MDOT
Michigan Department of Transportation

Winter Operations

Study Guide

FOR
WORK ELEMENTS
2142, 2143, 3142, 3143 & 3145

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Prepared by
Division of Operations

FOREWORD

The policy of the Michigan Department of Transportation is to keep all state highways free of ice and snow, insofar as available personnel, equipment and weather conditions will permit. During the winter season, Maintenance employees in both direct and contract counties are subject to 24 hour call. Every effort is made to clear highways of ice and snow prior to peak traffic periods, especially in the early morning.

This Study Guide is designed to give basic guidelines for safe winter operations. Equipment used in winter operations includes snow plows, large plow trucks equipped with ground speed controlled chemical distribution systems, hopper boxes and underbody blades. Side wing plows, power graders, front end loaders and snow blowing equipment are also used. Prior to use, the equipment should be checked to be sure it is in proper working order.

It is presumed that the trainee has a current Michigan Commercial Driver's License (CDL), with a Group "A" Designator and an "N" Endorsement. The trainee should have adequate knowledge of the Michigan Vehicle Operator's Code and know and abide by the rules of the road regarding courtesy and safety behind the wheel. This guide is designed only to familiarize the trainee with the safety aspects of the equipment and operation and not to make the trainee a proficient operator.

Before being trained for winter operations the trainee should have a basic understanding of hydraulics. The trainee must also be knowledgeable of truck operations and be familiar with the operator's manual for all equipment to be used in winter operations (including the proper warm-up and cool-down periods). The trainee must learn how to inspect all applicable items listed on the Winter Operations Checklist (on page 1) for each piece of winter equipment to be used.

When performing any task all applicable Department, MIOSHA and OSHA policies, rules and regulations must be followed.

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WINTER OPERATIONS CHECKLIST

Engine Compartment
- ☐ any leaks / hoses / all belts
- ☐ oil level
- ☐ coolant level
- ☐ power steering fluid
- ☐ water pump
- ☐ alternator
- ☐ dust nipple
- ☐ wiring
- ☐ air compressor
- ☐ air restriction gauge
- ☐ auto transmission (Only at normal operating temperature)
- ☐ alcohol evaporator
- ☐ fan blades / radiator

Cab Check
- ☐ clutch / gearshift
- ☐ temperature gauge
- ☐ oil pressure gauge
- ☐ ammeter or voltmeter
- ☐ mirrors / windshield
- ☐ spare electrical fuses
- ☐ fire extinguisher
- ☐ red triangles
- ☐ first aid kit
- ☐ flashlight
- ☐ calibration chart
- ☐ vehicle inspection log book
- ☐ motor vehicle accident sheet
- ☐ proof of insurance

Cab Check continued
- ☐ wipers / washers
- ☐ all lighting indicators
- ☐ horns
- ☐ heater / defroster
- ☐ parking brake check
- ☐ airbrake check
  air loss / warning light
  parking & trailer valves
- ☐ safety belt
- ☐ two speed operation
- ☐ dump box lock-out
- ☐ hopper / spreader controls
- ☐ radio check
- ☐ steering play

Lights/Reflectors
- ☐ clearance
- ☐ head (high / low)
- ☐ tail
- ☐ turn signals
- ☐ 4-ways
- ☐ brakes
- ☐ hopper
- ☐ reflectors
- ☐ blade
- ☐ strobes
- ☐ plow
- ☐ dome
- ☐ map

Steering Components
- ☐ steering boxes / hoses
- ☐ steering linkages
- ☐ steering shaft

Front of Vehicle
- ☐ hydraulic cylinder / lines
- ☐ plow jack / bolts / release arm
- ☐ hydraulic pump / hoses

Rear Suspension
- ☐ springs
- ☐ mounts (F-C-R)
- ☐ overload springs

Distribution Area
- ☐ flight chain / sprockets / adjust.
- ☐ air / electric / hydraulic lines
- ☐ Y chutes (physical damage)
- ☐ belt / side delivery adjustment
- ☐ gate opening / correct setting
- ☐ hopper bearings greased
- ☐ spinner not plugged, bearings greased
- ☐ side delivery operation left - right - spinner
- ☐ left / right Y chute flapper
- ☐ gear box grease / oil level

Front Suspension
- ☐ shocks
- ☐ springs
- ☐ mounts
  - ☐ front
  - ☐ center
  - ☐ rear

Side of Vehicle
- ☐ drain air tanks / air dryer system
- ☐ door / mirror / frame
- ☐ fuel tank / fuel cap
- ☐ drive shaft / components
- ☐ hydraulic fluid level
- ☐ battery / box / cover
- ☐ exhaust / rain cap

Rear Brakes
- ☐ stroke indicator
- ☐ slack adjustors
- ☐ chambers
- ☐ hoses
- ☐ drums & linings

Front Brake
- ☐ slack adjustor
- ☐ chamber
- ☐ hoses
- ☐ drums & linings

Underbody Blade
- ☐ circle / stops / hanger plates
- ☐ hydraulic lines
- ☐ swing cylinder
- ☐ blade locks
- ☐ cutting edge / bolts

Rear Wheels
- ☐ rims
- ☐ tires
- ☐ axle seals
- ☐ lug nuts
- ☐ spacers
- ☐ valve stem capped & centered

Rear of Vehicle
- ☐ mud flaps
- ☐ backup alarm
- ☐ steps
- ☐ hand shovel
- ☐ lock bar / tail gate / secured

Front Wheels
- ☐ rim
- ☐ tires
- ☐ hub oil seal
- ☐ lug nuts

Wing Plow
- ☐ safety retaining chain hooked up
- ☐ main frame (physical damage)
- ☐ big bolt / castle nut / cotter pin
- ☐ bolt / nuts
- ☐ cutting edge / bolts
- ☐ wear plate or shoes
- ☐ hydraulic lines / hoses / cylinders
- ☐ safety / marker lights
- ☐ push arm condition / retaining pins
- ☐ wing out light in cab (works and is not on before releasing wing retaining chain)

Trailer Coupling Area
- ☐ Glad hand / covered
- ☐ trailer wiring plugs covered
- ☐ pintle hitch greased

SAFETY PROCEDURES

1. Wear a hard hat, gloves, safety glasses and safety boots when inspecting, maintaining or operating winter maintenance equipment (hard hat, gloves and safety glasses are not required inside the cab of the truck).

2. All motorized pieces of equipment should carry a flashlight, spare electrical fuses, fire extinguisher and first-aid kit (trucks should also have three red, reflective triangles).

3. Always wear the safety belt.

4. Clean all windshields, windows, lights and reflectors before operating.

5. Know the capacity of your equipment and the height of your load.

6. Keep the operator's compartment clean and heavy objects secured in case of a rollover.

7. Be sure the heater/defroster and state radio/phone work properly. All warning lights such as the beacons or strobe lights must be inspected and used when performing winter operations.

8. Use care when operating on steep grades.

9. Obey all traffic laws when traveling on public roads.

10. Know your snow route and the hazards along it.

HIGHWAY PRIORITY- WINTER MAINTENANCE SNOW AND ICE CONTROL

Each trunkline is classified based on its level of importance to each region and each classification has been assigned a minimum level of service during winter storm conditions.

Significant Route (Priority Service Level I) — Orange Routes

Provide maintenance service as appropriate under prevailing weather conditions, with a goal of providing a pavement surface over its entire width **"generally bare of ice and snow"**. This work may be accomplished using overtime as necessary.

Clearing the pavement bare of ice and snow over its entire width will be a continuous process during and after the snow event using overtime as necessary.

Note: Depending on the severity and duration of the storm, maintaining a full complement of operators may not be practical and may require staggering the workforce and/or reducing the service level on routes in the "local service route".

Local Service Route (Priority Service Level II) — Blue Routes

Provide maintenance service as appropriate under prevailing weather conditions, with a goal of providing a pavement surface **"generally bare of ice and snow"** in the center portion wide enough for one-wheel track in each direction. This work may be accomplished using overtime as necessary during a winter storm event.

Clearing the pavement bare of ice and snow over its entire width will be accomplished as soon as reasonably possible after the winter storm event, without working overtime.

GENERAL INFORMATION

1. Winter Maintenance

   A. The purpose of winter maintenance is to provide the best driving surface that weather conditions will allow while staying within our priority service level guidelines.

   B. Once salt particles left on the road surface begin to work, they will generally work for about three hours.

   C. A good way to tell if salt is working is to look at the slush being thrown from passing vehicles. If it is thrown to the side of the wheels in a splashing manner, the salt is still working. If the slush begins to stiffen and is being thrown directly behind the wheels, the salt is losing its effectiveness.

   D. Before applying salt again, consider the weather prediction, time of day, and traffic volumes. When to apply again is a judgement call.

   E. When the roads are in danger of being plugged from a severe storm or because of equipment breakdown, you may need to make an orderly retreat to regroup and establish priorities.

2. Blading Snow

   A. Before using the underbody blade, always check for excessive wear and loose or missing bolts.

   B. Reduce speed and watch for pedestrians when blading in a residential or urban area.

   C. When blading in tandem, the space between trucks should be adequate (2,500') to allow traffic to move freely through the blading operation.

   D. When only blading snow, periodically engage the flight chain, side delivery system and/or spinner to prevent them from freezing up.

3. Salting and Sanding

   A. Operators must know and maintain the correct hopper box gate opening for their unit to accurately apply the necessary pounds of salt per mile. The calibration should be checked on all types of distribution systems each year.

   B. Super elevated curves and ramps should be salted on the high side.

   C. When loading the hopper box with a front end loader, the underbody blade should have the discharge end of the blade on the opposite side of the loading operation.

OPERATING PROCEDURES

1. Blading

   A. Clean the centerline on the first pass.

   B. Use the minimum blade pressure required to effectively clean the surface.

   C. Avoid excessive pressure on seal coated surfaces.

   D. Maintain a slower speed for ice or packed snow, and a faster speed for loose snow.

   E. Use truck ballast to keep traction.

2. Front Plowing

   A. As a general rule, use a plow when more than 8 inches of snow needs to be removed from the shoulders.

   B. Maintain an adequate speed for the plow to properly throw the snow (maximum speed 25 mph).

   C. If possible, do not blind following vehicles. Occasionally pull over and stop to allow traffic to clear if you can do so safely without creating a hazard.

   D. Be careful of obstacles, soft shoulders, and turn-a-rounds that are too tight for a truck with a plow.

   E. The Hustin Hitch lock pins must be kept well lubricated and fully engaged whenever the plow is on the truck.

   F. Be aware of green delineators and the obstructions they are marking.

   G. When losing momentum with the plow on a large snow bank, pull out and clear the plow, regain speed and turn back into the snow bank. High spots or points that are left can be pushed back on the second pass.

   H. Grease the plow wheels (bogie wheels) at the end of each shift and before unhooking the plow.

   I. When unhooking the plow, block it up so the bogie wheels or skid pads do not touch the ground.

3. Wing Plowing

   A. Be thoroughly familiar with the controls and length of the wing before use.

   B. Always inspect the wing plow before use.

C. Be aware of restricted vision when wing is in the upright position.

D. Always operate at a safe controlled speed.

E. Vehicles equipped with a wing-plow attachment shall not occupy two lanes of traffic at a time.

F. Always hook safety retaining chain when wing plow is not in use.

4. Blading and Plowing

A. Raise the blade and/or plow slightly at railroad crossings to avoid damage of any kind.

B. Avoid blading gravel from the shoulders by leaving an inch or two of snow (white shoulder policy).

C. Use caution when blading or plowing soft shoulders.

D. Have only enough materials in the hopper box for ballast when clearing shoulders.

E. Do not throw snow off overpasses or over median barrier walls.

5. Spot Salting/Blading

The purpose of spot salting/blading is to selectively apply salt on hazardous or troublesome spot locations such as hills, curves, or intersections.

A. While spot salting, blade any accumulated snow.

B. Under most conditions, apply salt at an application rate not to exceed 450 lbs. per two-lane mile.

C. Never exceed 35 mph while applying salt.

D. Consider the temperature, weather prediction and expected traffic volumes in deciding when to spot salt or sand:

1. Below 10ºF - Spot Sanding is preferred.
2. 10º to 20ºF - Spot salting or sanding.
3. Above 20ºF - Spot salting is preferred.

E. Avoid salting too quickly when it is extremely cold or when temperatures are falling. Salt wets the pavement and can cause icy conditions. Allow snow to blow off the pavement unless hazardous conditions develop.

6. Spot Sanding/Blading

The purpose of spot sanding/blading during extreme cold conditions is to apply sand at hazardous locations or over slippery sections of highway to increase traction.

A. Blade loose snow from the surface before applying sand.

B. When sanding is required, a typical application rate would be one ton per mile.

C. Sand alone will not remove ice and snow. Sand is most effective when used to provide traction under severe temperature conditions (below 20ºF).

7. Continuous Salting/Blading

The purpose of continuous salting/blading is to put down a steady application of salt on the roadway to eliminate general slippery conditions.

A. Blade accumulated snow from the surface before applying salt. Blading performed at the same time as salting is part of continuous salting.

B. Under most conditions, apply salt at an application rate not to exceed 450 lbs. per two-lane mile. If too much salt is used, a white dusty residue may remain on the road after the storm is over.

C. Consider the temperature, weather prediction and expected traffic volumes in deciding when to continuously salt:

1. Below 10ºF - Spot Sanding is preferred.
2. 10º to 20ºF - Continuous salting or sanding.
3. Above 20ºF - Continuous salting is preferred.

D. Avoid salting too quickly when it is extremely cold or when temperatures are falling. Salt wets the pavement and can cause icy conditions.

E. In most cases, place chemicals on the centerline of the roadway. Place chemicals on the high side of super elevated curves and ramps.

F. After applying salt, you should allow time for the salt to work. The more the temperature drops below 20ºF, the longer it takes salt brine to form and start working.

G. To help keep the salt from bouncing onto the shoulder or into the ditch, the truck's speed should never exceed 35 mph while applying material. Sometimes even slower speeds are necessary.

8. Winter Road Patrol

The purpose of winter patrol of roads is to determine the development of hazardous conditions requiring attention by maintenance forces.

A. Patrol all assigned highways for winter operations.

B. When conditions arise requiring attention by maintenance forces, make notification through established lines of communication.

C. Each night complete the mandatory patrol log (Form 452D), including on it:

1. Routes traveled and road conditions.
2. Action taken to call out crews to perform maintenance.
3. Maintenance performed.
4. Other incidents, observations or problems pertaining to the patrol.

D. Record the location of damaged or missing signs, poor sign reflection, damaged delineators, guardrail reflectors, etc. for the day or night crew to repair.

E. All logs should be retained in a notebook for three years pending any related lawsuits.

9. Additional Highway Patrol

Additional highway patrol is used to observe and treat icy bridge decks. Maintenance garages which have chronic icy bridge problems should provide additional highway patrol prior to the morning traffic peak on those days when the weather forecast indicates a potential for icy bridge conditions. Research on the prediction of frost forming on bridge decks concludes that the following conditions are needed for frost to form on bridge decks.

A. Temperatures below 32ºF.

B. Weather calm and clear.

C. The dew point is greater then 32ºF or the humidity at 32ºF is greater than 80 percent. The bridge deck surface is usually five degrees below the air temperature.

These conditions usually come together during the early morning hours. Frost that is formed on the bridge decks is quickly iced over by the early morning commuter traffic. The equipment operator performing the additional highway patrol may need to drive a chemical or sand-spreading unit to respond immediately to the sudden formation of frost on the bridge decks.

One effective treatment for icy bridge decks is salt with a pre-wetting solution. The wetted salt has a better ability to stick to the icy surface and not be blown off. Dry salt has limited effectiveness because of the lack of moisture present and it is easily blown off the driving surface before it can be imbedded in the ice layer. By using the spinner, a broader application of the chemical can be applied to the entire bridge deck.

When treating a bridge deck, a heavier application of chemical may be desirable. This can be achieved by pushing the blast button. The response time for the salt distribution system varies from one truck to another. Be sure the material is reaching the pavement a few feet in advance of the start of the bridge deck to ensure the entire deck is being treated. Remember to decrease or discontinue the heavier application of material at the departure end of the bridge.

Additional highway patrol shall be restricted to those days when the weather forecast indicates a strong potential for icy bridge deck conditions.

SHUTDOWN AND STORAGE

1. Shutdown

   A. Follow established fueling procedures.

   B. Set the parking brake.

   C. Cool down for 3 to 5 minutes at 1,000 rpm.

   D. Thoroughly clean the equipment.

   E. Grease the machine thoroughly.

   F. Check for loose or missing blade bolts on the underbody blade, wing or front-end plow. Check for blade wear and change blades as needed.

   G. Complete the driver's vehicle inspection report (if applicable.)

   H. Tag the unit if not operable.

2. Storage

   A. Repaint where necessary to prevent rust.

   B. Grease or coat the appropriate unpainted parts.

BLADING AND PLOWING DO'S

1. Do clear the centerline on the first pass when blading.

2. Do use a front plow when more than 8 inches of snow builds up on shoulders.

3. Do occasionally stop when safe to allow traffic to clear when plowing or blading.

4. Do be careful of obstacles, soft shoulders, and tight turn-a-rounds.

5. Do use truck ballast to keep traction.

6. Do grease plow wheels at the end of each shift and before unhooking the plow.

7. Do block up the plow when unhooking so wheels or skid pads do not touch the ground.

8. Do lift the blade and/or plow when crossing railroad tracks.

9. Do plow at the proper height - a minimum of two inches.

10. Do check blade wear regularly on the underbody blade and wing/front plow.

11. Do check for loose or missing blade bolts on the underbody blade and wing/front plow.

12. Do clean your truck's lights, mirrors and reflectors of ice and snow regularly.

13. Do swing the underbody blade occasionally to keep it free of ice or snow build-up.

14. Do be sure the blade lock devices are operating properly.

15. Do relieve the down-pressure on the underbody blade before attempting to change the direction of discharge.

16. Do engage the flight chain, side delivery system and/or spinner for a few seconds occasionally to prevent them from freezing up.

17. Do know the width of your vehicle when using a wing plow.

18. Do chain your wing in the upright position when not in use.

WINTER OPERATIONS DO'S AND DON'TS

1. Do check the hopper box door for the correct opening before loading the hopper.

2. Do have the discharge end of the blade on the opposite side of the loading operation.

3. Do make sure that the flight chain, spinner, side delivery, or drop chute are in working condition before loading the hopper.

4. Do check the effect the wind might have on the chemical being applied. **Apply the material so it stays on the roadway, not on the shoulders or in the ditch.**

5. Do review "Wing Plow Safety" video.

6. Don't use equipment if the brakes do not function properly.

7. Don't stockpile any material on private property without written permission of the owner.

8. Don't blind following vehicles if possible when plowing.

9. Don't throw snow off overpasses.

10. Don't blade gravel from shoulders, maintain a White Shoulder Policy.

11. Don't remove snow from shoulders with a fully loaded hopper box.

12. Don't blade salt off the roadway while it is still working.

13. Don't have the wing plow down in a live lane of traffic.

14. Don't use a damaged wing plow.

TEN RULES FOR SNOW FIGHTERS

1. Come to work well-rested and physically & mentally fit to face whatever Mother Nature throws at you.

2. Before starting your truck, check all fluids, tires, lights, wipers/washers, heater/defroster, horn, replaceable cutting edges, log book and all required safety equipment.

3. Know the route that you will be responsible for when performing winter maintenance. Drive your route before it gets covered with snow to learn the hazardous spots.

4. Remain alert, especially when working near guardrail, stalled cars and mailboxes. This is particularly true when using a wing plow.

5. Stay calm even though cars and trucks may pass you on both sides and tailgate. Anger only multiplies the potential for problems.

6. Keep your state radio communications as brief as possible. Others may need to use the radio for an emergency.

7. Always shut off the power to an attachment before performing any kind of maintenance on it. Be aware of all types of stored energy that could create a hazard when inspecting or performing maintenance on winter equipment.

8. When getting into or out of your truck always use 3-point contact. Pick a safe spot to park. Before exiting the cab put your transmission in park and set the brake. When parked, follow MDOT's idling policy.

9. When performing winter maintenance or when stopped along the roadway, make certain your headlights and all warnings lights are turned on and working properly.

10. Adjust the speed of your truck to the conditions of the road and the type of operation you are performing. Never exceed 35 mph when applying salt.