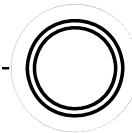


Winter Maintenance Snow and Ice Control – Module 2 –



PRE-SEASON ACTIVITIES, PLOWING, AND POST-STORM ACTIVITIES



PRESENTED BY:
DELAWARE T²/LTAP CENTER

Delaware T²/LTAP Center

2

- T² Centers or LTAPs located in all 50 states
- Funded by FHWA and state DOTs
- Mission – promote training, tech transfer, research implementation at local level
- Delaware T² hosted by University of Delaware, part of Delaware Center for Transportation
- Delaware T² funded by FHWA and DelDOT



The Preliminaries

3

Today's Instructor:

- Matheu J. Carter, P.E.
 - Engineering Circuit Rider
 - Back when he actually worked...
 - ✦ Heavy construction
 - ✦ Design engineer
 - ✦ Public works director
- Zoom Meeting is our platform today
 - Potential to be interactive, so join in
 - We will be recording today's session



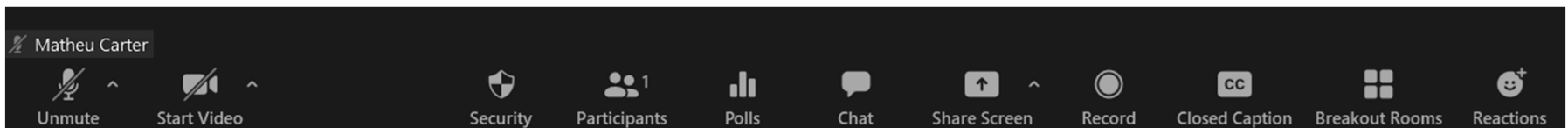
Extra Credit
Name the Band

The Preliminaries

4

Zoom Navigation and Tips

- Microphone - please remain muted except when speaking or asking a question
- Video – turn it on or not, no judgement – but we're all beautiful online, so why not?
 - ✦ You can choose a Virtual Background with the little up arrow to the right of the Start Video icon – you can select one of theirs and even choose your own photo if you like
- Polls – we'll do a few of these but we'll try not to over do it
 - ✦ Please participate in these as they help guide the instructor

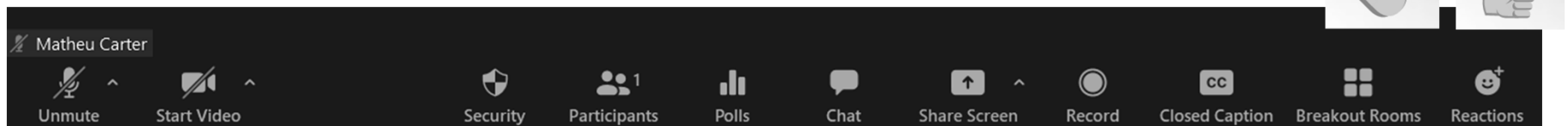


The Preliminaries

5

Zoom Navigation and Tips

- Use the Chat box to ask questions, make comments, or share an example along the way
 - ✦ We have someone monitoring the chat box and he/she will help draw the instructor's attention to them as appropriate
 - ✦ We may hold off to answer questions or invite you to share your example until we get to a natural point for it – hang in there
- Reactions – they're a little limited, but feel free to clap or give a thumbs up
 - ✦ Notice there are only positive reactions – hey, that's on Zoom



More Preliminaries

6

- Questions – any time
- Interactive is good
- Sharing of thoughts or examples – any time – put it in the chat box
- And if something doesn't sound right, sound the alarm and speak up
 - This instructor thinks everything that comes out of his mouth is pure gold...thinks he's the cat's meow
 - But your experience may be different, so let's talk about it – we'll all learn from each other



Who Is Here?

7

- Let's try out the chat pod
- Please put the following in the chat pod
 - Name
 - Agency
 - State where your agency is
 - Anything you want to add – funny or otherwise

The T² Center Winter Maintenance Program

8

What we cover:

- **Module 1**
 - Introduction to snow and ice control
 - Planning/program development
- **Module 2**
 - Pre-season activities
 - Plowing
 - Post storm activities
- **Module 3**
 - Deicing
 - Anti-icing
 - Pre-wetting
 - Liquids
 - Post season activities

} Today's stuff



Acknowledgements

9

Primary references:

- AASHTO Guide for Snow and Ice Control
- APWA, New England Chapter
 - “Plow Power” and “White Gold”
- (former) Salt Institute
- National Local Technical Assistance Program (LTAP)
- Iowa Department of Transportation
- NCHRP
 - Report 526 - Snow and Ice Control: Guidelines for Materials and Methods
 - Report 577 - Guidelines for the Selection of Snow and Ice Control Materials to Mitigate Environmental Impacts

Pre-Season Readiness

10

PERSONNEL TRAINING AND REFRESHERS
STAKEHOLDER BRIEFINGS
CONTRACTING AND MATERIAL ACQUISITION
STORAGE AND HANDLING MATERIALS
EQUIPMENT READINESS
CREW AND EQUIPMENT ASSIGNMENTS; PRACTICE RUNS
SNOW MARKERS AND PASSIVE CONTROL DEVICES
CHECK/CLEAR DRAINAGE WAYS
CALIBRATE SPREADERS AND OTHER EQUIPMENT

Poll Question

11

Do you have a target readiness date for equipment, personnel, and materials? [Closest Answer]

- Yes, by the end of October
- Yes, early to mid-November
- Yes, mid to late November
- Yes, early to mid-December
- Yes, later than mid-December
- Nope



Post Planning, Pre-Season Activities

12

- You wrote/revised the plan in the summer
 - Now it's fall
 - It's time to start implementing your pre-season tasks
- Don't wait until December
 - That invites unpleasantness



Personnel Stuff

13

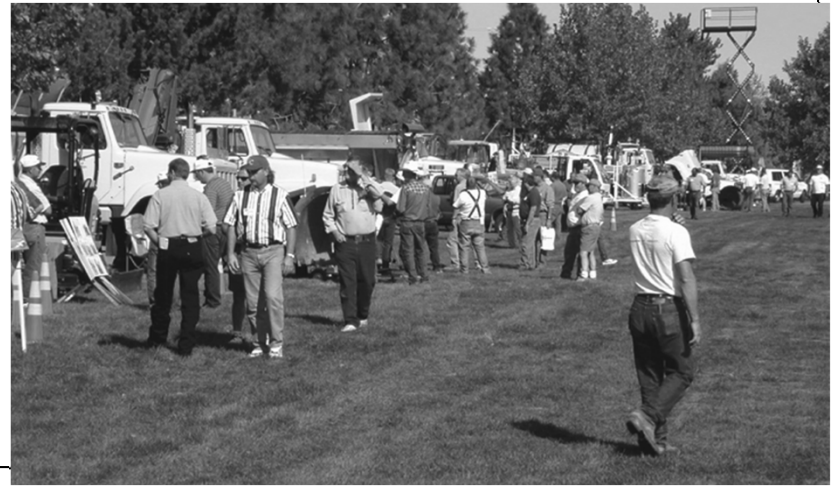
- **Conferences**
 - North American Snow Conference
 - Eastern Snow Conference
 - Western Snow Conference
 - Western Snow and Ice Conference...
- **Classroom training**
 - Conventional training (like today)
 - Training videos
 - Tailgate meetings
 - Mentoring and peer training
 - Dark hours training



Personnel Stuff

14

- Certifications
- Rodeos
- Open houses
- Competitions
- Vendor fairs
- Demonstrations



Personnel Stuff

15

- **Work force rules**
 - Keep abreast of new rules (local, state, federal)
 - Start with your personnel experts
 - Fair Labor Standards Act, etc.
 - Each approach has advantages/disadvantages and implications for pay, comp time, work hour limitations
 - ✦ Maximum time to report for duty?
 - ✦ Stand-by duty
 - ✦ On call
 - Minimum pay for call-in, standby, on call, etc.?
 - Altered shifts – three 8-hrs; two 12-hrs?
 - Briefing – remind everyone of the procedures for the season

Personnel Stuff

16

- **Drug and alcohol refresher**
- **Personnel logistics**
 - Modes of contact for on-call personnel – phones, pagers, email, social media
 - Rest areas at facility for operators?
 - Latitude on take home vehicles and or ability to pick up/drop off employees
- **Route familiarization**
 - Dry runs, including dark hours
 - Rehearsals
 - Equipment training

Training Resource



WINTER OPERATIONS

17

- Iowa Department of Transportation
 - Fully updated in 2019; available on the YouTube
 - 13 videos totaling 94 minutes – range from 3 – 15 minutes each
 - ✦ Introduction *
 - ✦ Pre-season truck preparation *
 - ✦ Pre-season plow preparation *
 - ✦ Regular Equipment Checks *
 - ✦ Proper Clothing *
 - ✦ Snow Fences
 - ✦ Winging Techniques
 - ✦ Snow Plowing Techniques *
 - ✦ Advanced Plowing Techniques
 - ✦ How Deicing Chemicals Work
 - ✦ AVL Truck Technology
 - ✦ Anti-icing and Deicing
 - ✦ Using Winter Weather Resources
 - Gather the crew in the shop once a week and watch the whole series – you can spare an average of 7 minutes a week!

* Recommended Follow up
Viewing After Today's
Training

See Entire Iowa DOT 13 Part Series on YouTube

Personnel Stuff

18

Know your
route



Video
41
Seconds

Personnel Stuff

19

- **Uniforms and gear**
 - Warm, dry clothing – layers, layers, layers
 - Foul weather personal gear
 - High visibility, retroreflective outwear/vests
 - Hard hats, ear protection, safety glasses
 - Fire extinguishers, emergency flares or triangles
 - First aid kit
 - Flash light
 - Tow chains, tow straps, tire chains, basic tools
 - Window scraper, brush, broom, shovel
 - Route map

Update the World

20

- **Stakeholder venues**

- Website postings
- Press releases
- Newspaper feature articles
- Radio public service announcements
- Public meeting presentations
- Rotary and Chamber of Commerce presentations
- Meetings with key institutions like hospitals
- Briefings to other emergency responders



- **Winter maintenance plan, SOPs, LOSs, chain of command**

Contractors

21

- Clearly establish scope of work, performance criteria, and what each party provides and when
- Dependability of equipment availability, performance, and safety
- Insurance
- Performance bonding
- CDL certifications
- Training certifications
- Contract payments
- Minimum season payments

Section B Price Proposal Sheet BLANKET PURCHASE AGREEMENT (BPA)
SNOW REMOVAL

Name of Company _____ Address _____ Contact Person(s) _____ Office Phone () _____ Home/Cell _____ FAX () _____ Email Address _____				For Office Use Only Date Issued _____ Agreement No. _____	
--	--	--	--	--	--

UNIT CODE	DESCRIPTION OF EQUIPMENT with Operator	MAKE	MODEL	UNITS AVAILABLE	PRICE PER HOUR
EXAMPLE:	Grader 16,000 - 21,000 G.V.W. Rating	Champion	C70A	4	\$ 141.25
G-1	Grader 16,000 - 21,000 G.V.W. Rating				\$ 141.25
G-2	Grader 21,001 - 28,000 G.V.W. Rating				\$ 175.00
G-3	Grader 28,001 - 30,000 G.V.W. Rating				\$ 210.00
G-4	Grader 30,001 & Over G.V.W. Rating				\$ 252.50
CT-1	Bulldozer (Crawler Type) 80 - 89 H.P. Rating				\$ 101.25
CT-2	Bulldozer (Crawler Type) 90 - 119 H.P. Rating				\$ 122.50
CT-3	Bulldozer (Crawler Type) 120 - 144 H.P. Rating				\$ 135.38
CT-4	Bulldozer (Crawler Type) 145 - 180 H.P. Rating				\$ 178.75
CT-5	Bulldozer (Crawler Type) 181 - 250 H.P. Rating				\$ 253.75
CT-6	Bulldozer (Crawler Type) 251 - 360 H.P. Rating				\$ 271.25
CT-7	Bulldozer (Crawler Type) 361 - ----- H.P. Rating				\$ 333.75
P-1	Pick-up Trk.				\$ 53.75
P-2	Pick-up Trk. 1-Ton, 6-Wheel Dump (10k to 17k GVW)				\$ 68.50
FST-1	6-Wheel Fuel/Service Truck				\$ 65.50
FST-2	10-Wheel Fuel/Service Truck				\$ 75.50
TT-1	Tractor & Trailer (20 - 30 Ton Capacity)				\$ 131.25
TT-2	Tractor & Trailer (31 - 40 Ton Capacity)				\$ 133.75
TT-3	Tractor & Trailer (41 - 50 Ton Capacity)				\$ 137.50
DT-1	6-Wheel Dump Trk. (6 Yd. Cap. 10 Ton Rating)				\$ 87.50
DT-2	10-Wheel Dump Trk. (12 Yd. Cap. 20 Ton Rating)				\$ 108.75
DT-3	Tri-Axis Dump Trk. (25 Ton Rating)				\$ 125.00

Note: Indicate which counties you wish to work in by placing a check in the blanks that apply.
 _____ New Castle County _____ Kent County _____ Sussex County _____ STATEWIDE
 ** This Form May Be Reproduced As Many Times As Needed **

Contractors

22

- Identify routes
- Establish single point of contact between parties
- 24-hour contact information requirement
- When are they called out and by whom?
- Penalties for non-response?
- Receive bids or set hourly rates?
- Mobilization charge? Stand by time? Minimum call out time? Allowance for mechanical repair time?
- Require/allow shotgun rider (second seater)?
- Training or orientation allowance?

Contractors

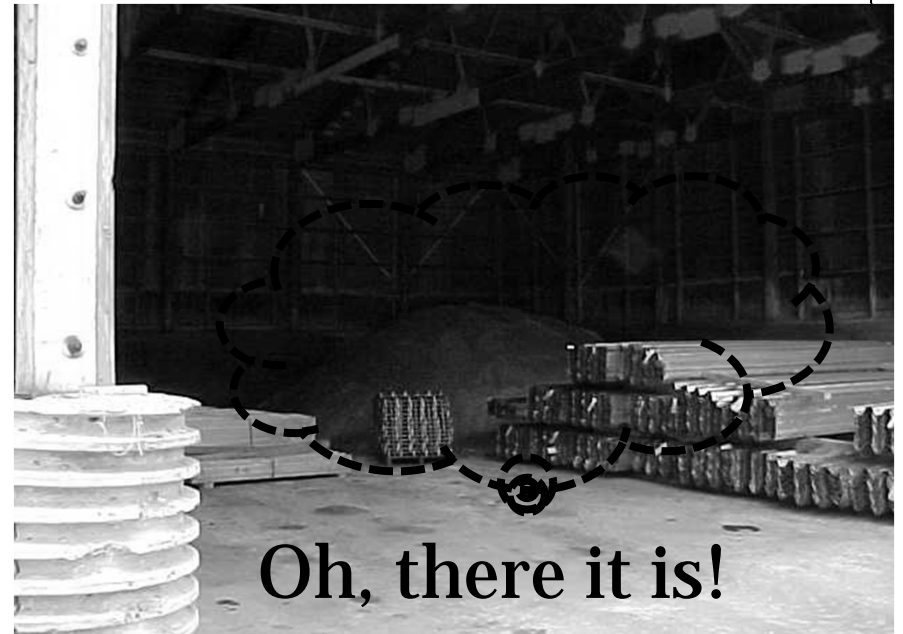
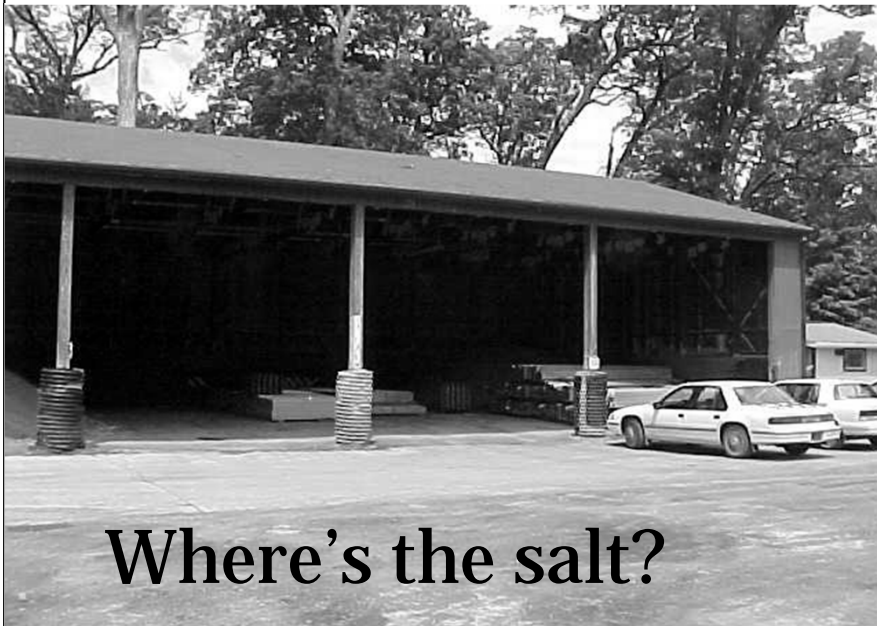
23

- Use of your equipment versus theirs
- Who provides abrasives and/or freeze point depressants (FPD)?
- Tell them which FPDs you'll be using – you don't want claims that they had no idea you'd be using salt
- Establish LOSs
- Require that all equipment be in good working order (define what that means)
- Normal contract language (severability, availability of funds, payment, safety, claims, etc.)

Material Inventories

24

- Your stockpile is low, your de-icing and anti-icing tanks are empty, and your material suppliers can't get to you until next week ... at the earliest!



Material Inventories

25

- **Inventory**
 - Abrasives
 - Freeze point depressants (salts)
 - Cutting edges
 - Other consumables and spare parts
- **Ideally, purchase 100% of expected seasonal need**
- **Store it properly**
 - DNREC – SW General Permit provisions
 - Under cover
 - On impervious slabs
 - Anti-caking provisions
- **Calibrate spreaders**



Material Inventories

26

Tons of Salt Required Per Season

(Based on 4 applications of 500 lb per 2-lane mile per storm)

No. of Storms	Miles of Two-lane Highway on Clear Pavement Standard						
	100	200	300	400	500	600	700
4	400	800	1200	1600	2000	2400	2800
6	600	1200	1800	2400	3000	3600	4200
8	800	1600	2400	3200	4000	4800	5600
10	1000	2000	3000	4000	5000	6000	7000
12	1200	2400	3600	4800	6000	7200	8400
14	1400	2800	4200	5600	7000	8400	9200
16	1600	3200	4800	6400	8000	9600	10,200
18	1800	3600	5400	7200	9000	10,800	11,600
20	2000	4000	6000	8000	10,000	12,000	14,000

Note: Minimum storage requirement is usually half of annual salt use.

This chart is computed on the basis of one ton of salt per two-lane mile per storm, or four 500 lb applications per storm.

Note: These are average figures. Conditions in some areas require several times the salt needed in some other areas.

Salt: Gradation

27

Finer

- Faster melting
- Sticks to the road
- Prone to caking
- Sticks to spreader

Coarser

- Better penetration
- Longer lasting
- More bounce & scatter

Equipment Readiness

28

- Plow and spreader support platforms (aka, trucks, graders, skid steers, loaders, mowers, whatever)
 - Full inspection and service (including fluids, hoses, belts, lights, heating systems, radios, hydraulic systems, etc.)
 - If the platform doesn't hold up, the plow does you no good
- Install plow supports and verify plow operation
- Install and calibrate spreaders
- Verify operability of other equipment – hydraulic brooms, tow behind spreaders, snow blowers
- Contractor and rental equipment, too

Equipment Readiness

29

Calibrate spreaders



Equipment Readiness

30

CALIBRATION CHART

Agency: _____
 Location: _____
 Truck No.: _____ Spreader No.: _____
 Date: _____ By: _____

GATE OPENING (HOPPER TYPE SPREADERS)				POUNDS DISCHARGED PER MILE								
	A	B	C	MINUTES TO TRAVEL ONE MILE								
Control Setting	Shaft RPM (Loaded)	Discharge Per Revolution (Pounds)	Discharge Rate (Lbs/Min)	5 mph x 12.00	10 mph x 6.00	15 mph x 4.00	20 mph x 3.00	25 mph x 2.40	30 mph x 2.00	35 mph x 1.71	40 mph x 1.50	45 mph x 1.33
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Equipment Readiness

31

- **Calibration of spreaders**
 - Application rate variables
 - ✦ Area of the gate opening in hopper box
 - ✦ Feed belt or auger speed
 - ✦ Truck speed
 - Controls
 - ✦ None
 - ✦ Manual
 - ✦ Automatic
 - ✦ Computer controlled
 - Automatic control
 - ✦ Control of rate achieved by ground-speed controllers
 - ✦ Operator can achieve a desired application rate at any speed



Equipment Readiness

32

- **Calibration of spreaders**
 - Calibration important regardless of type of spreader
 - Even new spreaders
 - Settings may change throughout season – recalibrate if in doubt
 - Need not be overly complicated
 - Calibration – calculating the pounds/mile actually discharged at various spreader rates and truck speeds
 - ✦ Count number of auger or conveyor shaft revolutions/minute
 - ✦ Measure the salt discharged in one revolution
 - ✦ Multiply these two and the rate it takes to travel one mile

Equipment Readiness

33

- Calibration equipment

- Tarp
- Scale
- Marker, pencil
- Timer
- Calculator
- Calibration card



Equipment Readiness

34

- Calibration
 - 1. Load the truck



Equipment Readiness

35

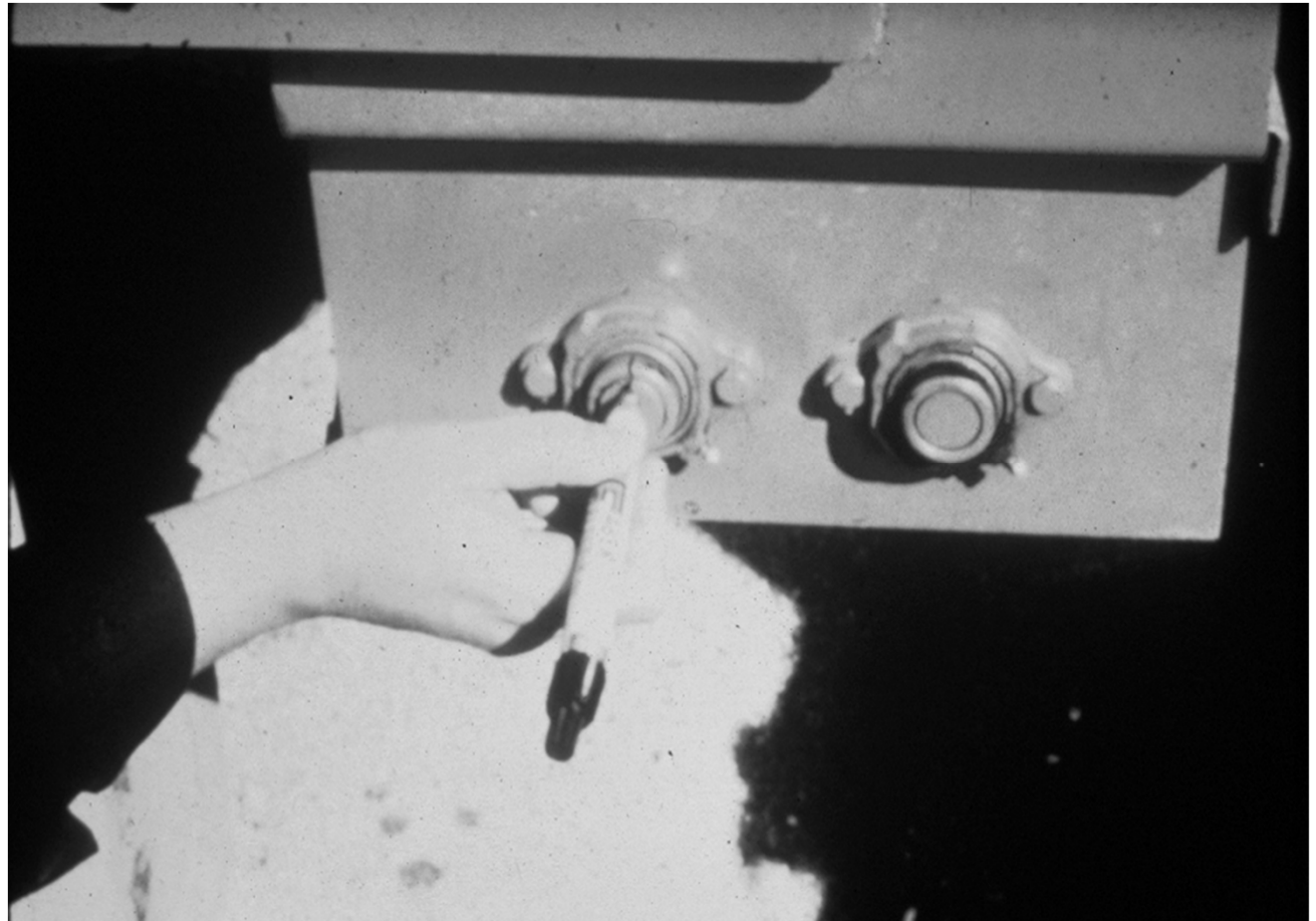
- Calibration
 - 2. Remove the spinner



Equipment Readiness

36

- Calibration
 - 3. Mark end of the shaft



Equipment Readiness

37

- Calibration
 - On a V-box, calibration is done for each opening of the gate



Equipment Readiness

38

- Calibration
 - 4. Time
RPMs of the
shaft



Equipment Readiness

39

- Calibration

- 5. Catch material from one revolution of the shaft



Equipment Readiness

40

- Calibration
 - 6. Weigh material



Equipment Readiness

41

- Calibration
 - 7. Fill in the chart
 - ✦ Copy in truck
 - ✦ Copy in office

CALIBRATION CHART

Agency: _____

Location: _____

Truck No.: _____ Spreader No.: _____

Date: _____ By: _____

Gate Opening _____
(Hopper Type Spreaders)

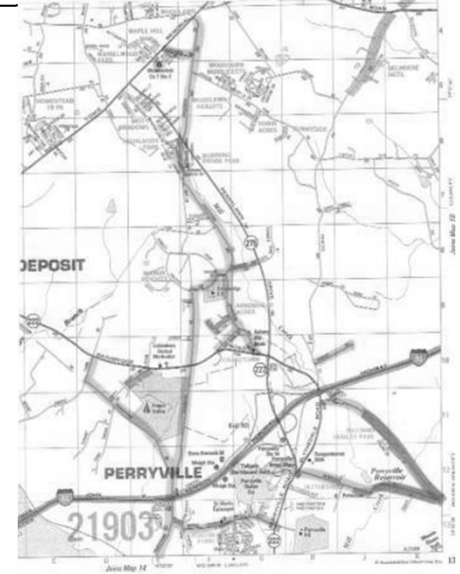
Control Setting	A Shaft RPM (Loaded)	B Discharge Per Revolution (Pounds)	C Discharge Rate (Lbs/Min)	POUNDS DISCHARGED PER MILE											
				MINUTES TO TRAVEL ONE MILE											
				5 mph × 12.00	10 mph × 6.00	15 mph × 4.00	20 mph × 3.00	25 mph × 2.40	30 mph × 2.00	35 mph × 1.71	40 mph × 1.50	45 mph × 1.33			
1															
2															
3	5	20	100	1200	600	400	300	240	200	171	150	133			
4															
5		This Weight Remains Constant													
6															
7															
8	20	20	400	4800	2400	1600	1200	960	800	684	600	533			
9															
10															
11															

SAMPLE CALCULATIONS

Equipment and Crew Assignments

42

- Circulate route maps
- Including contractors
- Holiday and vacation schedules
- Other leave time
 - Training
 - Conferences
- Identify gaps in equipment or personnel
 - Attempt to arrange contingency personnel from sister agencies
- Verify communication trees



Drainage Systems

43

- **Closed drainage systems**
 - Inspect drain inlets and clear them of debris and silt
 - Inspect drainage pipes and clear them
 - Remove sources of new blockages (leaf piles, trash)
- **Open drainage systems**
 - Inspect ditches, re-point as necessary
 - Dress shoulders to ensure positive drainage into ditches
- **Cross culverts**
 - Inspect for upstream debris that may dislodge and block
- **Anticipate snow melt**

Seasonal Aids

44

- **Snow markers**
 - Hydrants
 - Inlets
 - Median curb markers
 - Pavement markers
- **Adopt a hydrant programs**
- **Winter signage**
- **Snow fence**
- **Self help systems**
- **Automated de-icing systems**



You're Ready

45

- All the pre-season prep is done?
- Sit back and wait for cold weather
- Or get back to the backlog of maintenance work that never ends
- Monitor the weather
- Relax – you're ready

Game Day

46

**STAKEHOLDER BRIEFINGS
SAFETY REFRESHERS
PLOWING TECHNIQUES
DISABLED, INOPERATIVE, ABANDONED VEHICLES
DISPOSAL OF SNOW/ENVIRONMENTAL CONCERNS
DEALING WITH THE PUBLIC**

Game Day

47

- Planning – done
- Pre-season preparations – done
- Forecast – snow and ice
- Time to suit up



First Things First

48

- Weather – find out what's coming
- Put the troops on alert – details to follow
- Brief elected officials, press, public
- Take inventory
 - Check your fuel reserves
 - Verify equipment condition
 - ✦ Update maintenance priorities
 - Roll call
- Team meeting
- Chain of command

Safety Briefing

49

- Tailgate or field office meeting
 - No need to belabor the point, but...
 - Brief reminders about safety
 - ✦ Climbing in and out of equipment
 - ✦ Dangers of walking around the operations yard
 - ✦ Safety vests whenever out of the equipment
 - ✦ Periodically cleaning off lights, emergency strobes/beacons
 - ✦ Speed regulation
 - ✦ No texting or phone calls while driving
 - ✦ Lookout for motorists and pedestrians
 - ✦ Responsible breaks
 - ✦ Black ice concerns

Staying Up To Date

50

- Traveling visuals
- Operator reports
- Traffic cameras
- Other reports
- Weather reports



Plowing

51

- **Driving considerations**

- Defensive driving
- Speed management
- Heightened awareness
 - ✦ Other motorists
 - ✦ Pedestrians
 - ✦ Downed or drooping utility lines, trees, poles
 - ✦ Abandoned vehicles
 - ✦ Other plows and emergency equipment
- Keep a sharp look up ahead at all times
- Allow extra time to stop or take evasive maneuvers
- A spotter or second seater can be handy to help on this front

Plowing

52

- **Equipment**

- Bigger not always better
- Big, high HP equipment
 - ✦ Tandem dump trucks with plows and spreaders
 - ✦ Main lines and wider streets
 - ✦ Heavy accumulations
- Smaller, more nimble equipment
 - ✦ 1-ton and smaller trucks with plows, maybe spreaders
 - ✦ Narrower streets, cul-de-sacs
 - ✦ Light to medium accumulations
- Specialty equipment
 - ✦ Loaders, backhoes, motor graders, industrial snow blowers and commercial mower platforms, skid steers

“You go to war with the Army you have – not the Army you might want or wish to have at a later time...” former Defense Secretary Donald H. Rumsfeld

Plowing

53

- **Priorities**

- Remember the first goal of snow/ice removal – public safety
- Provisions to accommodate emergency response comes first
- Clear the primary streets first and keep them clear
- Clear the secondary streets next and keep them passable
- Tertiary streets can be responded to quickly if primary and secondaries remain passable
 - ✦ Quaternary, quinary, senary, septenary, octonary, nonary, and denary streets? – well, these have to wait until later
- Maintain close contact with emergency dispatchers
 - ✦ If there's a call on a tertiary street, dispatch plows to that area and make sure the streets are passable ahead of the ambulance, etc.

Plowing

54

- **Multi-lane highways (multiple lanes, one direction)**
 - Critical issues
 - ✦ High priority roadways
 - ✦ Managing windrows
 - ✦ Snow storage
 - ✦ Wind
 - ✦ Median storage (or lack)
 - Close echelon plowing (multiple trucks)
 - ✦ Multiple lanes cleared at once; other vehicles do not pass
 - ✦ Helps control windrows
 - Tandem plowing (multiple trucks)
 - ✦ 1-1½ lanes cleared at a time – other vehicles can maneuver around



Plowing

55

- **Two lane, two way highways**

- **Critical issues**

- ✦ **Narrow/non-existent shoulders**
 - ✦ **Managing windrows**
 - ✦ **Snow storage**
 - ✦ **Wind**

- **Start at centerline, push everything to the right**

- ✦ **Four passes may be necessary to clear one lane in each direction**
 - ✦ **Get snow back off the shoulder early if you can, particularly if another storm or melt/freeze is anticipated**

- **Tandem or echelon plowing (multiple trucks)**

- ✦ **Never drive wrong way in the opposing lane**



Plowing

56



Video
112
Seconds

Plowing

57

- **Urban streets**

- **Critical issues**

- ✦ One lane or two, one way or two way
 - ✦ Narrow/non-existent shoulders
 - ✦ Adjacent sidewalks
 - ✦ Adjacent parking
 - ✦ Intersections
 - ✦ Managing windrows and piles, snow storage
 - ✦ Adjacent utility poles, overhead utility lines

- Intersections – carry the snow around to the right; then clean up the center with other equipment or subsequent passes
 - Heavier storms – contingency for loading it out



Plowing

58



**Video 37
Seconds**

Plowing

59



Video
36
Seconds

Plowing

60

- On-street parking

- Local regulations
- Snow emergency routes
- Consistent enforcement
- Alternate side of the street parking
 - ✦ Removal in days afterward
 - ✦ Skid steer, backhoe, loader
- Be democratic
 - ✦ Don't always push to right
 - ✦ Switch it up left and right
 - ✦ Use a V-plow to share the pain
- Tow contracts
 - ✦ Makes for cranky owners
 - ✦ In for a penny, in for a pound



OR



R7 201P



R7 201aP



R7 202P



R7 202aP DE



R7 202aP DE1



R7-203



Photo: Andrew Giscel

Plowing

61

- **Sidewalks**

- Who is responsible for snow/ice?
 - ✦ Establish clearly by ordinance
- ADA says someone must be – don't leave as a question
- Don't make it worse with street plowing
 - ✦ Slow down the street plows
- Sidewalk maintenance can be automated
 - ✦ Just ask UD's Grounds Services
 - ✦ 25 miles of pedestrian pathways – 4'-16' wide
 - ✦ Walk behind snow blowers
 - ✦ Mowers with plows and brooms and tow spreaders



Plowing

62

- Sidewalks
 - Small equipment can be versatile



Plowing

63

UD Grounds



Winter Maintenance Training – Delaware T² Center

Plowing

64

- **Cul-de-sacs**

- Lighter equipment typically better – maneuverability is key in these tight places
- There are so many types of cul-de-sacs
 - ✦ Large and small
 - ✦ With and without center island
 - ✦ Centered, off-centered left or right
 - ✦ Lots of driveways or few
- There's no one, cookie cutter, always works great method
- Most cul-de-sac methods end up violating either the “never back up rule” or the “never travel the wrong way rule” – if you can avoid breaking these rules, great, but...

Plowing

65

- **Cul-de-sac approaches**

- **Inner island**

- ✦ With a one-way plow, plow the main line just past the cul-de-sac street, back up carefully, enter the street and then enter the cul-de-sac itself the wrong way, pushing snow to the right and inward to the island; then re-enter the island the normal way and push snow to the right and outside, catching your windrows as best as you can

- **Inner island**

- ✦ With a reversible plow, you can do much the same but always travel in the correct direction (enter on the right of the cul-de-sac), moving the plow left and right

- **No island**

- ✦ Back up to the rear of cul-de-sac; make several passes forward

Plowing

66

- **Alleys**
 - Special safety concerns
 - Smaller equipment
 - Materials in the way
- **Dead ends**
 - Similar to cul-de-sacs
 - Storage problems
 - Obtain right of way or easement for T-turnaround if you can
- **Take these slowly**

Plowing

67

- **Bridges**
 - Bridges freeze before roadways – act accordingly
 - What's under the bridge?
 - ✦ What does the snow hit when it goes over the rail?
 - ✦ Another road, vehicles?
 - ✦ Slow down to minimize throwing snow over
 - Drainage
 - Melt water control

Plowing

68

- **Parking lots**

- Get to them before folks arrive – life is sweeter
- Watch the wheel stops – know where they are
- Don't back into light posts – obvious but important
- Melt water – pile the snow at the downhill side to avoid a skating rink
- But...don't create a drainage problem on the neighbor
- Push boxes can be very effective



Plowing

69

Handling & Compensation

Video – 26 seconds



Plowing

70



Video
39
seconds

Plowing

71

- **Blowing/drifting snow**
 - Where it's a routine problem, think about snow fence or a line of bushes or trees that might bring similar result
 - For routes that can be cut off, without another entry point, have an established contingency plan
 - Loaders are a terribly slow proposition
 - Don't create the problem
 - ✦ If light, fluffy snow is coming down, try to cast it with the wind rather than against it- i.e., send it where it wants to go

Plowing

72

- **Controlling melt water**
 - Superelevated curves
 - ✦ Plow to the low side
 - ✦ Plow beyond the shoulder break on the high side
 - Keep drainage facilities cleared
 - ✦ Storm drains
 - ✦ Ditches
 - ✦ Outfalls
 - ✦ Shoulder pathways to ditches
- **Managing windrows**
 - Good plowing techniques will take care of most of the time
 - Intersections can leave windrows and piles more easily

Plowing

73

- **Snow storage**
 - Problem areas
 - ✦ Cul-de-sacs
 - ✦ Dead ends
 - ✦ Alleys
 - ✦ Adjacent sidewalks
 - ✦ Parking areas/lots – be mindful of designated ADA spots
 - Adjust plowing techniques/patterns where you can
 - Think about where melt water will go
 - Have a contingency plan for when the big one hits and you're out of room along the routes

Loading, Hauling, Disposing Snow

74

- Usually need only in severe storms
- Avoid where you can (obviously), but be judicious
- Usually a post storm activity, but not always...
- Alleys
- Cul-de-sac and dead end streets
- Narrow channel areas
- On-street parking areas
- Environmental considerations when disposing
 - Once scooped up, snow, chemicals, and abrasives are pollutants – consult DNREC if in doubt about disposal

Safety, Risk Management, Liability

75

- **Public safety – operators should**
 - Obey traffic laws
 - Watch speed, stopping distances, turning radii, skid control
 - Avoid making sudden moves
 - Avoid pushing snow
 - ✦ Over bridge rails
 - ✦ Onto sidewalks
 - ✦ Into storefronts
 - Keep to right approaching oncoming traffic
 - Control material spinners relative to vehicles and pedestrians
 - Report stranded motorists

Safety, Risk Management, Liability

76

- Public safety – traveling public should
 - ✦ Stay off roads until after storm cleanup, if possible
 - ✦ Obey traffic laws – including Move Over Law
 - ✦ Avoid walking in vehicle travelways
 - ✦ Watch speed, stopping distances, skid control
 - ✦ Avoid making sudden moves
 - ✦ Keep to right approaching oncoming plows/equipment
 - ✦ Stay back where operators can see you in mirrors
 - ✦ Be aware – equipment backs up and operators can't always see
 - ✦ Report stranded motorists
- This can be part of pre-season public relations

Plowing

77

- **Speed**

- **Reasons to care**

- ✦ Safety
 - ✦ Effectiveness
 - ✦ Productivity
 - ✦ Minimize problems beyond roadway

- **Plowing**

- ✦ Faster broadcasts snow better but threatens mailbox posts
 - ✦ Slower places less snow on sidewalks and protects pedestrians

- **Spreading abrasives and FPDs**

- ✦ Match your speed to your distributor – based on calibration

- **Generally, slower is better**



Plowing



WINTER OPERATIONS

78

See Entire Iowa DOT 13 Part Series on [YouTube](#)

Video – Speed – 58 Seconds

Poll Question

79

What's your typical, average plowing speed?

- ☐ 15 mph
- ☐ 20 mph
- ☐ 25 mph
- ☐ 30 mph
- ☐ 35 mph
- ☐ 40 mph
- ☐ 45 mph
- ☐ 50 mph
- ☐ 55 mph

Plowing

80

- **Beyond the roadway**
 - Sidewalks
 - ✦ First rule – do no harm
 - Curb ramps
 - ✦ Historically left to defend for themselves
 - They resolve themselves thermally
 - ✦ They get piled up with snow and ice
 - ✦ No one owns them, it seems
 - ✦ We need a better plan
 - Commercial and private entrances
 - ✦ Encourage residents to toss their snow downstream of their entrance to minimize what you carry over



Plowing

81

- Mailboxes

- Less of an issue in urban environment
- Failure modes
 - ✦ A direct hit from a snow plow
 - ✦ The plume of broadcast snow
 - ✦ Wind from the storm itself (some of these are on their last leg as it is)
 - ✦ Someone else hitting it
 - ✦ It was just its time
- Different philosophies
 - ✦ Agency assumes total responsibility
 - ✦ Partial responsibility – e.g., direct hit by plow only
 - ✦ Agency assumes no responsibility
- Postal service access (beyond normal plowing)
 - ✦ Typically left to the owner to dig out



Plowing

82

- **Sensitive roadside features**
 - Planters, decorative plantings, landscaping effects
 - Fire hydrants
 - Wetlands
 - Historic elements
- **First priority is safety and mobility of the public**
- **Where you can**
 - Move things back
 - Protect things
 - “Adopt a Hydrant” programs
 - Slow or redirect plows and material spreaders

Plowing

83

- **Disabled, inoperative, stuck, disabled, abandoned vehicles**

- Agency has authority to remove private vehicles?
 - ✦ Under what circumstances and where?
 - ✦ Communicate this to the public – don't allow surprises
- Tow company contract?
- Who deals with irate owner? How do they find car?
- Other means to move – loader bucket full of snow?
- Insurance and training



R7-203



OR



R7 201P



R7 201aP



R7 202P



R7 202aP DE



R7 202aP DE1

Back To Our Storm...

84

- So, the storm is in full swing and your troops are at it
- You briefed your stakeholders before the storm
- Time to do it again
 - Elected officials
 - Senior management
 - Press
 - Public

Back To Our Storm...

85

- Talking to the outside world
 - Control expectations
 - Remind them of established Levels of Service (LOS)
 - Elevate relationship of chemicals and abrasives with environmental protection
 - Remind them that you're trying to be mindful of their tax dollars
 - Remind them to clear their sidewalks
 - ✦ And curb ramps, maybe?
 - ✦ And maybe fire hydrants?



Deicing and Such

86

- Salts and sands and all that?
- That's covered in Module 3 of this series
 - Stay tuned to this channel

Post Storm Activities

87

**PUSH BACK SHOULDERS
CLEAR DRAINAGE WAYS
REFREEZING
MAINTAIN AND CLEAN EQUIPMENT
RESTORING SAFETY FEATURES AND SIGHT DISTANCES
REMOVAL OF SNOW
ASSET INVENTORY
INTERIM PAVEMENT REPAIRS
ASSESS PERFORMANCE AND DEBRIEF**

Post Storm Activities

88

- You fought the storm
- Everyone's back at work, the mall, the PTA meeting, and football practice
- The crews have gone home to rest (and clean out their own driveways)
- Tomorrow, it's time to get ready for the next storm – your post storm tasks

Get Ahead of the Public

89

- Press release, letter to the editor, appearance at a council meeting, etc.
- Thank the public for their cooperation during the storm
- Forget about the ones who didn't cooperate
 - Release your negative ions
 - This is positive time
- Tell them how much it helped your operation
- It steals thunder from the cranky ones
- It could make them more cooperative next time

Cleanup

90

- This is the stuff beyond passable roads and achieving Levels of Service
 - Recognize the difference between what has to be done immediately versus what can wait...while you rest a bit
 - Establish your LOSs during the storm
 - Make roads passable and safe for a prudent driver
 - ✦ Then rest
 - The stuff we'll talk about now can wait a day or so
 - ✦ Usually
 - ✦ But not much longer

Cleanup

91

- Push back shoulders



Cleanup

92

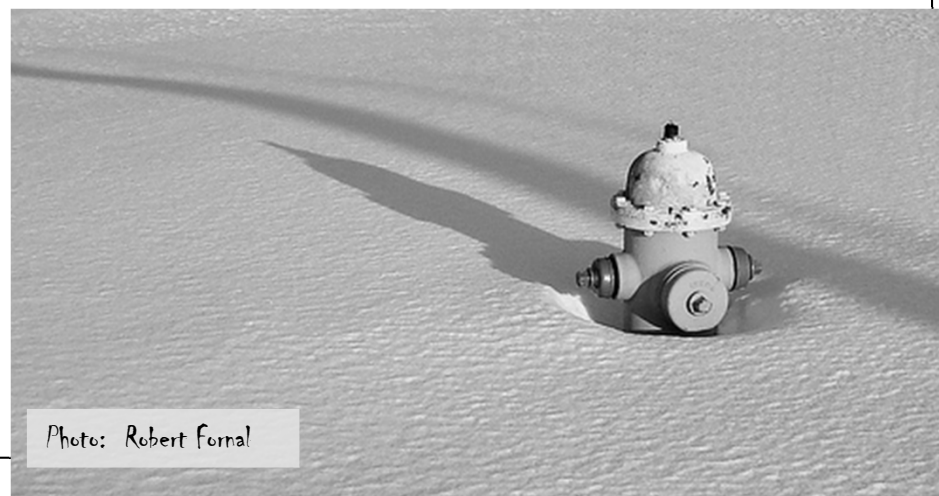
- Cleanup parking lots



Cleanup

93

- Clear drainage ways
- Expose hydrants



Cleanup

94

- Clear curb ramps
- Deice sidewalks
- Watch for refreezing



Cleanup

95

- Maintain equipment
- Equipment repairs
- Check cutting edges
- Wash equipment
- Clean spreaders



Post Storm Activities

96

- **Cleaning/repairing equipment is important after each storm**
 - Get the salt out of the nooks and crannies
 - Verify free movement of all parts
 - Repair worn or damaged parts
 - Check all safety lights and equipment



Post Storm Activities

97



Video – 1
minute

Cleanup

98

- Replenish chemicals/abrasives



Photo: Allie Gerlach



Cleanup

99

- Melt water control

Photo: William Spaetzel



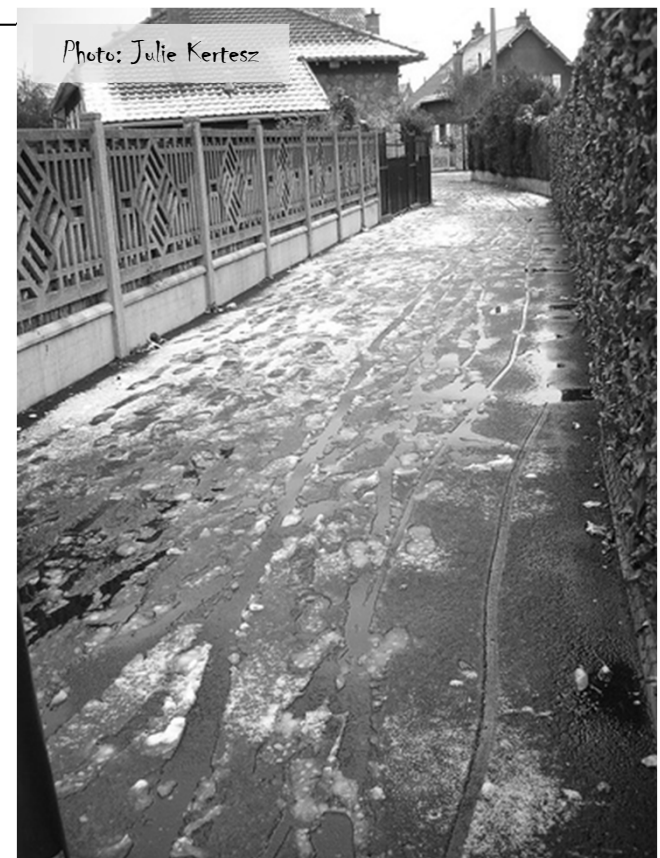
Photo: Geoff LMV



Cleanup

100

- Melt water control



Cleanup

101

- Melt water control



Cleanup

102

- Melt water control
- Reestablish drainage paths

Photo: Steve Dinn



CAUTION
SNOW MELTING
IN PROGRESS

Photo: Andrew Whitis



Cleanup

103

- **Restore safety features and signs**
 - Impact attenuators
 - ✦ Repair
 - ✦ Clear snow away (don't allow ramp effect)
 - Guardrail
 - ✦ Similar concerns to attenuators
 - Median barrier
 - Sign posts (breakaway, yielding)
 - ✦ The No Littering sign can wait
 - Light poles
 - Signs
 - Restore sight distances

Cleanup

104

- Loading, hauling, disposal of snow
 - Parking areas
 - Remove buildup for next storm
 - Dump only in approved areas



Cleanup

105

- Loading, hauling, disposal of snow

- Safety

- ✦ Your personnel
 - ✦ Vehicles
 - ✦ Pedestrians

- Temporary Traffic Control?



Cleanup

106

- **Bridges**
 - Clear scuppers for drainage
 - Open sidewalks
 - Watch for refreezing



Cleanup

107

- **Pavement and shoulder repairs**
 - Pothole patching
 - Cold patch, hot/warm mix
- **Brush cutting/tree removal**
- **Utility restoration**
 - Overhead
 - Underground
- **Abrasives cleanup**
 - Vacuum truck, if you have or have access to
- **Mailbox repair/replace (if applicable)**



Cleanup

108

- **Debrief and assess**
 - What went well
 - What didn't
 - Why
 - How to improve
 - Actions that can't wait
 - Apologies to be made/hurt feelings to mend
 - Make notes for changes to plan
 - Involve the whole crew and no outsiders – speak freely



Okay, Who Was That Band?

109



Need More?

110

Matt Carter
Municipal Engineering Circuit Rider
Delaware T² Center
matheu@udel.edu
(302) 831-7236

<http://www.ce.udel.edu/dct/T2.html>

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