVEMENT SNOW AND ICE PROGRAM INAUGERATED IN 1968

Now review the over all program and preparations for snow removal of Unigov. Prior to January 1, 1968, neither the City of Indianapolis, nor Marion County had a bare pavement snow and ice program. The only program was to let the snow fall and attempt to salt, sand, and plow, by complaint, intersections around the city with strong emphasis in the downtown mile square. Should our memories not be so short as to forget the snowstorm of 1965, which completely paralized the city for a long period of time.

When the administration changed on January 1, 1968, a completely new concept was introduced to the people. Bare pavement maintenance —this concept was not easy to put into operation. There were no snow-route books, or route sheets, to tell our drivers and supervisory

people where to go, or what to do. The entire program had to be manually relayed in verbal orders in order to do the job.

If I may reiterate upon Johanson's topic for a moment—on January 5, 1968, we had a six-inch snow storm in Indianapolis. It was about 11 p.m. on the night of the 5th, I received a telephone call in my office. The party calling stated, "Your graders are now coming north on Arlington and crossing 38th Street. Would you please have them swing into this little subdivision and open up our street so that the six families living here can get out?"

My answer was, "Sir, we have a definite snow program that we are working on, this is something that you have not had in the City of Indianapolis in the past. It is impossible at this time to deviate from this program." His next remark was, "You don't known who I am, I'm the [VIP]."

My comment was, "Sir, I don't care who you are, we are not plowing your street. Furthermore, I will give you the headline for the paper tomorrow. They can print this in big, bold type. 'STREET COMMISSIONER REFUSES TO DO SPECIAL FAVOR FOR [VIP].' Don't try to bribe my people, or the byline can be, City Employee Fired for taking [VIP] Bribe." His street was not plowed and there was no bold headlines in the paper the next morning.

Deviation from Established Program Must Be Avoided

Once you start to deviate from any plan; you have opened Pandora's box. Everyone has an equal right to the same type deviation. You are not here for special favors, but to do a job for all.

The news media is one of your biggest assests in snow and ice control. They can communicate for you to the public the conditions and what you are doing to assist in getting the public to and from their work areas. But you cannot afford to have anyone dictating to you what you are going to do, or changing your program at will.

JUSTIFICATION OF THE BARE PAVEMENT PROGRAM'S COST

How can we justify this expenditure? First, let's look at the effects on the economy. It has been estimated, for example, that lost wages alone during a very light, but untreated, snowfall in a large city would amount to as much as $100,000. This relatively light snowfall or freezing rain might cause an additional 400 to 800 accidents, with the resulting property damage soaring to a third of a million dollars and who knows how many deaths.

Severe storms do not cause as many accidents, but the economic loss and wage losses would be higher due to restricted auto and truck travel, delivery of goods and services and lower the levels of commerce and sales activity.

Although the less frequent, but more severe ice and snow storms, which tie up a city or state, receive greater attention, the milder storms may collectively cause the greatest loss in life, travel delays and property damage.

Speaking strictly on a dollars and cents basis, I think we require no further justification of this expenditure. But I would like to point out that the most important function of snow and ice control is for the saving of lives and prevention of human injury and suffering.

The following statement was made by H. R. "Hap" Malott, chief field representative, Salt Institute, Washington, D. C.:

"Cars, guardrails, trucks, and other material items can all be replaced at a dollar cost. But life cannot be. And what are we losing when we lose a life? Last fall, my attention was drawn and my curiosity aroused as I read the following headline: 'Three Killed in Crash on Icy Highway.' Incidentally, this is an all too common type of headline. And the article began, 'A local neurosurgeon was killed along with his wife and sister-in-law on Sunday when his car skidded on a patch of ice and collided with another car six miles north of this city.'

"I think this was a preventable accident. I investigated the spot where it happened and found that this was a known trouble area and, in my humble opinion, a spreader should have been there well ahead of this accident. But let's account for the waste and loss in this mishap. We will consider but one victim. A neurosurgeon spends four years in college, four years in medical school, a year of internship and another four years specializing in his chosen field. This man had spent a third of his life learning how to save other lives, at a total cost to him of about $50,000.

"Now, let's assume that this man would have practiced until he was 65, or another 33 years. His earnings would have been in the area of $48,300 per year for a lifetime total of $1,593,900. Of this amount, he would have paid in taxes approximately $16,210 each year, for a lifetime total of $534,930.

"With this tax money, the state could have purchased approximately 44,577 tons of salt, or could have bought 44 new trucks, complete with

spreaders and snow plows. They could have purchased a new truck with spreading equipment each year, loaded it with salt and stationed it with a driver at this point for six months of every year, and for the next 33 years and they would have had plenty of money left over.

"We also wonder about the loss of other lives over the next 33 years. This man would have seen an average of 20 patients each day and performed an average of 100 delicate, life-saving operations each year for the next 33 years. Out of those 3,300 operations, how many lives could he have saved? We will never know how many people died that day on that neglected icy patch of road. Maybe one of them could be you or I."

CHANGES IN PROGRAM MADE ONLY WHEN WARRANTED

We have developed the standards of winter snow and ice maintenance, we wish to strive for. Here in Indianapolis, as Johanson has previously stated, 939 linear miles of streets and roads are set up for bare pavement maintenance throughout the winter. Changes in our program can only be made when warranted.

You may have detours, traffic volume that changes, or have new interstates coming through that throw a heavy load of traffic coming in on particular roads that were not on your program in the past. The building of new schools, and other items of this nature, will require you to review and change your basic program.

Records should be maintained on the performance of every snowstorm. These should be evaluated and compared with your establisher standards. Corrective action should be taken on deviations and also will point out where further study is required, as well as modifications in your program.

WEATHER SHOULD BE WATCHED SO SALTING CAN BEGIN BEFORE STORM HITS

During the winter a good motto to go by is, *"It is always going to get worse before it gets better."* How many times have you listened to the weather report and nothing was predicted on snow and ice accumulation, and you wind up with four to ten inches of snow on the ground? We do not have a crystal ball or magic wand. The elements of weather are God's work.

Police can fight crime; fire departments can fight fires and trash collectors can collect trash. Each of these departments are capable of

establishing deterents to assist in their problems. We can only be prepared.

Looking at weather forecasts in general, if you wait until you have the condition existing, you are now behind the storm. A constant watch of conditions existing and prevailing up to 250 miles away should be maintained at all times.

We all have certain troughs our bad weather normally comes through. Such as, Lafayette receives many storms coming by way of St. Louis, which we do not receive in Indianapolis.

Things to watch for are wind direction, velocity, temperatures, temperature drops, and percent of precipitation factors.

Let's take a storm in St. Louis, Missouri, with the wind blowing out of the southwest at 25 mph and it's snowing at 10 p.m. last night. The temperature drop in St. Louis was 20° in a three hour period of time. This is telling you that there is a cold air mass moving through with a warm air mass in front of it. You are going to have a good storm moving in on you.

The belt is from Springfield, Illinois, to Vandalia, Illinois. You can rest assured in approximately six to ten hours this storm is going to be hitting right here in Lafayette, Indiana.

Knowing that this storm is moving in, now is the time to start hitting your bridges, hills, underpasses, curves, railroad crossings, and things of this nature.

John Q. Citizen is going to be very intolerable when he comes off of a ramp or to an intersection and he finds it is slick and he's sitting in the ditch or cannot move.

This is where you will require a second program other than your main program. By the way, this reminds me of another problem which confronted us in the winter of 1968-1969.

During the summer of 1968, we had our drafting department drawing, and typists typing, preparing for the 1968-1969 winter and evaluating things that had taken place in the winter of 1968. All of us were extremely happy when the work was completed for we knew that our city was ready for the winter of 1968-1969.

We issued the books and route sheets to our supervisors for distribution to their truck drivers and grader operators.

Yes, it happened, our first snowstorm hit, the trucks are out with the new snow books, route sheets, and route maps. My phone rings about 2 a.m. in the morning. A very iriate hysterical male voice is on the other end, wanting to know what is going on. I asked politely what

did he mean. He proceeded to tell me, that he was walking down the sidewalk as one of my trucks was approaching. The truck abruptly stopped, the driver jumped out and came charging at him with something in his hand. This man was scared! When the driver stopped running, he pointed down to what looked like a map and asked "Am I at this corner yet, where I am supposed to turn?"

My gosh, it hit me! We have the most beautiful plan, but failed to take into consideration 40 percent of my people could not read or write. I mention this due to the fact we all assume too many times we are dealing with people of our own mentality actually when we are not. We corrected this problem by calling in supervisors from other departments and having them guide the people around the snow routes to show them the way to go.

SALTING PROCEDURE

We have found that our snow and ice control procedures cannot be one fast clad rule. On our initial pass we apply straight sodium chloride at the rate of 600 pounds for a two-lane mile. As temperatures drop, we start adding calcium chloride at 12° to 15° above zero. Sodium chloride has a eutectic temperature of —6°, but will lose its effectiveness at approximately 8°. Calcium chloride has a eutectic temperature of —58°, but is quite slow in working below —30°.

Wind Should be Considered in Salting Operations

During the month of February, 1970, we had a storm move in and the temperature dropped from 33° to 3° in a short period. We had added calcium chloride to our sodium chloride, but for some reason the salt was not activated in to brine. Our streets were quite slick, this I could not understand. After every storm, I review our complete operation to find ways of improving and becoming more efficient. Taking everything into consideration, we found that one alarming factor completely overlooked. No consideration had been given to the wind velocity of 25 mph. There was an artic wind blowing and we had a chill factor of —40°, or in other words with no wind 40° below temperature. I have enclosed in my paper a copy of our chill factor chart (Fig. 1.) and an explanation of reading. (Example #1)

Example I

Here in Indianapolis, we have basically two types of winds, Artic wind and Gulf wind. The attached chart is to be used only with Artic-type winds.

STREET OPERATIONS, DEPARTMENT OF TRANSPORTATION

CHILL FACTOR CHART

Artic Wind Velocity M. P. H.

Temp.	Calm	3	5	7	10	12	15	18	20	23	25	27	30	33	35	37	40
+50	50	49	48	45	40	38	36	34	32	31	30	29	28	28	27	26	26
+45	45	44	43	38	34	32	29	27	25	24	23	22	21	20	19	18	18
+40	40	38	37	32	28	25	22	20	18	17	16	14	13	12	11	10	10
+35	35	34	32	27	22	19	15	13	11	9	8	7	6	4	3	2	1
+30	30	29	27	21	16	12	9	6	4	2	-0	-1	-2	-3	-4	-5	-6
+25	25	24	22	16	10	6	-2	-1	-3	-5	-7	-8	-10	-11	-12	-13	-14
+20	20	18	16	10	4	-0	-5	-7	-10	-12	-15	-16	-18	-19	-20	-21	-21
+15	15	13	11	-4	-2	-6	-11	-14	-18	-20	-22	-23	-25	-26	-27	-28	-29
+10	10	8	6	-2	-9	-13	-18	-21	-25	-27	-29	-31	-33	-34	-35	-36	-37
+ 5	5	3	-0	-7	-15	-21	-27	-29	-31	-34	-35	-39	-40	-41	-42	-43	-44
0 -	-0	-3	-5	-12	-21	-29	-36	-37	-39	-41	-44	-46	-48	-48	-49	-51	-53
- 5	-5	-7	-10	-18	-27	-33	-40	-44	-46	-48	-51	-53	-55	-57	-58	-59	-61
-10	-10	-12	-15	-24	-33	-38	-45	-49	-53	-56	-59	-61	-63	-65	-67	-68	-69
-15	-15	-17	-21	-29	-39	-45	-52	-56	-60	-63	-67	-69	-70	-72	-74	-76	-77
-20	-20	-22	-26	-35	-46	-52	-58	-63	-67	-70	-74	-77	-79	-80	-82	-84	-85
-25	-25	-28	-31	-41	-52	-59	-65	-70	-75	-78	-81	-84	-87	-88	-89	-90	-93
-30	-30	-33	-36	-47	-58	-66	-72	-78	-82	-85	-88	-91	-94	-96	-98	-99	-100
-35	-35	-39	-41	-53	-64	-71	-78	-83	-89	-92	-96	-99	-101	-103	-105	-106	-108
-40	-40	-45	-47	-58	-70	-77	-85	-89	-96	-100	-104	-107	-109	-111	-113	-114	-116
-45	-45	-49	-52	-64	-76	-84	-92	-96	-103	-107	-111	-115	-117	-119	-121	-122	-124
-50	-50	-53	-57	-70	-83	-91	-99	-104	-110	-114	-118	-122	-125	-127	-129	-130	-132
-60	-60	-65	-68	-81	-95	-107	-112	-116	-121	-128	-133	-137	-140	-142	-145	-147	-148

* Calcium Chloride should be added to Salt as chill factor drops below this line.

Fig. 1. Chill Factor Chart.

Note on the attached chart that the temperature runs down the page and the wind goes across the page. To use the chart—example: Temperature +12° wind out of the north west at 22 to 34 mph. Reading down the side of the page you will find +15° and +10°, but no +12°. Reading across the top of the page you will find 23 mph, 25 mph, 27 mph, 30 mph, 33 mph, and 35 mph, but no 22 mph, or 34 mph. This is where we have to put our minds to work when we read the following:

	23 mph	25 mph	27 mph	30 mph	33 mph	35 mph
+15°	—20	—22	—23	—25	—26	—27
+10°	—27	—29	—31	—33	—34	—35

Now we realize +12° is between +10° and +15°, so average—

+12°	—23	—25	—27	—29	—30	—31

With the temperature at +12° and wind at 22 to 34 mph, we now see that our chill factor is —23° to —31°, or an average chill factor of —27°. We should not only consider the current +15° but also the —27° when adding calcium to our salt. (End example #1.)

The usage of straight sodium and calcium chloride without the aid of abrasives may sound to be quite expensive. Actually, it is less expensive. You have a better control on application, plus every ton of cinders or sand put down will have to be picked back up again one way or another. You will have sand, or cinders, in your gutter lines, catch basins, lateral lines, and in your sewer system. This only aggravates the normal problems of drainage.

PLOWING PROCEDURE

As a rule of thumb, normal plowing operations should start when there is one inch of snow, or more, on the ground. If you have been able to get a layer of salt down prior to your starting to plow, your brine solution will act as a lubricant and also prevent friction freeze. On our main arteries and collectors, we apply a heavier concentration of sodium chloride and use the traffic to churn our snow into slush and brine water. This eliminates a great amount of snow removal, cleaning of outlets, and losing our parking lanes. When you plow around cars, snow islands are left and must be removed as quickly as possible. When we have four or more inches accumulation on the ground, we drop the plows on our main arteries.

Many of you have had problems in areas of drifting snow. Where you are aware drifting will occur and no snow fences are available, never apply salt to these spots. Here, I recommend plowing and sanding only. The use of salt only adds to your problem by making a wet surface and the snow will adhere to it more readily than on a dry surface. I have found roads blown shut with drifts today and blown open prior to a plow getting there. But if salt had been applied the road would have stayed shut.

STATUS OF CLEARING OPERATIONS SHOULD BE KNOWN AT ALL TIMES

It is very important to know at all times what roads are open, salted, plowed, not touched, or drifted shut. Each of our trucks are radio equipped and we require every driver to mark in and out each

time he gets a load of salt, starts to or leaves his subdistrict, starts or completes each of his routes. A copy of our Route Log and example is illustrated in Exhibit #2. From this log we can review at any time our effectiveness on the storm, where we are having trouble, and if we should start calling for rental equipment.

DISPATCHER PAGEL, WM DATE 1-2-70 PAGE 1 OF 3 SHIFT DAY 8:00AM TO 8:??

DIS	RADIO	EQUIP	DRIVER	INSPECT	1	2	3	4	5	6	7	REMARKS
1	211	401	BROWN, H							X	X	
2	212	315	SMITH, W.							X	X	
3	213	403	HAMMEL									
4	223	424	WEGNER						X	X	X	
5	221	423	FAUCET							X	X	WRONG AUGER SPD CORRECTED 10:00
6	222	405	MORELAND									
7	451	317	LEGG					X	X	X	X	
8	453	316	HARRIS								X	COMP 1:18 STARTING OVER
9	233	429	BAKER							X	X	
10	231	436	EDMONDSON								X	
11	234	109	MOORE, WILLIE							X	X	SPINNER QUIT 9:45
12	244	430	SMITH H						X	X	X	
13	24											
14	26											
15	26											
16	33											
17	33											E SPD 11:15
18	33											
19	45											
20	27											
21	27											
22	27											
23	27											NOT REAISE
24	28											
25	28											
26	45											
27	456											3e
28	455X	408	NAPIER							X	X	X	
29	454	323	TABOR							X	X	X	
30	458	361	GLASCO							X	X	X	LOADER 904 & GRADER 815
31	463	253	STAFFORD							X	X	X	GRADER 815
32	462	219	BRAY							X	X	X	GRADER 816
33	461	260	MOORE, W.O							X	X	X	GRADER 810
34	473	440	BARGER							X	X	X	
35	471	252	GRUNDY							X	X	X	
36	472	480	BROWN, A.							X	X	X	
37	466	449	SMITH, T.							X	X	X	
38	275	328	NEWCOMB							X	X	X	
39	465X	251	MCKNIGHT							X	X	X	GRADER 807
40	464X	227	HARRISON							X	X	X	GRADER 814
41	468X	333	KOHN							X	X	X	GRADER 806
42	469X	450	BLACK							X	X	X	

EXHIBIT #2

Symbols for Snow and Ice Control Dispatcher Record.

△ Empty going to Salt File.

▲ Loaded with salt, starting to Route.

◢ or / Starting on Route.

✕ or X Completed Route.

⧗ or ✕ Plowing and Salting

SUMMARY

In summation, I cannot over-emphasize that an effective and efficient snow and ice control program requires more than good planning and adequate material and equipment, it also requires good men and common sense.

You have a plan—but you must be able to work the plan.