

INSTRUCTOR GUIDE

REV: July 2012

Winter Weather Operations Training

MNT812

12-hour

TRAINING COURSE

Maintenance Division/
Workforce Development

INSTRUCTOR GUIDE

WINTER WEATHER OPERATIONS TRAINING

MNT812

Texas Department of Transportation

PREPARED FOR

Texas Department of Transportation
Maintenance Division/
Workforce Development

REV: July 2012

INTRODUCTION

PRE-SEASON PREPARATON

MOUNT A V-BOX SPREADER

MOUNT A REVERSIBLE SNOW PLOW

PRE-TRIP INSPECTON

SNOW AND ICE CONTROL MATERIALS

CALIBRATE A V-BOX SPREADER

CALIBRATE A LIQUID SPRAY APPLICATOR

PREPARING FOR SNOW/ICE REMOVAL

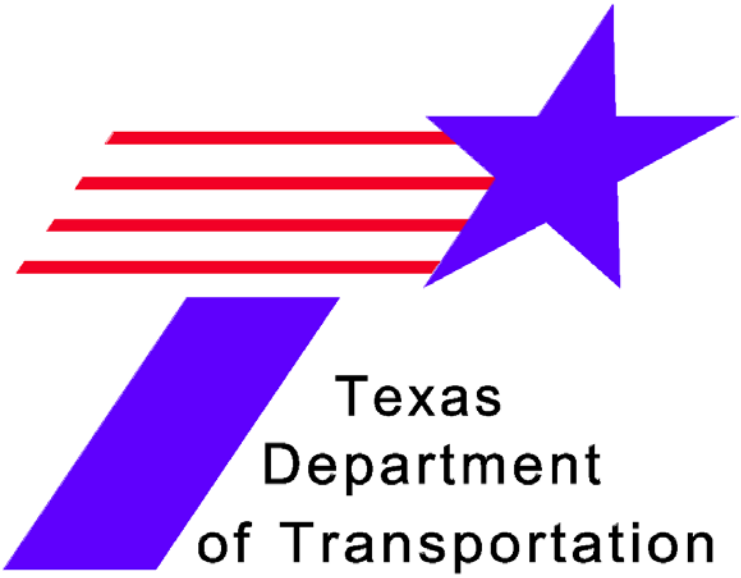
SNOW PLOWING TECHNIQUES

POST-STORM CLEANUP

COURSE SUMMARY AND ASSESSMENT

WINTER WEATHER OPERATIONS TRAINING

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TABLE OF CONTENTS

DESCRIPTION PAGE

Front Matter
Title Page ..... *i*
Acknowledgements ..... *ii*
Table of Contents ..... *iii*
Learning Objectives ..... *v*
About TxDOT ..... *vi*

CHAPTER 1. INTRODUCTION
Slide Presentation Handouts 1-1
Learning Exercises 1-27
Reference Material 1-31
Assessment and Review 1-39

CHAPTER 2. PRE-SEASON PREPARATION
Slide Presentation Handouts 2-1
Learning Exercises 2-29
Reference Material 2-33
Assessment and Review 2-47

CHAPTER 3. MOUNT A V-BOX SPREADER
Slide Presentation Handouts 3-1
Learning Exercises 3-37
Reference Material 3-39
Assessment and Review 3-57

CHAPTER 4. MOUNT A REVERSIBLE SNOW PLOW
Slide Presentation Handouts 4-1
Learning Exercises 4-41
Reference Material 4-43
Assessment and Review 4-59

CHAPTER 5. PRE-TRIP INSPECTION
Slide Presentation Handouts 5-1
Learning Exercises 5-25
Reference Material 5-27
Assessment and Review 5-47

CHAPTER 6. SNOW AND ICE CONTROL MATERIALS
Slide Presentation Handouts 6-1
Learning Exercises 6-21
Reference Material 6-23
Assessment and Review 6-27

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TABLE OF CONTENTS, cont'd.

DESCRIPTION PAGE

CHAPTER 7. CALIBRATE A V-BOX SPREADER
- Slide Presentation Handouts 7-1
- Learning Exercises 7-23
- Reference Material 7-25
- Assessment and Review 7-33

CHAPTER 8. CALIBRATE A LIQUID SPRAY APPLICATOR
- Slide Presentation Handouts 8-1
- Learning Exercises 8-19
- Reference Material 8-21
- Assessment and Review 8-37

CHAPTER 9. PREPARING FOR SNOW/ICE REMOVAL
- Slide Presentation Handouts 9-1
- Learning Exercises 9-27
- Reference Material 9-29
- Assessment and Review 9-33

CHAPTER 10. SNOW PLOWING TECHNIQUES
- Slide Presentation Handouts 10-1
- Learning Exercises 10-47
- Reference Material 10-53
- Assessment and Review 10-97

CHAPTER 11. POST-STORM CLEANUP
- Slide Presentation Handouts 11-1
- Learning Exercises 11-37
- Reference Material 11-39
- Assessment and Review 11-43

CHAPTER 12. COURSE SUMMARY AND ASSESSMENT
- Slide Presentation Handouts 12-1

FINAL EXAM (Instructor Handout)

COURSE EVALUATION (Instructor Handout)

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LEARNING OBJECTIVES

WINTER WEATHER OPERATIONS TRAINING
MNT812

Course Description

Winter Weather Operations Training is a 12-hour roadway maintenance course designed to instruct operations personnel on how to more effectively respond to winter storms. Delivered through both classroom presentations and hands-on learning exercises, this practical, common-sense, implementation-type workshop is based on a recent research study of best practices for winter weather management and operations.

Target Audience

This course has been designed for operations personnel with one to three years of roadway maintenance experience. More experienced personnel including operators, crew chiefs, lead workers, assistant supervisors, and maintenance supervisors will also benefit from the instruction.

Learning Objectives

Upon completion of this course, the participant will be able to:

1. List safety considerations associated with winter weather conditions, equipment, materials, and operational tasks.
2. Describe winter maintenance activities associated with pre-season preparation.
3. Explain how available road maintenance equipment is used to fight snow and ice.
4. Mount winter maintenance equipment including material spreaders and snow plows.
5. Conduct a “pre-trip” inspection on winter maintenance equipment.
6. Comprehend the importance of calibrating equipment in order to “hit the target rate” when applying snow and ice chemicals.
7. Identify the basic snow and ice control chemicals used in TxDOT.
8. Compare and contrast traction improvement, de-icing, and anti-icing as snow and ice treatment strategies.
9. Demonstrate basic knowledge of snow and ice removal techniques.
10. Identify post-storm cleanup activities associated with winter weather operations.

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ABOUT TxDOT

HISTORY

The Texas Legislature established the Texas Highway Department in 1917 to administer federal funds for highway construction and maintenance. Its responsibilities increased in 1975 when the Legislature merged the agency with the Texas Mass Transportation Commission to form the State Department of Highways and Public Transportation.

In 1991, the Legislature combined the State Department of Highways and Public Transportation, the Department of Aviation and the Texas Motor Vehicle Commission to create the Texas Department of Transportation (TxDOT).

TEXAS TRANSPORTATION COMMISSION

TxDOT is governed by the five-member Texas Transportation Commission and an executive director selected by the commission. Commission members, serving overlapping six-year terms, are appointed by the governor with the advice and consent of the Texas Senate.

TxDOT MISSION

Work with others to provide safe and reliable transportation solutions for Texas.

TxDOT VALUES

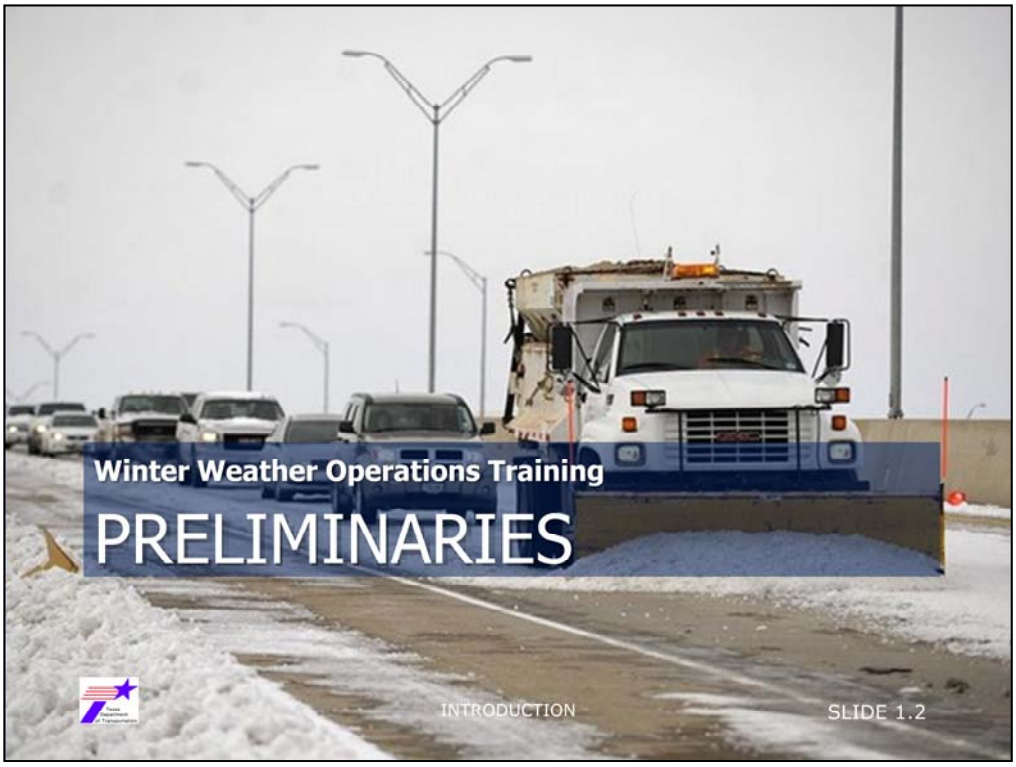
- Trust - We understand the importance of being trustworthy and credible, both as an agency and as individuals.
- Integrity - We honor our commitments and keep our word.
- Responsibility - We are reliable and dependable in carrying out our mission and roles.
- Excellence - We do our work at a high level of quality.
- Service - We do what we do for others with a spirit of humility and honor.

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Instructor Notes: Present the following key points.

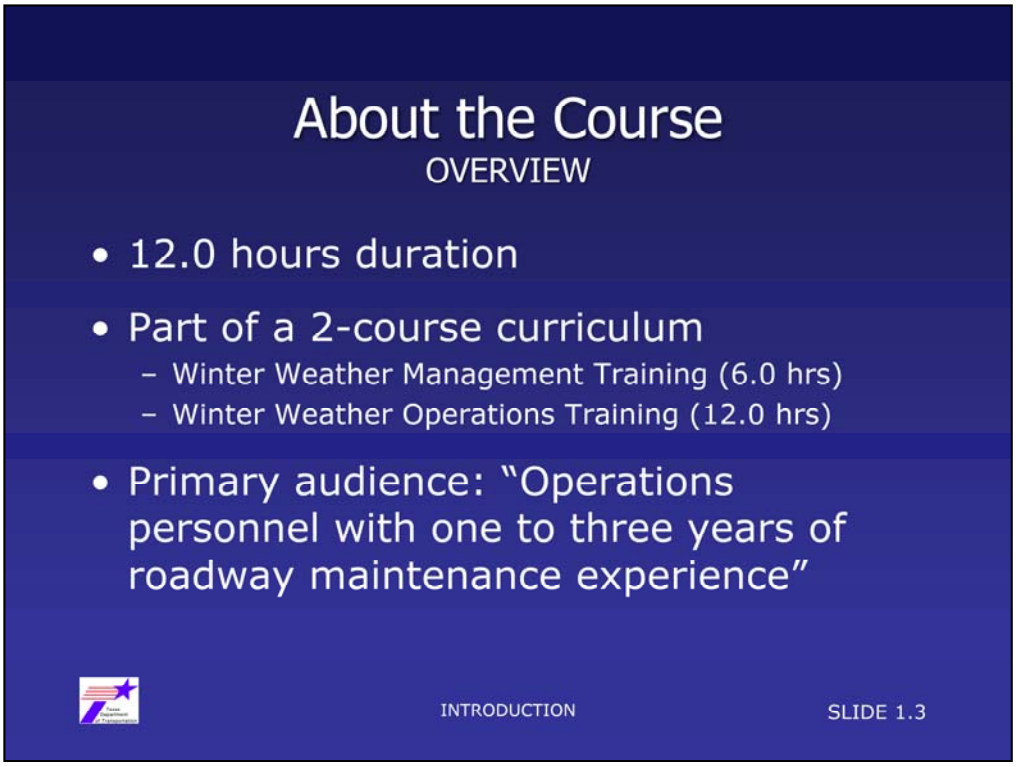
Welcome to Winter Weather Operations Training.



Instructor Notes: Present the following key points.

We have some preliminaries which we need to discuss in order to achieve an effective learning experience.

These appear in the following slides.



Instructor Notes: Present the following key points.

Winter Weather Operations Training is a 12-hour course.

The audience can include anyone from a new employee to a maintenance supervisor.

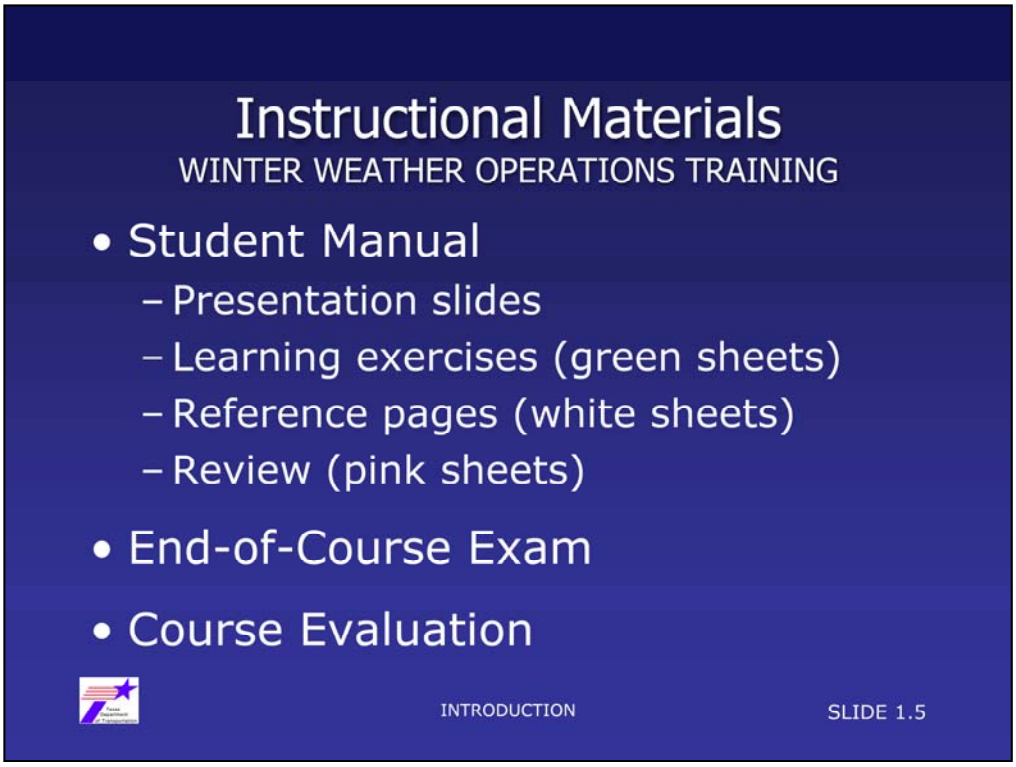
Maintenance personnel at any level of experience will find the course to be helpful. However, the course was designed for operations personnel with one to three years experience.



Instructor Notes: Present the following key points.

These are the twelve topics we will discuss in this course. Instruction per topic averages about one hour each, but this varies. Some will take only 30 minutes. Some will take a little more than an hour.

This is also a good time to ask students to take a moment to review the course SCHEDULE. This schedule identifies when each topic will be discussed, and the nature of the activity.



Instructor Notes: Present the following key points.

Each learner should have a Student Manual. Mention that it is theirs to use, to make notes in, and to keep as a resource following the course. They can (and should) put their name on it.

The first 11 modules will all contain the four parts shown here:

- Presentation slides
- Learning exercises (green sheets)
- Reference pages (white sheets)
- Review (pink sheets)

You will want to illustrate this, say, using Module 1 as an example.

Note that Module 12 is review and only has slides.

<u>About the End-of-Course Exam</u>

- State that there will be an exam. The required passing score is 80% complete.
- The exam is open book but not open neighbor.
- The exam questions will come *directly* from the instruction presented in the class.
- If students attend all sessions, participate in discussion, and in particular pay attention to the review exercises (pink sheets), they should have no problem passing the exam.



Instructor Notes: Present the following key points.

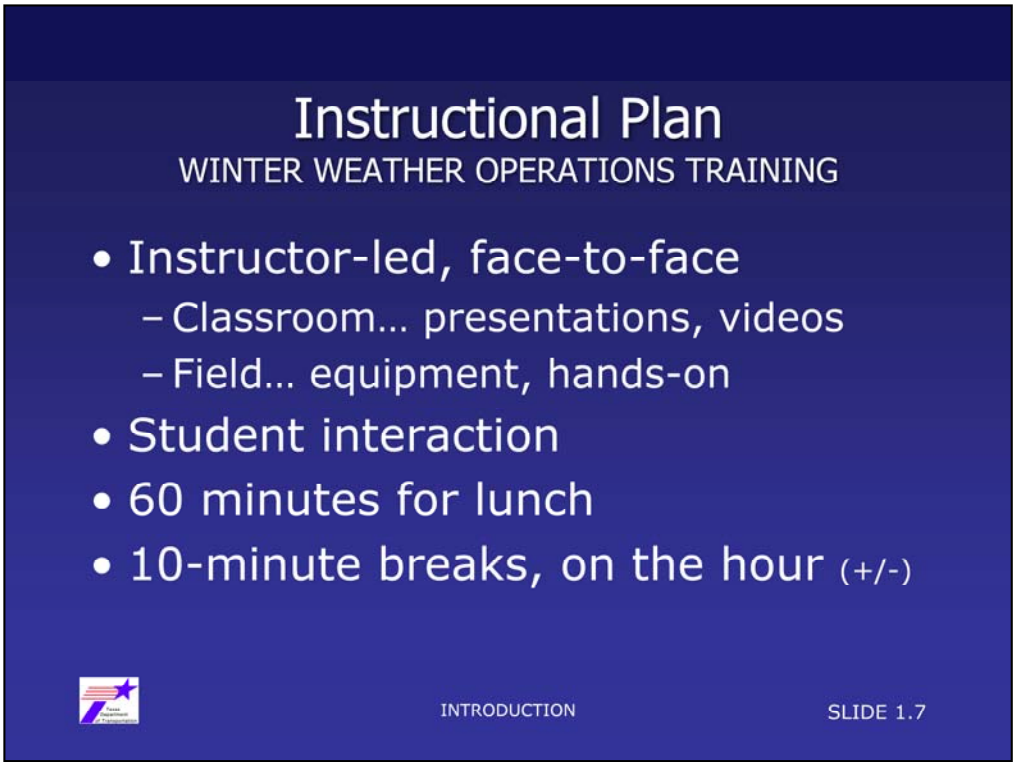
Note the learning icons. These will be pointed out as we go through the instruction.

•The shovel guy… these are learning exercises (green sheets), some of which we will do and some which we will only mention.

•Video clip… the training includes 50 brief videos, ranging in length from about 20 seconds to about 6 minutes. These are excellent and will be a highlight of the training.

•Blue Reference Marker… this indicates additional material that amplifies the material being taught

•Snow plow truck… this indicates the end of the module. This is where we do the review questions (pink sheets).

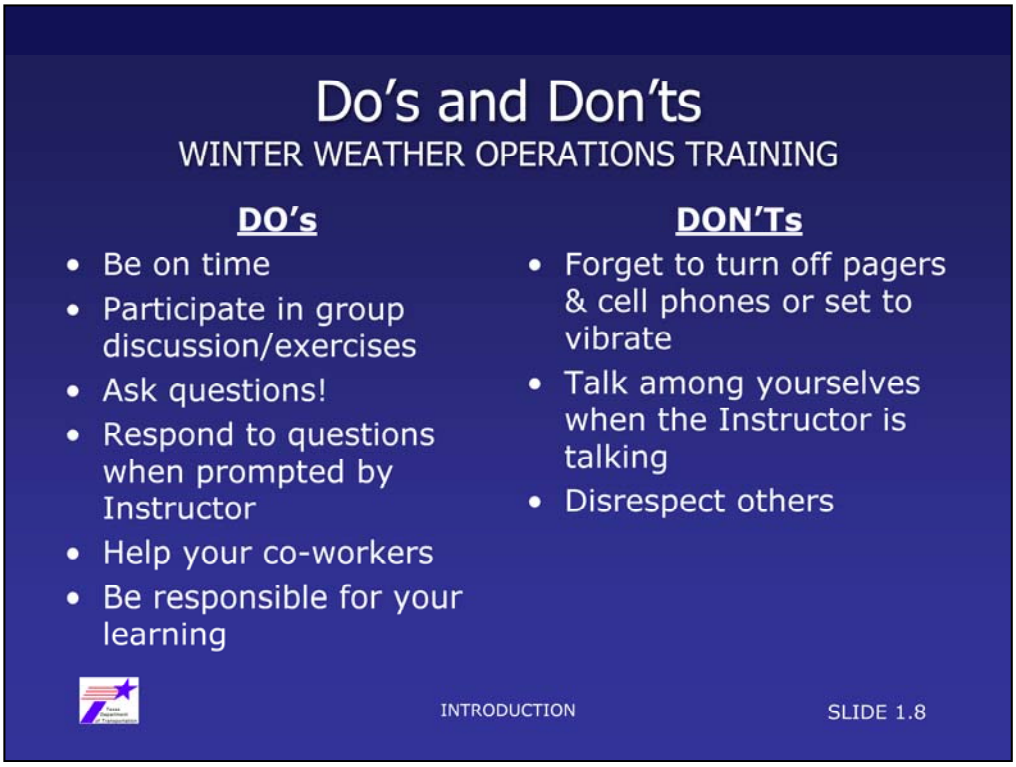


Instructor Notes: Present the following key points.

Briefly note that this is how the course will be taught.

Review each point…

Emphasize that this course includes several hands-on equipment exercises.



Instructor Notes: Present the following key points.

Emphasize that students will get out of this class what they put into it. It is better when they ask questions and respond to questions.

Experienced personnel should, in particular, help the newer guys.

As a courtesy to other learners, turn off cell phones and pagers. DO THIS YOURSELF in front of the class.



Instructor Notes: Present the following key points.

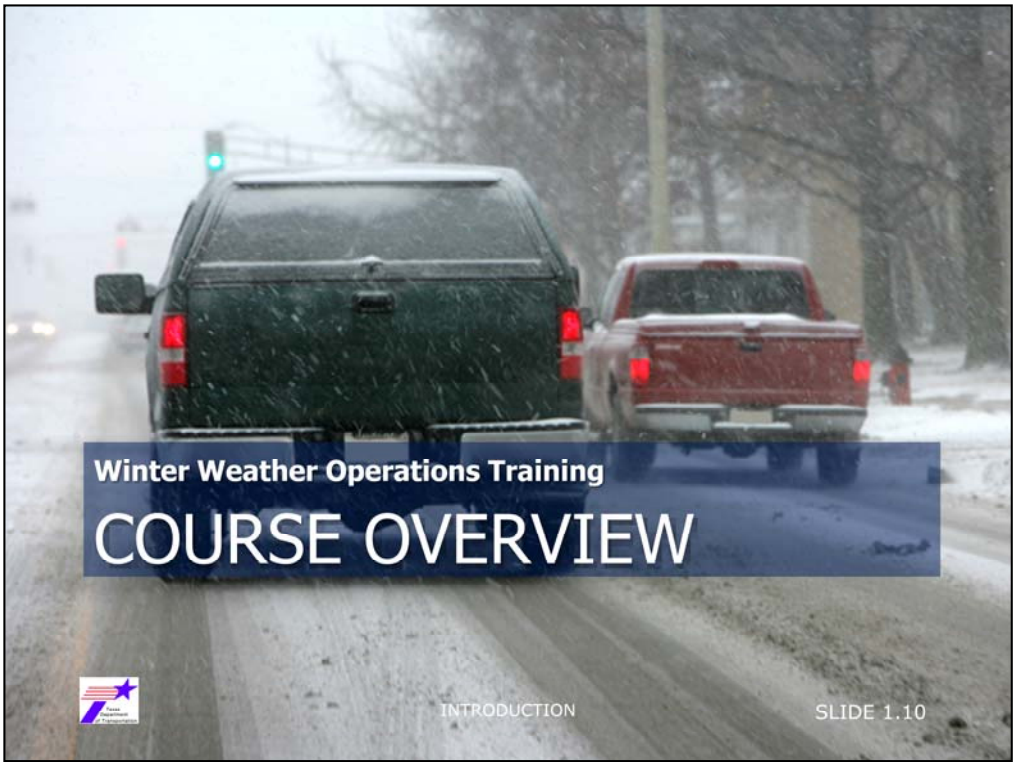
NOW we get to introductions.

Everyone should have a name tent card. Use it.

Because of the field exercises, name tags would also probably be helpful.

The students should introduce themselves first, as shown here.

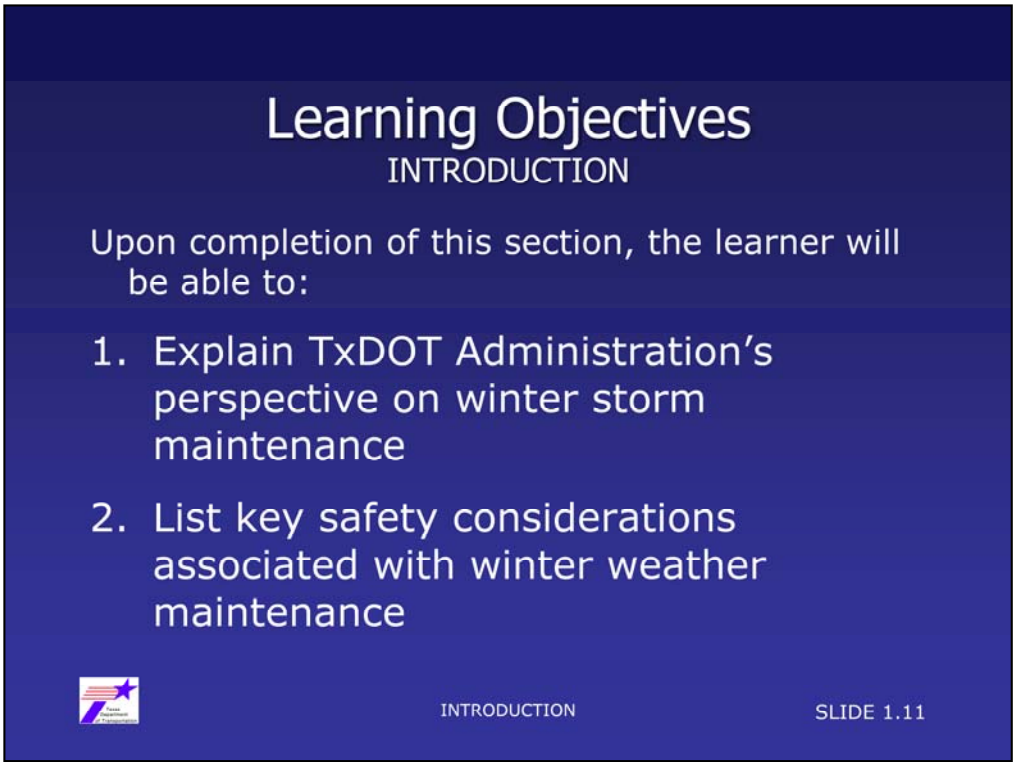
The instructor then introduces himself.



Instructor Notes: Present the following key points.

Having completed the preliminaries, we can now move to the instruction.

We begin with an overview of the topic.

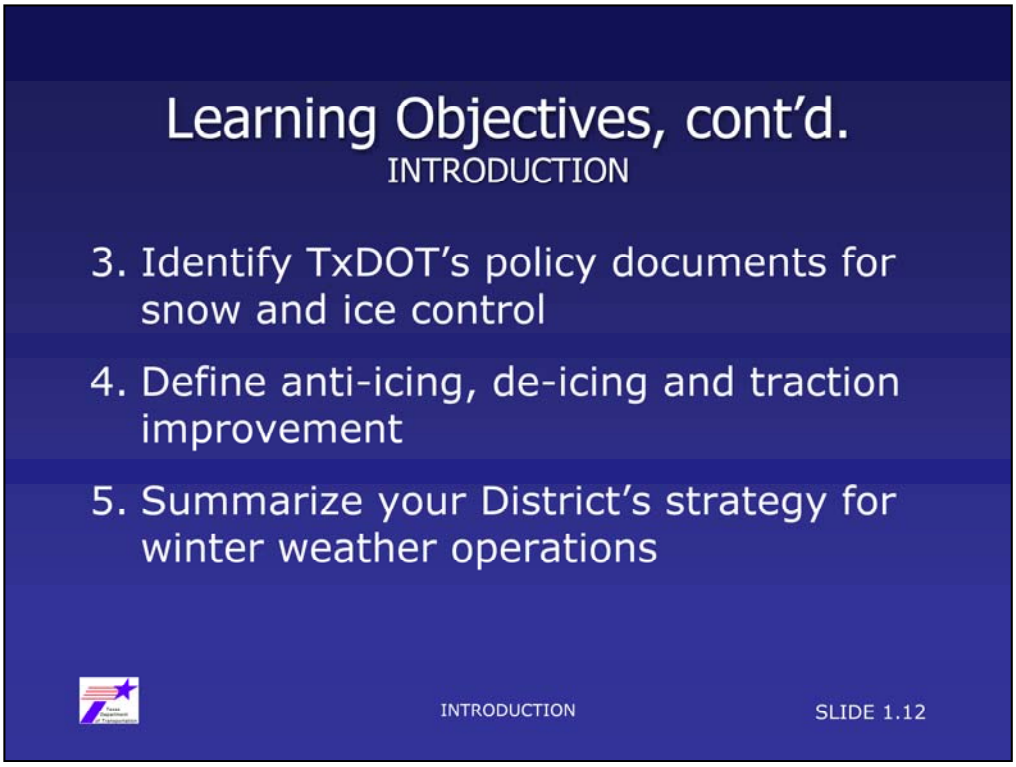


Instructor Notes: Present the following key points.

Each module starts with a listing of specific learning objectives for that module.

Since this is the first module, it will be helpful to go through these one by one, commenting that each objective identified will be a specific topic of the instruction.

It is usually not necessary to spend a lot of time on this in future modules, but rather just to highlight key points.



Instructor Notes: Present the following key points.

Again, these represent the topics that will be presented in this module.



Instructor Notes: Present the following key points.

We begin with the first of our videos.

This is a message from the TxDOT Administration, specifically, Mr. John A. Barton, PE.

The goal of this video is to emphasize that leaders in the highest levels of the TxDOT organization care about this topic, they believe in its importance, and they have commissioned this training to help operations personnel better do their jobs in this area.

Also, note the blue reference marker. Reference R1.1 is the script for this video.



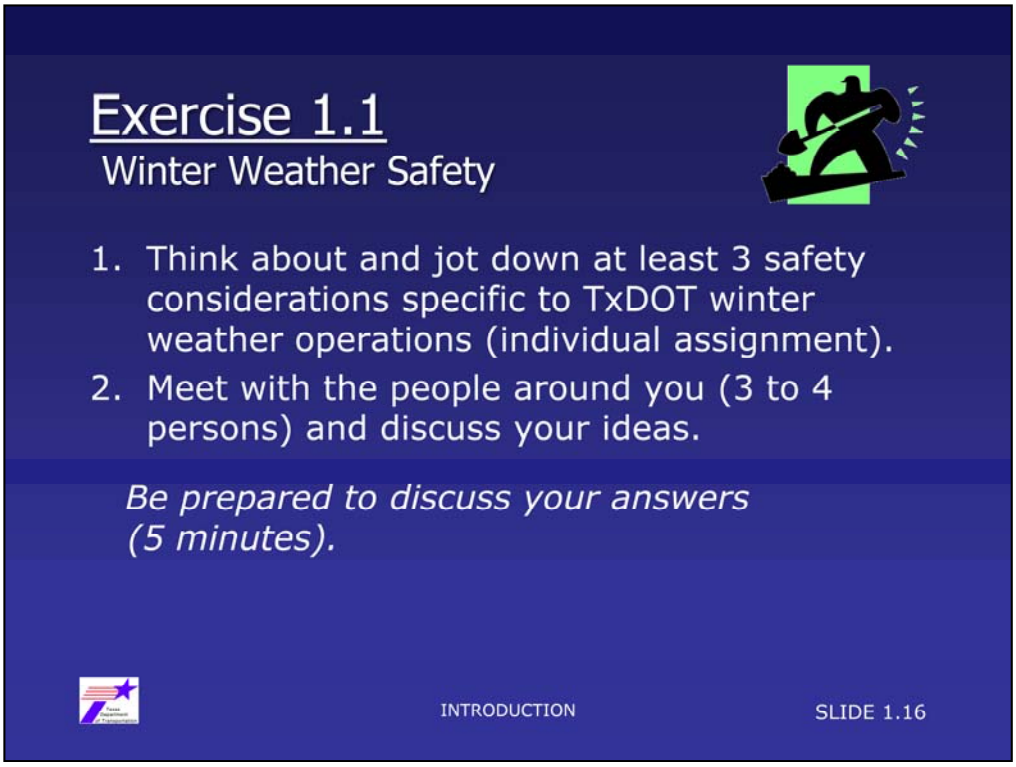
Instructor Notes: Present the following key points.

These are some of the key themes that Mr. Barton emphasizes. These topics will appear and will be discussed throughout the training.



Instructor Notes: Present the following key points.

SAFETY is of first importance in winter maintenance operations, so we will begin with a discussion about winter weather safety.



Instructor Notes: Present the following key points.

Our first GREEN SHEET.

DO THIS ONE.

Have students think individually and discuss in small groups as noted (no more than 3 minutes). Then have the discussion where you ask the various groups what safety topics they identified.

Write these on the board.

Encourage students to put SAFETY FIRST. Their Mothers asked you to say this.



Instructor Notes: Present the following key points.

This slide summarizes several key aspects of winter weather safety, many of which should have been identified from the green sheet exercise.

This provides an opportunity to emphasize SAFETY associated with winter maintenance operations.

Point out that SAFETY will be discussed throughout the training



Instructor Notes: Present the following key points.

TxDOT has an initiative entitled FOCUS ON SAFETY.

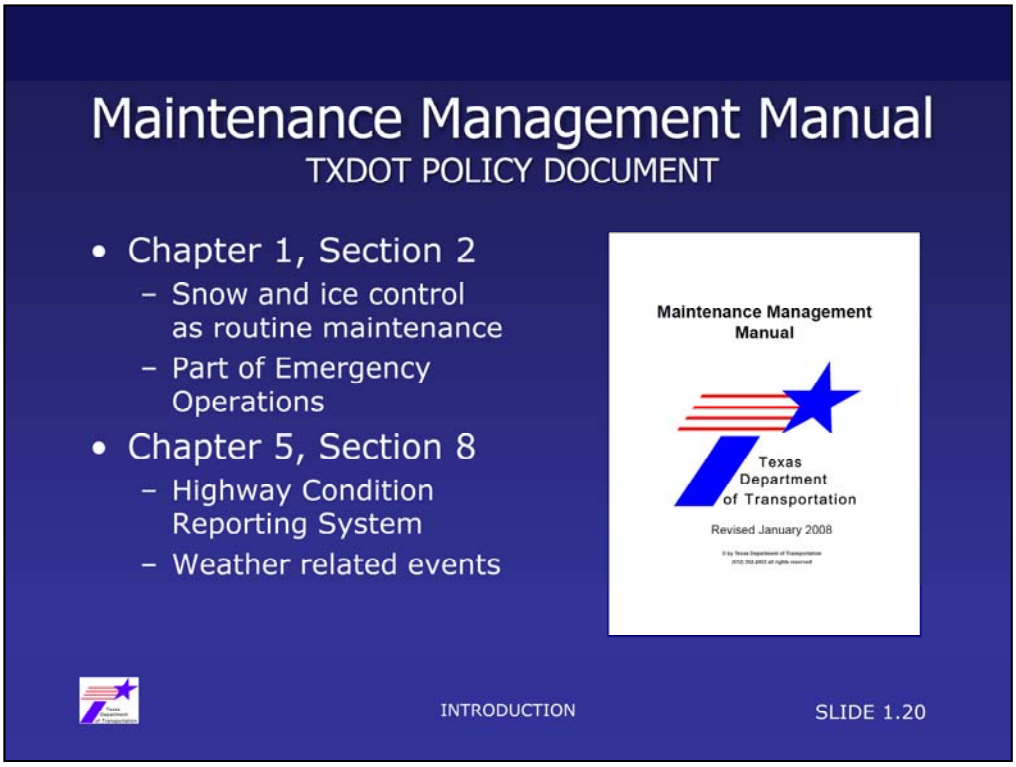
This certainly has its place in winter weather maintenance.

There is no substitute for safety.



Instructor Notes: Present the following key points.

The third topic is Maintenance Policy.

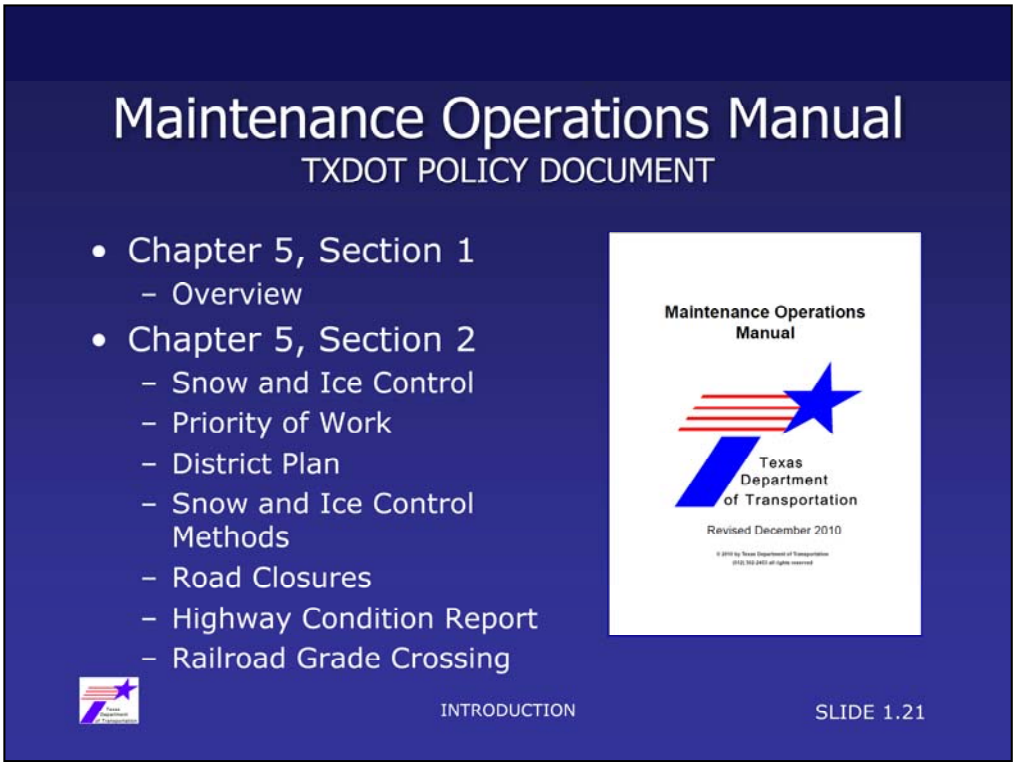


Instructor Notes: Present the following key points.

This series of slides is to let you know that policy exists relative to winter maintenance operations. Your Supervisor knows this in detail.

For operations personnel, it is important that you understand that the policy exists.

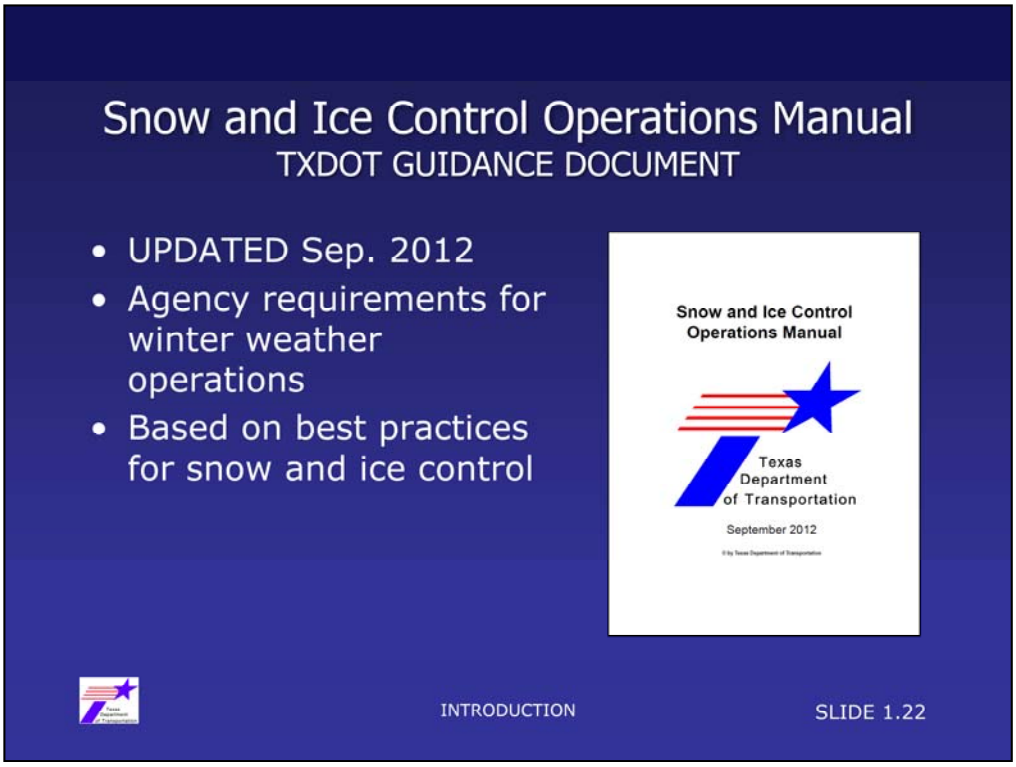
The Maintenance Management Manual is TxDOT's most high-level policy document, and it defines snow and ice control as routine maintenance which is part of emergency operations.



Instructor Notes: Present the following key points.

The Maintenance Operations Manual provides a lot more detail.

Note the topics identified.



Instructor Notes: Present the following key points.

TxDOT has a manual specifically on the topic of Snow and Ice Control Operations.

As instructor, you should have a copy of this to show the class, and to pass around.

State that this Manual has been recently updated, and it provides detailed guidance about how TxDOT maintenance forces are to respond to winter storms.

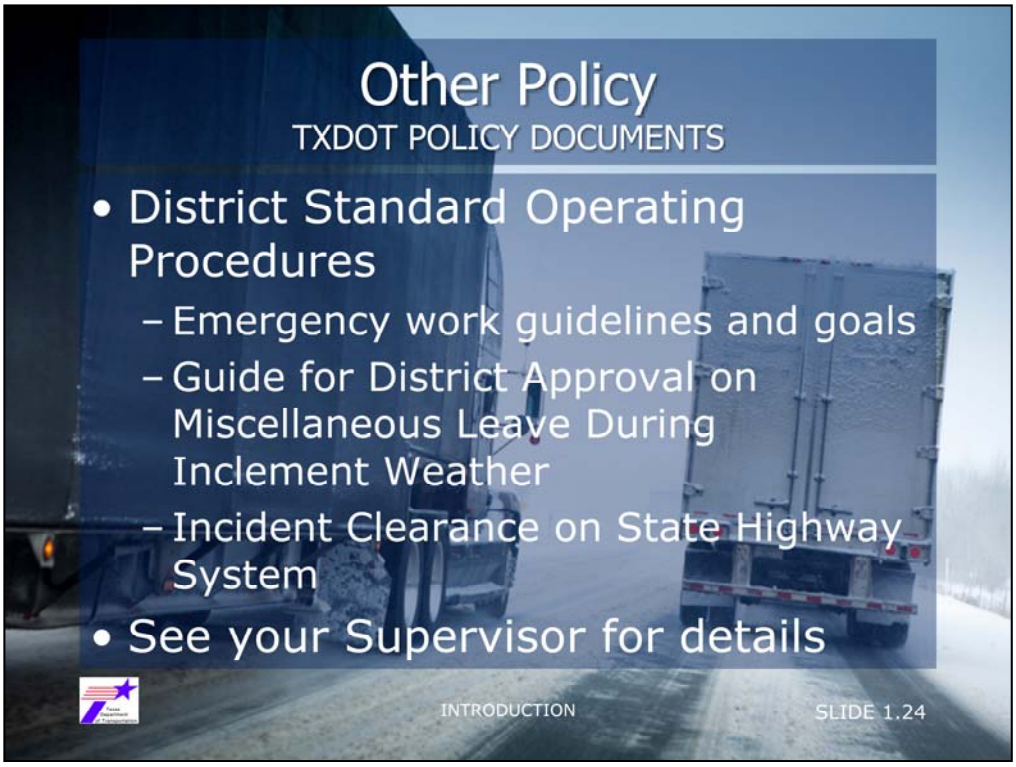


Instructor Notes: Present the following key points.

This is a TxDOT Public Service Document (brochure).

Note reference R1.2 … the brochure is included at the end of the module.

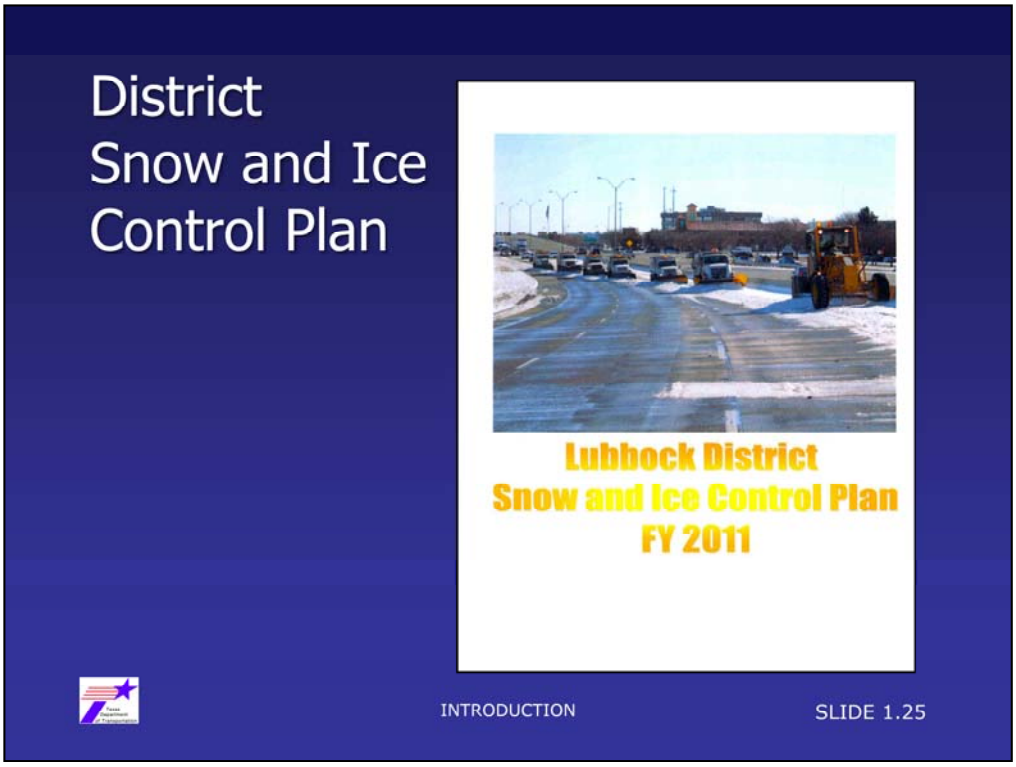
This brochure is available to the public. It provides helpful information to them.



Instructor Notes: Present the following key points.

TxDOT Districts have other winter weather policy documents as well, some of which are identified here.

The maintenance Supervisor will know about and have these.



Instructor Notes: Present the following key points.

One of the key policy documents for winter weather operations is the DISTRICT SNOW AND ICE CONTROL PLAN.

As instructor, you should have a copy of several (perhaps all) of these for each District. In particular, you should have a copy for the district where you are training.

This is the primary document that operations personnel need to know about.



Instructor Notes: Present the following key points.

The District Snow and Ice Control Plan will discuss many things, some of which are shown on the slide.

Note in particular the appendices. These are of specific interest to operations personnel.



Instructor Notes: Present the following key points.

This section discusses various strategies for winter weather operations.



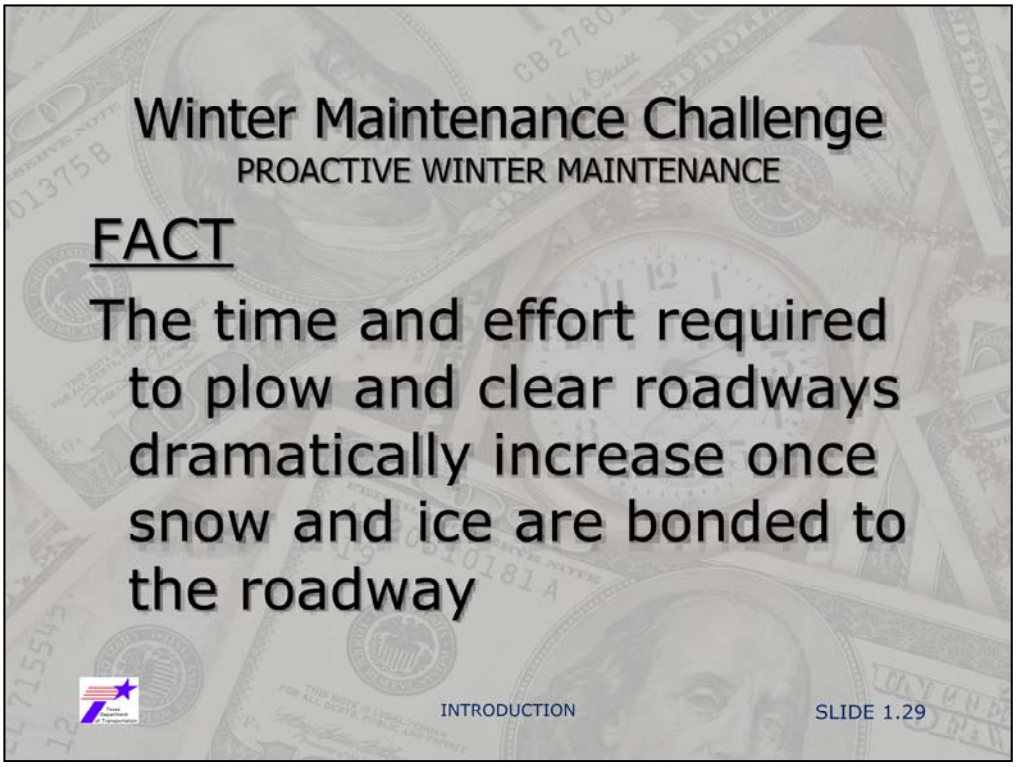
Instructor Notes: Present the following key points.

We need to begin by defining three key winter weather operations terms:

•ANTI-ICING

•DE-ICING

•TRACTION IMPROVEMENT.



Instructor Notes: Present the following key points.

Point out that this is a true statement which is of significance to maintenance personnel.



Instructor Notes: Present the following key points.

Here is the basic idea:

Wouldn't it be "neat" if there was some way to keep snow and ice from bonding to the roadway, much like we use cooking spray to keep our eggs, potatoes, etc. from sticking to the frying pan.

Fortunately, this does exist.



Instructor Notes: Present the following key points.

The strategy that keeps snow and ice from bonding to the roadway surface is called "anti-icing."



Instructor Notes: Present the following key points.

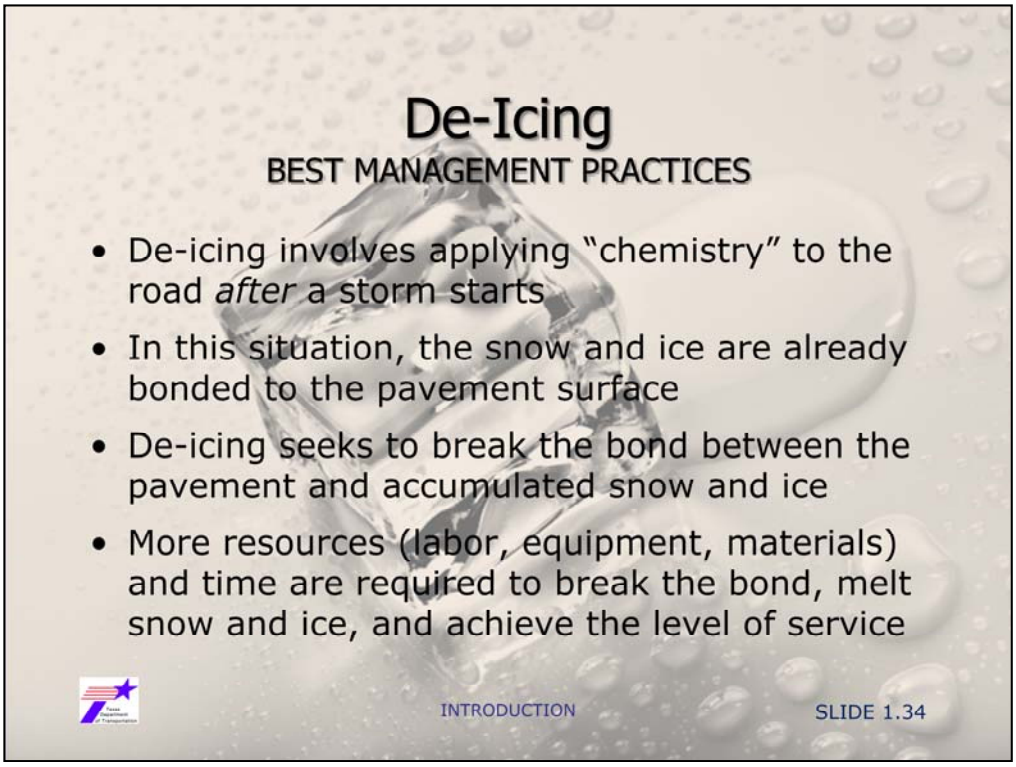
This is the formal definition of anti-icing.

Emphasize that anti-icing is done prior to the snow/ice event.



Instructor Notes: Present the following key points.

De-icing is used when snow and ice are already on the road.



Instructor Notes: Present the following key points.

This is the formal definition for de-icing.

Note that chemicals are required, and these are applied on top of the snow and ice. Thus, traffic is necessary to work the chemical down to the pavement surface.

That is why de-icing takes more effort and more chemical that anti-icing.



Instructor Notes: Present the following key points.

UNLIKE anti-icing and de-icing, traction improvement DOES NOT use chemicals.

Traction improvement only uses inert materials, such as sand, ice chatt, etc., to improve friction on the pavement surface (which is coated with snow/ice).



Instructor Notes: Present the following key points.

Traction improvement is accomplished with abrasives, as shown here.



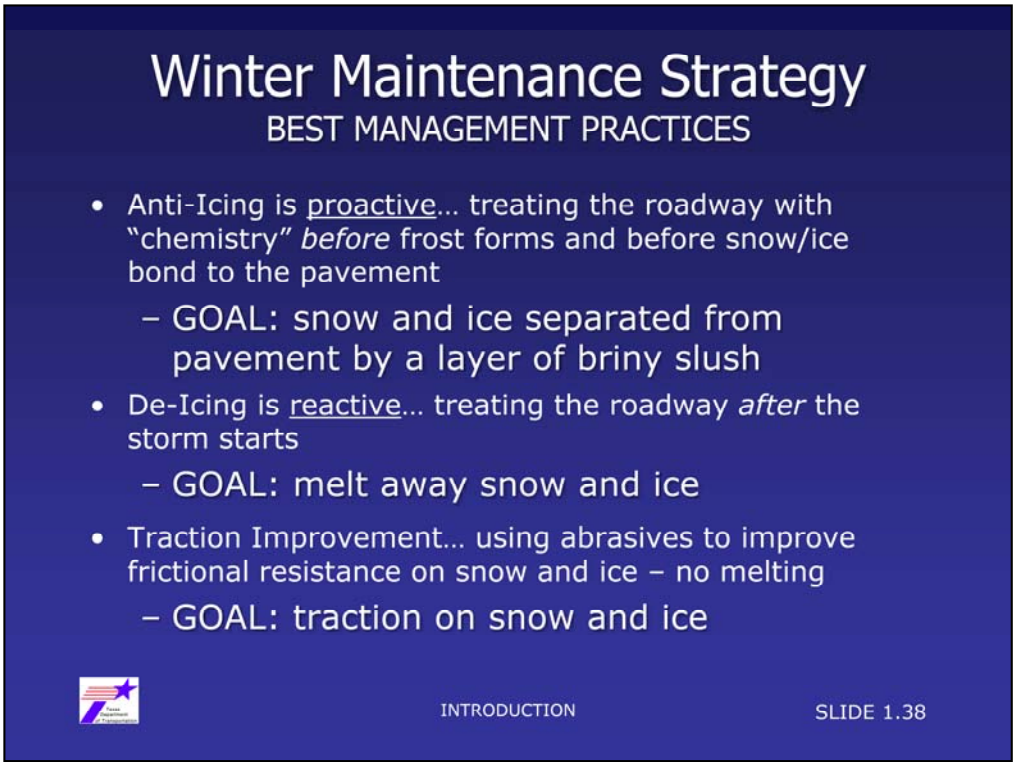
Instructor Notes: Present the following key points.

This video summarizes the different snow and ice treatment strategies.

TWO things to note:

1. This video was produced by the IOWA Department of Transportation. The Iowa DOT is a national leader in snow and ice maintenance operations. Iowa gets a lot of winter weather, and the Iowa DOT knows a lot about how to deal with it. They were gracious to allow us to use their videos for this training.
2. The reason we do not use ALL of the IOWA DOT videos (although we do use many of them) is because Texas weather is different from Iowa. Therefore our roadway maintenance operations have to be different. This is a TEXAS course, and while we adapted training resources from IOWA and others, our focus will be on Texas winter roadway maintenance.

As always, the blue reference marker (R1.3) means the video script is included.



Instructor Notes: Present the following key points.

This slide summarizes the three terms.

Notice the goal for each is different.



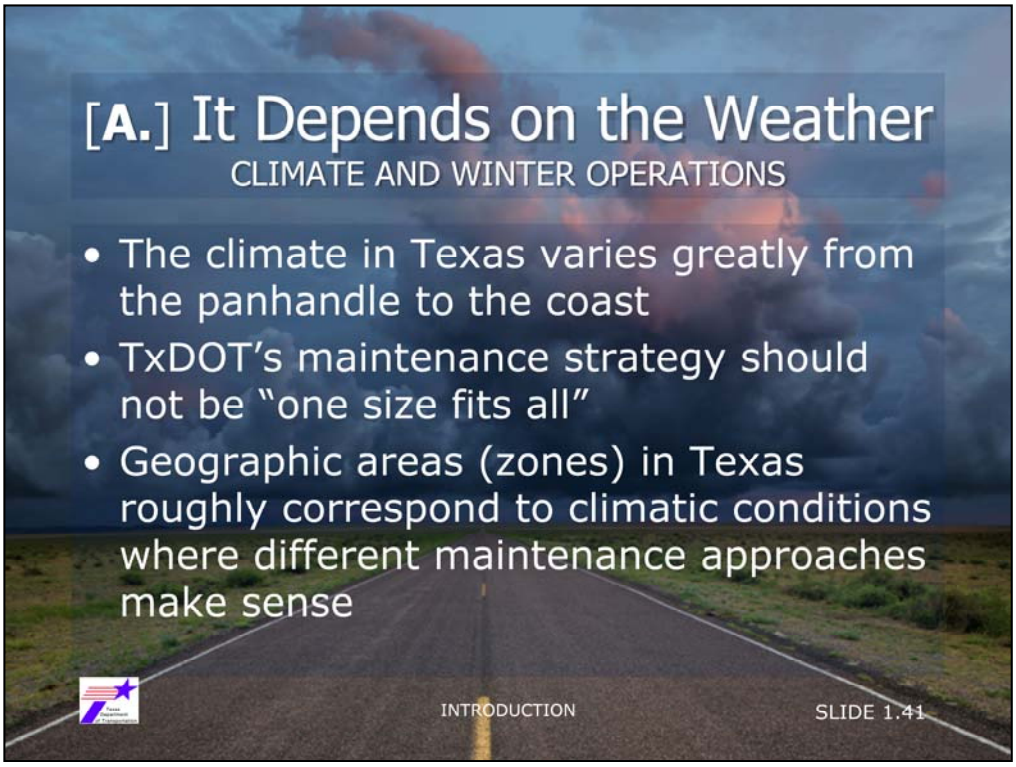
Instructor Notes: Present the following key points.

The images are intended to communicate that snow and ice control chemicals, responsibly used with an appropriate anti-icing and de-icing strategy, can significantly improve treatment effectiveness and reduce the effort needed to achieve this.



Instructor Notes: Present the following key points.

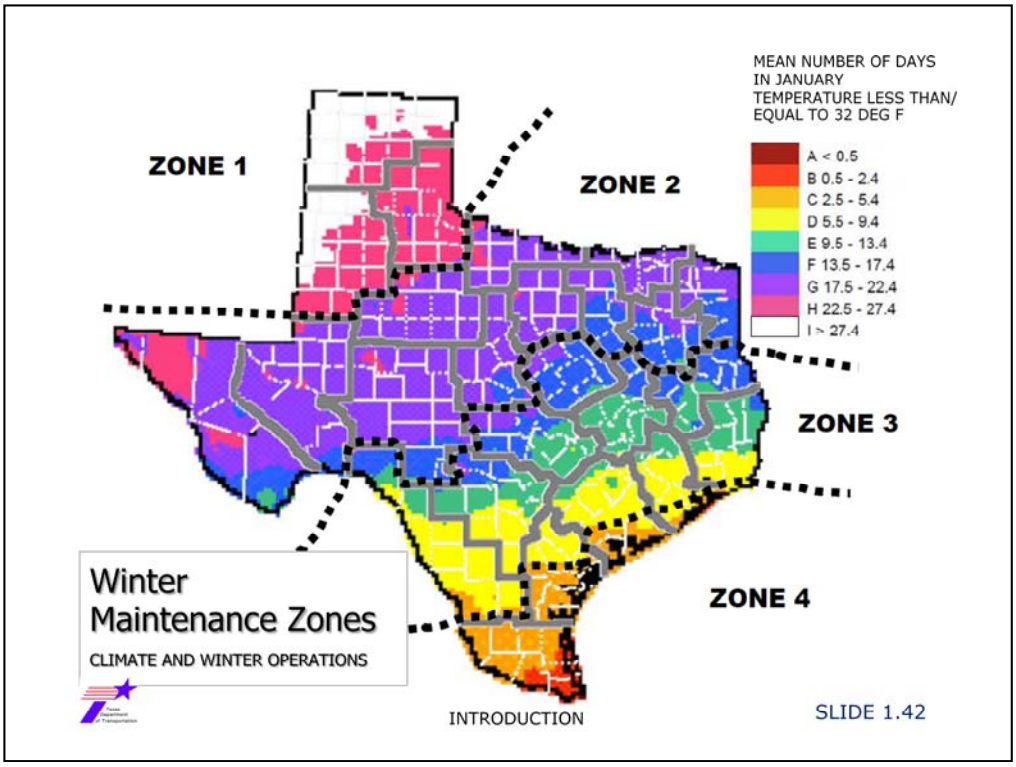
This brings up a question for the District maintenance personnel who are in the training.



Instructor Notes: Present the following key points.

The answer to the question is that the roadway maintenance strategy for snow and ice control will depend on the weather.

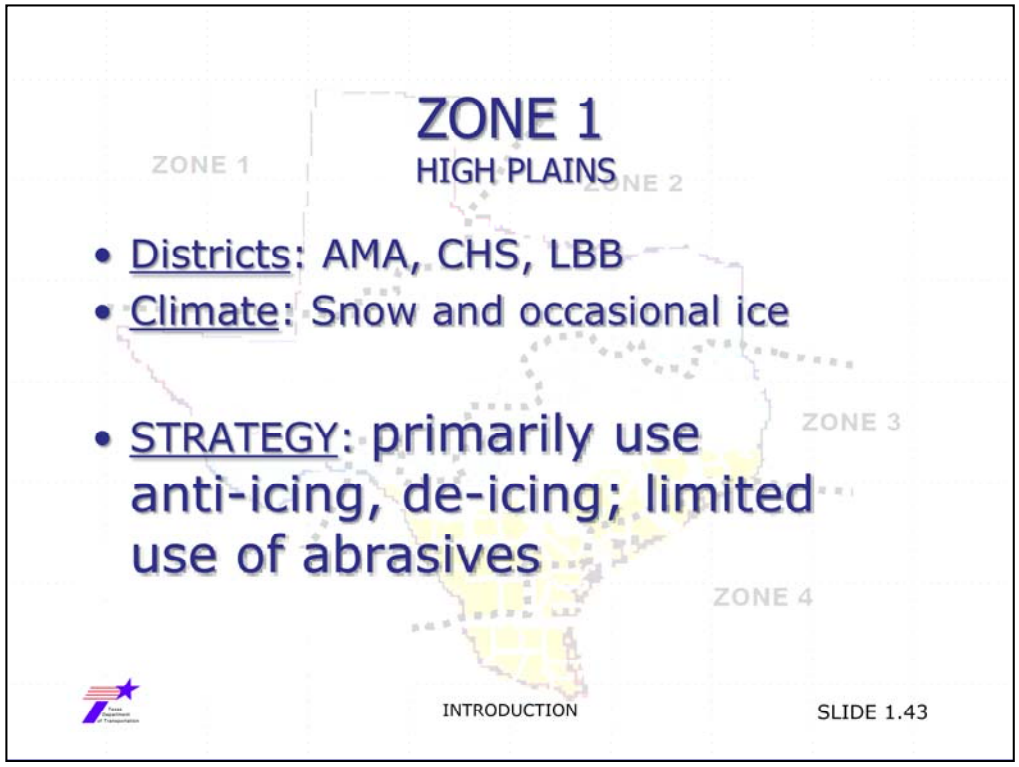
Emphasize that maintenance personnel in different areas of the state do things differently, and for good reasons.



Instructor Notes: Present the following key points.

This map identifies four zones in Texas that roughly depict areas where different snow and ice control operational strategies make sense.

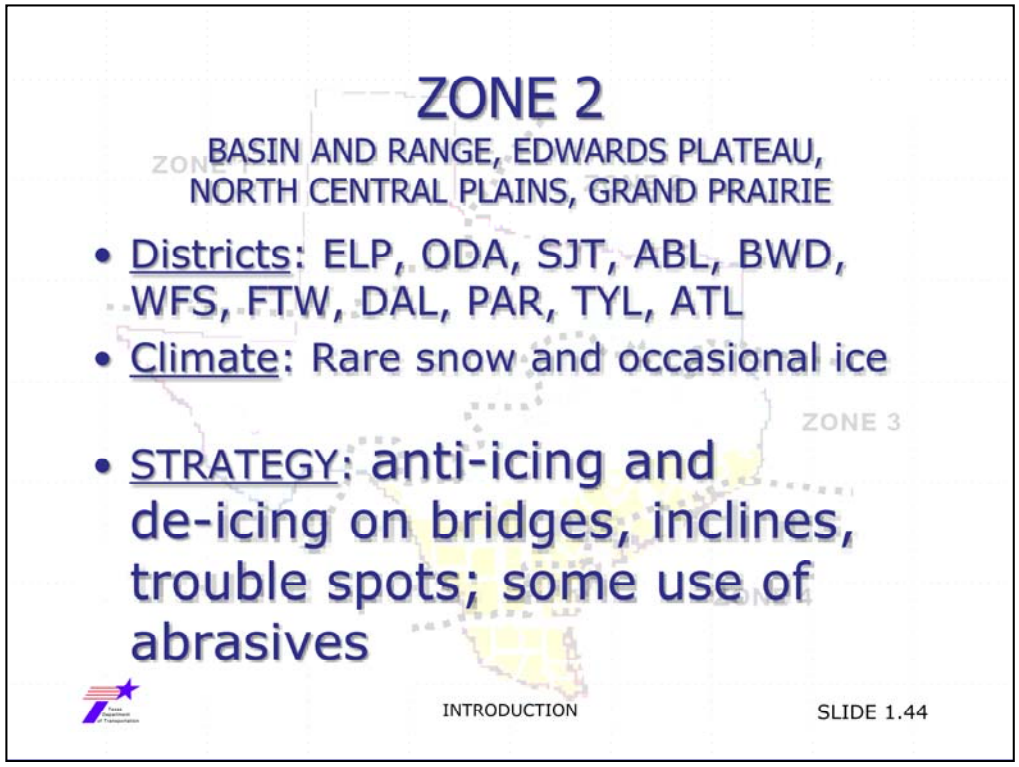
Take time to name the four zones, and point out where they are in the state.



Instructor Notes: Present the following key points.

Here is the treatment strategy for the Panhandle area of the state, which is the area that gets the most snow.

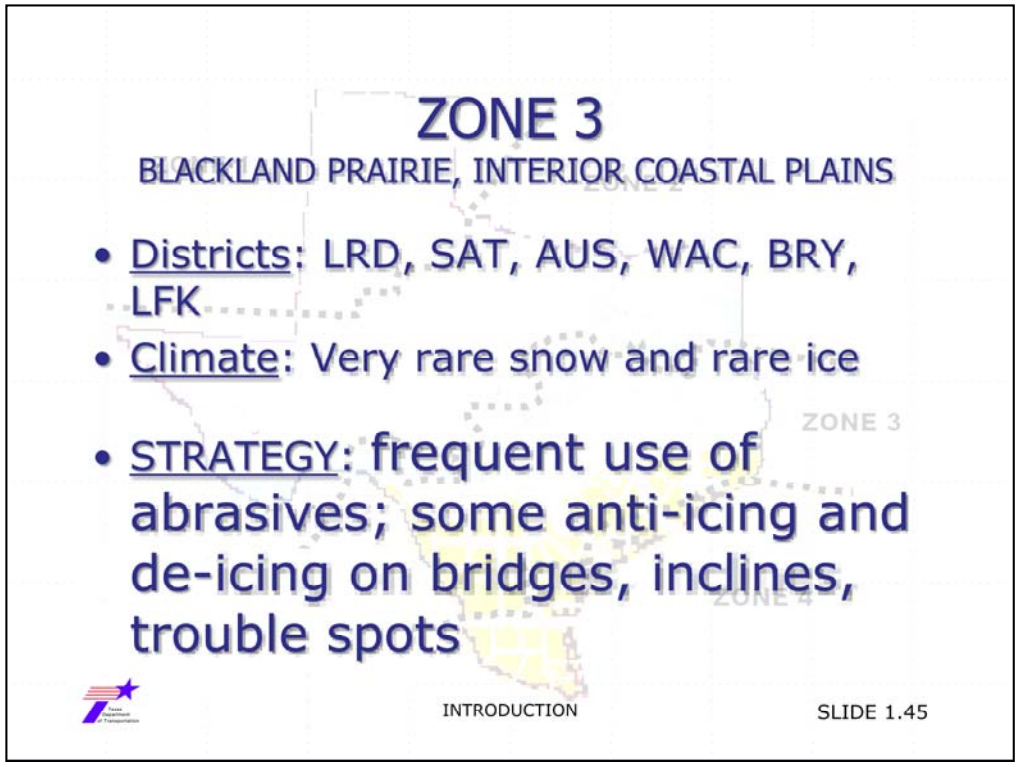
These maintenance personnel deal with winter weather every season.



Instructor Notes: Present the following key points.

Here is the treatment strategy for the area roughly between IH20 and the south limit of the Texas Panhandle, i.e., the Caprock.

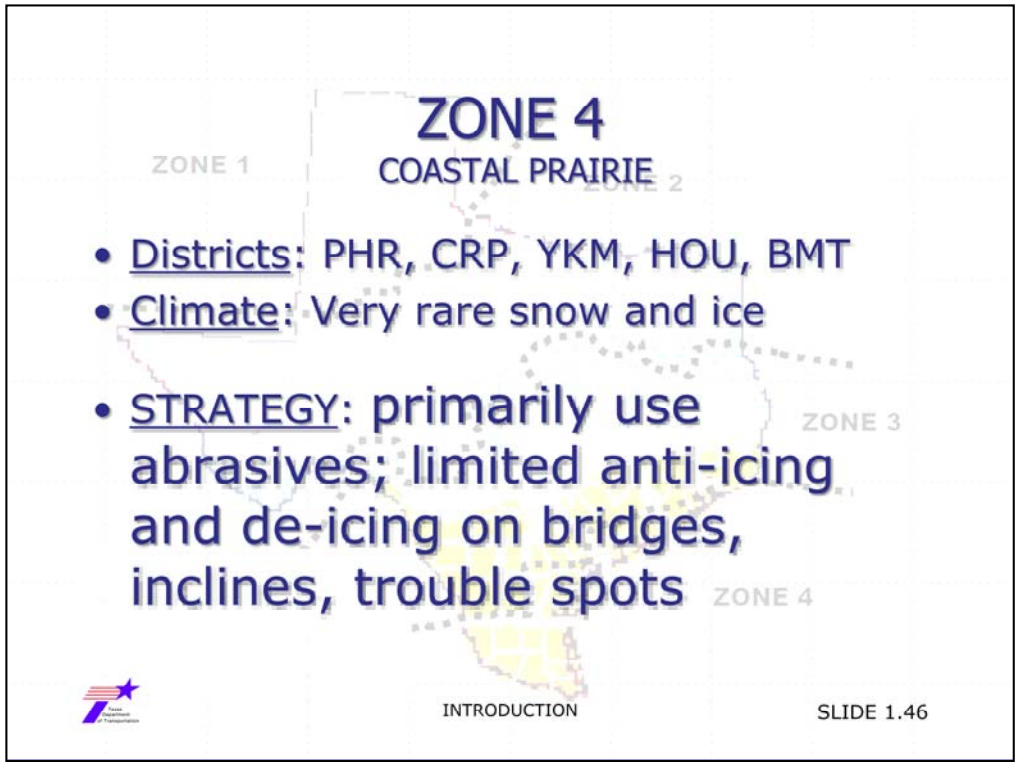
Notice that this area gets more ice than snow, and it does include some major metropolitan areas.



Instructor Notes: Present the following key points.

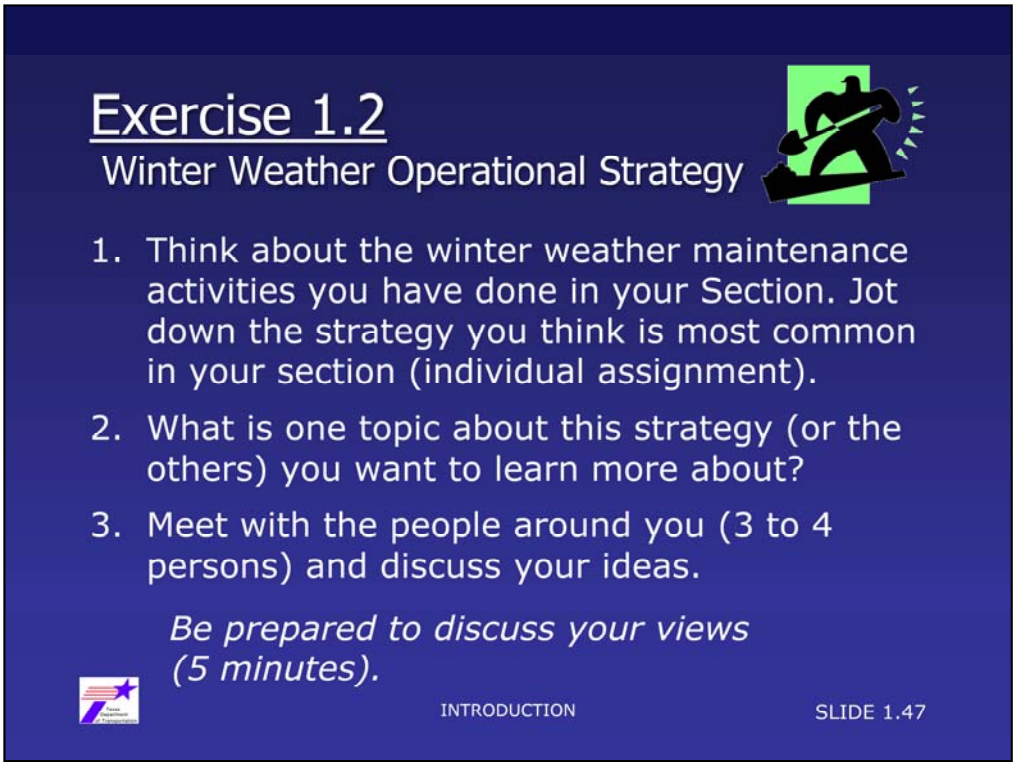
This is the area from IH20 south to the Gulf Coast. The type of weather here is similar to that of the previous zone, but winter weather is less frequent in Zone 3.

A different strategy makes sense.



Instructor Notes: Present the following key points.

The Gulf Coast does not get much winter weather, but it does get some. Frost and black ice can be a problem for bridges, overpasses, etc.



Instructor Notes: Present the following key points.

GREEN SHEET.

This green sheet activity is to encourage the students to think about what strategy they use in their own maintenance section, and in particular, what they feel they need to learn more about.

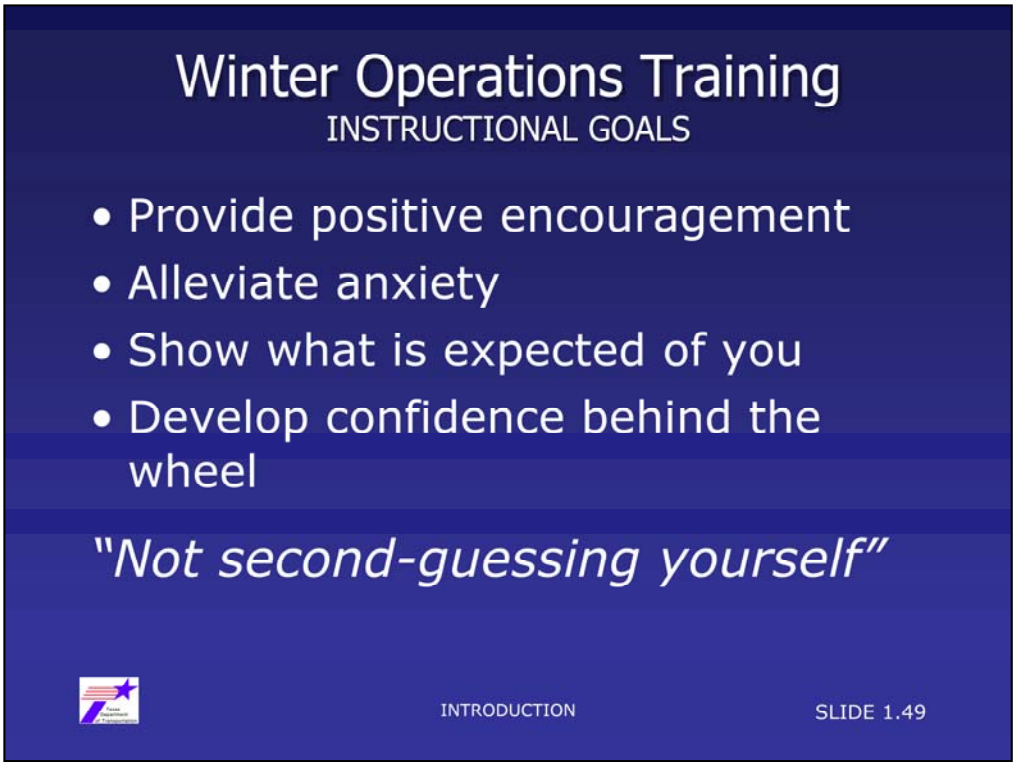
Do this if the schedule allows.

If the schedule does not allow, mention that we will be discussing aspects of all the different maintenance strategies in the remainder of this training.



Instructor Notes: Present the following key points.

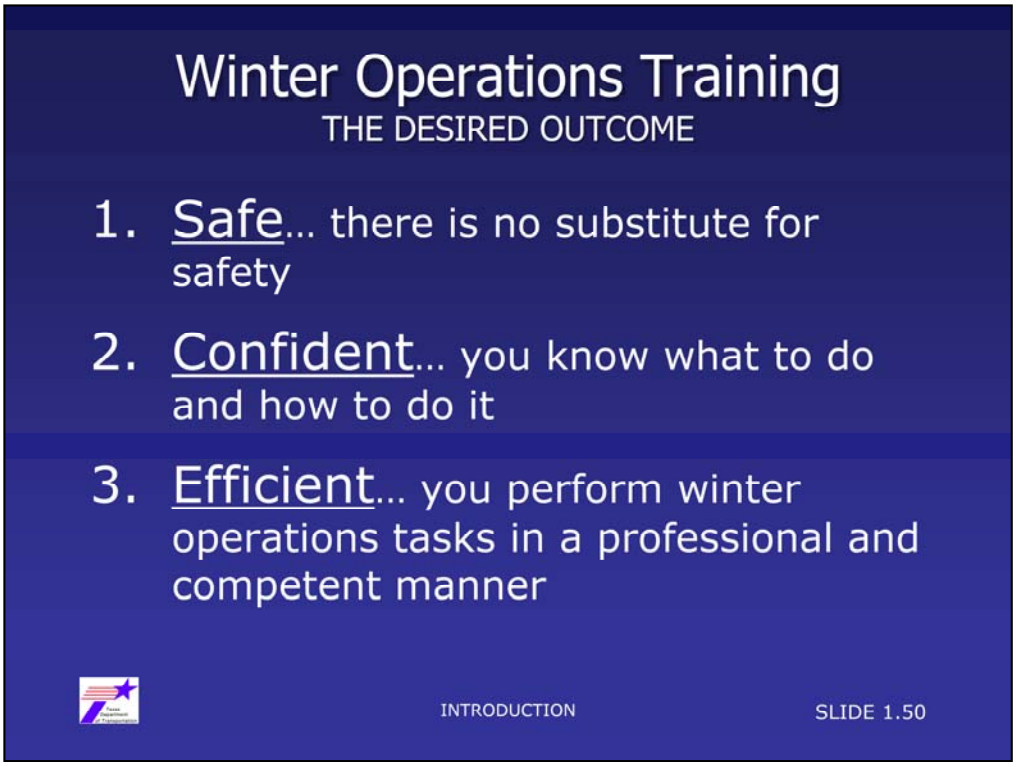
What does TxDOT intend that the operators take away from this training?



Instructor Notes: Present the following key points.

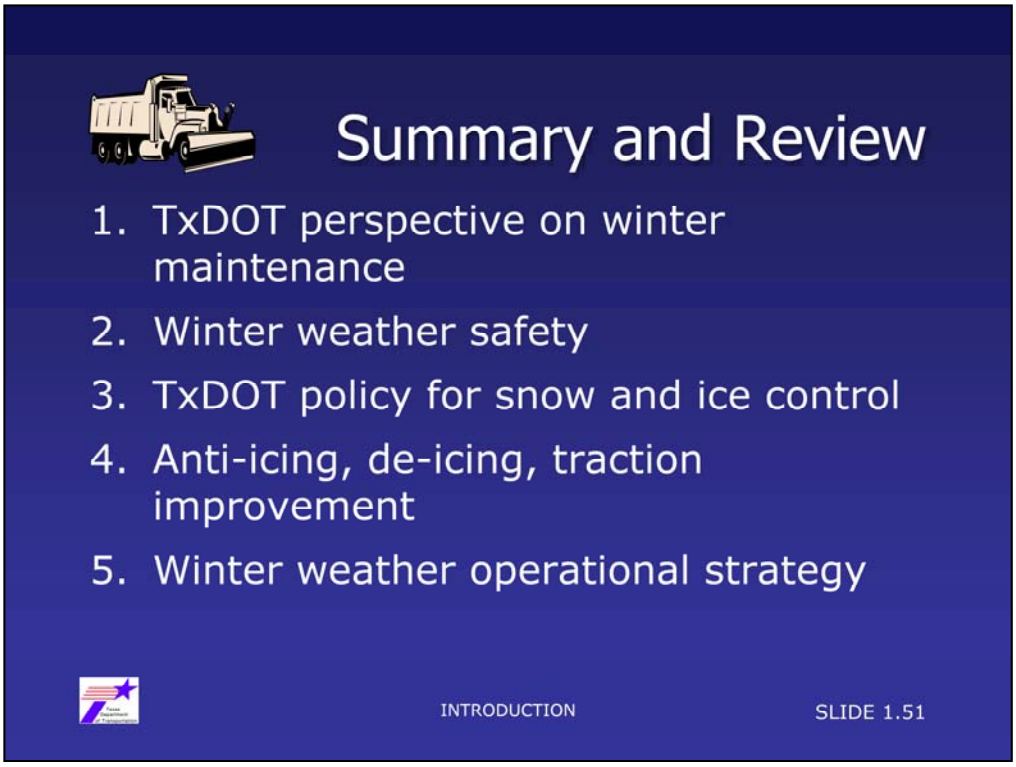
This is what the training is intended to provide to operations personnel.

Highlight the key points.



Instructor Notes: Present the following key points.

These are the qualities of a well-trained operator. This is what students in the course should strive for, and it is what TxDOT wants.



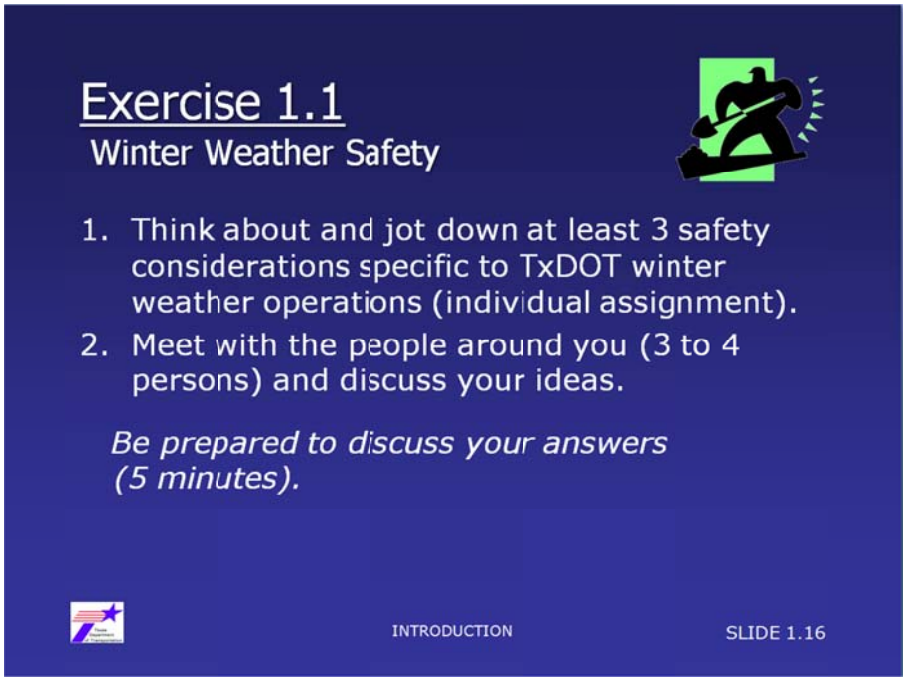
Instructor Notes: Present the following key points.

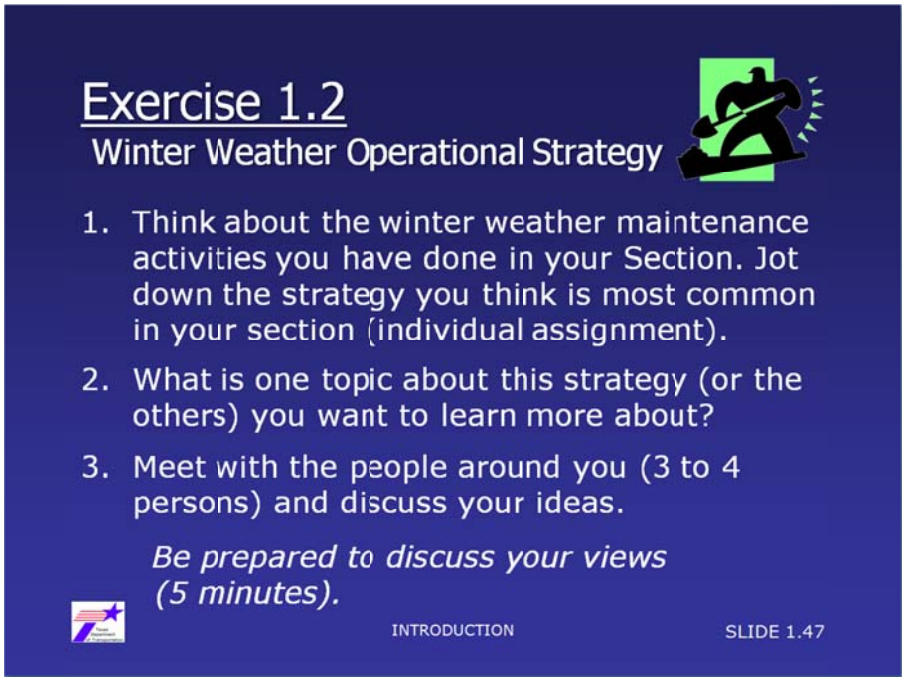
PINK SHEETS!

The SNOW PLOW icon means this is the review exercise… i.e., the PINK SHEETS.

Go through the pink sheets.

Answer each question.


Exercise 1.1
Winter Weather Safety
1. Think about and jot down at least 3 safety considerations specific to TxDOT winter weather operations (individual assignment).
2. Meet with the people around you (3 to 4 persons) and discuss your ideas.
Be prepared to discuss your answers (5 minutes).
INTRODUCTION
SLIDE 1.16


Exercise 1.2
Winter Weather Operational Strategy
1. Think about the winter weather maintenance activities you have done in your Section. Jot down the strategy you think is most common in your section (individual assignment).
2. What is one topic about this strategy (or the others) you want to learn more about?
3. Meet with the people around you (3 to 4 persons) and discuss your ideas.
Be prepared to discuss your views (5 minutes).
INTRODUCTION
SLIDE 1.47

VIDEO 1.1. TXDOT WINTER WEATHER MAINTENANCE (02:00)

SCRIPT

The Citizens of Texas expect us to keep our highways safe and open to traffic during winter storm events. This is a responsibility we must meet. By clearly describing our expectations and policies, carefully planning and preparing, and effectively communicating this information to our employees, we can accomplish this goal.

We are fortunate that here in Texas, we don't normally experience harsh winter weather, like many states north of us do. However, the 2011 winter storm that slammed into Texas during Super Bowl XLV showed us the importance of being adequately prepared before snow and ice storms strike.

Proper planning and preparation are critical to successfully respond to storm events. We must clearly define for our employees what we expect of them and the roles that we will play should we be called into action.

In support of this objective, the Administration is working with the Districts and Divisions to take specific steps to ensure we have an effective statewide response to any winter storms.

You will be asked to understand and explain TxDOT's commitment to the traveling public in your District, to know and understand your own responsibilities when responding to winter weather, and to coordinate your efforts with others to achieve an effective response when faced with a winter weather event – whether that be in your district or in other areas of the state.

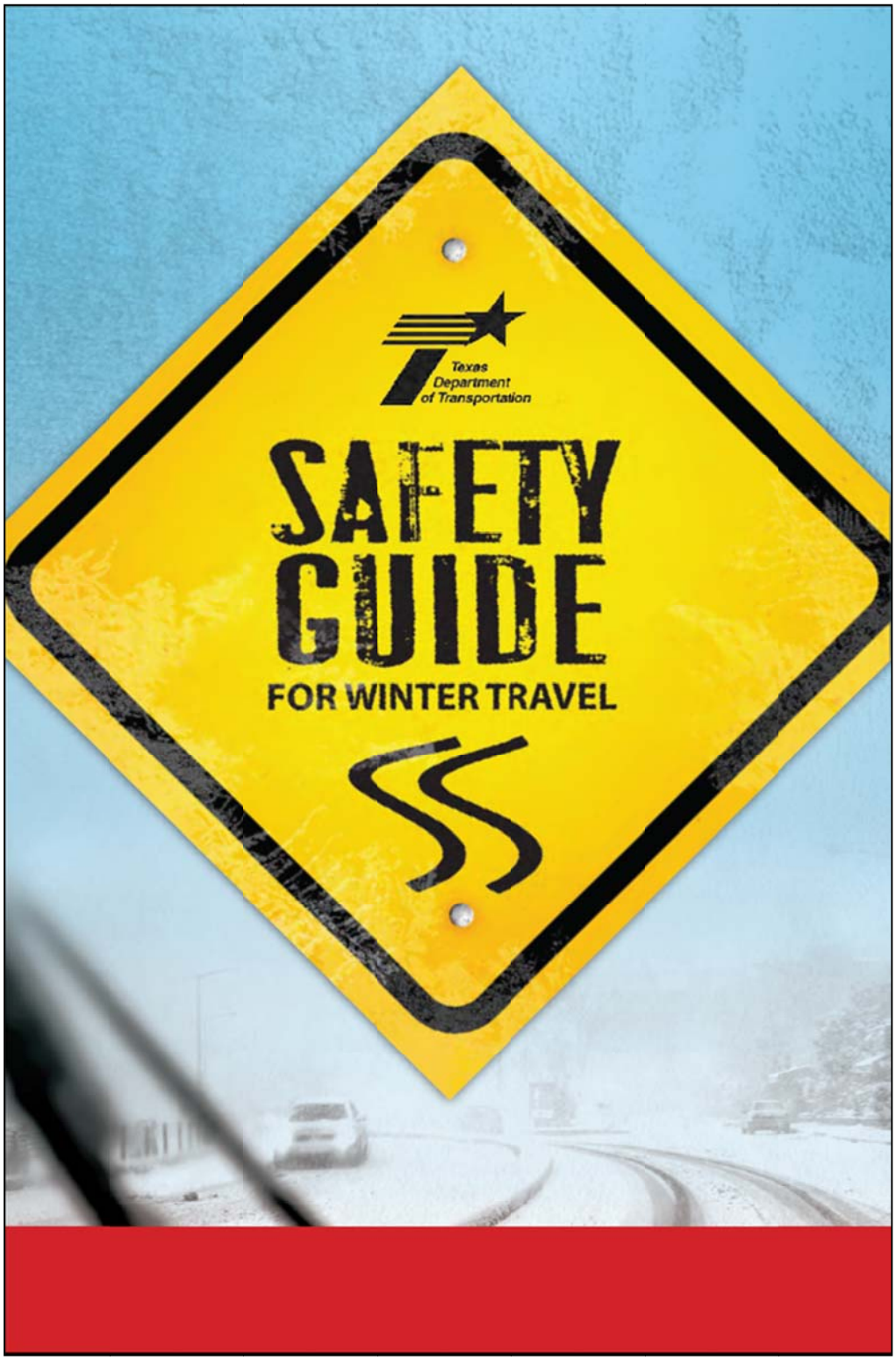
In all cases, communication – both internally within TxDOT and externally to the cities, counties, emergency responders, and other safety personnel in affected areas – is critical.

By diligently planning and preparing for winter weather events, we will ensure Texas has a safe and reliable transportation system, no matter what Mother Nature will bring our way. This is our mission, this is what the Citizens of Texas expect of us, and this is what we do every day.

Thank you.

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TXDOT PUBLIC SERVICE DOCUMENT (WINTERSAFE)



Source: TxDOT Internet Website, 2012.


WinterSafe
TEXAS DEPARTMENT OF TRANSPORTATION
WE'RE READY
Winter emergency road preparedness
Hazardous weather can unexpectedly change from freezing ice to snow and fog in some areas of the state. TxDOT works 24/7 to ensure our roads remain passable and safe year-round. Road Crews throughout the state are especially prepared to improve road safety during severe winter weather conditions.
Particular attention is given to bridges, high traffic interchanges and roadways. TxDOT uses snowplows, salt spreaders and liquid de-icing rigs to assist with de-icing/anti-icing of the roadways and bridges.
TxDOT stockpiles various types of de-icers and anti-icing agents for winter storms as well as sand or small aggregate. Because each winter storm is unique, TxDOT will use a combination of materials and equipment depending on the severity of the storm.
TREATING THE ROADS
Each area of Texas treats roads based on weather conditions.
The two most common materials used to include:
Liquid Anti-Icing solution to prevent roads from iding
Granular De-Icing materials to improve traction.
USE CAUTION!
Simple driving tips to practice on the roads
TxDOT's #1 priority is the safety of the traveling public, including using every resource available to keep the roads open and passable during winter storms. Motorists should always exercise caution and, if possible, allow extra time to reach destinations or delay travel until conditions improve.
Remove snow and ice from your vehicle before you drive
Maintain your vehicle in accordance with manufacturer's recommendations
Ensure headlights and tail lights are functioning properly
Accelerate slowly, drive slowly, and observe traffic signs and alerts
Approach bridges, shaded spots, and turns slowly


PLAN FOR THE ROAD
Reduce your risks and avoid winter road hazards
You can reduce your risk by simply practicing a few road safety habits. Avoid getting caught by surprise, plan ahead, and be aware of alerts and advisories. Good road safety tips include:
Stay tuned to local news and weather alerts
Obtain information about road conditions online at www.TxDOT.gov keyword: ROAD CONDITIONS or by calling 1-800-452-9292
AUTO SAFETY CHECK
Ensure your vehicle is maintained
Wiper blades
Heater/defroster
Ignition/battery
Anti-freeze level
Headlights and tail lights
Fuel
Brakes
Tires
PREPARE A ROAD EMERGENCY KIT
Booster cables
Texas road map
Chain/tow strap/shovel
Abrasive materials (sand or cat litter)
First-aid kit
Flashlight
Extra pair of socks and gloves
Blanket
Batteries
Snacks and water
Ice Scraper
Flares and matches
TxDOT Road Conditions 24 Hour Hotline: 1-800-452-9292
www.TxDOT.gov Keyword: Winter Weather


ROAD SAFETY ALERT
TAKE EXTRA PRECAUTIONS
while traveling through remote counties, primarily in North and West Texas during winter months.
Historically, North and West Texas experience the heaviest snowfalls, extreme white-outs, icy road and bridge conditions. These areas are generally where you could encounter major winter storms. If you plan to travel on roads leading towards El Paso or Amarillo be prepared. Rural areas of the state have very limited- to- no access to food, lodging, gas, or emergency medical services.
STAY INFORMED. BE WINTERSAFE.
The information contained in this safety guide is intended to help you be aware of potential hazardous conditions andcontains tips to improve your road safety preparedness. Stay tuned to local news for road closures, changing conditions, and advisories.
For more information visit www.TxDOT.gov Keyword: Winter Weather
WinterSafe
TEXAS DEPARTMENT OF TRANSPORTATION
Follow us on:
Texas Department of Transportation
Texas Road Conditions Hotline: 1-800-452-9292
If stranded, call the Texas Department of Public Safety's Stranded Motorist Hotline toll-free 1-800-525-5555.

VIDEO 1.2. ANTI-ICING AND DE-ICING (01:58)

SCRIPT

It wasn't many years ago that a 50/50 mixture of rock salt and sand was the primary formula used to combat snow covered icy highways.

Today, advance materials technologies and methods are providing many more options for effective and cost efficient application of de-icing chemicals and abrasives.

Both anti-icing and de-icing techniques are becoming highly refined. That is because of the greater selection of de-icing chemicals, improved application equipment, better trained personnel, improved weather forecasting, and roadway weather information systems data.

But before we go further, let's define anti-icing and de-icing.

As the term anti-icing implies, it is taking measures prior to a precipitation event to prevent formation of a bond between precipitation and the pavement by timely applications of deicing chemicals.

In other words, anti-icing is a proactive weather fighting measure.

On the other hand, de-icing is a reactive measure to break the bond that has formed between ice and pavement by chemical or mechanical means or a combination of the two.

With each approaching winter storm you may want to first consider an anti-icing strategy. It can pay off handsomely through savings and material equipment and labor.

Research has shown that it is 10 times more expensive deice than it is to take anti-icing measures and keep precipitation from bonding to the road surface.

Anti-icing may not be the best answer in all locations at all times. Check with your supervisor to determine if anti-icing is suitable for your area.

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Class Exercise – Review Questions
Module 1 – INTRODUCTION

MNT812 Winter Weather Operations Training

1. The primary reason TxDOT Administration has sponsored this winter weather operations training is:

   A. Because some TxDOT maintenance personnel have not had snow and ice training.

   B. To help keep roadways safe and open for movement of people and commerce.

   C. Because winter maintenance training is now required by legislative mandate.

   D. To avoid criticism and liability arising from winter road conditions.

   The correct answer is B.

   Each selection has some truth to it, but Item B represents the mission of the agency.

2. Which of the following safety topics apply to winter maintenance operations?

   A. Cold weather health hazards

   B. Snowplow operations

   C. Defensive driving

   D. All of the above

   The correct answer is D.

3. Which TxDOT guidance document would be most useful when you need information on winter weather operations in your District?

   A. Snow and Ice Control Operations Manual

   B. WinterSafe Safety Guide for Winter Travel

   C. District Snow and Ice Control Plan

   E. Maintenance Management Manual

   The correct answer is C.

   The other documents contain useful information, but only Item C is specific to your District.

4. When you apply chemical to the road after the storm starts, to break the bond between the pavement and accumulated snow and ice, this is called:

   A. De-icing
   B. Traction improvement
   C. Anti-icing
   D. Post-storm cleanup

   The correct answer is A.

   This is the textbook definition of de-icing.

5. The main factor that determines your district's strategy for winter weather operations is:

   A. Equipment
   B. Labor
   C. Climate
   D. Public outcry

   The correct answer is C.

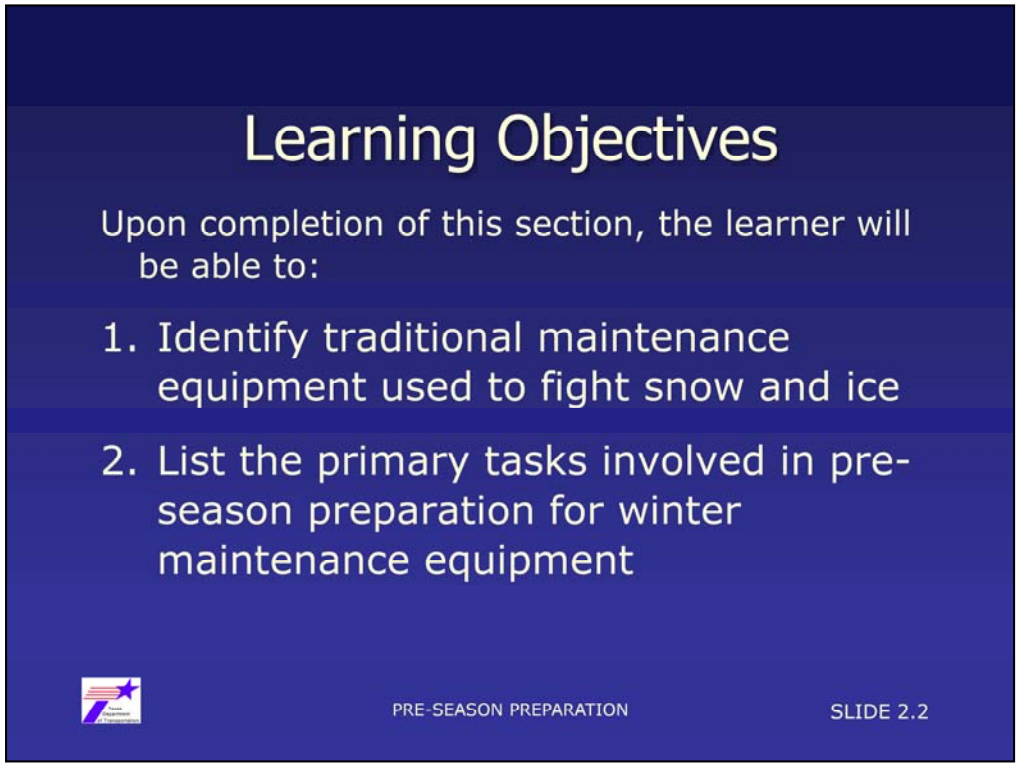
   All of the other things identified here may be involved, but winter weather strategy is primarily driven by climate, which is to say, the typical weather for a given area.



Instructor Notes: Present the following key points.

Effective winter weather response requires advance preparation.

Operations personnel have much to do to get ready for the winter season. This module introduces some of these pre-season activities.



Instructor Notes: Present the following key points.

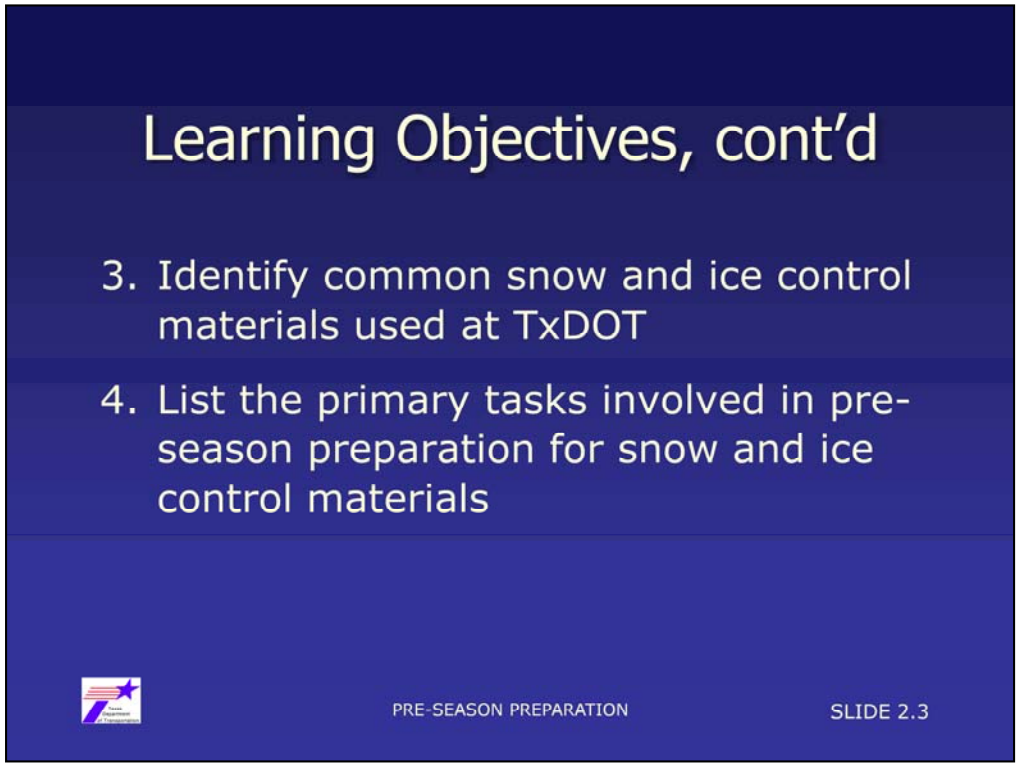
Note the learning objectives.

In this module, we will focus on pre-season activities associated with

•EQUIPMENT

•MATERIALS

These first two objectives discuss equipment.



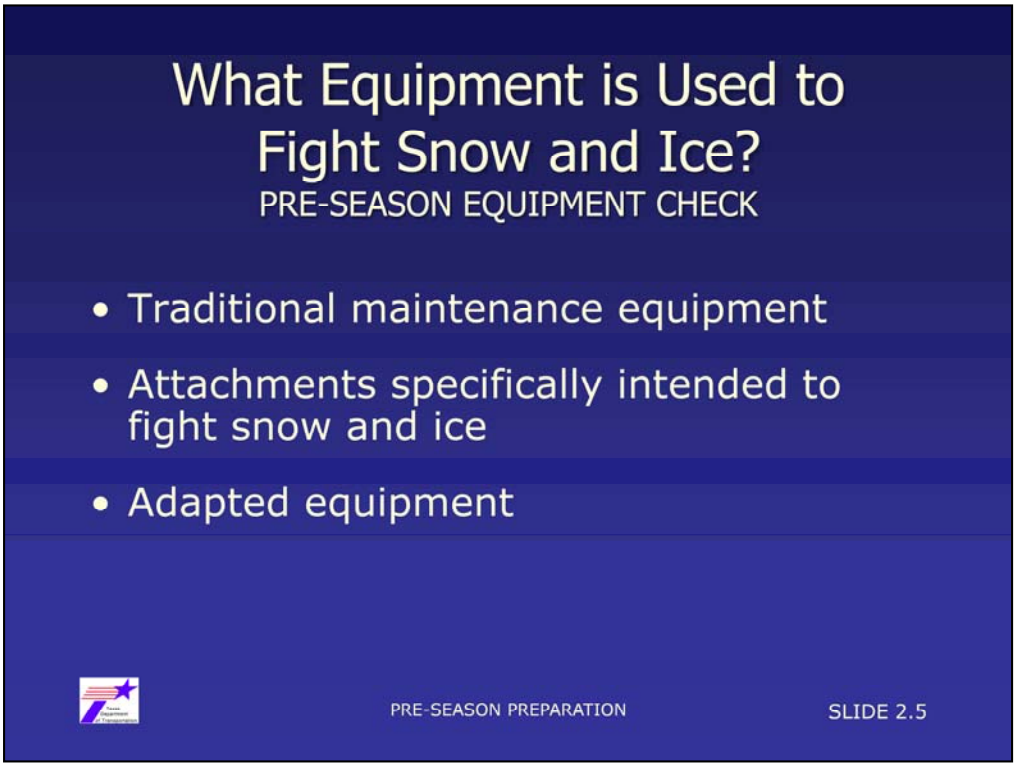
Instructor Notes: Present the following key points.

Learning objectives for materials.



Instructor Notes: Present the following key points.

EQUIPMENT.



Instructor Notes: Present the following key points.

It makes sense that TxDOT maintenance sections respond to winter weather using the equipment they have.

In most cases, this consists of TRADITIONAL maintenance equipment , such as is used throughout the year for other maintenance functions.

In addition to traditional equipment, some attachments are available specifically for snow and ice.

Adapted equipment also exists.



Instructor Notes: Present the following key points.

The TxDOT Snow and Ice Control Operations Manual identifies the dump truck as "the work horse" of winter weather response.

And so it is.



Instructor Notes: Present the following key points.

The V-box spreader, used to distribute granular snow and ice control chemicals, or abrasives, fits into the dump truck.



Instructor Notes: Present the following key points.

For those Districts that receive snow, the snow plow is mounted on the front of the dump truck.



Instructor Notes: Present the following key points.

Motor graders can be used to plow both snow and ice. All maintenance sections have these.



Instructor Notes: Present the following key points.

Loaders are used to stockpile and load the snow and ice materials into the V-box spreaders.



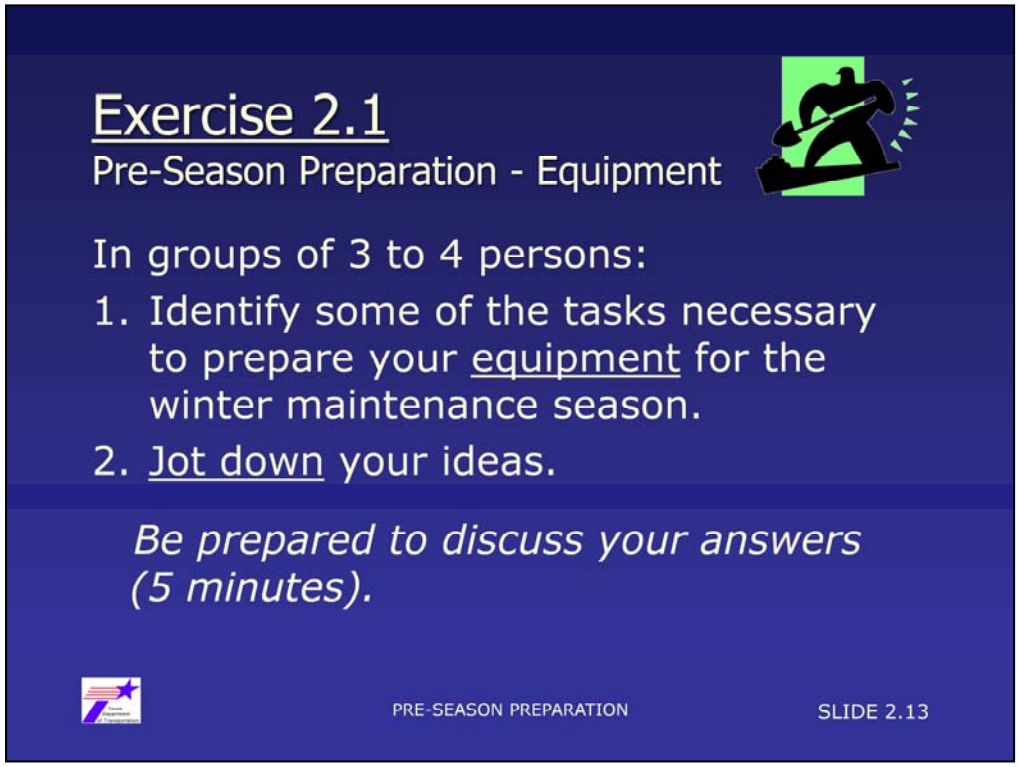
Instructor Notes: Present the following key points.

Liquid chemicals are applied using spray rigs. Often, these are herbicide rigs that are adapted to the winter chemical application.



Instructor Notes: Present the following key points.

What tasks need to be done to get equipment ready for the winter season?



Instructor Notes: Present the following key points.

GREEN SHEET.

It is helpful to do this exercise; then proceed with the material in the following slides.

Do if the schedule will allow.



Instructor Notes: Present the following key points.

Winter maintenance operations follow a cycle… Pre-season, in-season, post-season.

Think about meal preparation at home… Going to the grocery store, cooking the meal, eating the meal, cleaning up. It is a cycle.

Do you begin preparing breakfast each morning by washing up last night's supper dishes?

Winter maintenance operations are, or can be, a lot like this.



Instructor Notes: Present the following key points.

Thus, it is appropriate to begin with the END OF SEASON checklist.

NOTE the blue reference marker, R2.1. The checklist is included. Turn to this checklist, take it out, and have the students do the same.

If your maintenance section took care of these things at the end of the last season, you are ahead of the game.

If not, this is where you start your pre-season activity.



Instructor Notes: Present the following key points.

Snow and ice control chemicals are corrosive!

Thoroughly washing equipment is the best way to keep the equipment from rusting out.

This wash stand, which is a really nice one, exists in Shackelford County (ABILENE) District.



Instructor Notes: Present the following key points.

This is the front gear and chain drive for a V-box spreader conveyor system. Note that it is caked in road salt. CORROSIVE!

This is not the way you want to put away your equipment after the season.



Instructor Notes: Present the following key points.

This photo came to us from McHenry County, ILLINOIS.

It shows a high-end equipment wash station. The McHenry County maintenance group is serious about washing the snow and ice chemicals off of their equipment to prevent the equipment from rusting out.

New equipment is hard to come by. Better to do what is necessary to make it last.



Instructor Notes: Present the following key points.

Chloride neutralizers are often used to coat exposed metal surfaces post season. Different maintenance sections use different products.



Instructor Notes: Present the following key points.

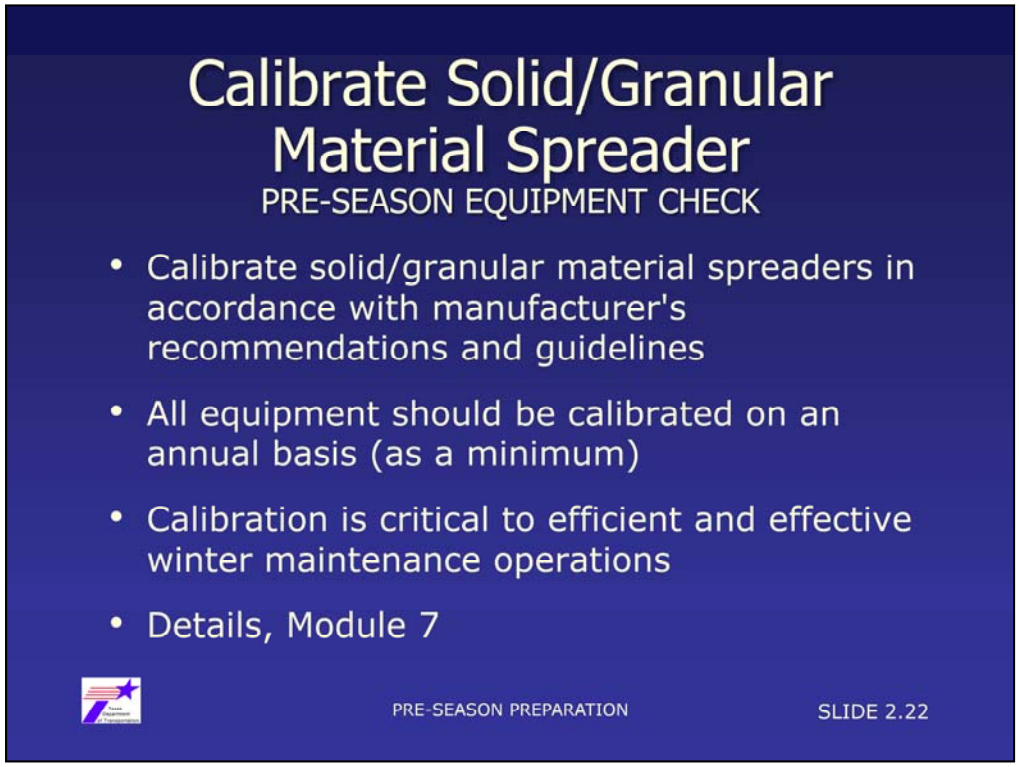
This video briefly discusses the equipment cleaning process.



Instructor Notes: Present the following key points.

V-box spreader calibration is definitely a PRE-SEASON activity.

Your Supervisor will ask you to help with this.



Instructor Notes: Present the following key points.

Note the points shown here.

We will discuss granular material spreader calibration in detail in MODULE 7.



Instructor Notes: Present the following key points.

Liquid spray rig calibration is another pre-season activity.



Instructor Notes: Present the following key points.

Note the points shown here.

We will discuss liquid spray rig calibration in detail in MODULE 8.



Instructor Notes: Present the following key points.

Part of pre-season equipment preparation includes checking the operational capability of your dump trucks.



Instructor Notes: Present the following key points.

NOTE reference R2.3…

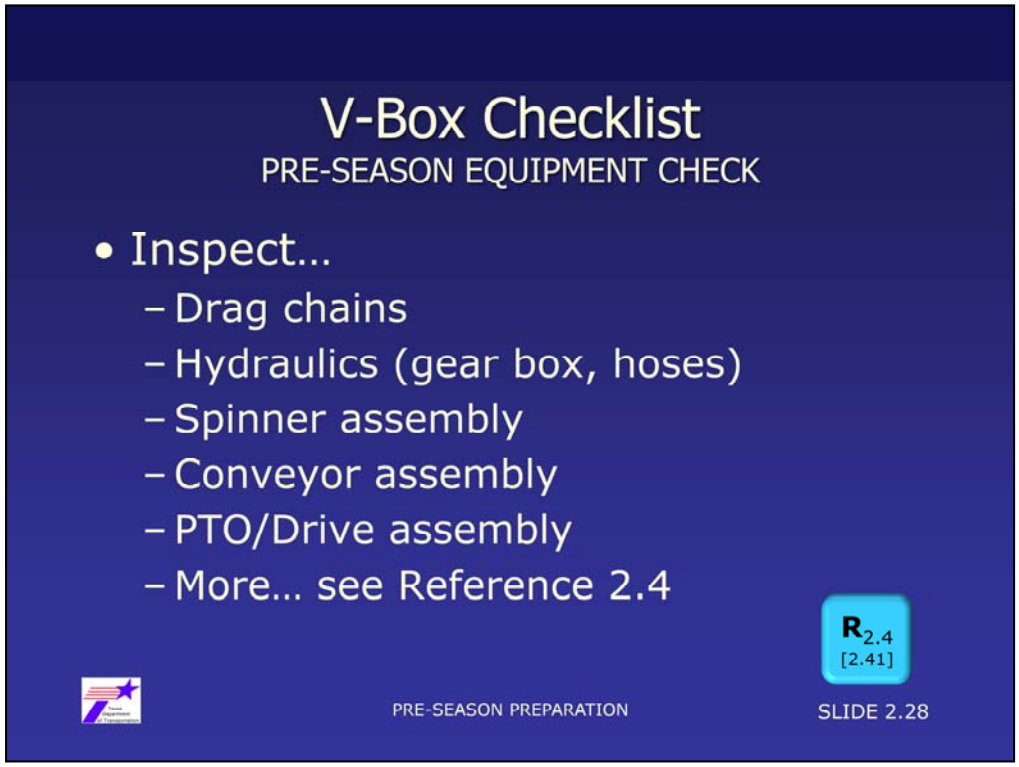
Review this checklist.

These things need to be done in the pre-season.



Instructor Notes: Present the following key points.

Check V-box spreaders.



Instructor Notes: Present the following key points.

NOTE the reference R2.4…

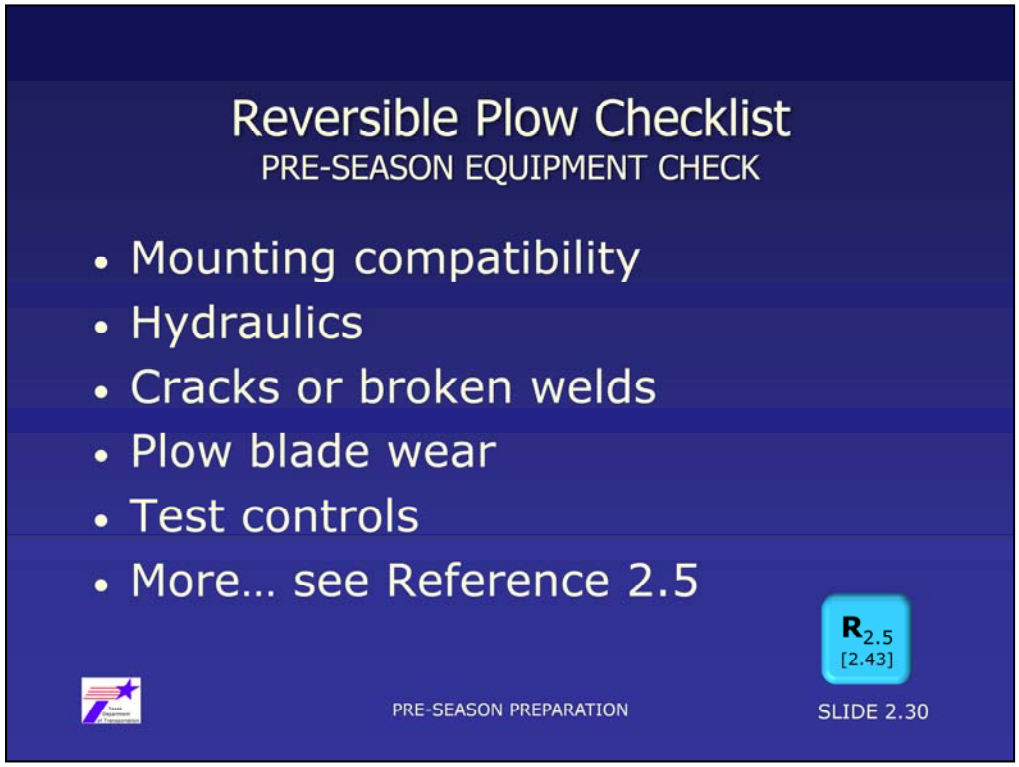
Review this checklist.

These things need to be done in the pre-season.



Instructor Notes: Present the following key points.

Check snow plows.



Instructor Notes: Present the following key points.

NOTE reference R2.5…

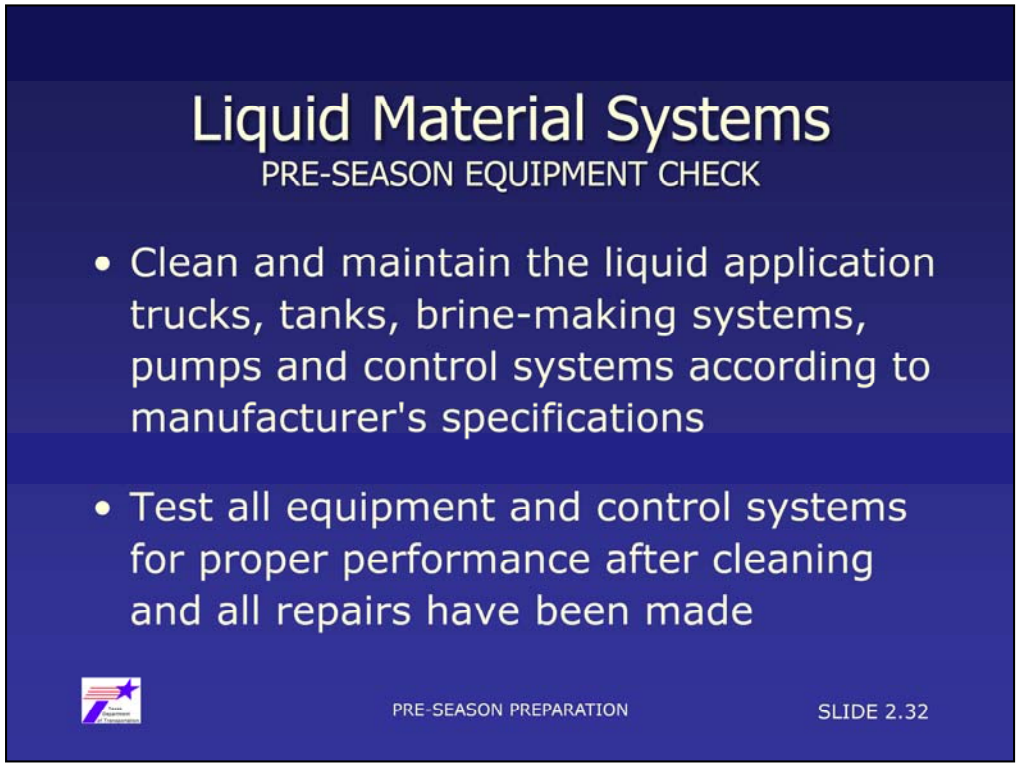
Review this checklist.

These things need to be done in the pre-season.



Instructor Notes: Present the following key points.

Check liquid storage and pumping systems.



Instructor Notes: Present the following key points.

Review this list.

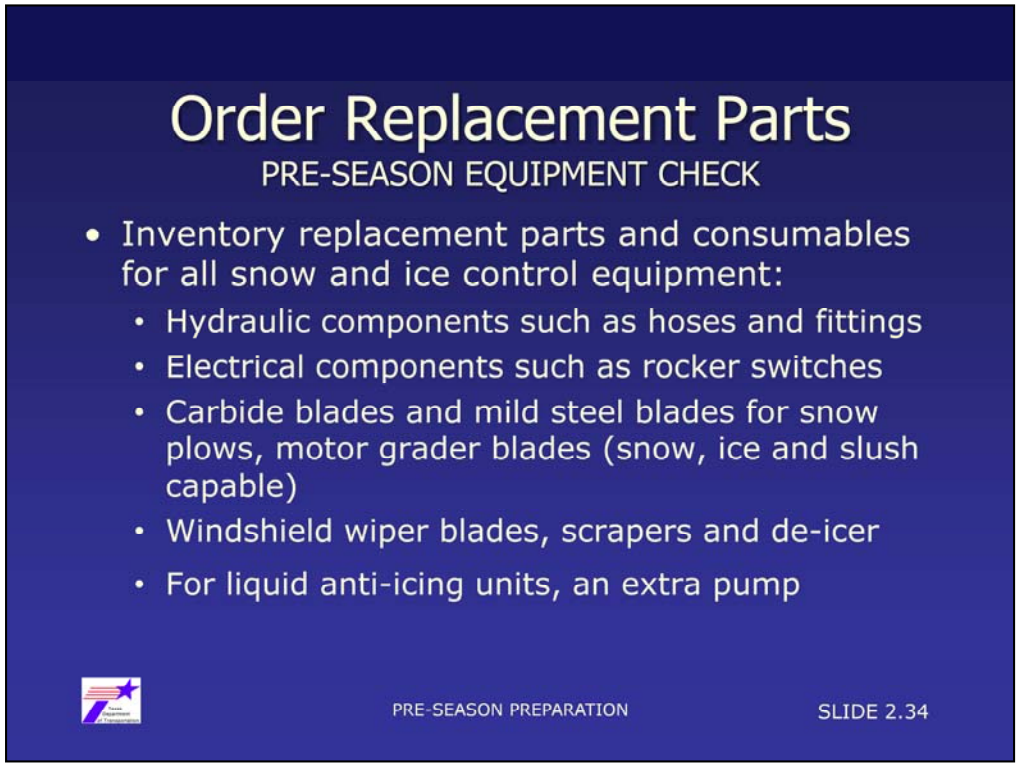
These things need to be done in the pre-season.



Instructor Notes: Present the following key points.

This slide shows replacement carbide blades for snow plows.

These and other wear parts need to be inventoried and ordered in pre-season.



Instructor Notes: Present the following key points.

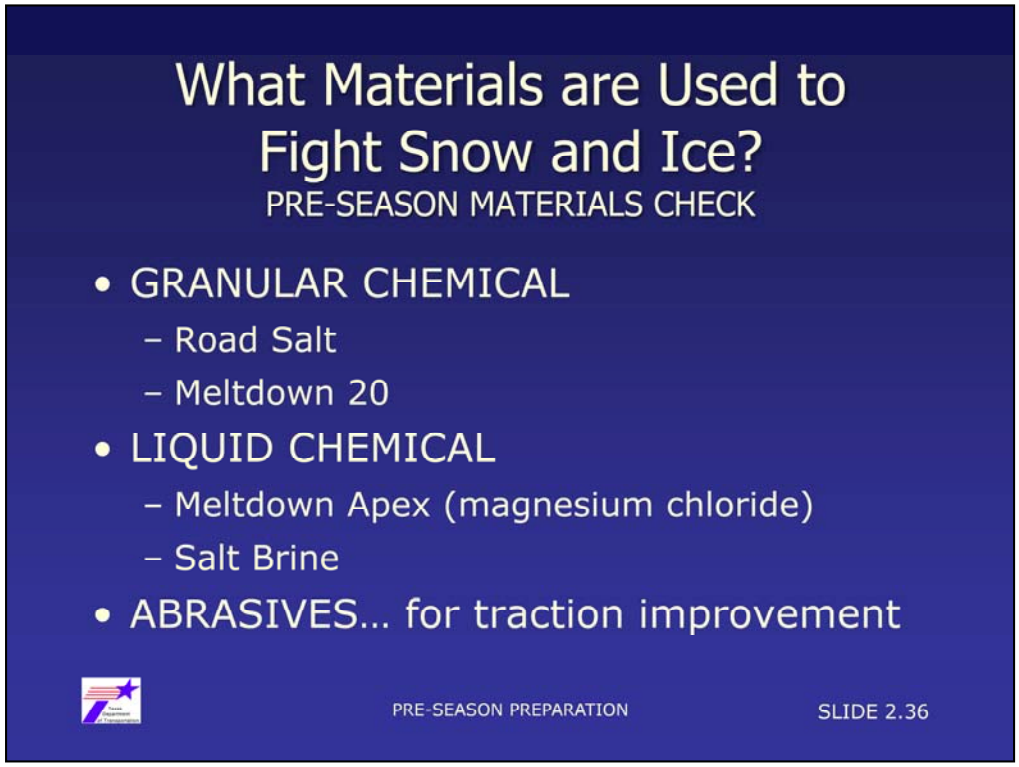
Review this list.

These things need to be done in the pre-season.



Instructor Notes: Present the following key points.

MATERIALS.



Instructor Notes: Present the following key points.

START with identifying the kinds of materials TxDOT uses.

GRANULAR CHEMICAL… two of these

LIQUID CHEMICAL… two of these

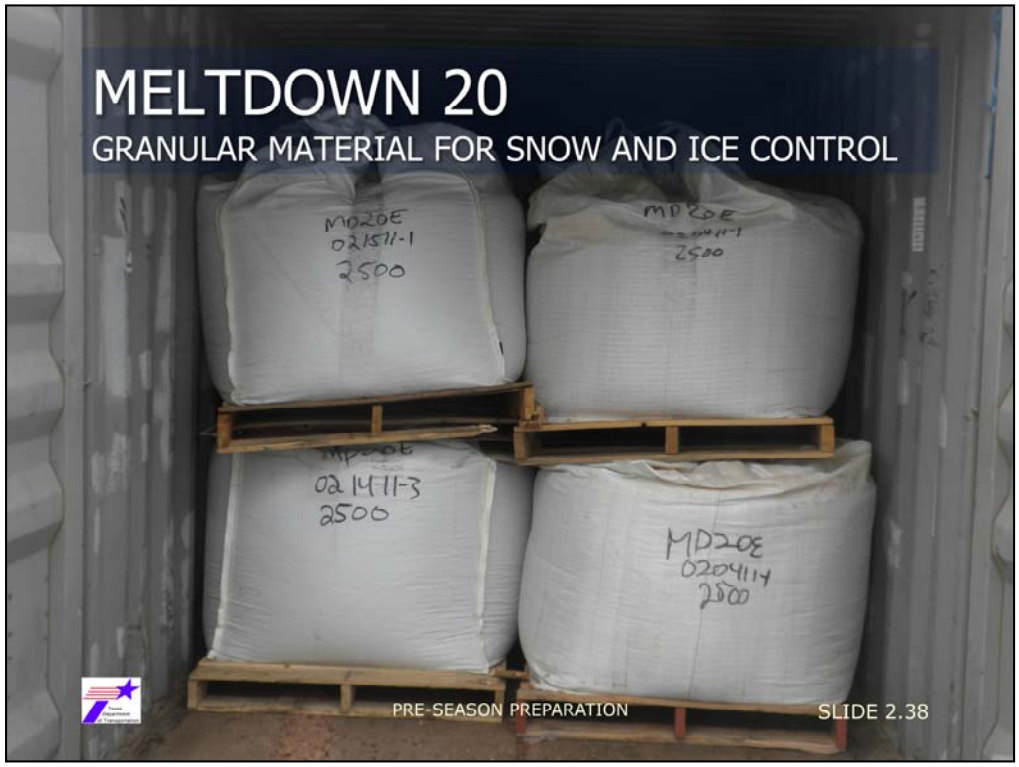
ABRASIVES…

This is what TxDOT uses.



Instructor Notes: Present the following key points.

Road salt (sodium chloride) is the most common granular chemical used.



Instructor Notes: Present the following key points.

Meltdown 20 is a type of road salt with performance enhancers added.

Note that it can be shipped in 2500 pound super sacks as shown here.



Instructor Notes: Present the following key points.

Magnesium chloride solution purchased under the trade name, Meltdown Apex, is the most common liquid chemical used by TxDOT.

The maintenance professionals shown in this photo are from the Amarillo District.



Instructor Notes: Present the following key points.

Salt brine is used in Childress and other locations and is starting to be used more frequently in Texas.



Instructor Notes: Present the following key points.

Different Districts use different materials for traction improvement.

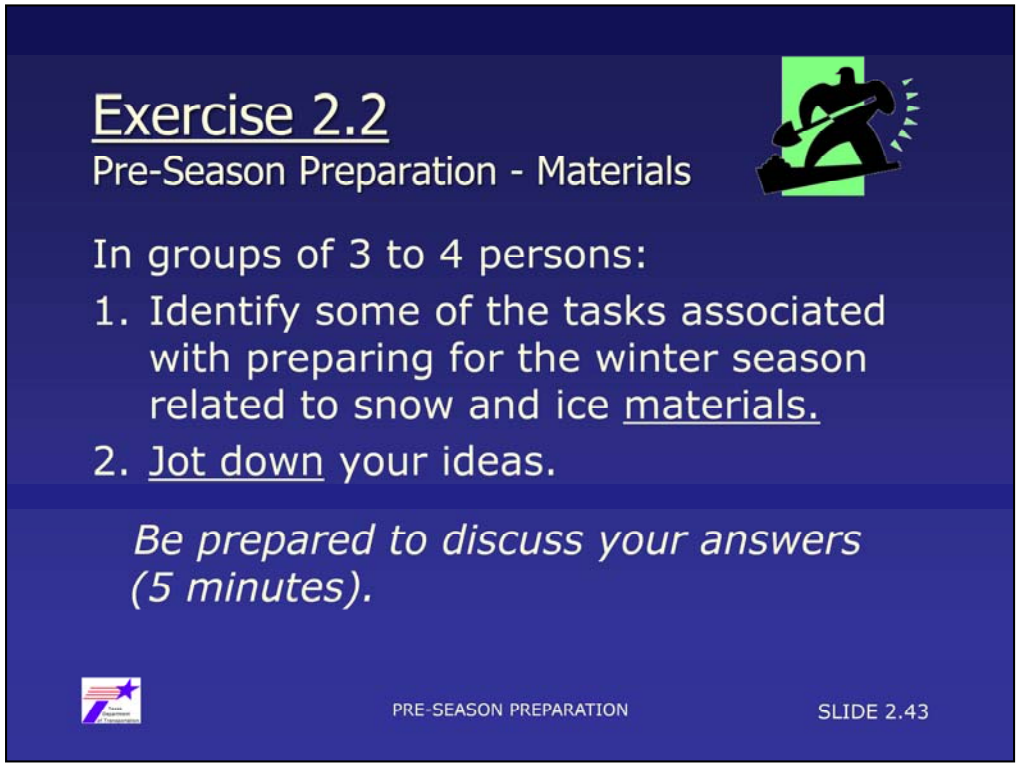
This photo, taken in the Amarillo District, shows a stockpile of bottom ash (dark material in the background). This product is readily available at this particular maintenance section.

The lighter mottle-color stockpile in the foreground consists of bottom ash that has been blended with road salt to keep the granular particles from freezing into clumps during winter weather.



Instructor Notes: Present the following key points.

What tasks need to be done to get snow and ice control materials ready for the winter season?

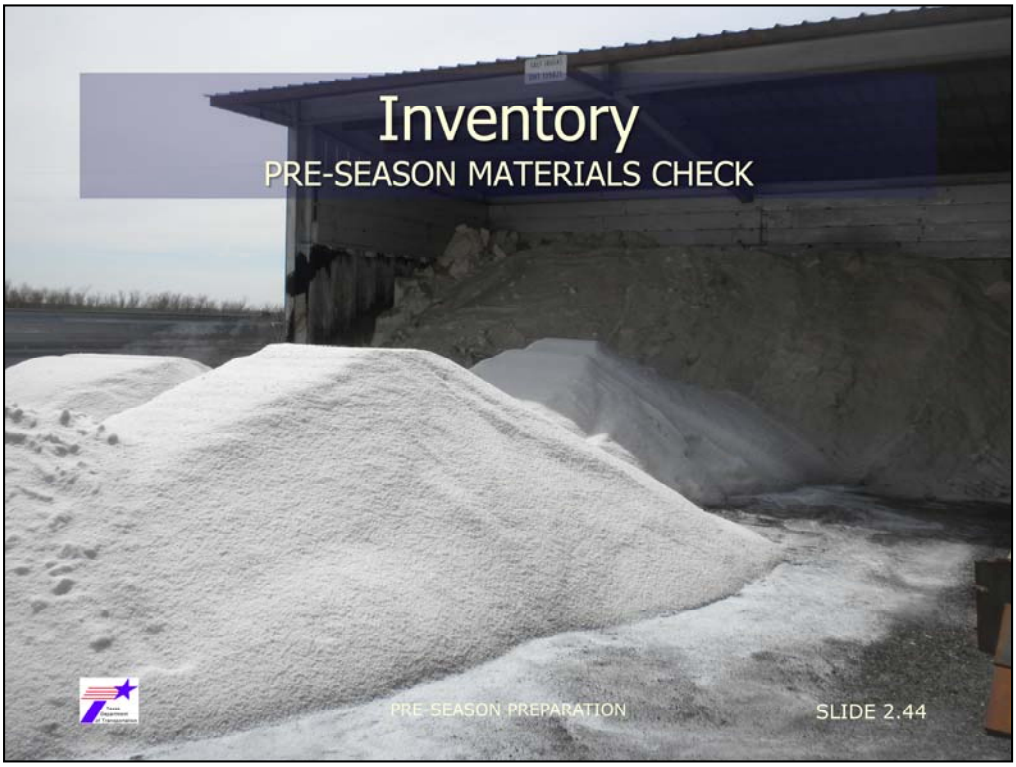


Instructor Notes: Present the following key points.

GREEN SHEET.

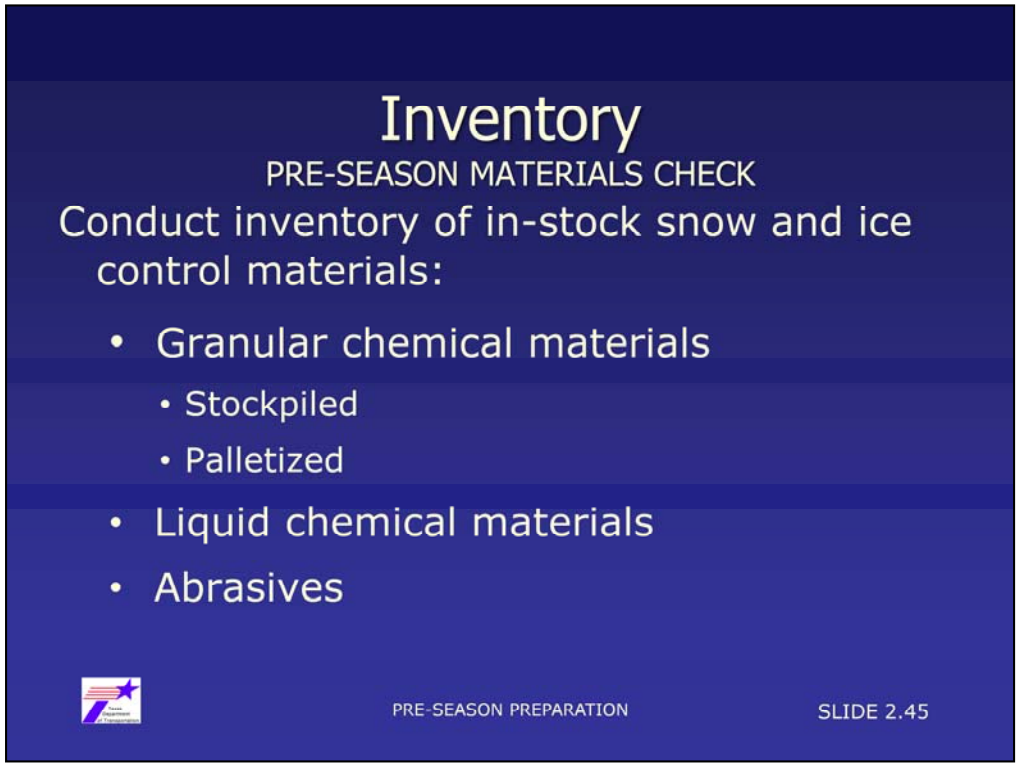
It is helpful do this exercise; then proceed with the material in the following slides.

Do if the schedule will allow.



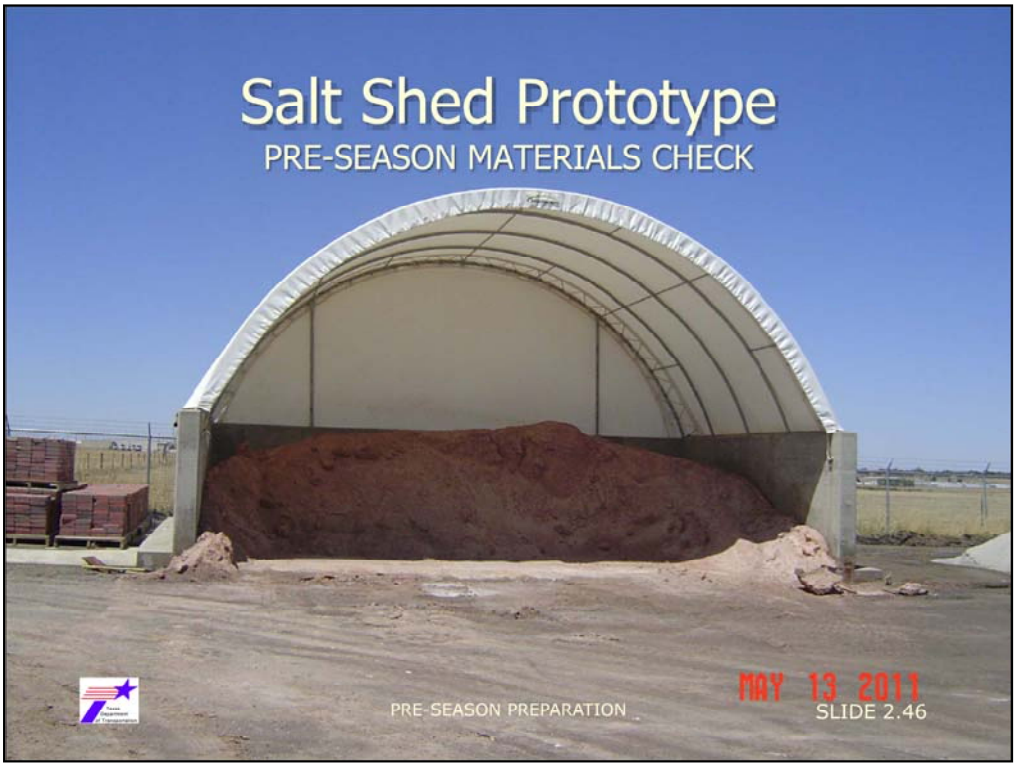
Instructor Notes: Present the following key points.

Your Supervisor will ask you to help inventory the snow and ice control materials you have on hand.



Instructor Notes: Present the following key points.

This will include both granular and liquid materials, in whatever form you store them.



Instructor Notes: Present the following key points.

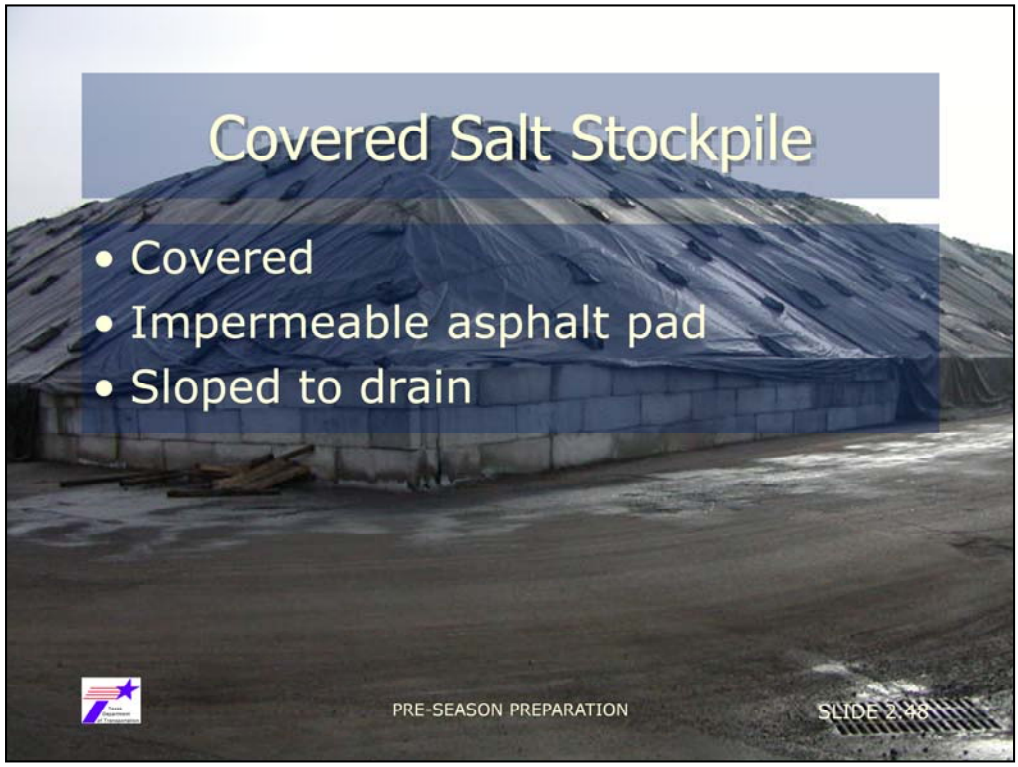
You may need to construct additional storage. Your Supervisor will provide guidance/plans to you for this.



Instructor Notes: Present the following key points.

The SALT INSTITUTE has published detailed guidance about how to properly store materials.

The items noted here are intended to protect and preserve the chemical, and to protect the environment.



Instructor Notes: Present the following key points.

Salt and Meltdown 20 bulk stockpiles should be covered if they are not in dry storage (barns).



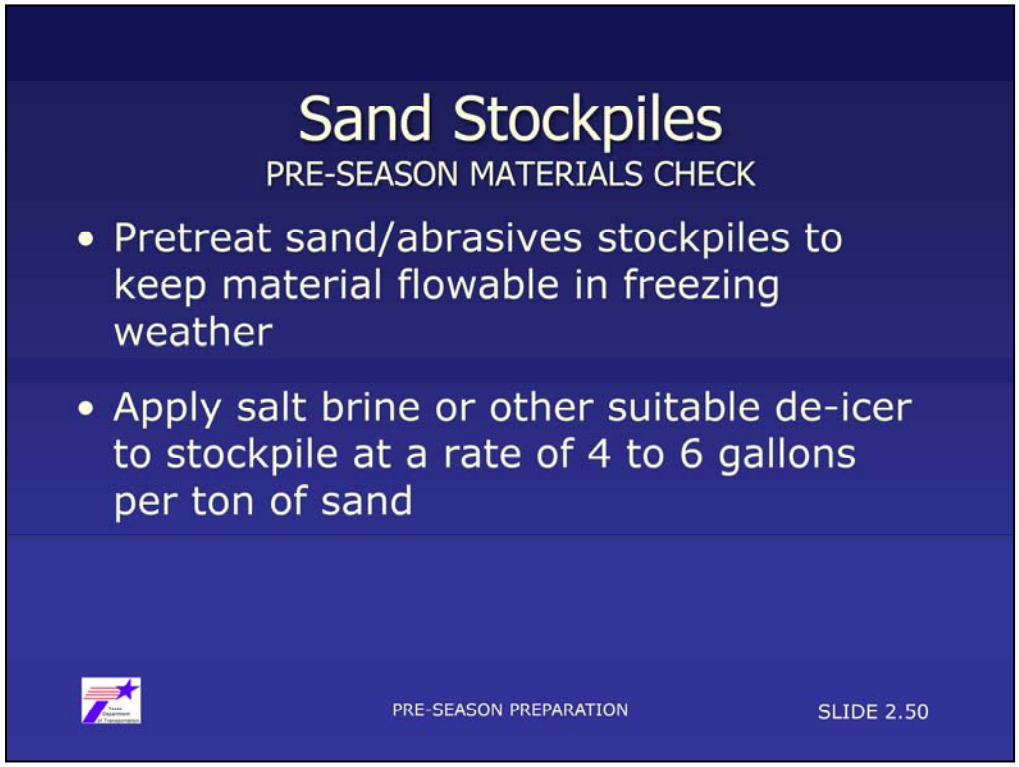
Instructor Notes: Present the following key points.

Abrasives can be stockpiled under bridges to keep them out of the weather. In winter weather, stockpile access is sometimes a problem.

It is acceptable to stockpile abrasives under bridges for protection. ABRASIVES only. NOT SALT or MELTDOWN20 which would be corrosive to the bridge structure.

ALSO, stockpiles of granular materials should be kept well away from bridge columns… no lateral loading.

ALSO, make sure you have adequate clearance for loading, and maneuvering room.



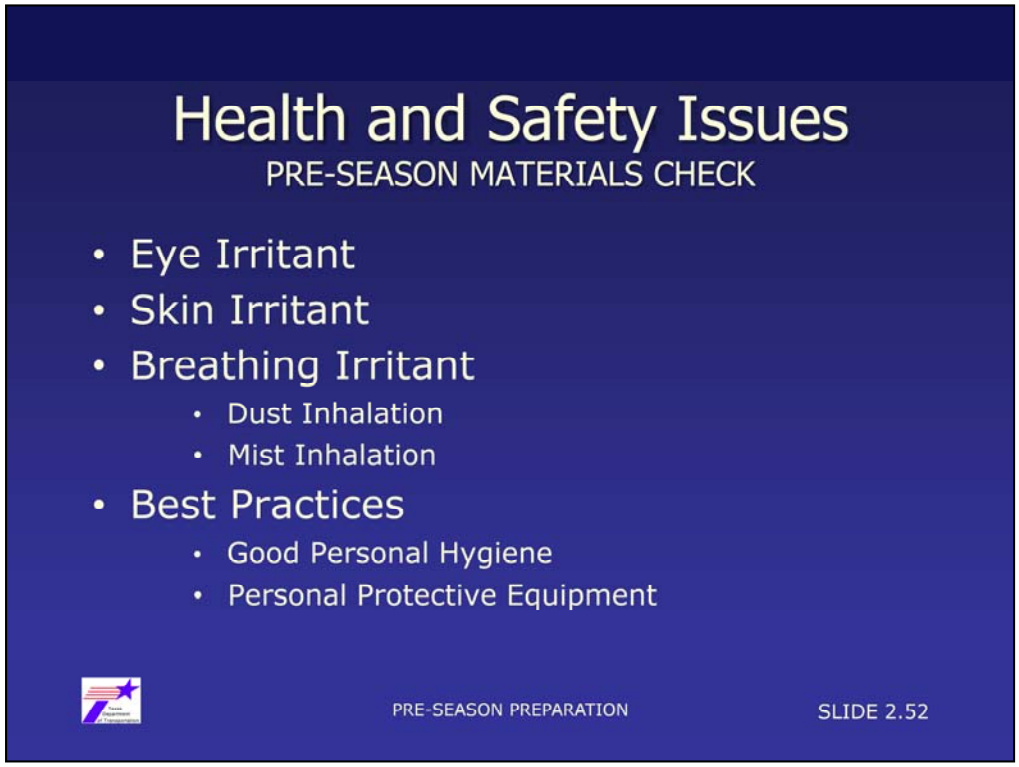
Instructor Notes: Present the following key points.

Stockpiles of abrasives can be conditioned with salt to keep the material flowable in freezing weather.



Instructor Notes: Present the following key points.

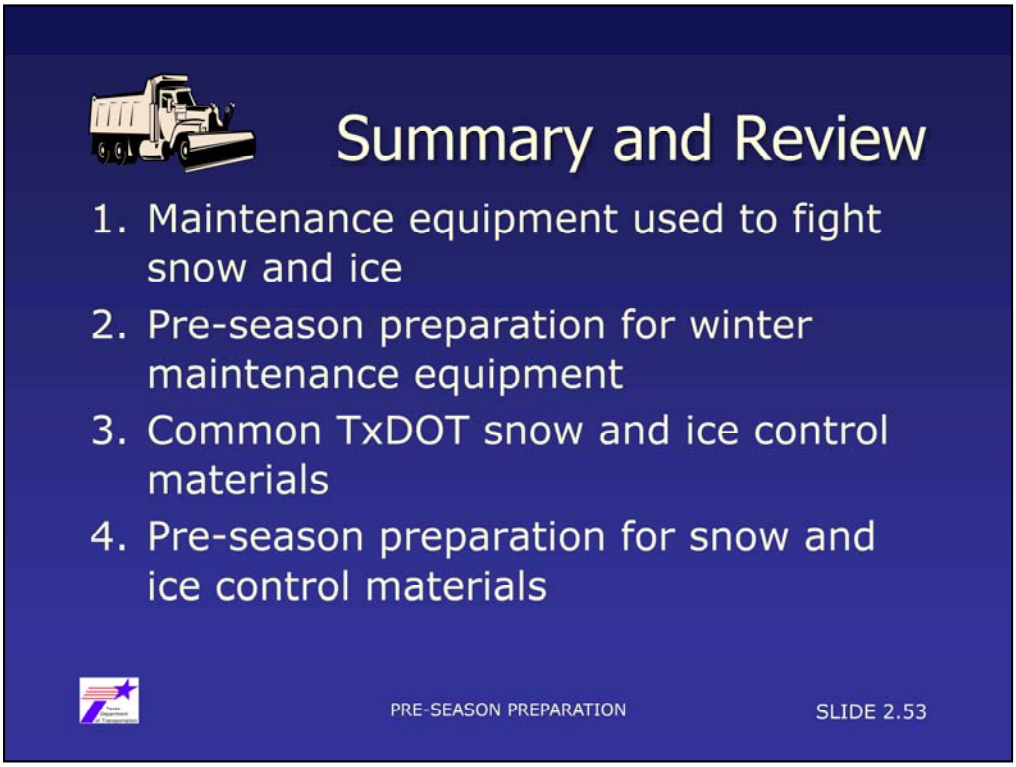
This film discusses one acceptable method of sand pile conditioning.



Instructor Notes: Present the following key points.

Snow and ice control materials can cause health concerns.

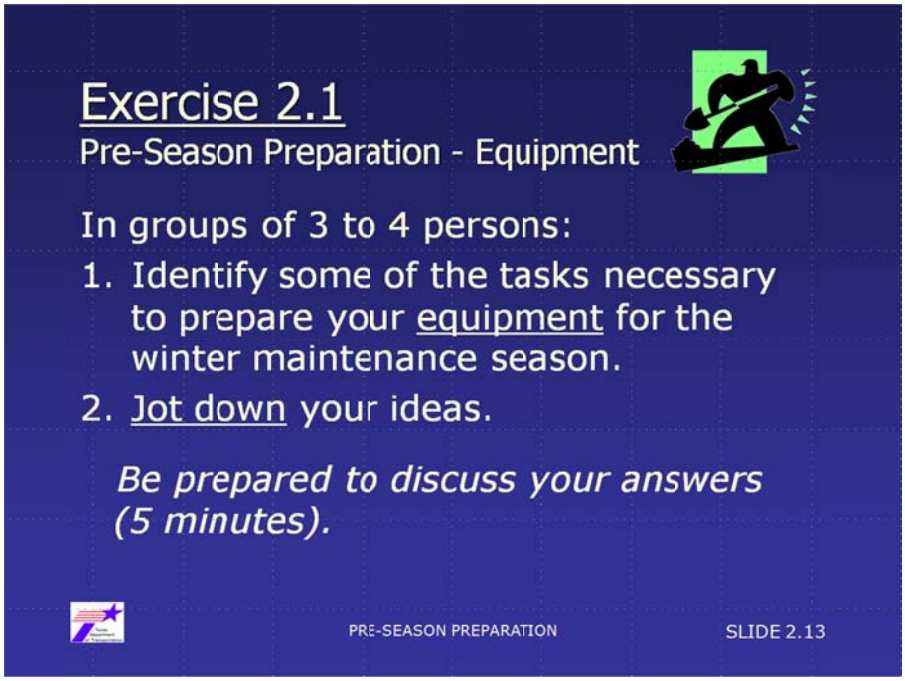
When working with snow and ice control materials, it is important to know the approved practices for the materials, to wear your personal protective equipment, and to follow safe material handling practices.

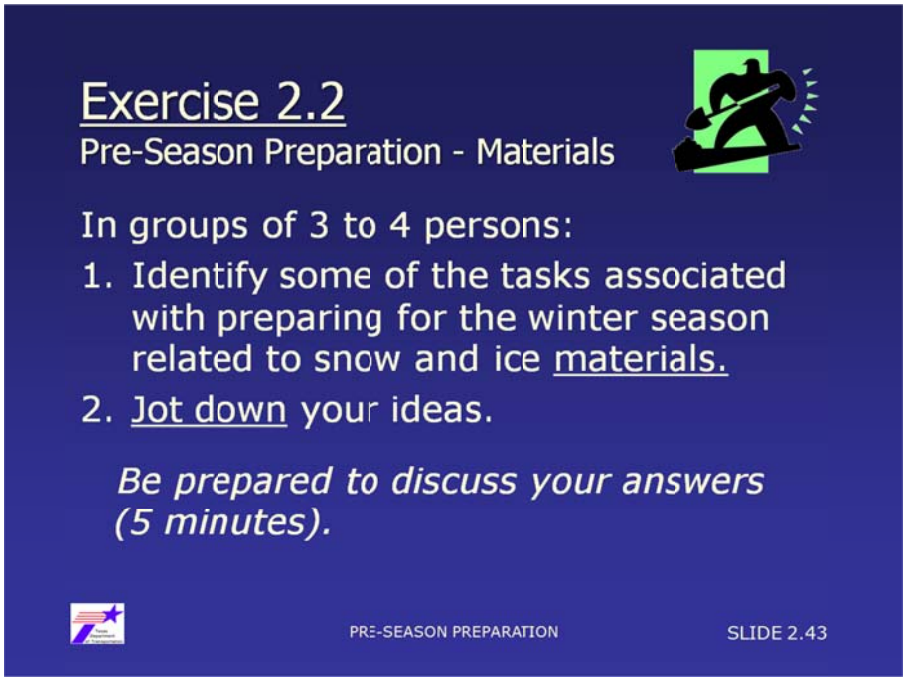


Instructor Notes: Present the following key points.

PINK SHEETS!

Answer all questions.


Exercise 2.1
Pre-Season Preparation - Equipment
In groups of 3 to 4 persons:
1. Identify some of the tasks necessary to prepare your equipment for the winter maintenance season.
2. Jot down your ideas.
Be prepared to discuss your answers (5 minutes).
PRE-SEASON PREPARATION
SLIDE 2.13


Exercise 2.2
Pre-Season Preparation - Materials
In groups of 3 to 4 persons:
1. Identify some of the tasks associated with preparing for the winter season related to snow and ice materials.
2. Jot down your ideas.
Be prepared to discuss your answers (5 minutes).
PRE-SEASON PREPARATION
SLIDE 2.43

END OF SEASON CHECKLIST

End-of-Season Tasks

- ☐ Remove trash and personal items
- ☐ Inventory tools
- ☐ Inventory safety equipment
- ☐ Remove and properly store winter-only tools/equipment
- ☐ Report damaged or missing items to supervisor
- ☐ Thoroughly wash vehicle and equipment; use chloride neutralizers
- ☐ Remove detachable equipment:
  - ☐ Perform additional cleaning as required
  - ☐ Lubricate
  - ☐ Safely store
- ☐ Clean and cover hydraulic connections
- ☐ Clean, apply silicon, and cover electrical connections
- ☐ Lubricate chains and sprockets
- ☐ Oil or collapse cylinders to protect rods
- ☐ Set air intake valve to summer use setting
- ☐ Paint or treat any bare metal parts
- ☐ Submit equipment requests
- ☐ Discuss modifications/improvement ideas with supervisor

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Source: "End of Season Tasks," Documents, **Equipment Maintenance CD**, Version 1, AASHTO Clear Roads Computer Based Training, July 2007.

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VIDEO 2.1. EQUIPMENT CLEANING (00:27)

SCRIPT

Once a storm is over and the roads are open and clear, get the equipment cleaned up as soon as possible so you are ready for the next snowfall.

After you have emptied any material left on your truck and put it back into the stock pile, wash the truck, making sure to get all of the salt thoroughly washed off, as well as sand and dirt.

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DUMP TRUCK CHECKLIST

Pre-season Checklist

- ☐ Read equipment manuals
- ☐ Familiarize yourself with new or infrequently used equipment
- ☐ Review your agency's pre-trip inspection process
- ☐ Allow truck to sit on impermeable surface overnight so leaks can be detected
- ☐ Inspect tires:
  - ☐ Verify that the tire sizes are correct for the vehicle and equipment
  - ☐ Verify that the tire load ratings are correct for the vehicle and equipment
  - ☐ Make sure the tread design on the front tires is the same
  - ☐ Look for tire checking and cracking
  - ☐ Look for punctures, nails or other damage
  - ☐ Inspect sidewalls between dual tires
  - ☐ Tread must be at least 4/32nds of an inch
  - ☐ Tread should be even across width of tire
  - ☐ Set tire pressure to the PSI value on sidewall to handle winter loads
- ☐ Inspect wheels:
  - ☐ Check tightness of wheel lugs
  - ☐ Check tightness of axle bolts
  - ☐ Check for leaks around wheel seals
  - ☐ Check for cracks on rim
- ☐ Inspect mud flaps
  - ☐ Must be securely fastened
  - ☐ Must extend full width of tire(s)
  - ☐ Must extend down within 8 inches of ground
- ☐ Inspect hydraulic system:
  - ☐ Check for leaks on garage floor
  - ☐ Check for leaks around each hose and fitting
  - ☐ Be sure hoses are not pinched
  - ☐ Be sure hoses are not rubbing against each other
  - ☐ Be sure hoses are not rubbing against another surface
  - ☐ Check hydraulic oil level
- ☐ Inspect lights:
  - ☐ Brake lights
  - ☐ Headlights (both high and low beams)
  - ☐ Plow lights
  - ☐ Turn signals (left/right, front/back)
  - ☐ Cab lights
  - ☐ Warning lights
  - ☐ Clearance lights
  - ☐ Sander lights
  - ☐ Wing lights
  - ☐ Check light wiring: should not be loose or hanging
  - ☐ Reflectors
  - ☐ Conspicuity tape

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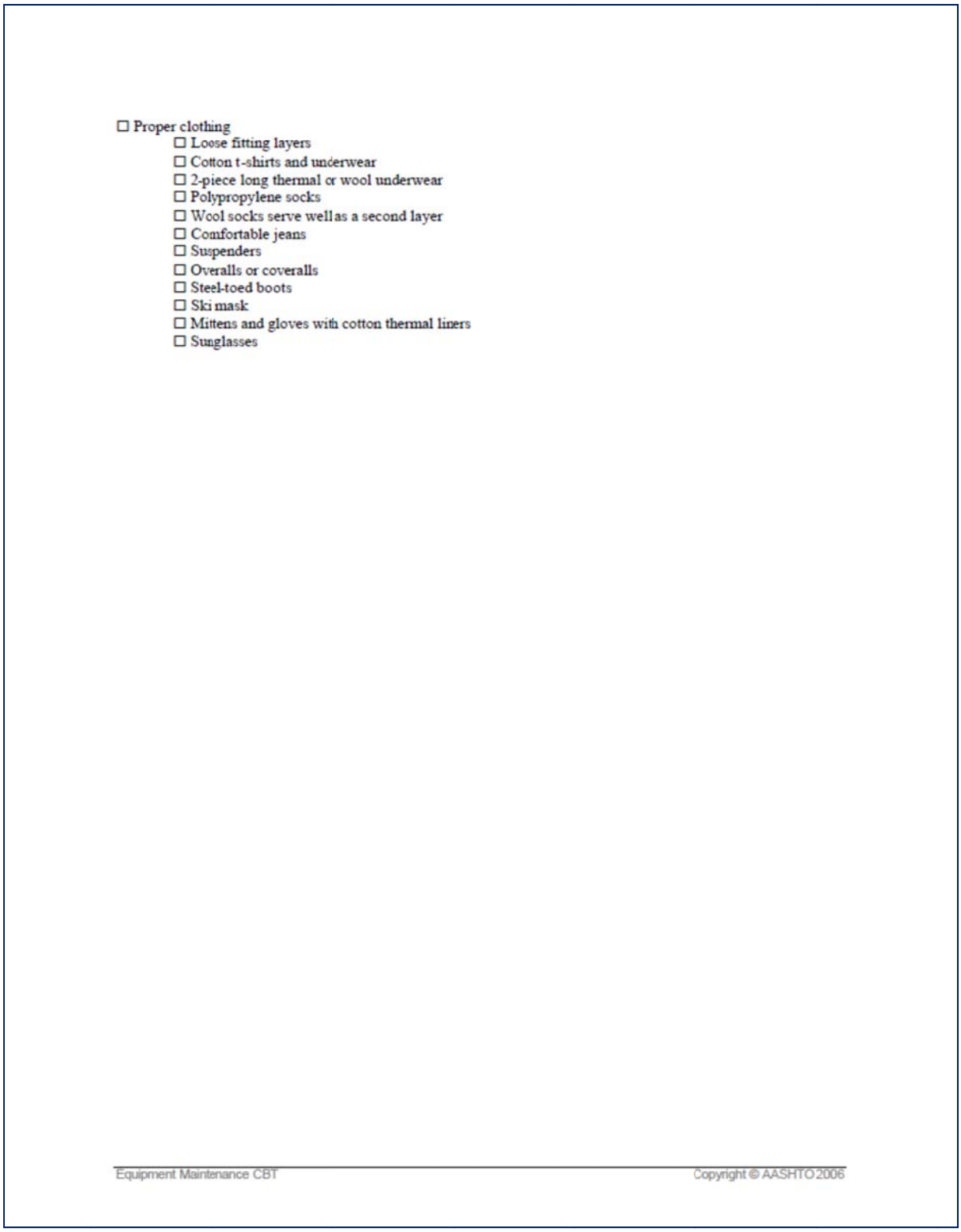
- ☐ Air restriction indicator:
  - ☐ Change air filter if required
  - ☐ Make sure air intake valve is set for winter conditions
- ☐ Fuel system:
  - ☐ Change fuel filter
  - ☐ Drain any water in the fuel/water separator
  - ☐ Check for evidence of fuel leaks
  - ☐ Understand the fuel blends you'll be using
  - ☐ Cycle winter blends into storage tanks prior to winter season
- ☐ Engine oil:
  - ☐ Check oil level; do not overfill
  - ☐ Check oil color
  - ☐ Check for burnt smell of oil
  - ☐ Check for significant oil leaks
- ☐ Cooling system:
  - Check coolant level; do not overfill; use correct fluid
  - Check for coolant leaks
  - Check for plugged or damaged radiator fins
- ☐ Transmission:
  - ☐ Check automatic transmission fluid level at operating temperature; do not overfill
  - ☐ Check manual transmission fluid level at plug beneath truck, if applicable
  - ☐ Check for transmission fluid leaks
- ☐ Check fan and other belts for frays, cracks and tightness
- ☐ Inspect wiring
- ☐ Check battery level and charge
- ☐ Check windshield washer fluid level
- ☐ Verify that all brackets, bolts and welds are in good condition
- ☐ Check the PTO pump mounting and drive shaft
- ☐ Check exhaust pipe
- ☐ Check tailgate trip arm
- ☐ Check ladder to dump box
- ☐ Check tarp system
- ☐ Check tool racks and boxes

Equipment Maintenance CBT

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- ☐ Application equipment:
  - ☐ Check condition and operation of spinner
  - ☐ Check condition of gear box
  - ☐ Check condition and operation of chain
  - ☐ Inspect pumps, valves, nozzles and hydraulics of liquid applicator equipment
  - ☐ Sand flaps should be in place
  - ☐ Calibrate solid and liquid application equipment
  - ☐ Calibrate on-board pavement temperature sensors
  - ☐ Check augers, conveyors, and spinners
  - ☐ Check tailgate spreaders
- ☐ Tool inventory:
  - ☐ Tire cables or chains
  - ☐ Towing chain
  - ☐ Extra plow and wing pins
  - ☐ Hand shovel
  - ☐ Other tools (e.g hammer, screwdrivers, wrenches)
- ☐ Cab checklist:
  - ☐ Check all of the dashboard lights.
  - ☐ Check dome lights.
  - ☐ Check the engine air restriction indicator
  - ☐ Check all gauges:
    - ☐ fuel gauge
    - ☐ temperature gauge
    - ☐ oil pressure,
    - ☐ speedometer
  - ☐ Check that the horn functions properly
  - ☐ Check windshield for damage.
  - ☐ Check condition/operation of wiper blades
  - ☐ Check the heating and defrosting systems outdoors
  - ☐ Cab should be clean of all debris
  - ☐ All items must be secure
  - ☐ Safety equipment:
    - ☐ Fire extinguisher:
      - ☐ full?
      - ☐ current inspection tag?
      - ☐ securely mounted?
      - ☐ readily accessible?
    - ☐ Flares and triangles
    - ☐ Flash light with good bulb and fresh batteries
    - ☐ First aid kit
    - ☐ CPR mask
    - ☐ Bloodborne pathogen protection kit
    - ☐ Emergency reflector kit
    - ☐ Verify that safety belts work properly
  - ☐ Ice scraper
  - ☐ Whisk broom or snow brush
  - ☐ Check 2-way radio
  - ☐ Supply of current accident/incident forms
  - ☐ Material/activity log sheets
  - ☐ Check mirrors for cracks and positioning
  - ☐ Check heated mirrors to ensure that they are operating properly

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Source: "Pre-Season Checklist," Documents, **Equipment Maintenance CD**, Version 1, AASHTO Clear Roads Computer Based Training, July 2007.

V-BOX SPREADER CHECKLIST

TxDOT Pre-Trip Inspection Checklist
V-Box Spreader

Pre-Trip Inspection Task or Activity	
Drive chains and drag chains should be checked for proper tension (slack); adjust as necessary	
Check conveyor chain (drag chain) for excessive wear, proper lubrication and proper operation	
Check all hydraulics (pumps, hoses and connections) for proper operation and leaks	
Check for leaks and wear on hoses (hydraulic system)	
Check PTO and drive assembly	
Check drag chain (conveyor) oiler for proper fluid level	
Check oiler lines for any damage, restrictions, wear or leaks; repair or replace as necessary	
Check spinner assembly (hinge rod and disk) for excessive wear, proper lubrication and proper operation	
Check spreader box and frame for fatigue cracks and broken welds	
Check all bolts, nuts, washers, pins and clips to ensure none are missing or damaged	
Check all bolts, nuts and other fasteners to ensure they are tight	
Check spreader controls (conveyor speed and spinner speed) to ensure they are working properly	
Set the spinner speed as needed to attain the desired width of spread	
Set the conveyor speed as needed to attain the desired quantity of material to be spread	
Set the gate opening as required to attain the desired quantity of material to the spinner	
Check the material baffles (flaps) below the spinner to ensure they are not damaged and are working properly	
Set the material baffles (flaps) as needed to attain the most appropriate spread pattern on the road	
Grease all grease fittings as required by the equipment manufacturer	
Check the condition of all spreader-mounted reflectors; replace if damaged	
Make sure all lights are operational and clean on the spreader	

Source: Work in Progress. Texas Tech University.

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PRE-SEASON REVERSIBLE PLOW CHECKLIST

Points to Remember When Mounting and Inspecting a Reversible Plow

- ☐ Be sure to mount the correct plow to the corresponding truck.
- ☐ For ease and safety, two people are generally required to mount the plow.
- ☐ When hooking up hydraulics, wear gloves and goggles; turn off vehicle. Clean connectors to be sure they are free of all dirt, dust, grit, etc.
- ☐ Do not place any part of your body beneath a raised plow unless it is safely resting on secure mount or blocks.
- ☐ After attaching equipment, before performing a thorough inspection, lower plow to floor.
- ☐ Look for cuts or frays in cable.
- ☐ Check for broken links in chain.
- ☐ Check plow for cracks or broken welds.
- ☐ All hydraulic cylinders should be inspected.
- ☐ Check all hydraulic fittings to be sure they are tight and not leaking.
- ☐ Inspect the stop blocks.
- ☐ Check for proper plow trip adjustment.
- ☐ Check plow blade for cracks or excessive wear.
- ☐ Check turntable mounts.
- ☐ If carbide is missing from blade, you should replace blade. If this is not possible, at least be aware that the blade will wear much faster. Replace blade when 2 inches or less of the blade remains between the bottom of the moldboard and the bottom of the blade. Rotate blades on plow for longer wear.
- ☐ Check tightness of all nuts on plow blade. Replace any missing nuts and bolts.
- ☐ Grease all grease fittings.
- ☐ Check the condition of all plow-mounted reflectors; replace if damaged.
- ☐ Check the condition of the flags; warn or faded flags should be replaced.
- ☐ Be sure plow shield, if applicable, is secure.
- ☐ Test all plow controls.

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Source: "Pre-Season Reversible Plow Checklist," Documents, **Equipment Maintenance CD**, Version 1, AASHTO Clear Roads Computer Based Training, July 2007.

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VIDEO 2.2. MATERIAL STORAGE AND HANDLING (01:25)

SCRIPT

Salt is stored at DOT garages in sheds and domes. It should be ordered, delivered, and put under cover well in advance of the winter season.

To store salt, use a loader to move the salt into the shed or dome filling from the back and working your way out. An auger or conveyor can be used to completely fill a dome by building a cone of salt in the center of the structure. For details about safe material handling practices, composition, and quality, ask your supervisor who has specifications and material safety data sheets for salt and all other de-icing chemicals.

Salt should be mixed with abrasives as a conditioner to prevent the sand stockpile from freezing and keep it workable during the winter. There are many ways to mix salt and sand. One way is to use a loader to move a quantity of sand out into an open area. Some garages use motor graders to do the mixing. A 10% salt mix, one loader bucket of salt and nine loader buckets of sand is a good mix when using salt as a sandpile conditioner. For road use, the percentage of salt you use and salt sand mixtures will vary depending on what you are trying to accomplish.

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Class Exercise – Review Questions
Module 2 – PRE-SEASON PREPARATION

MNT812 Winter Weather Operations Training

1. Traditional roadway maintenance equipment can be used/adapted for winter weather maintenance. Traditional maintenance equipment typically would NOT include:

   A. Snow blower
   B. Dump truck
   C. Motor grader
   D. V-box spreader

   The correct answer is A.

   TxDOT does not use snow blowers.

2. Pre-season tasks associated with winter maintenance equipment include:

   A. Clean, inspect, and repair all snow and ice control equipment
   B. Calibrate both granular and liquid snow and ice control application equipment
   C. Procure an adequate supply of replacement parts and consumables
   D. All of the above

   The correct answer is D.

3. Which of the following is NOT a common snow and ice control material used by TxDOT?

   A. Road Salt
   B. Freeze Guard
   C. Salt Brine
   D. Meltdown Apex

   The correct answer is B.

   TxDOT has used Freeze Guard some, but not much. But they use the other materials shown here quite frequently.

4. Pre-season tasks associated with snow and ice control materials would typically NOT include:

   A. Provide adequate storage facilities for both liquid and granular snow and ice control materials

   B. Inventory snow and ice control materials to ensure an adequate supply is on hand

   C. Perform research and field testing to improve material effectiveness

   D. Provide appropriate loading and delivery areas for all liquid and granular snow and ice control materials

   The correct answer is C.

   Research and testing are necessary part of what TxDOT does, but are not considered part of pre-season preparation.

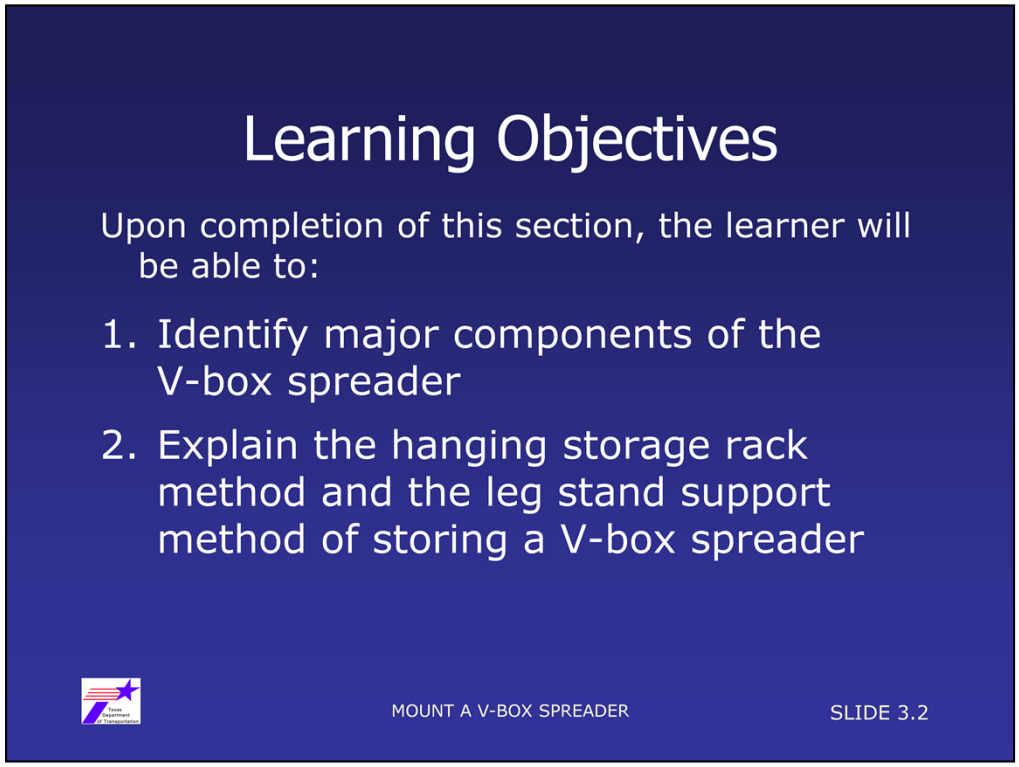


Instructor Notes: Present the following key points.

In this module, you will learn how to mount a V-box spreader in a dump truck.

Be aware that this is actually a PRE-EVENT activity rather than PRE-SEASON preparation.

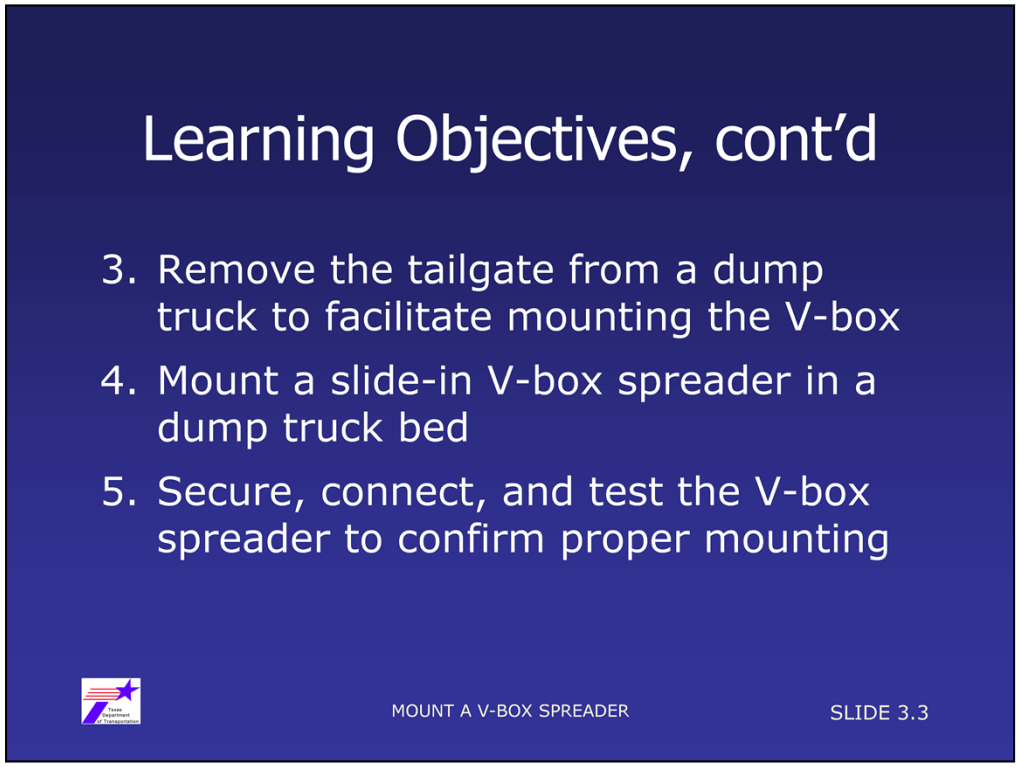
Mounting the V-box spreader is typically one of the tasks you perform in advance of a winter storm, as directed by your Supervisor.



Instructor Notes: Present the following key points.

Here are the learning objectives…

Note that we will be presenting two methods for storing the V-box spreader – the hanging storage rack and the leg stand support.



Instructor Notes: Present the following key points.

More learning objectives.

Note each one.



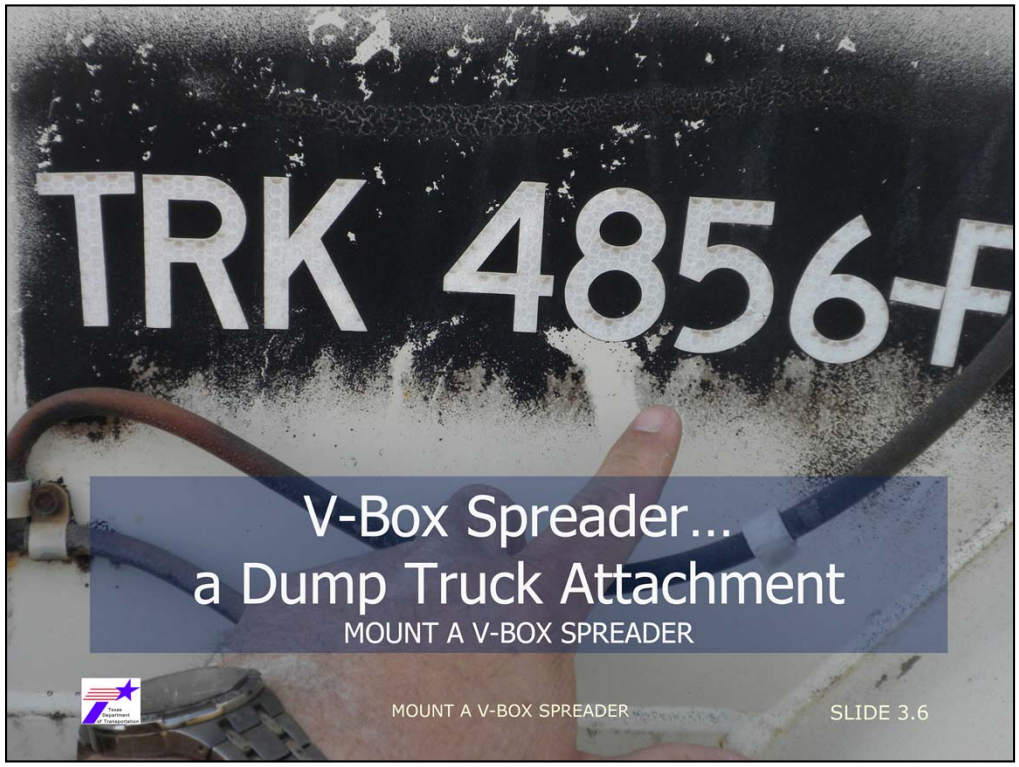
Instructor Notes: Present the following key points.

It is important to be able to identify the components of the V-box spreader.



Instructor Notes: Present the following key points.

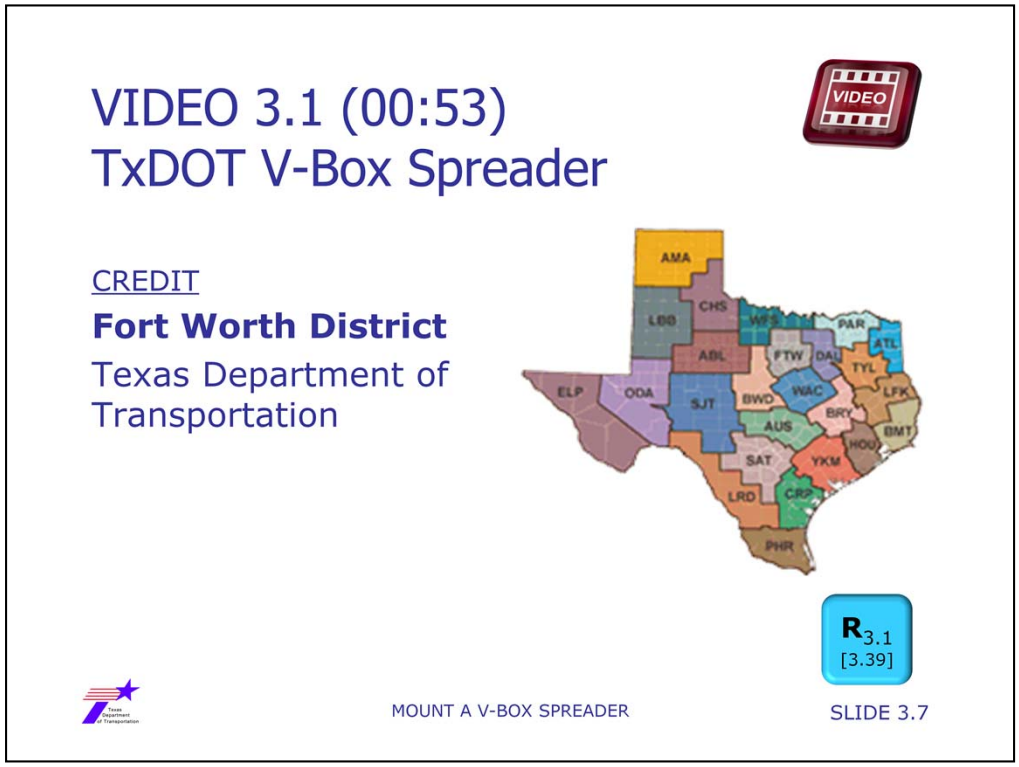
Recall that the V-box spreader is an attachment to a dump truck and is considered standard or “traditional” maintenance equipment.



Instructor Notes: Present the following key points.

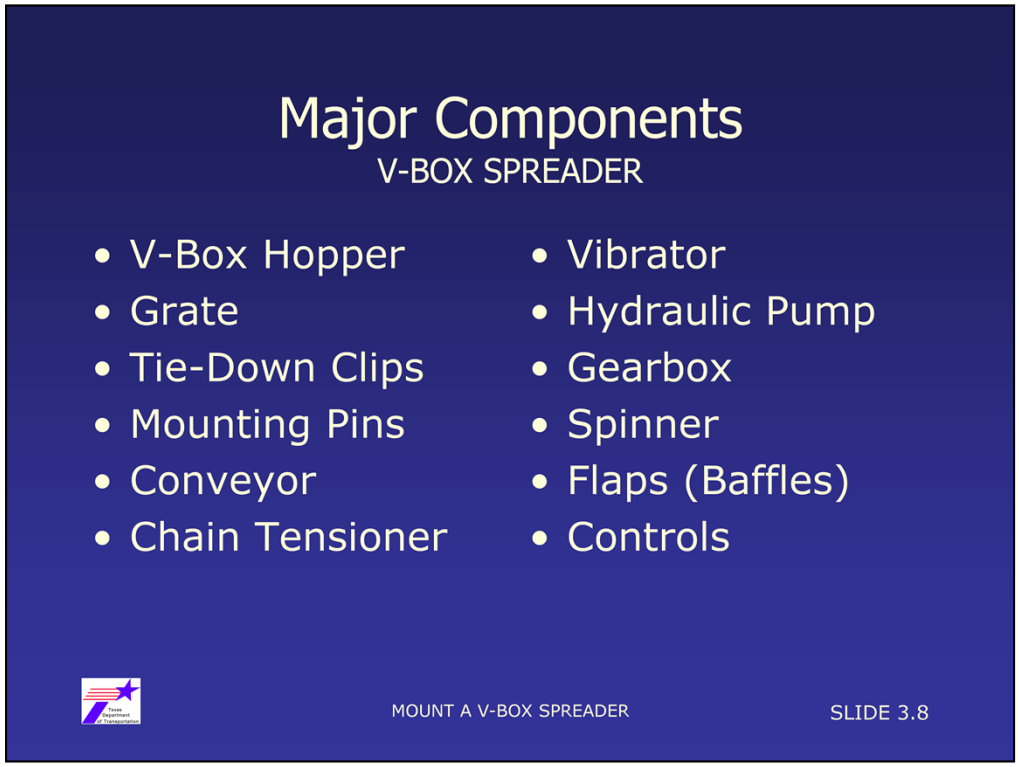
Each V-box spreader is matched to a particular truck. The truck number will actually be stenciled on the V-box so there is no confusion.

V-box spreaders and trucks are matched pairs. This means you CANNOT mount any 10 CY V-box in any 10 CY truck. For a number of reasons, this will not work.



Instructor Notes: Present the following key points.

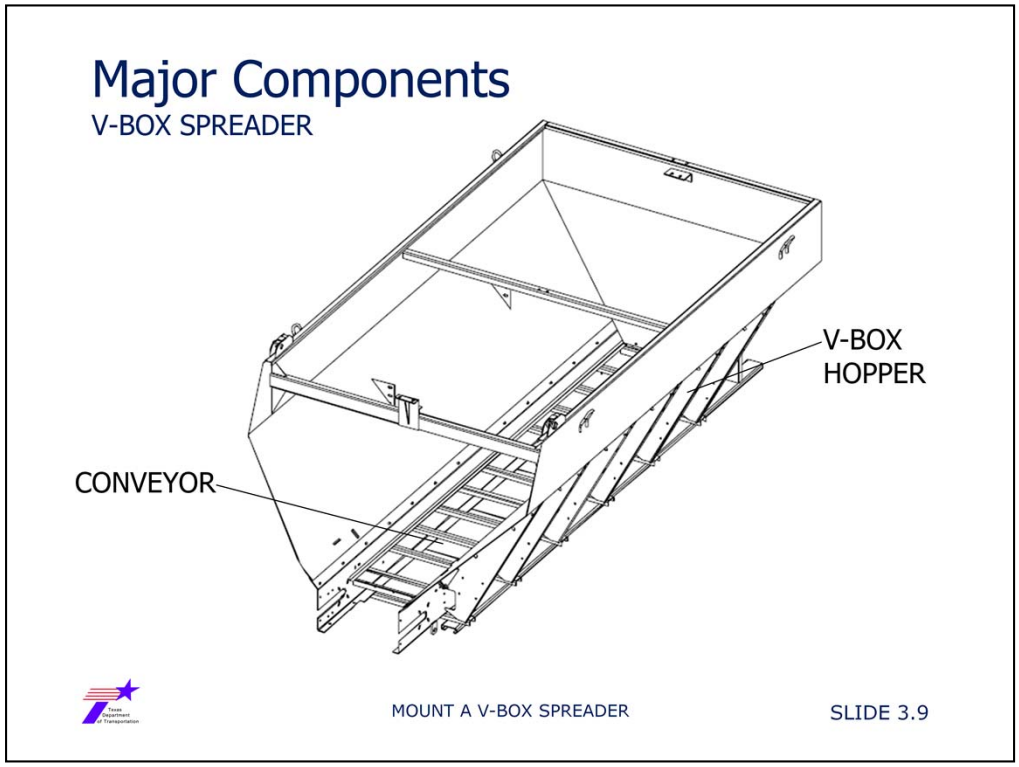
This video shows the V- box spreader in action for winter weather maintenance.



Instructor Notes: Present the following key points.

The major components of the V-box spreader are identified here.

The following series of slides depicts these components.

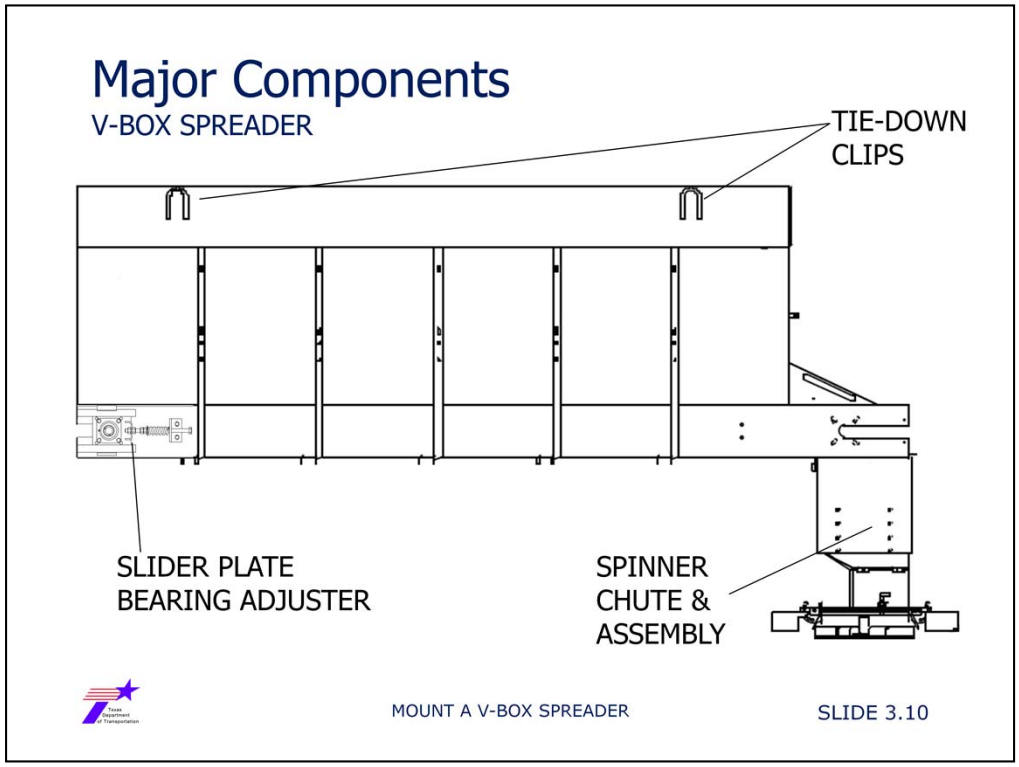


Instructor Notes: Present the following key points.

Note the major components as shown.

Identify each part.

State the name and explain what it is.



Instructor Notes: Present the following key points.

Note the major components as shown.

Identify each part.

State the name and explain what it is.



Instructor Notes: Present the following key points.

Some, but not all, V-boxes have vibrators to keep material flowing to the conveyor. This photo shows a typical hopper vibrator.

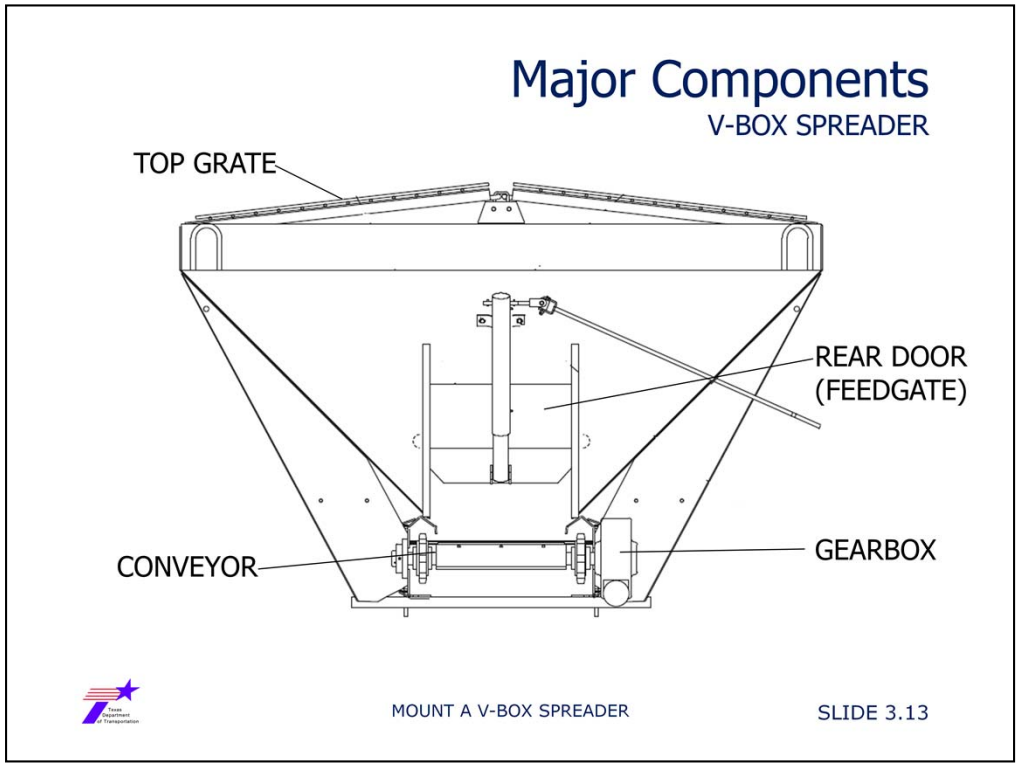


Instructor Notes: Present the following key points.

The spinner chute and assembly for all V-boxes will contain flaps, or baffles, to regulate the width of the granular material application.

If the flaps are down, application can be limited to one lane.

If the flaps are up, application can cover up to three lanes, depending on spinner rotational speed.



Instructor Notes: Present the following key points.

THIS is the rear of the V-Box.

Note the major components as shown.

Identify each part.

State the name and explain what it is.



Instructor Notes: Present the following key points.

The mounting pins represent one method of securement of the V-box to the dump bed.

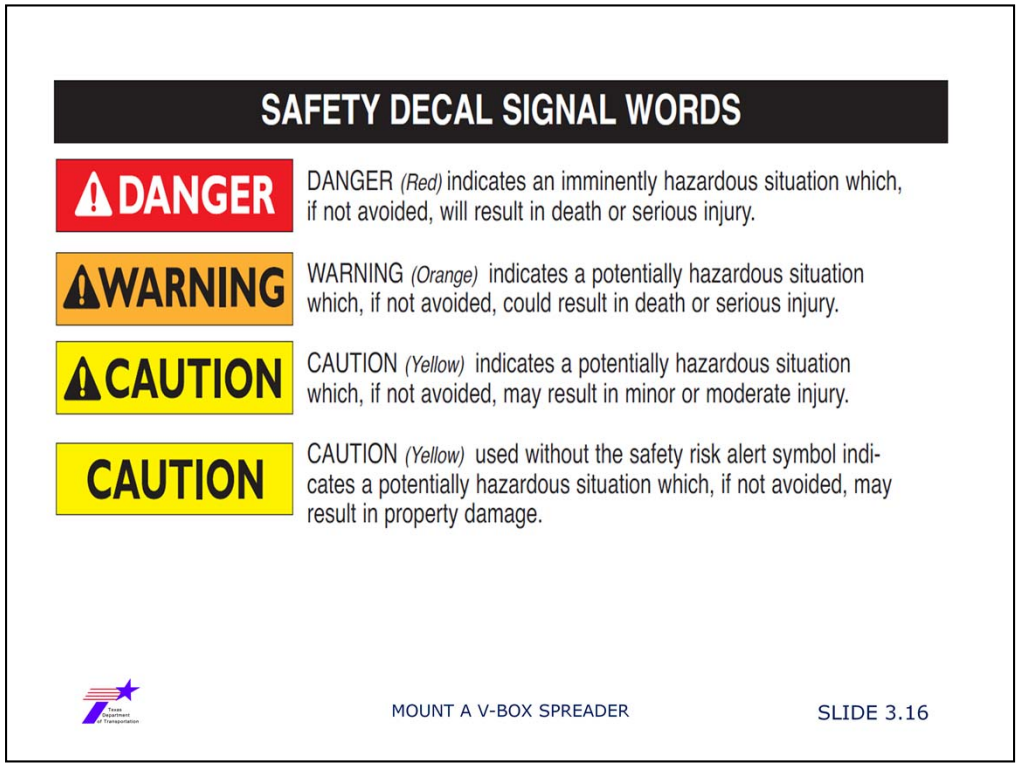
But this is not sufficient by itself. Other securement methods are also required.



Instructor Notes: Present the following key points.

SAFETY FIRST!

Take a moment to review the safety warnings associated with V-box spreaders.

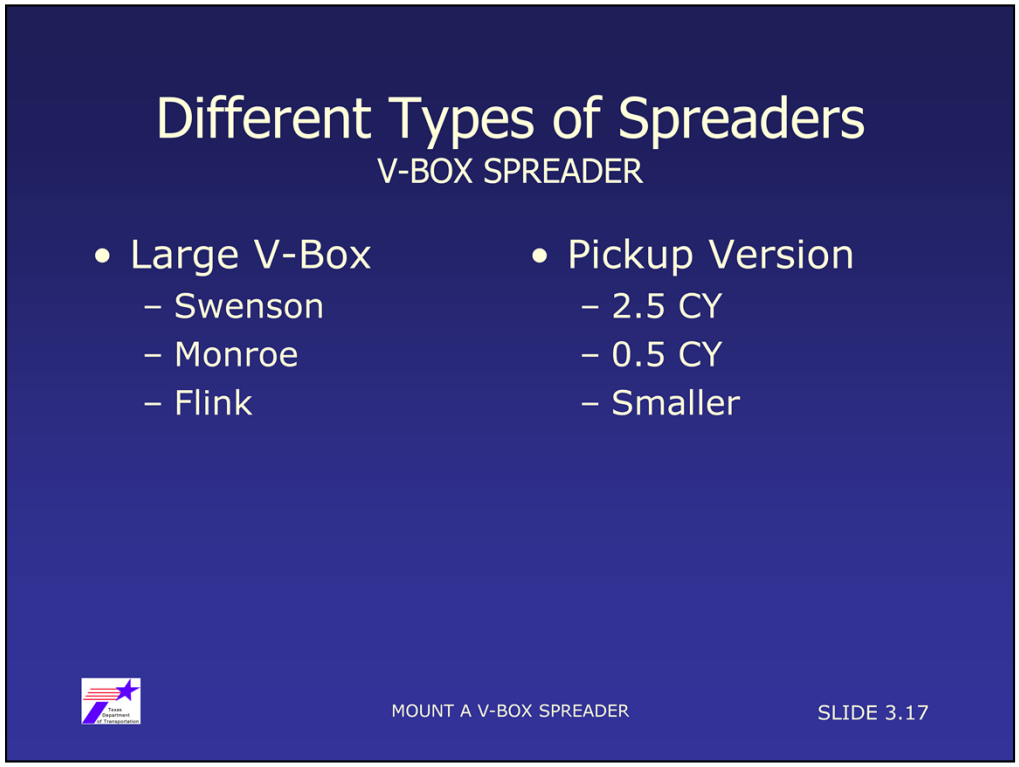


Instructor Notes: Present the following key points.

Note that the safety decal signal words classify into different categories.

RED… "… will result in DEATH OR SERIOUS INJURY."

SAFETY FIRST!



Instructor Notes: Present the following key points.

TxDOT uses different types of V-boxes.

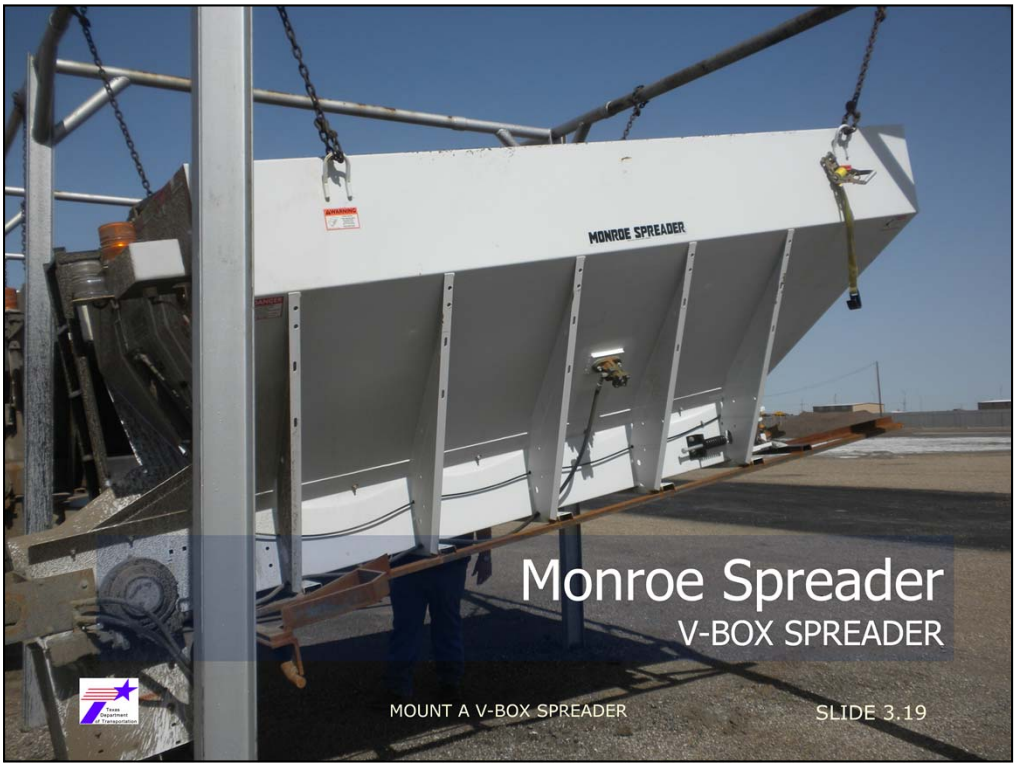
The large versions fit into 6 CY and 10 CY trucks.

The smaller versions fit into pickups.



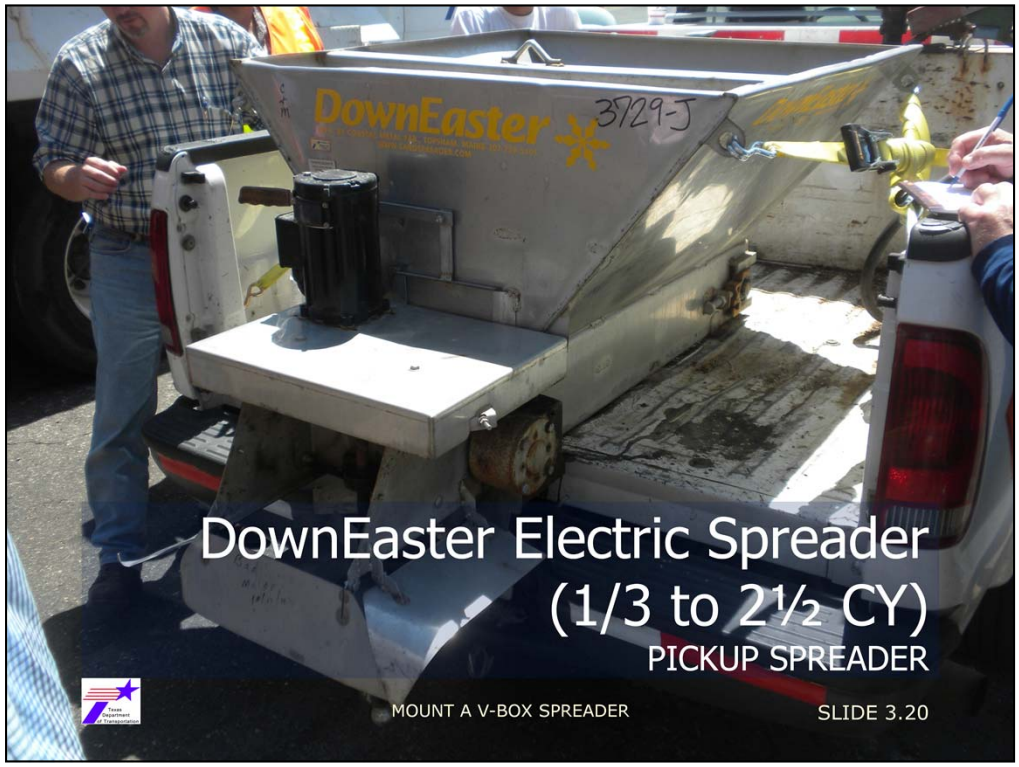
Instructor Notes: Present the following key points.

Typical V-box for a 10CY truck. Swenson is the manufacturer.



Instructor Notes: Present the following key points.

Typical V-box for a 10CY truck. Monroe is the manufacturer.



Instructor Notes: Present the following key points.

This is a pick-up model. The spreader is placed in the pickup bed with the tailgate removed.

It is similar to the large truck versions, but uses an electric motor to power the conveyor and spinner.

Some Districts, especially those that receive snow and ice only occasionally and which are mostly rural with limited infrastructure, use these to treat their FM bridges and other trouble spots.

A smaller spreader for a smaller application.



Instructor Notes: Present the following key points.

This is a larger version of the pick-up model. It uses a gas engine to power the conveyor and spinner.



Instructor Notes: Present the following key points.

This receiver-mounted spreader is among the smallest of the pickup spreaders. No conveyor. The spinner is powered electrically.



Instructor Notes: Present the following key points.

Let’s discuss V-box storage.



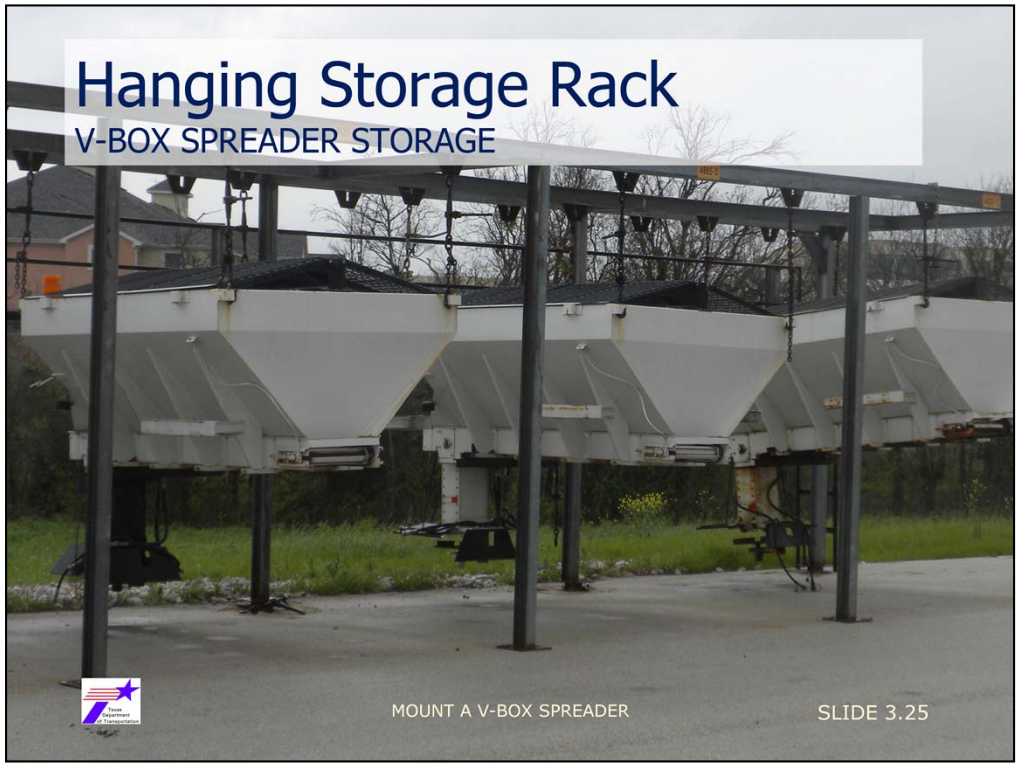
Instructor Notes: Present the following key points.

TxDOT stores its V-boxes (and by this, we are primarily referring to the large ones) in one of two ways.

1. HANGING STORAGE RACKS

2. LEG STAND SUPPORTS

Some Districts place their V-boxes on metal saw horses, but this is not very common.



Instructor Notes: Present the following key points.

This hanging storage rack system, located in the AUSTIN District, is fairly typical.

It is open top. It adequately supports the V-boxes. The paved surface is helpful during inclement weather.



Instructor Notes: Present the following key points.

This hanging storage rack, in the ABILENE District, is covered.

Also, this storage rack features a raised catwalk system that enables maintenance personnel not to have to climb up on top of the V-box during mounting and dismounting. A good safety feature.



Instructor Notes: Present the following key points.

This hanging storage rack system, in LUBBOCK, is among the more simple designs.

Open top, granular surface, no catwalk. Functional.



Instructor Notes: Present the following key points.

This hanging storage rack, in the ATLANTA District, is covered.

This storage rack has two safety features:

1. The V-box is supported by a cable and pulley system which is hoisted using a hand-winch. This means that maintenance personnel directly raise and lower the V-box into the truck bed while they stand on the ground.

2. The storage rack includes a limited raised catwalk system for removing or attaching the support chains.



Instructor Notes: Present the following key points.

This hanging storage rack system, in LUBBOCK, shows maintenance personnel on top of the V-box, removing the support chains.

This raises some safety questions.

V-box mounting can be done safely using this system, and in fact, it is done safely every day.

Personnel who use this system need to be properly trained. CARE has to be used to prevent falls or other accidents associated with climbing on top of or climbing down from the V-box.



Instructor Notes: Present the following key points.

The LEG STAND SUPPORT is a second typical method of V-box storage.



Instructor Notes: Present the following key points.

This image shows V-box insertion into the dump truck bed.

Note the front leg stands, which swing back under the V-box.

Variations on this theme exist.



Instructor Notes: Present the following key points.

This image shows the rear leg stands, which are fixed into the ground for this particular system.

This rear leg stand design features a cradle that supports the rear of the V-box during loading and unloading.



Instructor Notes: Present the following key points.

This image shows the rear fixed legs, with the cradle supporting the mounting bracket on the back of the V-box.



Instructor Notes: Present the following key points.

This is an alternative rear leg stand support system. It is used in the FORT WORTH District.

Note that for this system, the rear leg stand supports TWO spreaders, one to the front (currently empty) and one to the rear (V-box in place).

Also, this system uses a pipe to support the rear of the V-box, rather than the cradle shown previously.

TxDOT has different designs, each with its merits.



Instructor Notes: Present the following key points.

Before you can mount a V-box spreader in a dump truck, it is necessary to remove the tailgate.



Instructor Notes: Present the following key points.

TxDOT maintenance personnel typically use one of two methods to remove the tailgate, shown here.

Once the tailgate is removed, it has to be stored.



Instructor Notes: Present the following key points.

This series of slides shows one way to safely do this… using a forklift to support the tailgate during removal.

This series of steps is explained in detail in Learning Exercise 3.1.

Note the steps as shown.

STEP 1.



Instructor Notes: Present the following key points.

STEP 2.



Instructor Notes: Present the following key points.

STEP 3.



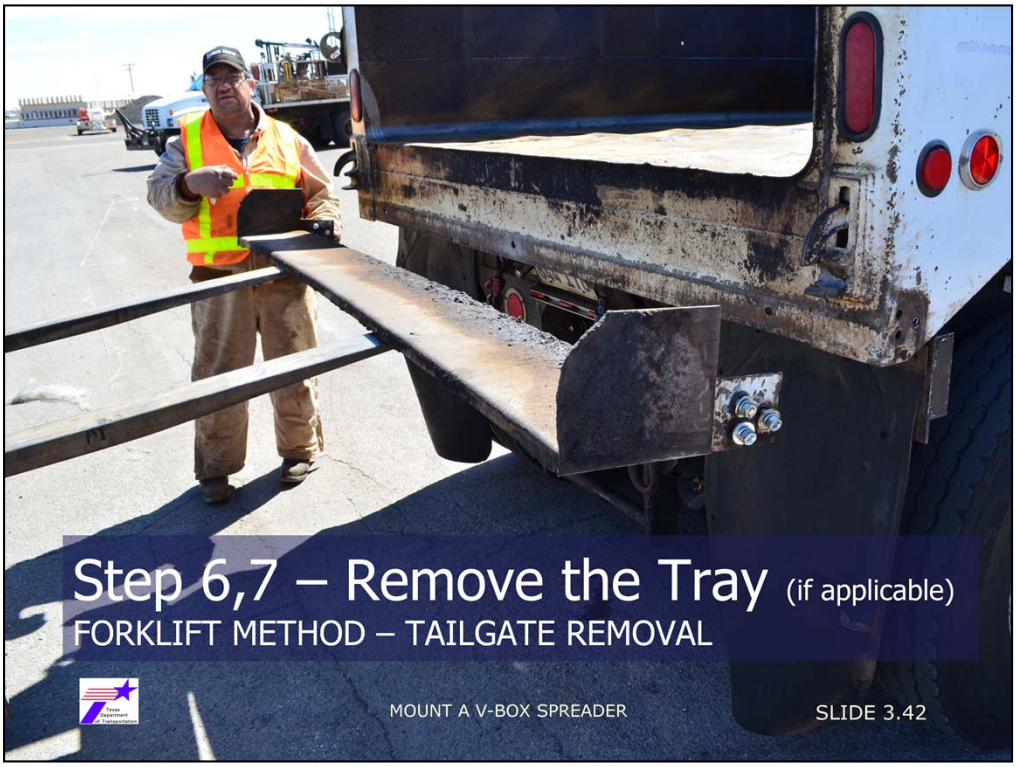
Instructor Notes: Present the following key points.

STEP 4.



Instructor Notes: Present the following key points.

STEP 5.



Instructor Notes: Present the following key points.

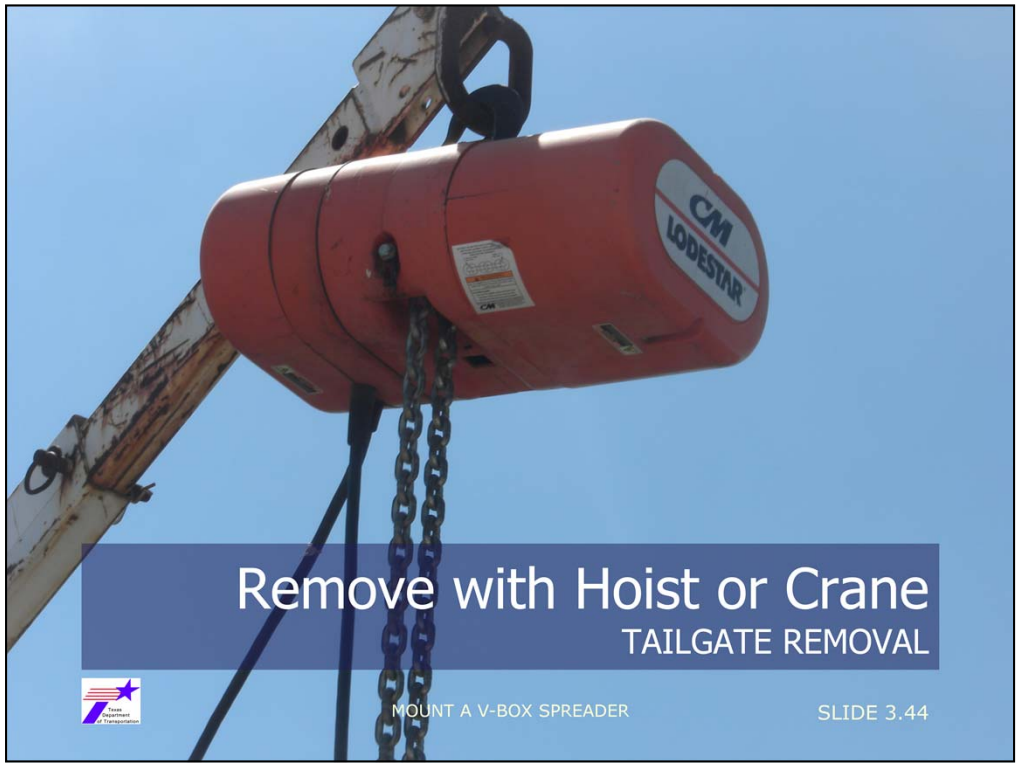
STEP 6, 7.

Some trucks have this tray affixed for asphalt operations. Remove as necessary – if the tray will interfere with the V-box spinner chute.



Instructor Notes: Present the following key points.

Some maintenance yards have dedicated, light-duty hoists to facilitate dump truck tailgate removal as shown here.



Instructor Notes: Present the following key points.

Close-up view of the hoist.



Instructor Notes: Present the following key points.

Hoist being used to place the tailgate into a storage rack.



Instructor Notes: Present the following key points.

TxDOT has different types of storage racks. This is a standard type. The basic idea is that the tailgate has to be stored when it is not on the truck.



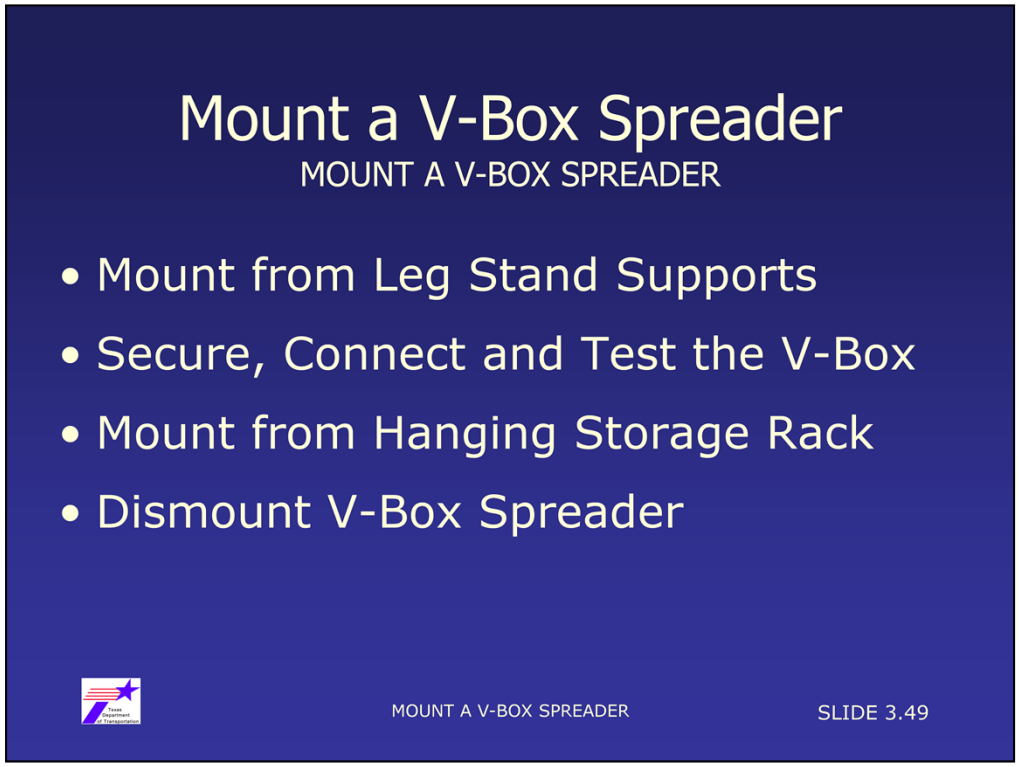
Instructor Notes: Present the following key points.

This system is a little more imaginative.



Instructor Notes: Present the following key points.

ONE of the pre-storm activities your Supervisor will ask you to perform is to mount a V-box spreader in a dump truck.



Instructor Notes: Present the following key points.

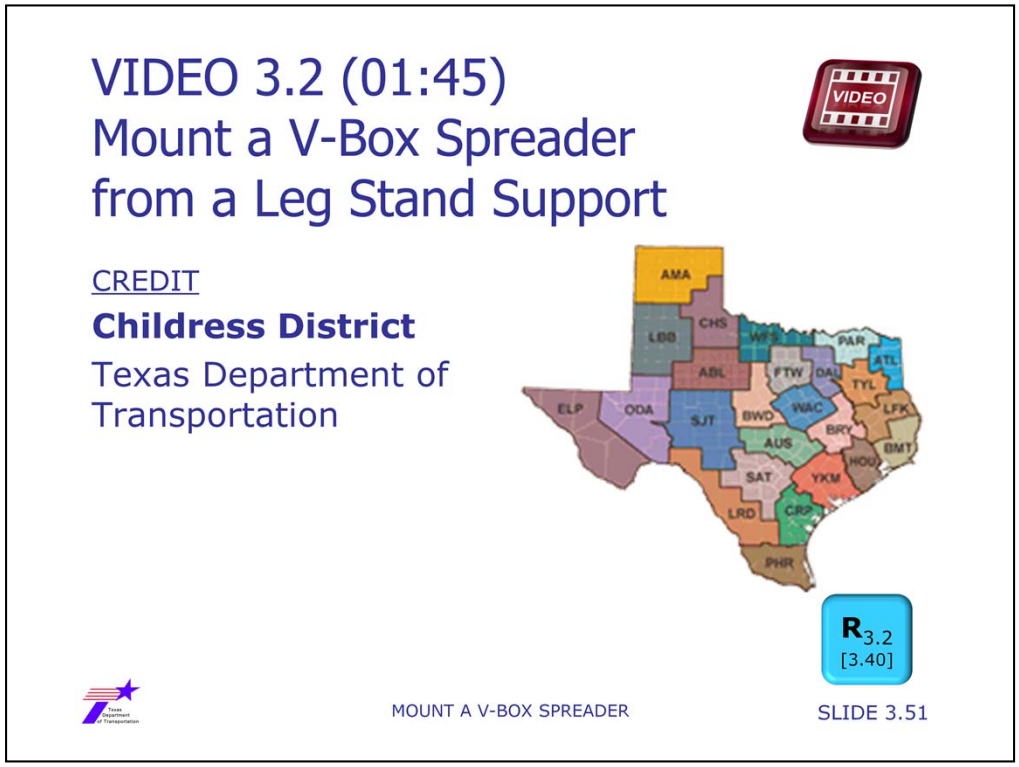
This slide identifies a series of videos that illustrate the V-box mounting and dismounting process.

This covers both leg stand support systems and hanging storage rack systems.



Instructor Notes: Present the following key points.

We will begin with mounting a V-box from a leg stand support system.

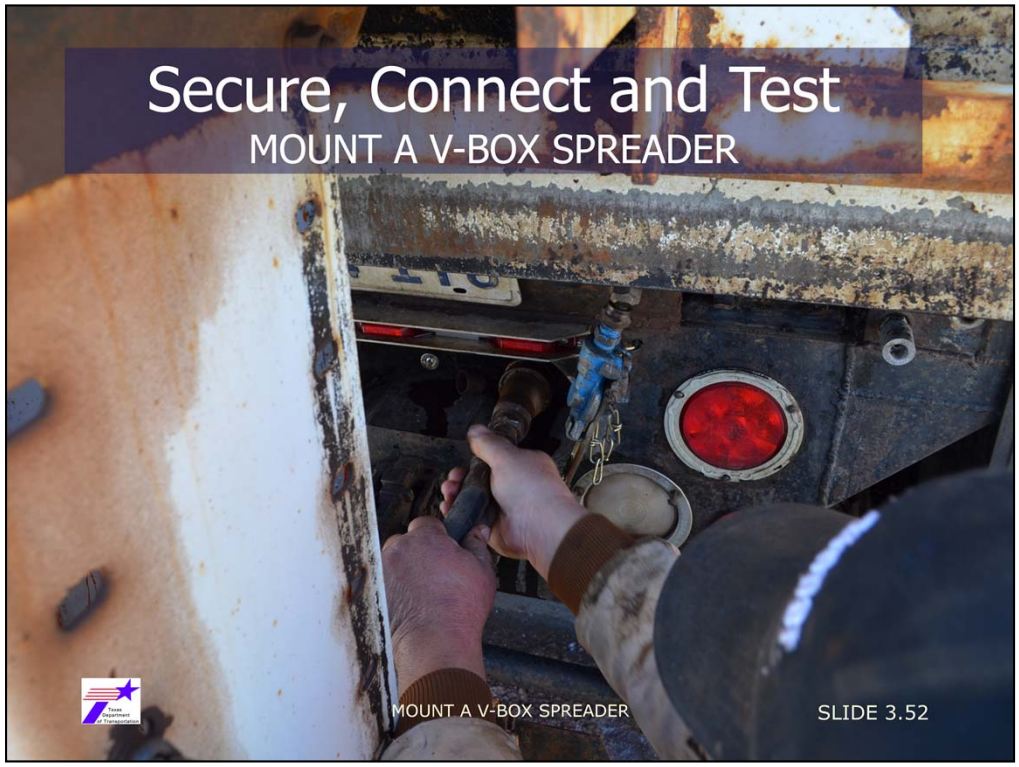


Instructor Notes: Present the following key points.

Credit for this video goes to the CHILDRESS District.

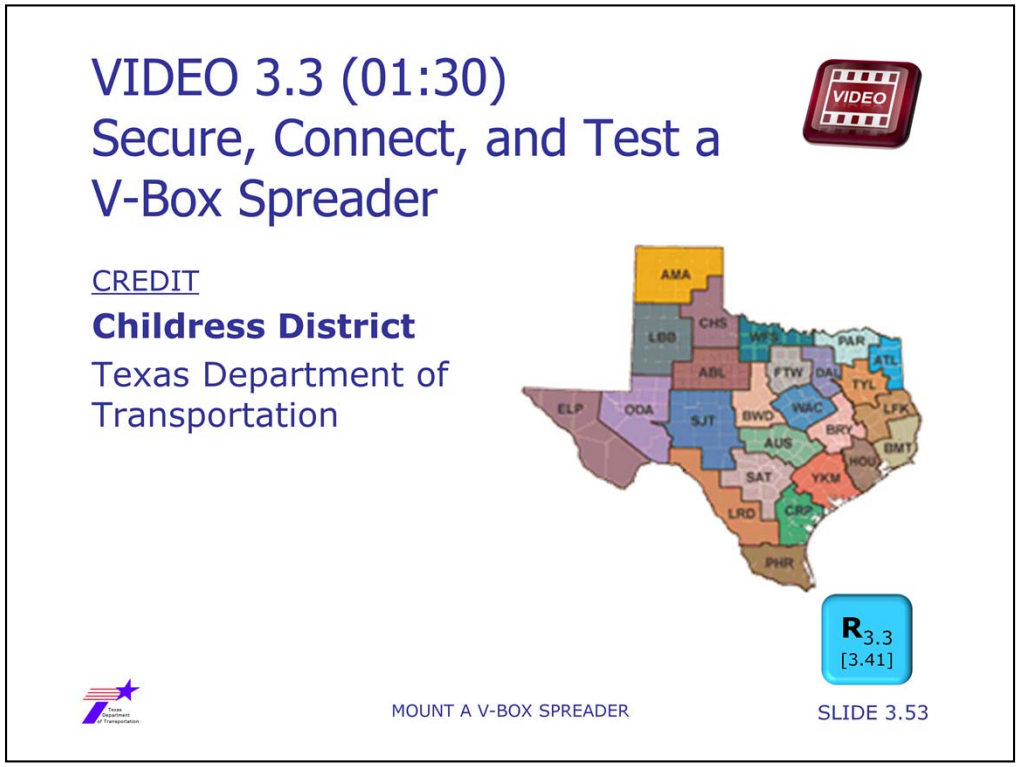
This video nicely illustrates how to mount a V-box using the leg stand support system.

NOTE that the script is provided (reference R3.2).



Instructor Notes: Present the following key points.

Once mounted, the V-box must be secured, connected, and tested.



Instructor Notes: Present the following key points.

Credit for this video goes to the CHILDRESS District.

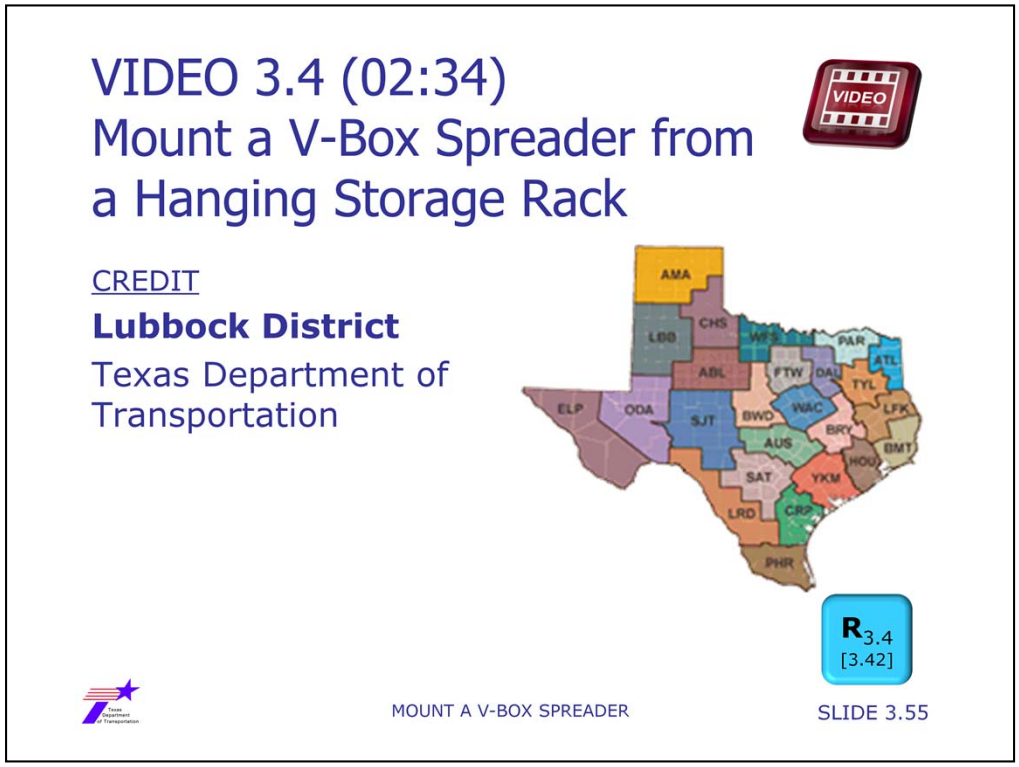
This video nicely illustrates how to secure, connect and test a V-box.

NOTE that the script is provided (reference R3.3).



Instructor Notes: Present the following key points.

Mounting a V-box from a hanging storage rack system is very common at TxDOT.

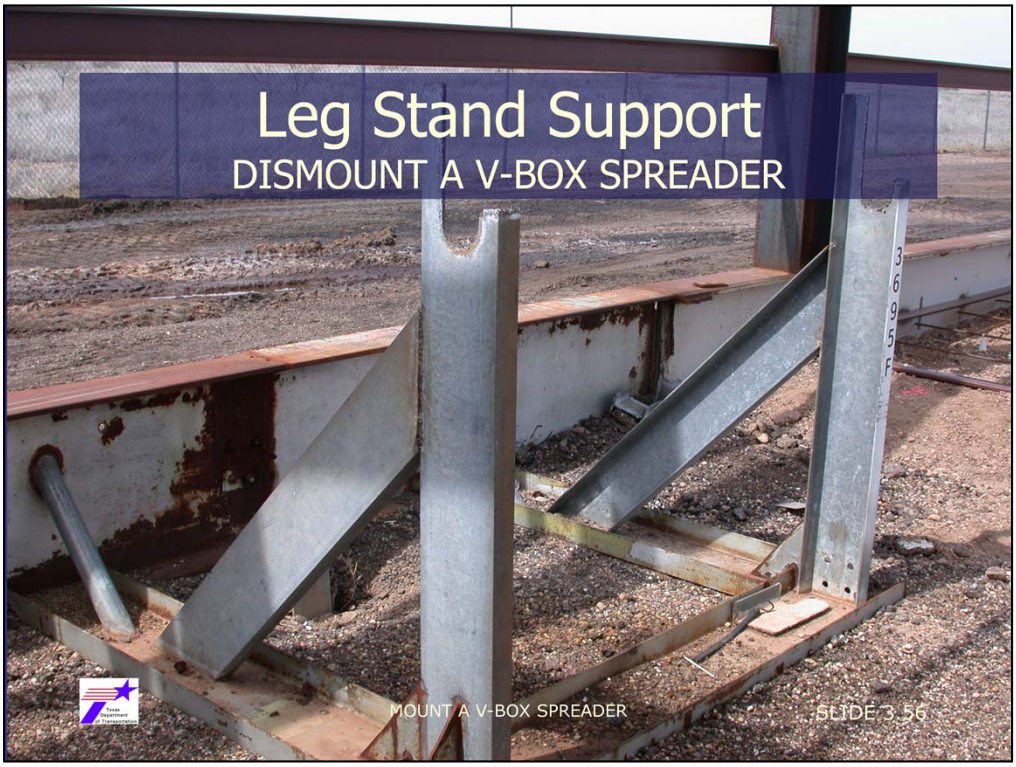


Instructor Notes: Present the following key points.

Credit for this video goes to the LUBBOCK District.

This video nicely illustrates how to mount the V-box from the hanging storage rack system.

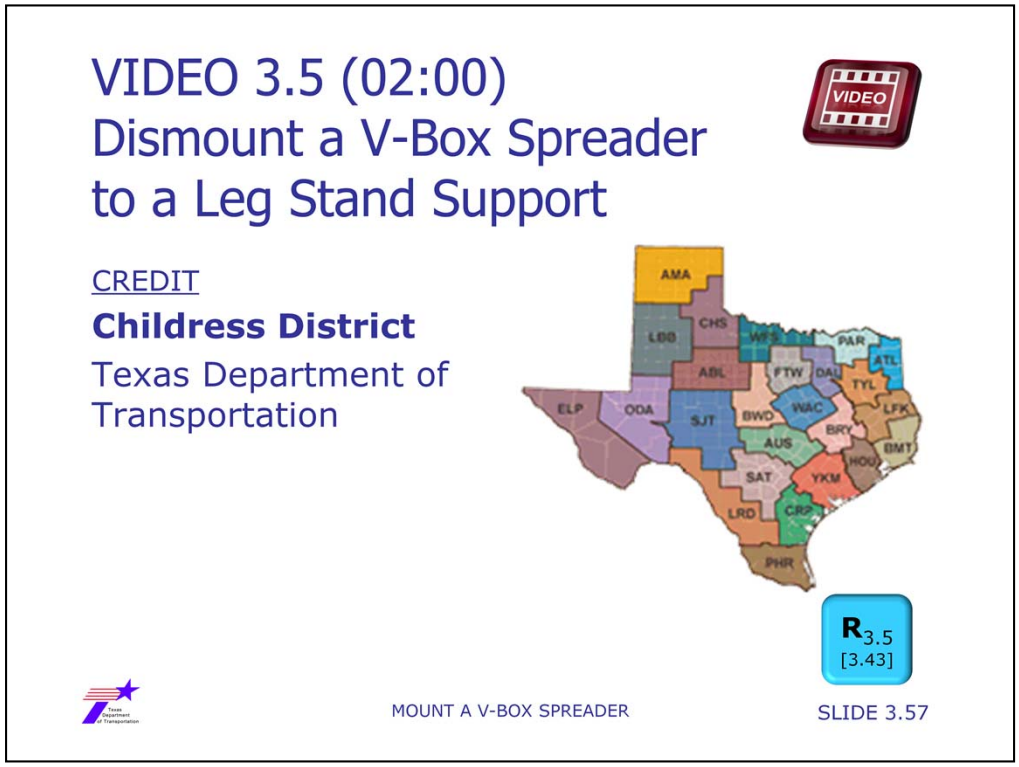
NOTE that the script is provided (reference R3.4).



Instructor Notes: Present the following key points.

Once mounted, and after the application is complete, the V-box has to be dismounted.

We will illustrate this using the leg stand support system.



Instructor Notes: Present the following key points.

Credit for this video goes to the CHILDRESS District.

This video nicely illustrates how to dismount the V-box using the leg stand support system.

NOTE that the script is provided (reference R3.5).



Instructor Notes: Present the following key points.

GREEN SHEET

Having seen the mounting process explained, and illustrated in video, it is now your turn to actually do the mounting process.

NOTE REFERENCE R3.6. This explains the complete process.



Instructor Notes: Present the following key points.

V-box spreaders require inspection and maintenance to ensure functionality.

We will mostly discuss this in MODULE 5, the PRE-TRIP INSPECTION, but we will identify a few points here.



Instructor Notes: Present the following key points.

It is necessary to confirm that the V-box spreader is secured in the dump bed. Clasping the mounting pins is not enough.



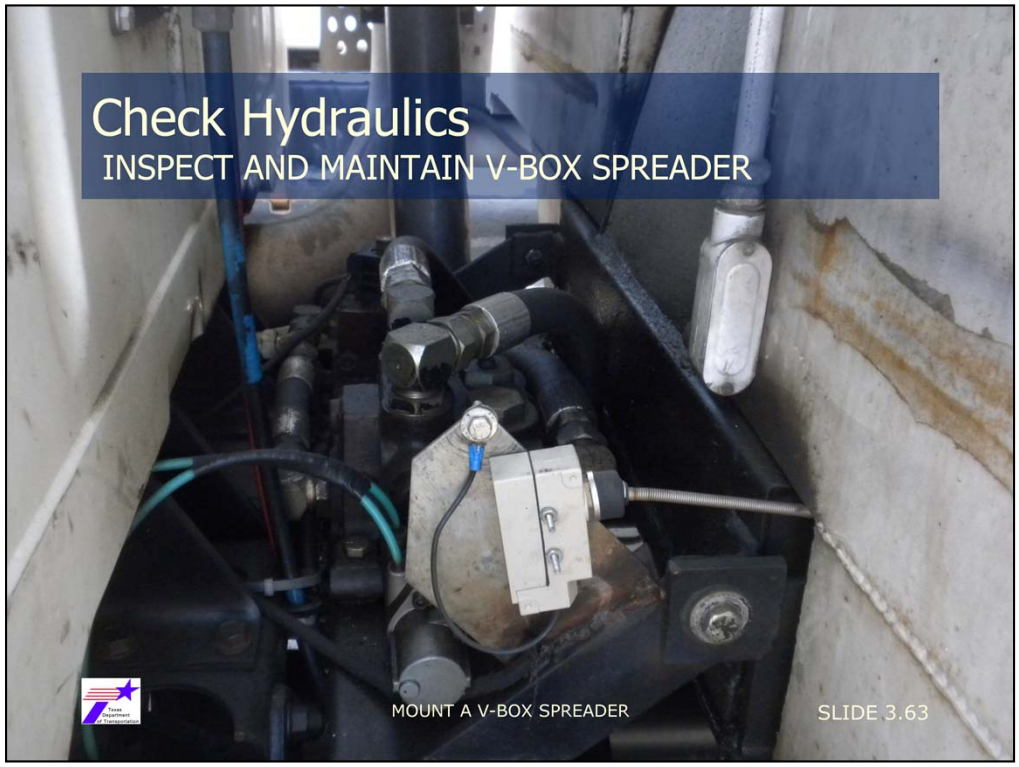
Instructor Notes: Present the following key points.

Make sure the spinner is functional. This image shows a spinner plate where the fins had to be replaced because of corrosion.



Instructor Notes: Present the following key points.

The conveyor chain should be tensioned properly.



Instructor Notes: Present the following key points.

Most TxDOT V-box spreaders use the truck hydraulic system to power the conveyor and the spinner.

This hydraulic system needs to be checked.



Instructor Notes: Present the following key points.

V-box controls for 10 CY trucks are typically located in the cab.

V-box controls for 6 CY trucks may be located under the dump bed as shown here.

The controls should be functional. We will discuss this in more detail in Module 7, CALIBRATION.

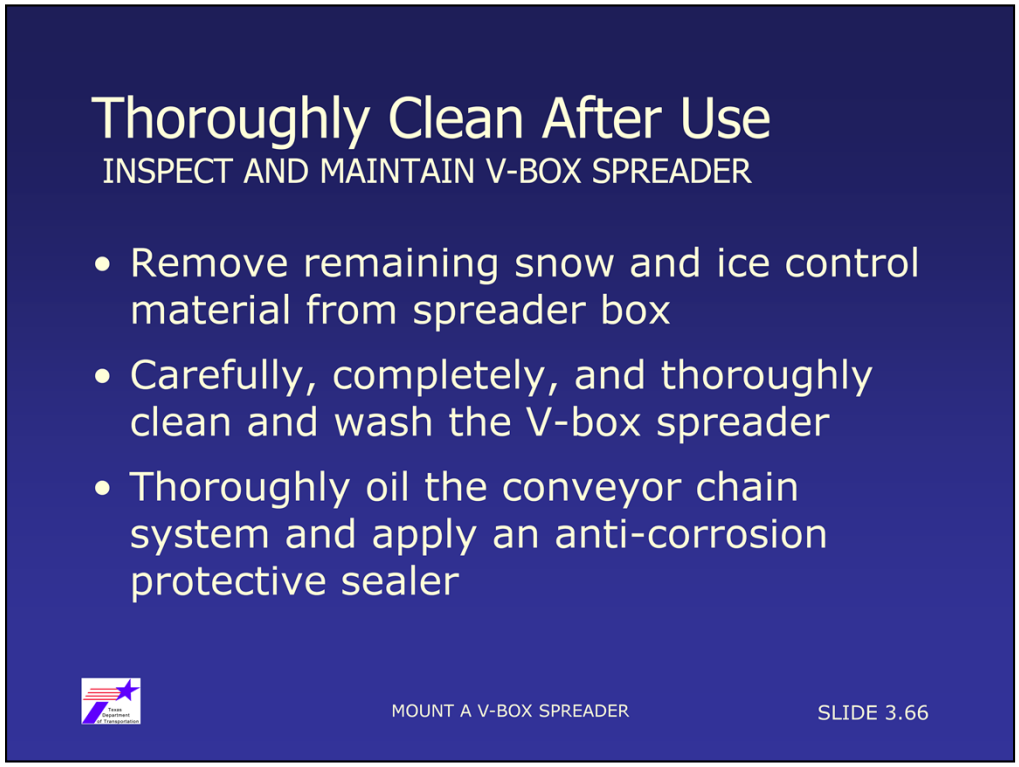


Instructor Notes: Present the following key points.

Proper lighting is an important functional and safety feature of winter maintenance operations. This is particularly true when applying granular snow and ice control chemical using the V-box spreader.

Check to make sure the lights work.

Chemicals are corrosive, and this is hard on wiring.



Instructor Notes: Present the following key points.

One of the themes of this training is that proper cleaning is necessary to control corrosion effects of snow and ice control chemicals.

Your Supervisor expects you to be diligent in taking care of the equipment.



Instructor Notes: Present the following key points.

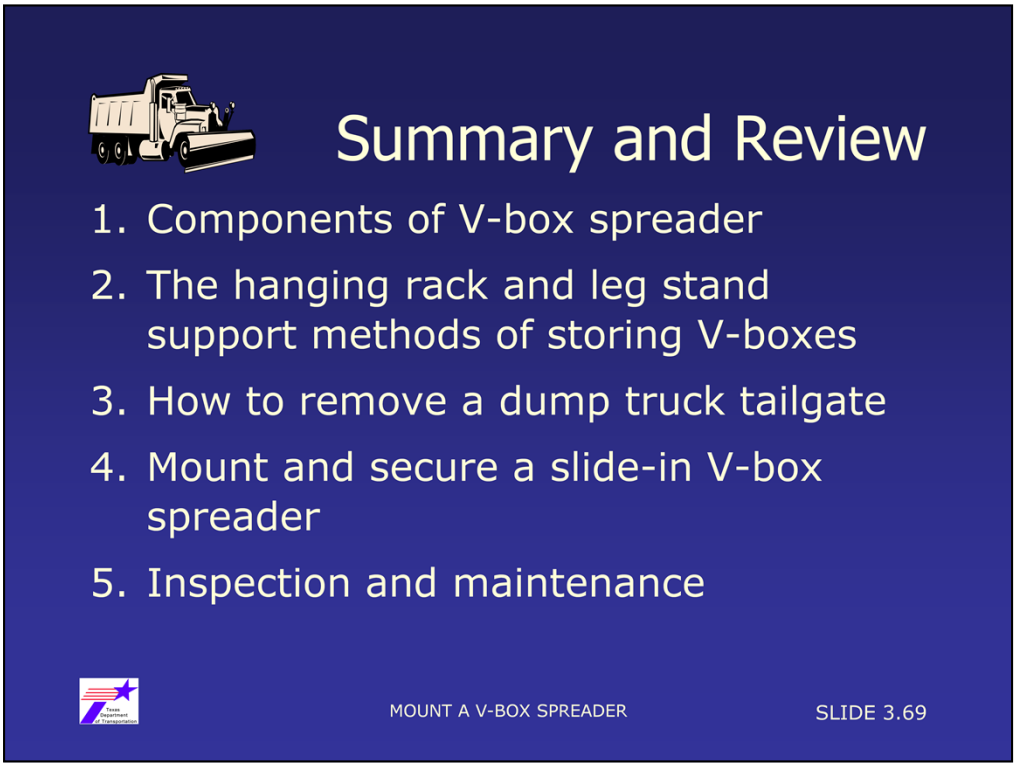
NOT like this!



Instructor Notes: Present the following key points.

Snow and ice control chemicals are corrosive.

Proper cleaning will help prolong equipment life.



Instructor Notes: Present the following key points.

PINK SHEETS!

Answer each question.


FIELD Exercise 3.1
Mount a V-Box Spreader
Stored on:
1. Hanging storage rack...
<OR>
2. Leg stand support...
R3.6
[3.45]
MOUNT A V-BOX SPREADER
SLIDE 3.58

VIDEO 3.1. TXDOT V-BOX SPREADER (00:53)

SCRIPT

Whether you are distributing sand for traction improvement as shown here, or distributing chemicals such as road salt or Meltdown20, the V-Box spreader features prominently in TxDOT's equipment used to fight ice and snow.

This particular video, showing multiple snowplows and spreaders operating in tandem, was taken in Fort Worth during TxDOT's response to the 2011 Superbowl storm.

Most all TxDOT maintenance sections have V-Box spreaders. Some are used with 10-yard trucks as shown in this video, some are used with 6 yard trucks, and some fit into the back of a pickup.

The V-Box spreaders in this video are distributing Meltdown 20 on an icy section of freeway, in a de-icing application.

The goal is always the same: the spreader distributes snow and ice control material onto the road surface.

VIDEO 3.2. MOUNT A V-BOX SPREADER FROM A LEG STAND SUPPORT (01:45)

SCRIPT

This V-Box is supported by leg stands. Notice the front leg stands which swing, and the rear leg stands, which are fixed into the ground.

Although designs vary in TxDOT, the rear leg stand showing here incorporates a cradle that supports the rear of the V-Box.

This particular setup includes a stand for the tailgate. The tailgate, of course, must be removed from the dump truck before the V-Box can be inserted into the dump bed.

Mounting a V-Box spreader from a leg stand support begins with carefully aligning the dump truck so that you can cleanly back underneath the V-Box.

A spotter is required to guide the truck operator.

Be sure to move any tie-down chains that might snag the dump truck bed during V-Box insertion.

To mount the V-Box, the operator raises the dump bed slightly and slowly backs the dump truck bed under the V-Box. When the front leg supports contact the rear of the truck, these legs swing back.

Guided by the spotter, the operator lowers the truck bed, and this causes a pivot which lifts the rear of the V-Box out of the cradle of the rear leg stands.

Insertion into the dump truck bed then continues until rear mounting pins on the V-Box align with the tailgate latches. The operator clasps the mounting pins with the tailgate latch.

The V-Box is now fully inserted into the dump truck bed.

VIDEO 3.3. SECURE, CONNECT, AND TEST A V-BOX SPREADER (01:30)

SCRIPT

With the V-Box inserted into the dump truck bed, the next step is to secure and connect the V-Box.

Connect the hydraulic lines, as shown here, which operate the conveyor and the spinner. You will also need to connect the lighting harness.

Securing the V-Box involves more than simply closing the tailgate latch. This particular V-Box is being secured with two tie-downs, one on each side, that use chains and ratchet binders. Other tie-down approaches include securement straps and anchor bolts. This will vary among maintenance sections.

The entire process takes a couple of minutes or so.

Once secured and connected, you should test the V-Box. Make sure the conveyor is working properly on its settings. Also, check the spinner.

VIDEO 3.4. MOUNT A V-BOX SPREADER FROM A HANGING STORAGE RACK (02:34)

SCRIPT

Mounting a V-Box spreader from a hanging storage rack begins with carefully orienting and aligning the dump truck so that you can cleanly back underneath the V-Box. Your spotter will help guide you.

Notice that the V-Box fits snugly within the dump bed, with very little extra room on either side.

Once you insert the V-Box into the dump truck bed, you will need to remove the rack support chains. This may require that you get up on top of the V-Box, as shown here. Safety is a key concern; use caution when doing this.

Some maintenance sections have fabricated hanging storage racks that include catwalks, and this does not require their personnel to get on top of the V-Box. Some use ladders for the same reason.

Releasing the V-Box from the storage rack is done in different ways. Here, the truck operator carefully raises the dump bed slightly to create slack in the forward chains, allowing them to be removed. He then lowers the dump bed to create slack in the rear chains, allowing them to be removed. The V-Box is now free from the hanging storage rack.

Other approaches are also used. For example, some maintenance sections use a winch and pulley system to lower the V-Box in the truck bed.

With the V-Box in the truck, it must be secured. Clasping the tailgate latches is not sufficient.

This V-Box uses a steel anchor-bolt type of securement system, one anchor bolt in each corner of the V-Box. Other approaches, such as straps or chains and binders, can also be used.

VIDEO 3.5. DISMOUNT A V-BOX SPREADER TO A LEG STAND SUPPORT (02:00)

SCRIPT

The process of dismounting a V-Box spreader is simply a reversal of the mounting process.

Disconnect the hydraulics and wiring harness.

Carefully orient and align the truck as it is backed into position for V-Box removal. A spotter is required for this.

Remove the securement from the V-Box, in this case, ratchet binders and chains. Place the chains inside the dump bed so they do not snag on the truck as the V-Box is removed. Also, be sure to have the operator unclasp the tailgate latch.

The truck operator will now slightly raise the truck bed. This tranfers support of the back part of the V-Box from the truck to the rear leg stand. Recall that the rear legs are permanently fixed into the ground.

With the dump bed in the raised orientation, the operator slowly pulls the truck forward, removing the V-Box and allowing the front legs to swing into place.

This completes the dismounting operation.

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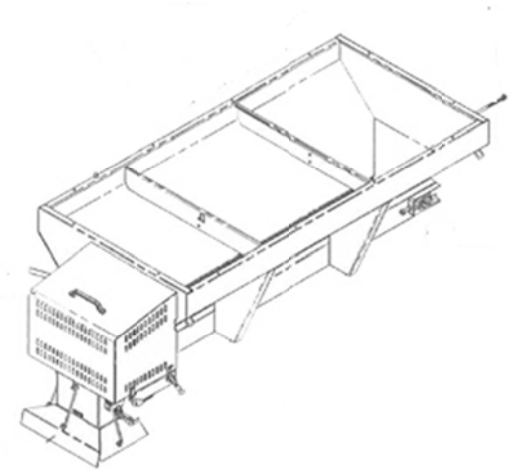
LEARNING EXERCISE 3.1

Mount a V-Box Spreader

Winter Weather Operations Training

Equipment Needed for this Exercise

1. Slide-in V-box spreader, 6 cubic yard (CY) or 10 CY model
2. Dump truck, 6 CY or 10 CY capacity
3. Forklift, crane, hoist or other approved lifting device for dump truck tailgate removal
4. Anchor bolts, chains, straps, tie-downs or other approved devices to secure the V-box spreader to the dump truck bed
5. Hand tools as needed for bolted connections and tailgate pin removal



V-BOX SPREADER SAFETY

- Read all installation, safety and maintenance instructions completely before operating this equipment.
- Keep all personnel clear of moving parts while equipment is being operated.
- While operating this equipment, use common sense, use caution, be alert and be safety-conscious.

Learning Objectives

Upon completion of this field exercise, the learner will be able to:

1. Identify major components of the V-box spreader
2. Explain the hanging storage rack method and the leg stand support method of storing a V-box spreader
3. Remove the tailgate from a dump truck to facilitate mounting the V-box
4. Mount and secure a slide-in V-box spreader in a dump truck bed
5. Inspect and maintain critical components on a V-box spreader

Description

The V-box spreader is a slide-in attachment for 6 CY and 10 CY dump bed trucks. Because of unique mounting and operational factors, each V-box spreader is matched to a specific dump truck and may not be used interchangeably with other trucks. Every V-box spreader is clearly marked with the equipment number of its corresponding truck.

TxDOT almost exclusively uses V-box (hopper type) spreaders instead of tailgate spreaders for winter weather maintenance. TxDOT's inventory of V-box spreaders includes several different makes and models that vary in age. Three common manufacturers are Monroe, Flink, and Swenson.

V-box spreaders are used to spread granular snow and ice control chemicals such as road salt and Meltdown 20 for deicing roadways where snow and ice bonds have formed on the pavement surface. The V-box spreader is also used to spread abrasives such as chat, flyash, ice rock, screenings, bottom ash or Grade 5 rock on roadways, bridges and trouble spots to improve traction.

Granular material application rates are controlled by adjusting the gate opening at the rear of the hopper, the conveyor chain (belt) speed and the spinner speed. The spinner speed and flap positions define the pavement area to be covered (one, two or three lanes) by the granular material.

Conveyor and spinner speed may be adjusted by turning the appropriate dial on the control panel. The control panel for the V-box spreader is normally mounted in the cab of the truck. Some older model spreaders have the controls mounted on the truck frame.

Storage for V-Box Spreaders

TxDOT maintenance yards store their V-box spreaders in one of two ways. These are (1) metal storage racks and (2) leg stand supports. A few maintenance sections use metal saw horses.

Metal Storage Racks V-box spreaders have traditionally been stored in TxDOT maintenance section yards on metal-frame storage racks. These storage racks use chains, one at each corner of the hopper, to suspend, or hang, the spreader box. Storage racks are sometimes covered with a roof to protect the spreader boxes from the elements.

Some storage rack designs require maintenance section personnel to climb on top of the spreader/truck bed or to work from a ladder to disconnect or connect the chains when loading or unloading the spreader. Some storage racks have fabricated catwalks with stairs in their rack designs as well as other innovations to facilitate safer access to the spreader boxes during loading and unloading.

Leg Stand Supports Some TxDOT maintenance sections store their V-box spreaders on leg frames or leg stands which typically have been designed and fabricated by local shop or operations personnel. Proprietary leg-stand systems are also available for purchase from some V-box manufacturers. As the name implies, the leg stand system uses legs to support the V-box directly on the ground rather than chains to suspend the V-box in the air.

Some leg stand designs enable the spreader to be mounted in the dump bed using only one man (the dump truck operator). The use of some leg stand designs may also reduce or eliminate the amount of time that a worker has to be on top of the spreader or dump bed, thus minimizing safety risks associated with falls.

The rear leg stands are securely anchored to maximize stability during the loading and unloading operation and while the spreader is being stored. The rear leg stands may be anchored in the ground using drilled shafts filled with concrete or otherwise connected to some type of rigid structure.

The front leg stands are attached to the front of the spreader box frame so that the legs are allowed to rotate during the loading and unloading process. During V-box loading, the front legs will rotate back underneath the V-box as the legs come into contact with the dump truck bed. The legs fold up completely alongside the hopper when the V-box is fully loaded.

During unloading, as the V-box spreader is being returned to storage, the front legs fall or rotate forward to the vertical position as the V-box slides out of the truck bed. In this way, the V-box is stored on two (rear) anchored leg supports and two (front) rotating leg supports.

Removing and Storing the Dump Truck Tailgate

The dump truck tailgate must be removed from the dump bed before the V-box spreader can be mounted in the truck. This requires a temporary storage location for the tailgate while the spreader box is on the truck.

TxDOT maintenance personnel use a variety of methods to remove the tailgate from the truck. Some use a forklift to remove the tailgate from the truck and transport the tailgate to its storage location or rack/fixture. Others prefer to employ a hoist or crane to lift the tailgate off the truck and store it in an adjacent rack or fixture.

For this learning exercise, we will describe the steps involved using both methods of tailgate removal.

Forklift Method

1. Completely raise the dump bed of the dump truck so the tailgate will open. The tailgate will be hanging vertically, connected to two pins at the rear/top of the dump bed.
2. Position the forks of the forklift beneath the bottom edge of the tailgate, as it is hanging vertically.
3. Raise the forks of the forklift to a point where the inside face of the tailgate is fully supported by the forks in a level position while still being connected to the large pins at the top back end of the dump bed. The tailgate will revolve on the pins as the forks are raised as the tailgate moves from a vertical to level position on the forks.
4. Remove the two pins that connect the upper portion of the tailgate to the dump bed.
5. Suspend or store the tailgate in an appropriate storage rack or location.

Some trucks are equipped with a tray, also called a pan or footpiece, at the bottom/rear of the dump bed. This tray serves as an extension to the truck bed and as a transition piece from the dump bed to an asphalt laydown machine or drag box to minimize spillage of material. The tray must be removed from the truck bed before the V-box spreader can be mounted. If so:

6. While supporting the tray with a forklift, remove the three nuts and bolts that fasten the tray to the dump truck bed on each side of the bed/tray.
7. Remove the tray from the bed of the truck and store the tray in an appropriate storage location.

Hoist or Crane Method

1. Position the dump truck in the area where the hoist and storage rack are located.
2. Connect the lifting sling of the hoist or crane to the lift points on the tailgate.
3. Take the slack out of the lifting sling so that the tailgate will be supported by the hoist when the tailgate is disconnected from the dump bed.
4. Disengage the lower tailgate latches using the controls in the truck cab.
5. Remove the two pins that connect the upper portion of the tailgate to the dump bed.
6. Lift the tailgate away from the truck bed, and move the truck away from the tailgate storage location.
7. Use the hoist or crane to position and set the tailgate in the storage location or rack.

8. Disconnect the lifting sling from the tailgate and return the hoist or crane to its ready position.

With the tailgate removed, the V-box spreader can now be mounted in the dump bed.

Mounting a V-box Spreader

Mounting a slide-in V-box spreader in a dump truck bed is typically a two-man operation, consisting of a dump truck operator and a spotter as a minimum. The spotter is responsible to guide the dump truck operator as he backs the truck into position to facilitate safe and efficient spreader installation. This section provides step-by-step instructions for mounting the spreader from either an elevated storage rack or from a leg-stand support system.

Elevated Storage Rack

1. The spotter confirms that the equipment number on the V-box matches the equipment number on the dump truck.
2. The operator backs the dump truck into position near the front of the suspended spreader box.
3. The operator raises the dump truck bed slightly to permit clearance of the front end of the V-box as the operator begins to back under the spreader.
4. The operator continues to back the truck into (toward) the spreader, making sure that the upper edges of the dump truck bed are carefully aligned with the sides of the V-box.

Note that less than three inches of total clearance space exists between the V-box spreader and the sides of the bed when installed.

5. The spotter guides the operator to continue to back the truck into the spreader until the lower back portion of the truck bed contacts (mates with) the latch bars on both sides of the spreader frame. The latch bars should engage the latches on either side of the truck bed that normally receive and lock the tailgate in the closed position.
6. Once the latch bars engage the tailgate latches, the spotter directs the operator to close the air-controlled tailgate latches.
7. The spotter directs the operator to raise the dump truck bed to a point until the weight of the front of the spreader is supported by the truck bed and the two front chains on the elevated rack start to become slack.
8. The two front chains can be removed from the spreader box.
9. The spotter directs the operator to lower the dump bed onto the truck chassis. This fully transfers the weight of the spreader to the truck. At this point, the two chains which formerly supported the rear of the spreader in the storage rack are fully slack, allowing the spotter to disconnect the rear chains from the spreader box.

10. The spotter and operator secure the V-box spreader to the dump truck bed. Dependent on the make and model of the V-box spreader, some units are equipped with anchor bolts for this purpose. Most units use chains and binders or tiedown straps.
11. Once the V-box spreader is fully secured to the dump truck bed, the operator connects the electrical wiring harness from the spreader to the truck (for lighting)
12. The operator connects the hydraulic lines from the spreader to the truck (for hydraulic power to run the conveyor/drag chain and the spinner).

SAFTEY NOTE: Exercise caution when connecting hydraulic lines. Hydraulic lines should be connected either when the truck is not running or when the hydraulic pump that supplies power to the spreader is disengaged.

Leg Stand Support System

1. The spotter confirms that the equipment number on the V-box matches the equipment number on the dump truck.
2. The operator backs the dump truck into position near the front of the spreader box. It is critical that the truck be kept square with the spreader box at all times. The sides of the truck bed should be carefully aligned with the sides of the spreader box to ensure a smooth, bind-free spreader installation.
3. The spotter directs the operator to raise the dump truck bed to a point where the plane of the truck bed will clear the front of the spreader box frame, below the point of rotation of the front folding leg stands, as the driver begins to back under the spreader.
4. The spotter makes sure the tiedowns at the front of the spreader box are positioned such that they will be draped along the outside of the truck bed rails as the truck is backed into the spreader box. This will facilitate a quick connection to the truck bed after the spreader box is loaded.
5. The operator backs the truck into the spreader box so that the lower back portion of the truck bed contacts the upper portion of the front leg supports. The front legs will begin to rotate as the driver continues to back the truck toward the anchored (rear) leg stand set. The front legs will fold completely underneath the spreader box.
6. The spotter directs the operator to continue backing toward the keyways or slots in the rear leg stand set until the welded bracket on the back of the spreader box frame fully engages the keyways in the rear leg stands. At the same time, the horizontal mounting pins at the ends of the welded bracket will engage the tailgate latches on either side of the truck bed. When these two things occur, the rear end of the spreader box is in intimate contact with the back end of the truck bed.

7. The spotter directs the operator to close the air-controlled tailgate latches which lock the rear end of the spreader box to the back of the truck bed.
8. The operator fully lowers the truck bed onto the truck chassis, freeing the back of the spreader box from the anchored rear leg stand set.
9. The spotter directs the operator to pull the truck forward to provide adequate working room between the back of the spreader and the spreader storage area.
10. The spotter and operator secure the front end of the spreader box to the truck bed using the two load tiedowns which are permanently attached to the upper tiedown points at the top/front portion of each side of the spreader box. Tighten as required by load and tiedown regulations.
11. Once the V-box spreader is fully secured to the dump truck bed, the operator connects the electrical wiring harness from the spreader to the truck (for lighting)
12. The operator connects the hydraulic lines from the spreader to the truck (for hydraulic power to run the conveyor/drag chain and the spinner).

SAFTEY NOTE: Exercise caution when connecting hydraulic lines. Hydraulic lines should be connected either when the truck is not running or when the hydraulic pump that supplies power to the spreader is disengaged.

Special Equipment Inspection and Maintenance

Snow and ice control operations are very demanding on equipment. Cold weather, a corrosive environment, impact loadings, over-loadings, and increased potential for collision with other vehicles or roadside features are some of the factors that increase equipment stress. As a result, particular attention has to be given to maintaining and repairing mobile snow and ice control equipment such as the V-box spreader.

The routine maintenance schedule recommended by the equipment manufacturer should be regarded as the absolute minimum requirement for mobile snow and ice control equipment. More frequent lubrication and inspection schedules usually result in greater up time. Strategic pre-operational and post-operational inspections should be conducted for each shift to help identify small problems, that if not corrected, can result in major or expensive repairs.

The following equipment inspections and maintenance activities on the V-box spreader will maximize equipment performance and minimize down time.

Pre-Storm Activities

Before a storm strikes, be sure to:

- Perform a V-box Spreader Inspection Checklist

- Check spinner assembly (hinge rod and disk) for excessive wear, proper lubrication and proper operation
- Check conveyor chain (drag chain) for excessive wear, proper lubrication and proper operation
- Check all hydraulics (pumps, hoses and connections) for proper operation and leaks
- Check PTO and drive assembly

During the Storm Activities

While using the equipment during the storm:

- Check for accurate dispersal of materials
- Perform a visual inspection of the equipment during operation to check for any problems (lights, leaks, etc.)
- Check drag chain (conveyor) oiler for proper fluid level

Post-Storm Activities

Once the storm is over, be sure to:

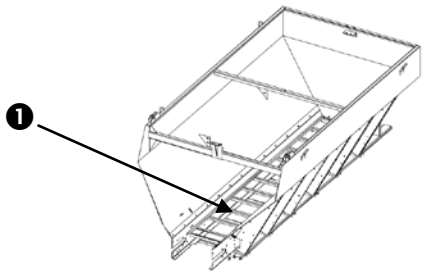
- Remove remaining snow and ice control material from spreader box
- Carefully, completely, and thoroughly clean and wash the V-box spreader
- Check for leaks and wear on hoses (hydraulic system)
- Make sure all lights are operational on the spreader
- Check the conveyor system (belt and chain)

When storing the V-box after the winter season, it is recommended to thoroughly oil the conveyor chain system and to apply an anti-corrosion protective sealer to all parts of the spreader box.

Class Exercise – Review Questions
Module 3 – MOUNT A V-BOX SPREADER

MNT812 Winter Weather Operations Training

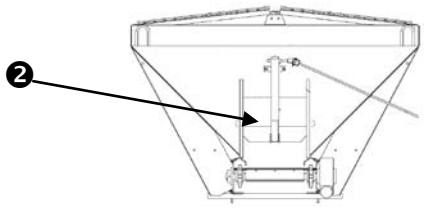
1. Identify component ❶ in V-box spreader drawing to right.



   A. Tie-down clips
   B. Spinner chute and assembly
   C. Conveyor
   D. V-box hopper

   The correct answer is C.

2. Identify component ❷ in V-box spreader drawing to right.



   A. Slider plate
   B. Spinner baffle
   C. Rear door (feedgate)
   D. Top grate

   The correct answer is C.

3. [True or False] The hanging storage rack method for storing V-box spreaders may require maintenance personnel to get on top of the V-box during mounting and dismounting.

   A. True
   B. False

   This statement is TRUE.

   For this reason, personnel must exercise caution when mounting/dismounting a V-box in this manner.

4. [True or False] Dump bed tailgate removal can be accomplished by forklift or by hoist/crane.

   A. True

   B. False

   This statement is TRUE.

5. [True or False] So long as the capacities are the same, any V-box can be mounted in any dump truck.

   A. True

   B. False

   This statement is FALSE.

   Each V-box is matched with a particular truck.

6. [True or False] Securing the V-box spreader to the dump truck bed is complete when the mounting pins engage the tailgate latch.

   A. True

   B. False

   This statement is FALSE.

   In addition to the tailgate latch, securement tie-downs are also required.

7. [True or False] Proper cleaning of the V-box spreader after using road salt or Meltdown20 requires that the V-box be removed from the dump truck bed.

   A. True

   B. False

   This statement is TRUE.

   Multiple wash cycles, from all angles, are necessary to properly clean the V-box and protect it from corrosion.



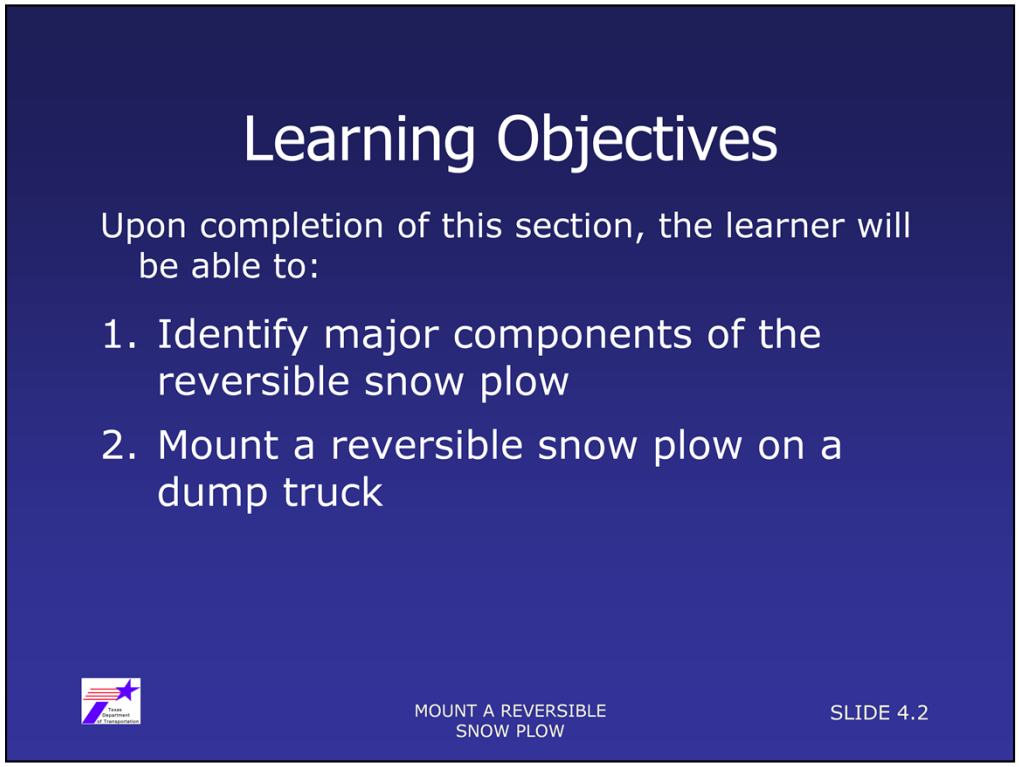
Instructor Notes: Present the following key points.

In this module, we will learn how to mount a reversible snow plow.

COMMENT FOR NON-SNOW PLOW DISTRICTS

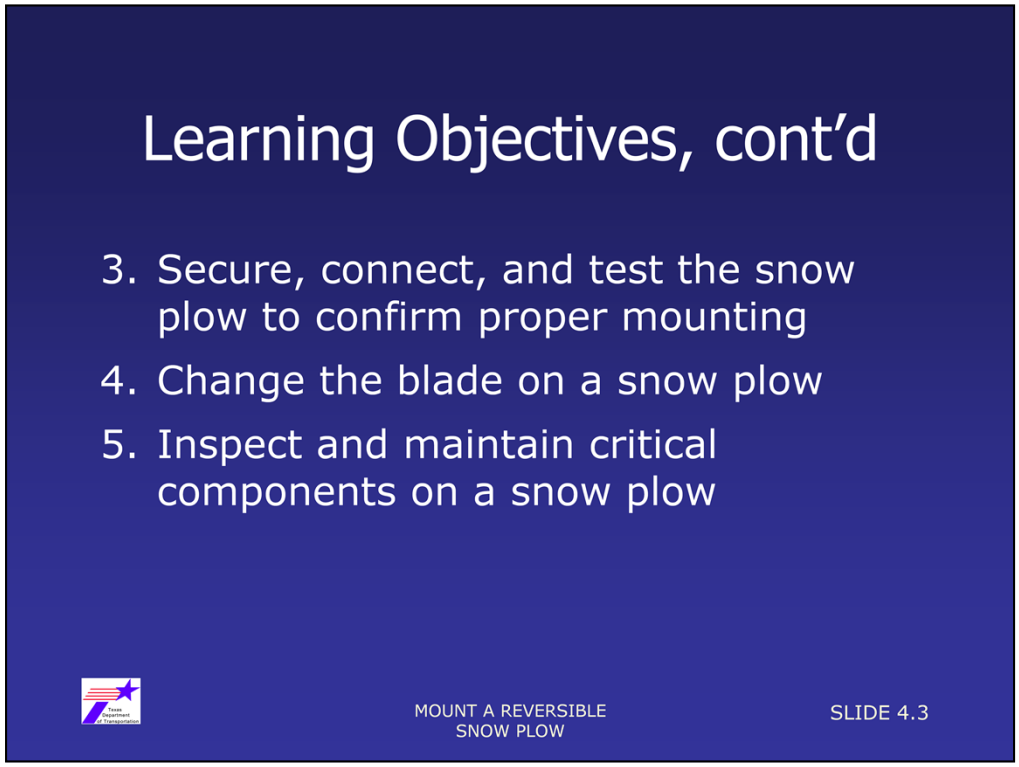
If you happen to be in a District that does not have snow plows, you might be thinking, “Why should I learn about this?”

The answer is, you may be asked to help out in a major snow or ice event where they do have snow plows, and it will be good for you to have basic knowledge about this.



Instructor Notes: Present the following key points.

Note the learning objectives.



Instructor Notes: Present the following key points.

Note the learning objectives.



Instructor Notes: Present the following key points.

We will begin with the description of the reversible snow plow.



Instructor Notes: Present the following key points.

Recall that the reversible snow plow is an attachment for a dump truck. It is a piece of specialty equipment in that its use is restricted to plowing snow.



Instructor Notes: Present the following key points.

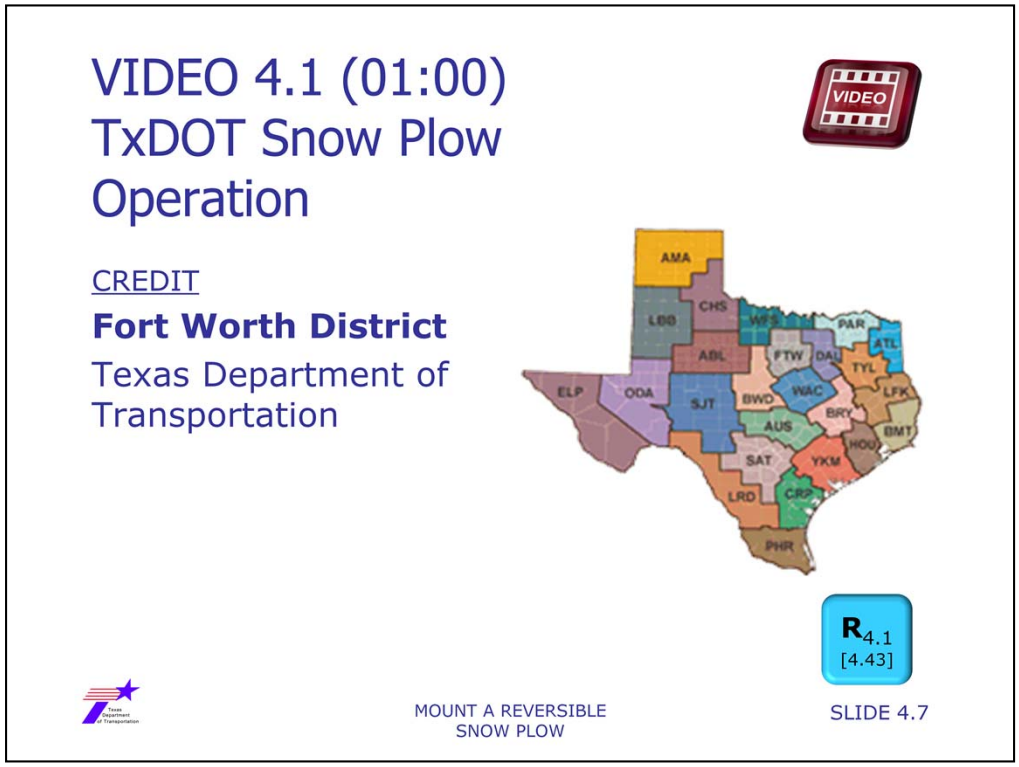
As with the V-Box spreader, a snow plow is mated to its particular truck.

One plow goes with one truck. Plows and trucks are not interchangeable.

NOTE that, because it is a piece of major equipment in its own right, the plow will have two equipment numbers on it.

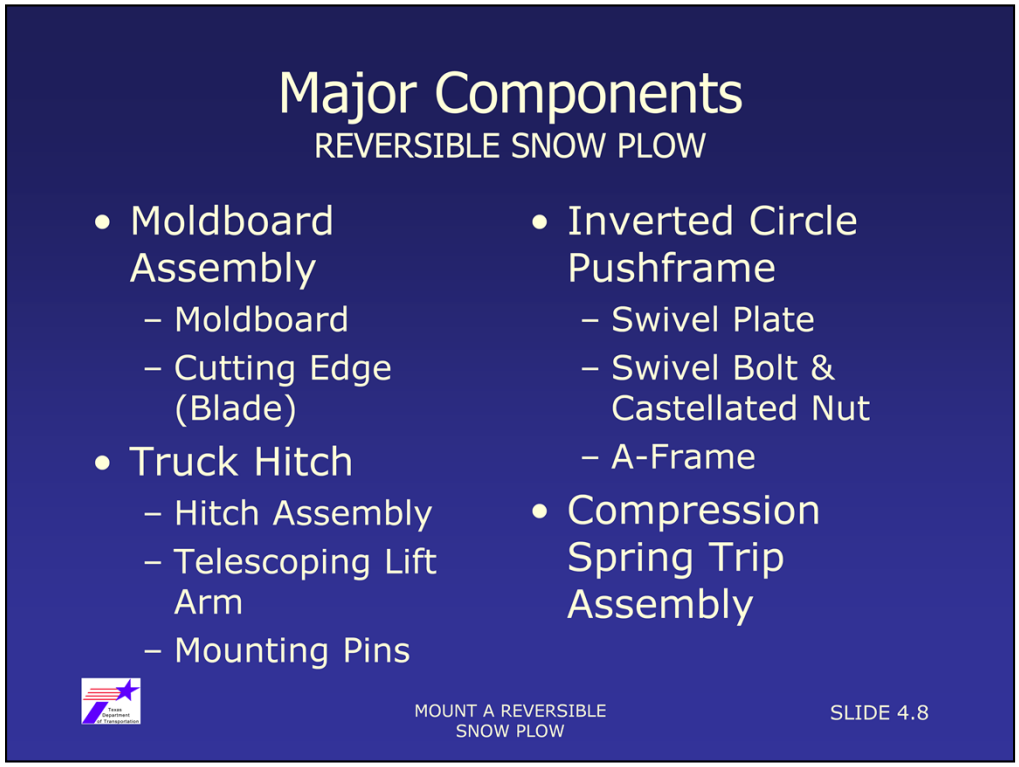
The 7000 series number (in this image, 5-7199-G) is the plow equipment number.

The other number (in this image, 4654-G) is the truck number that corresponds to and goes with this particular plow.



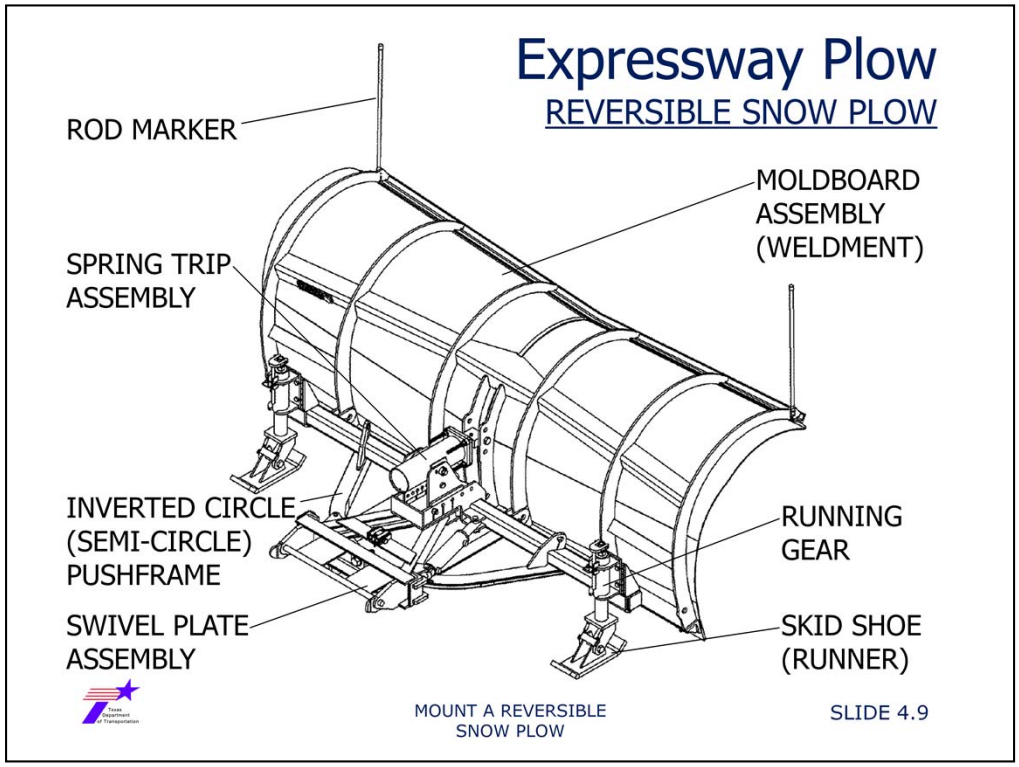
Instructor Notes: Present the following key points.

This video shows snow plow operation on Texas roads.



Instructor Notes: Present the following key points.

The major components of a snow plow are identified.

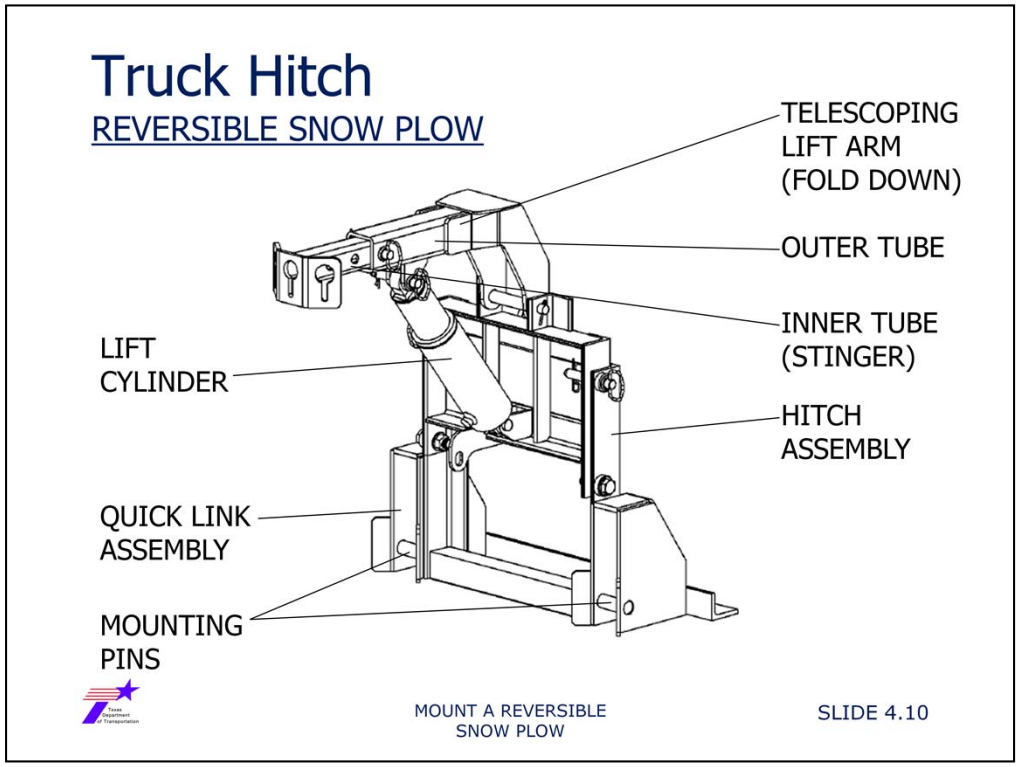


Instructor Notes: Present the following key points.

Note the major components as shown.

Identify each part.

State the name and explain what it is.

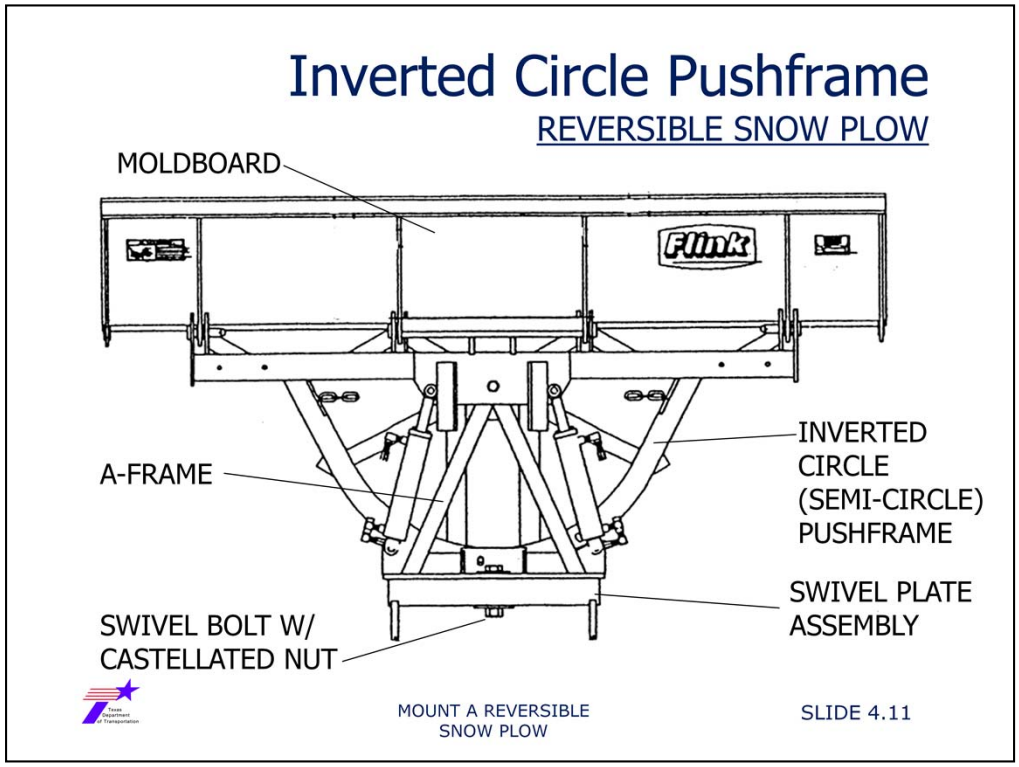


Instructor Notes: Present the following key points.

Note the major components as shown.

Identify each part.

State the name and explain what it is.

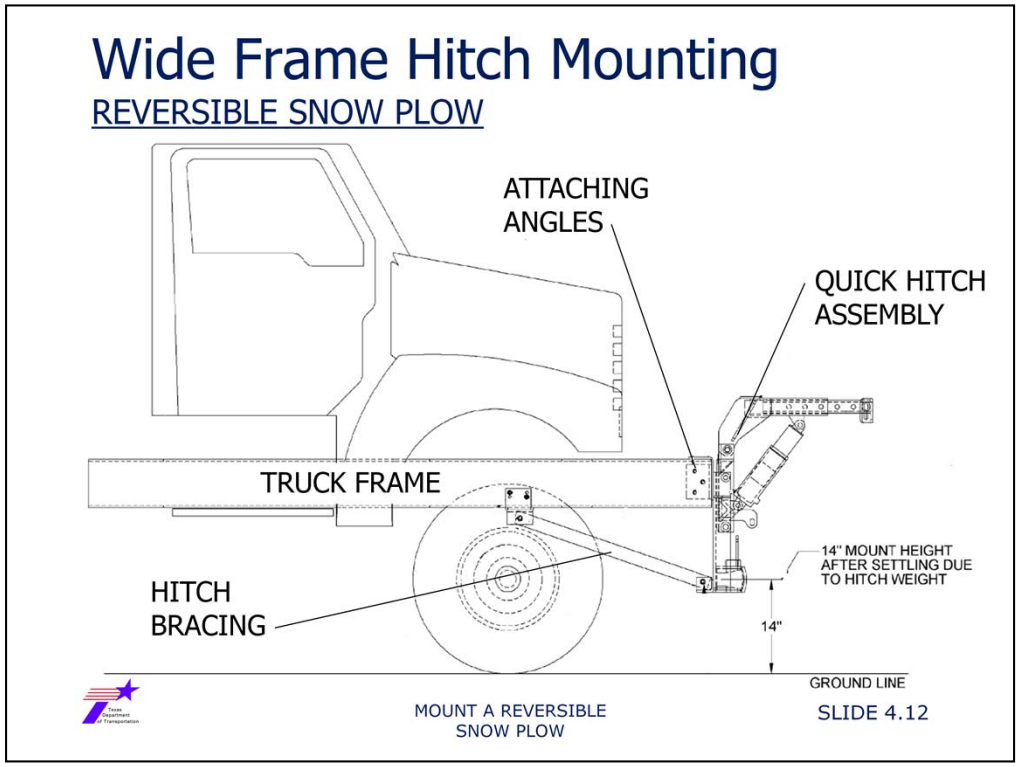


Instructor Notes: Present the following key points.

Note the major components as shown.

Identify each part.

State the name and explain what it is.

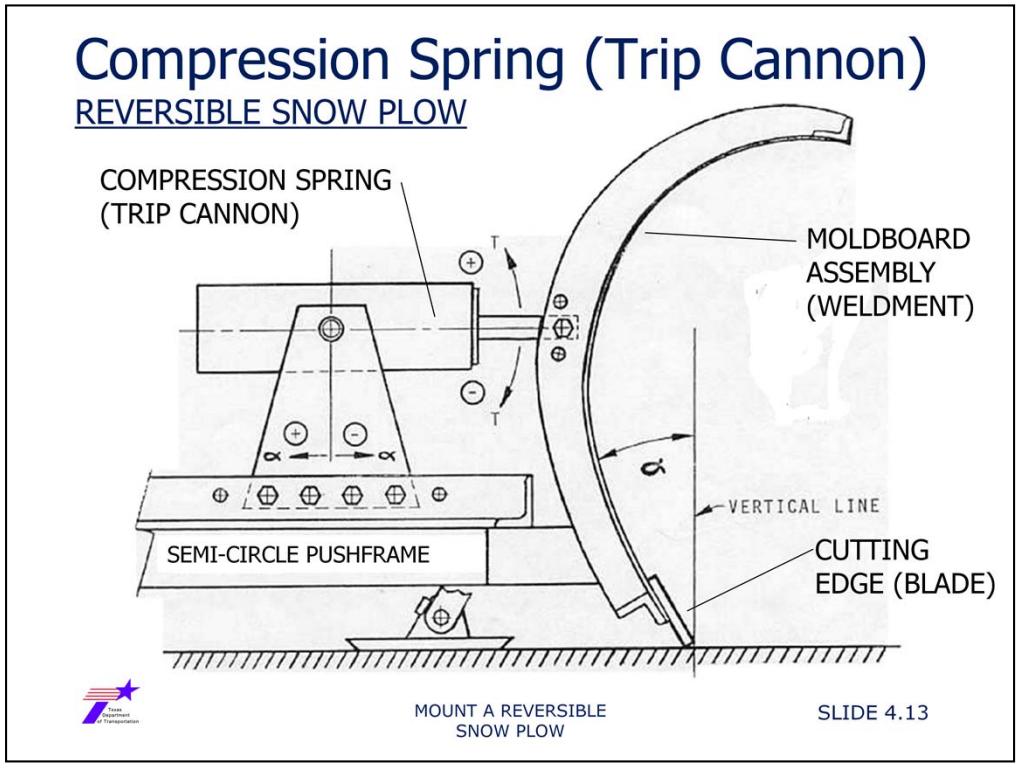


Instructor Notes: Present the following key points.

Note the major components as shown.

Identify each part.

State the name and explain what it is.



Instructor Notes: Present the following key points.

Note the major components as shown.

Identify each part.

State the name and explain what it is.

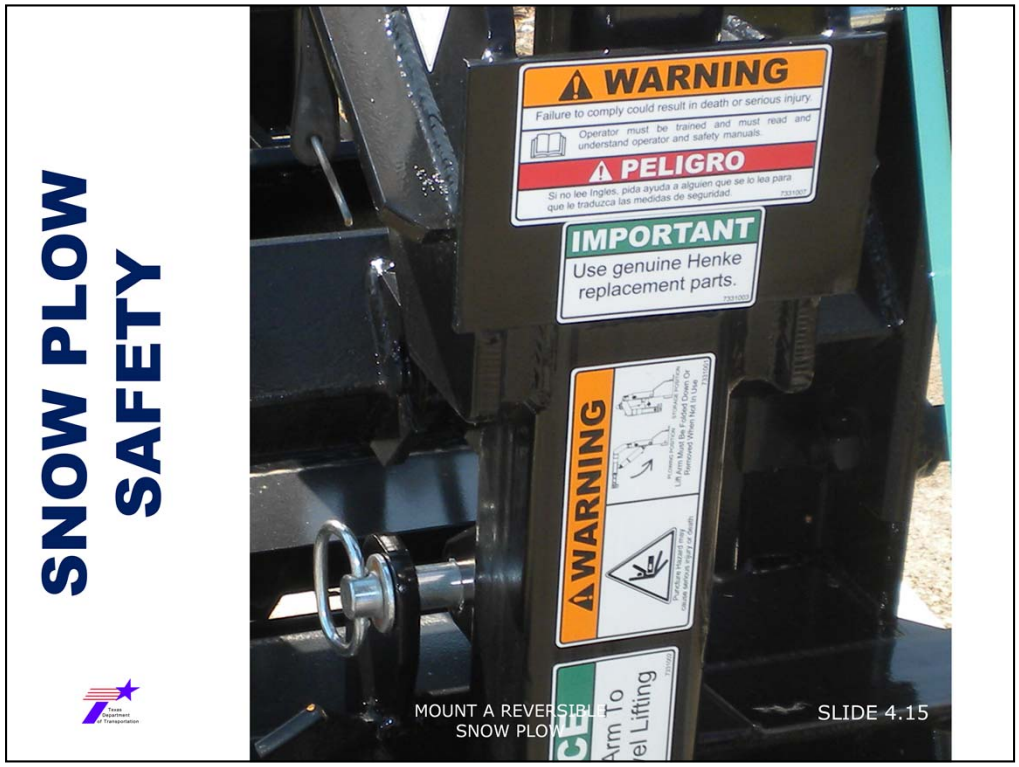


Instructor Notes: Present the following key points.

SAFETY FIRST.

Snow plows include numerous warning labels.

Take a moment to review the safety warnings.

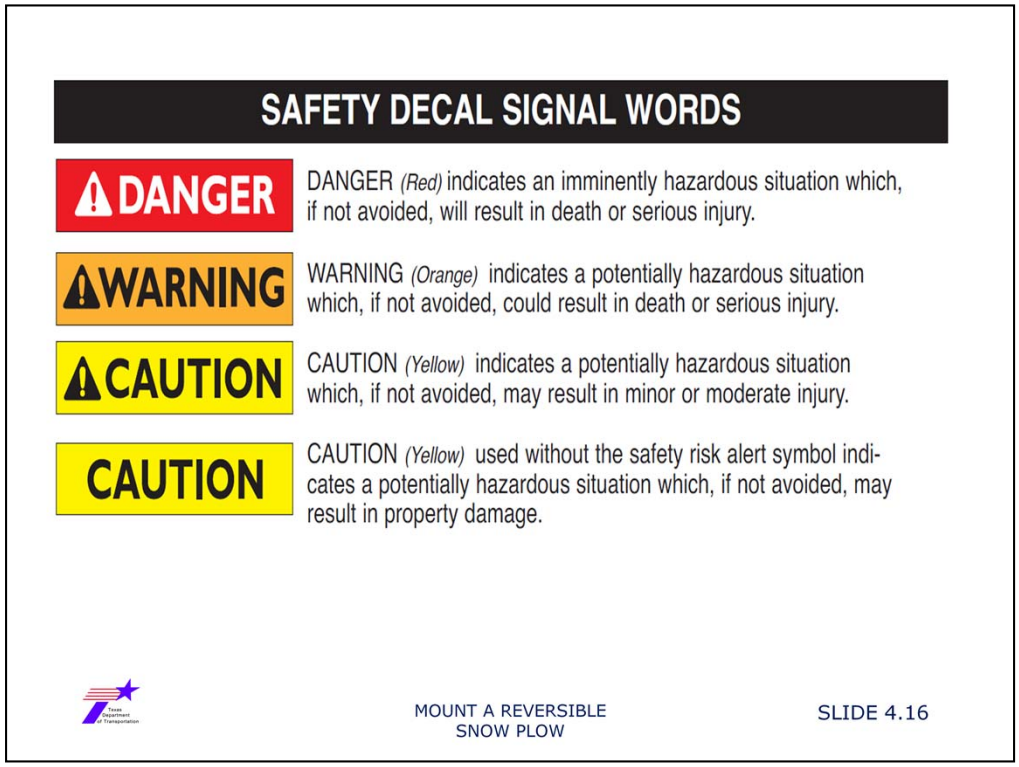


Instructor Notes: Present the following key points.

SAFETY FIRST.

The snow plow hitch assembly also includes numerous warning labels.

Take a moment to review the safety warnings.

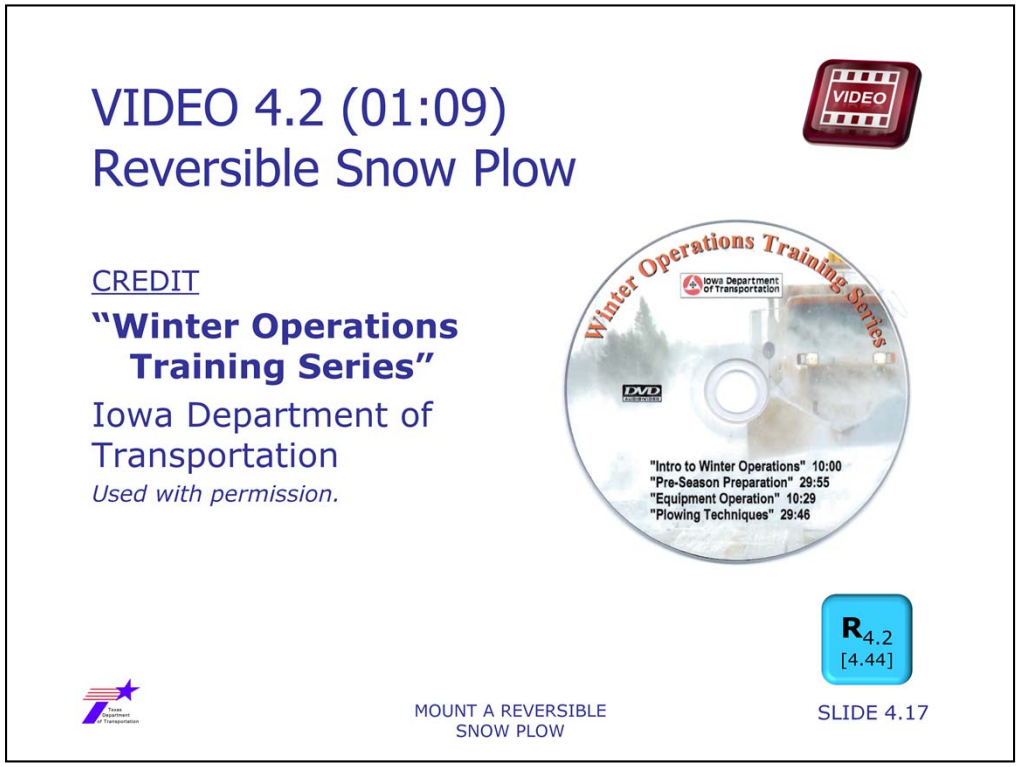


Instructor Notes: Present the following key points.

Note that the safety signal words classify into different categories.

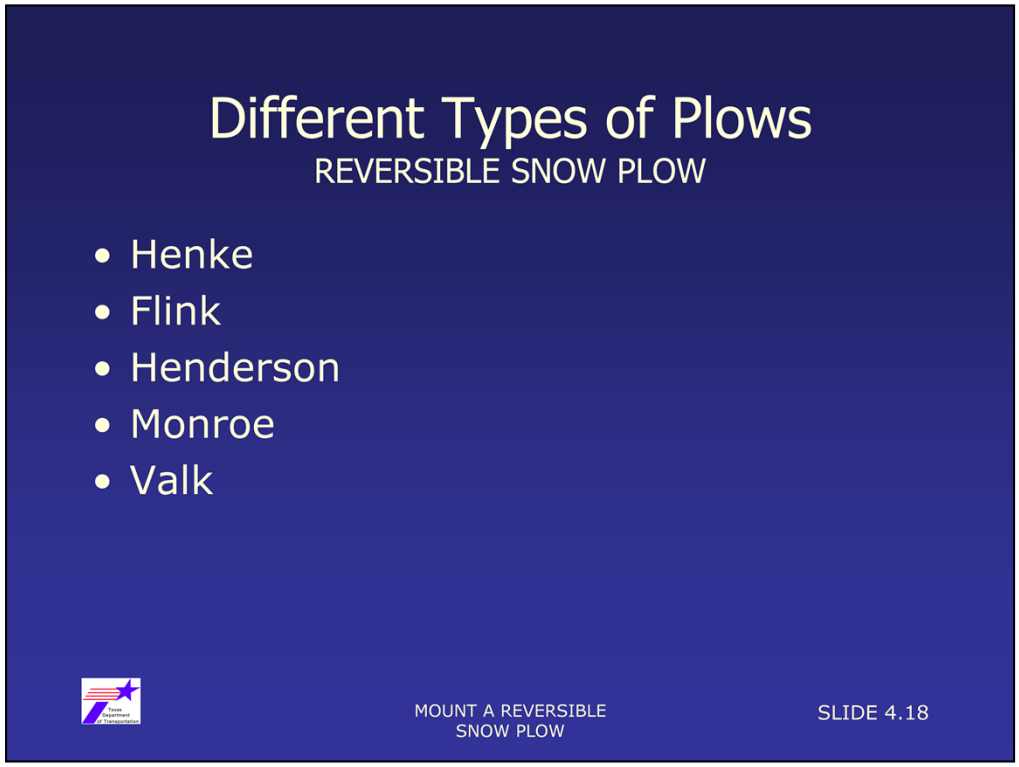
RED… "… will result in DEATH OR SERIOUS INJURY."

SAFETY FIRST.



Instructor Notes: Present the following key points.

This video provides a brief introduction to the reversible snow plow, explaining its function and operation.



Instructor Notes: Present the following key points.

TxDOT has several makes of snow plows in its fleet. Some of the primary manufacturers are identified here.



Instructor Notes: Present the following key points.

TxDOT added over 80 of these HENKE plows to its fleet in 2011.



Instructor Notes: Present the following key points.

Another view of an older style HENKE plow.



Instructor Notes: Present the following key points.

The FLINK plow.

Note the snow deflector that will help minimize spray of snow onto the truck windshield during plowing.



Instructor Notes: Present the following key points.

The moldboard weldment for the FLINK plow.



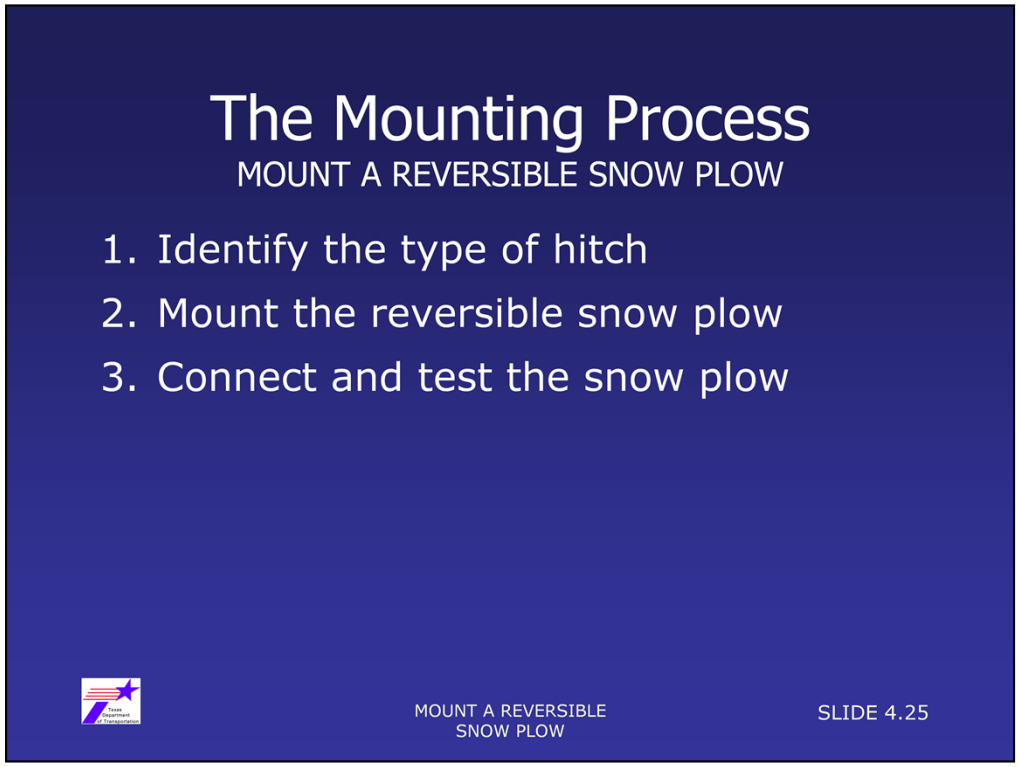
Instructor Notes: Present the following key points.

A VALK snow plow. Basic but effective for plowing snow.



Instructor Notes: Present the following key points.

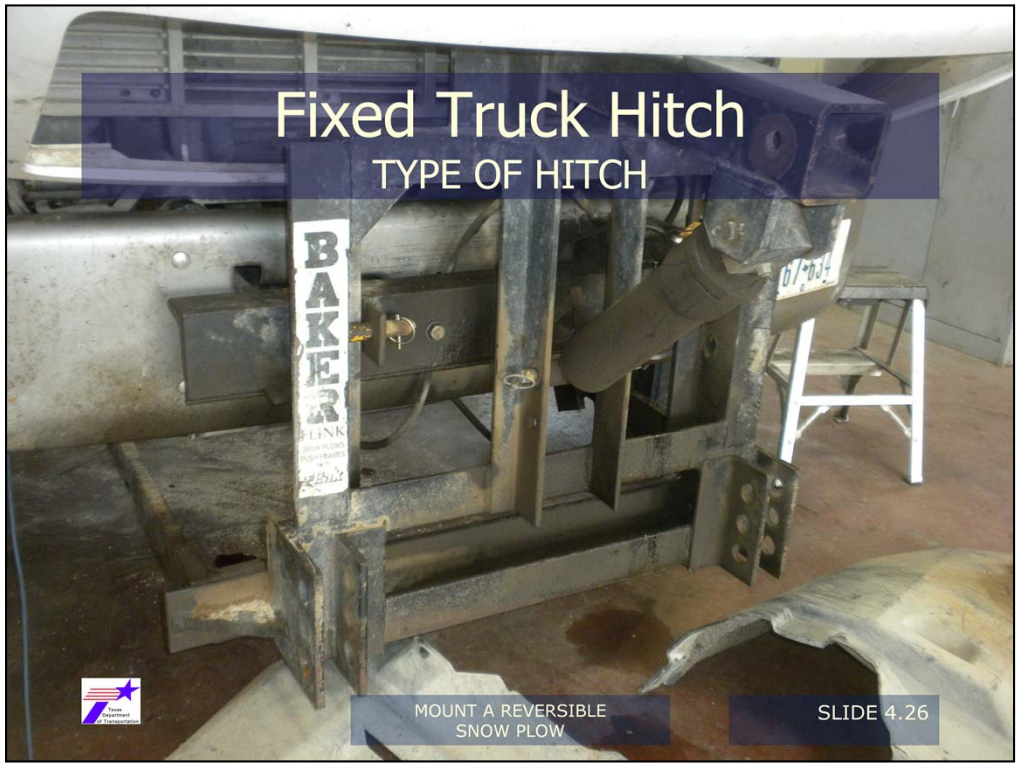
ONE of the pre-storm activities your supervisor will ask you to perform is to mount a snow plow onto a dump truck.



Instructor Notes: Present the following key points.

The basic process for mounting a plow is shown here.

Step by step.



Instructor Notes: Present the following key points.

TxDOT uses two different types of hitches. These are FIXED hitches (shown in the image) and QUICK hitches.

NOTE that the FIXED hitch includes a series of holes in the hitch mounting bracket which facilitate proper alignment of the plow.

The goal is to mount the plow so that the plow frame is horizontal, thus transmitting force (from plowing) directly from the plow, through the plow frame, and to the truck frame.



Instructor Notes: Present the following key points.

Some plows have a QUICK hitch assembly as shown here.

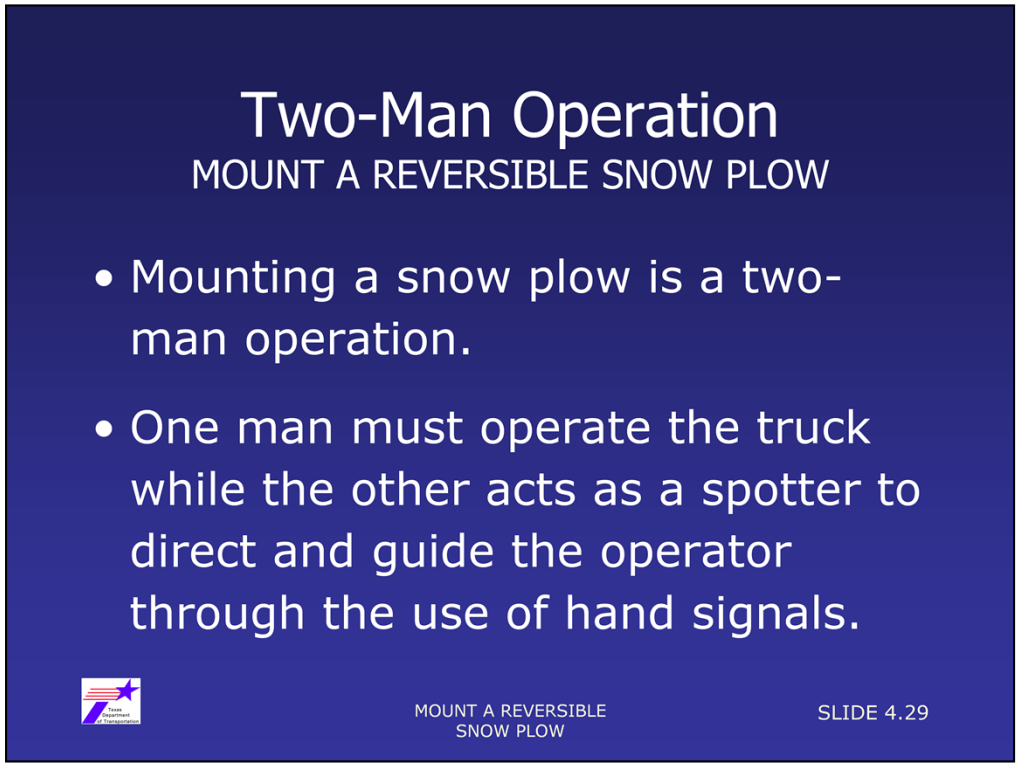
The quick hitch mates with a mounting rod on the plow swivel plate assembly.



Instructor Notes: Present the following key points.

The swivel plate assembly is that part of the plow that connects to the truck hitch.

The swivel action allows the plow to ride on the contours of the road surface while plowing.



Instructor Notes: Present the following key points.

Mounting a snow plow requires an operator and a spotter.



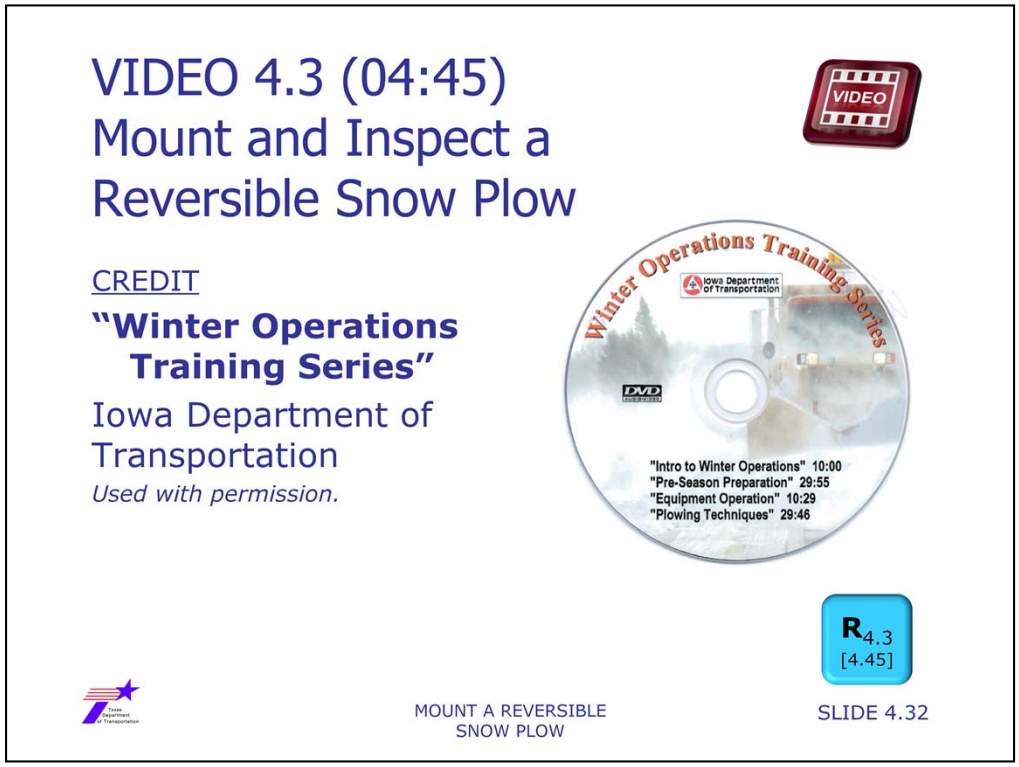
Instructor Notes: Present the following key points.

The operator is responsible to align the truck with the plow to facilitate mounting.



Instructor Notes: Present the following key points.

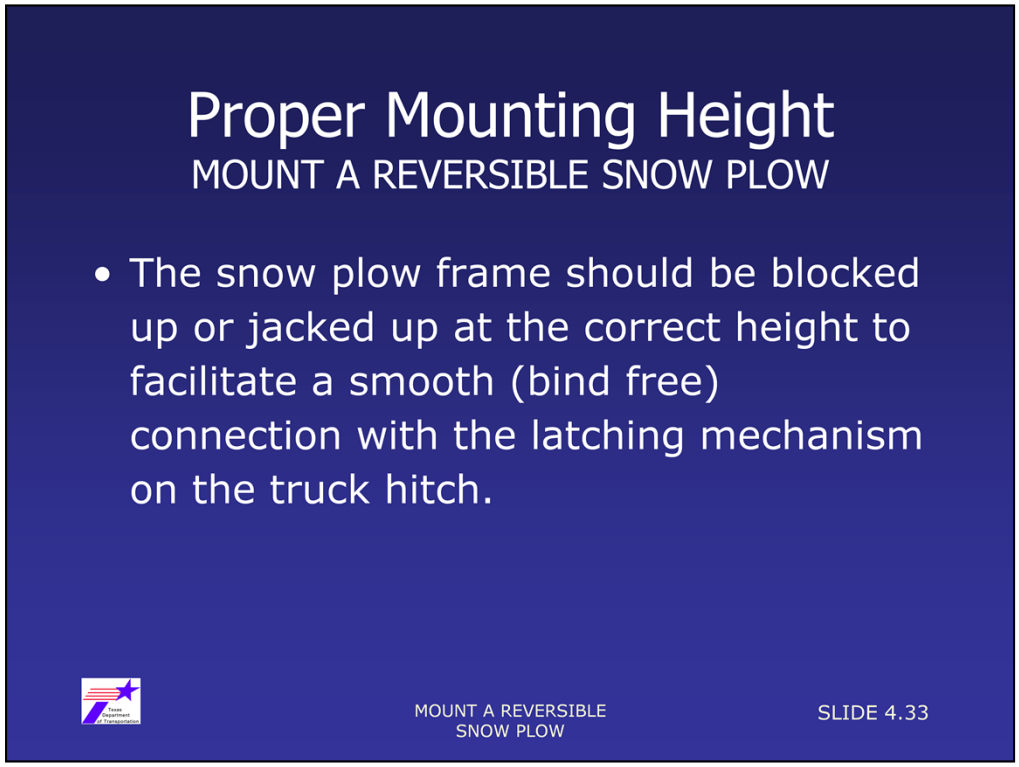
The spotter guides the operator during the mounting process.



Instructor Notes: Present the following key points.

This video explains how to mount and inspect a reversible snow plow.

Note the script is attached (reference R4.3).



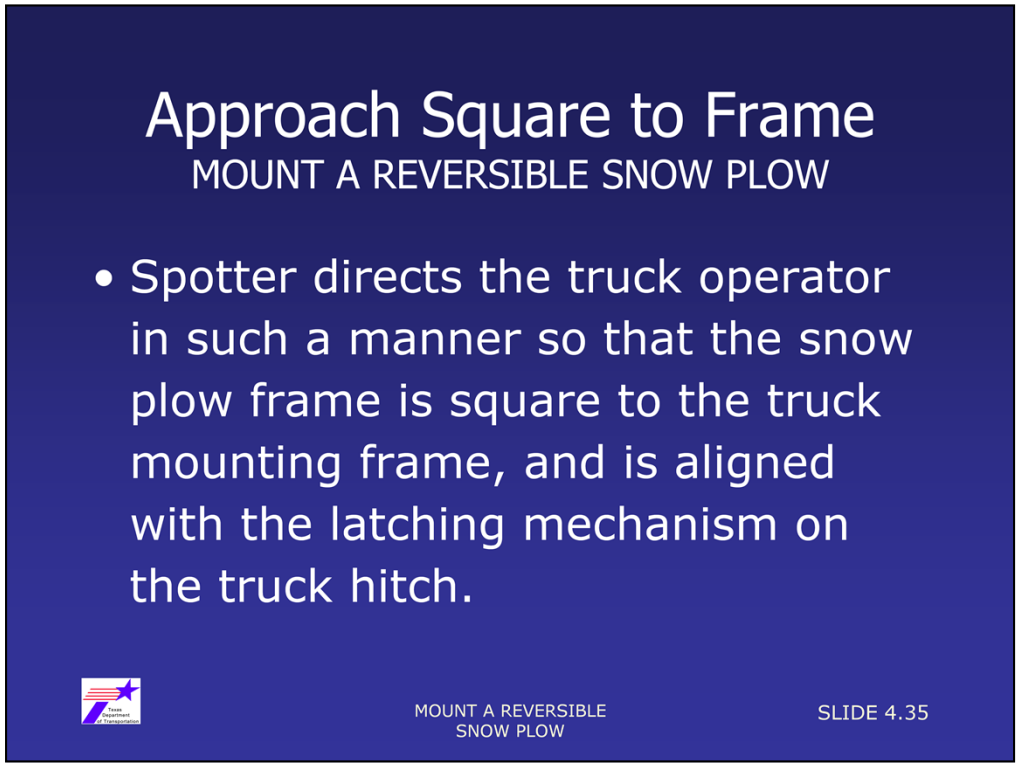
Instructor Notes: Present the following key points.

Proper mounting height is essential.



Instructor Notes: Present the following key points.

During the mounting process, proper mounting height can be achieved by either a hoist, a floor jack (shown above) or other suitable mechanism.



Instructor Notes: Present the following key points.

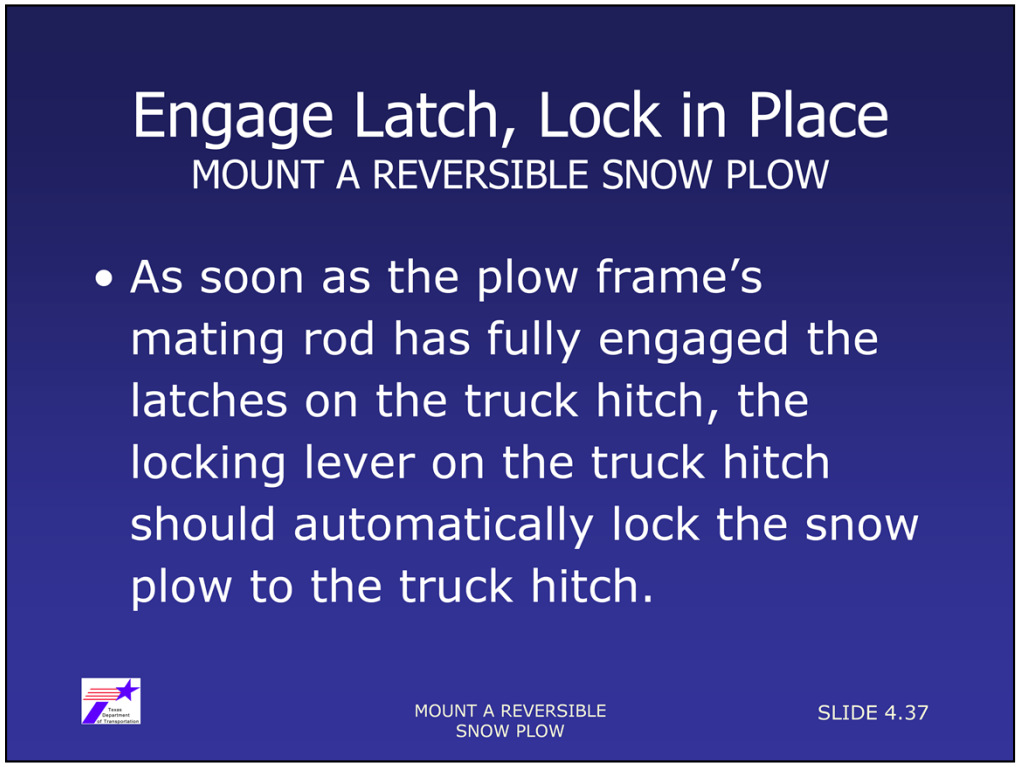
Proper alignment is critical to a clean mounting process.



Instructor Notes: Present the following key points.

The quick hitch (on the truck) mates with the mounting rod on the plow swivel plate assembly.

However, the hitch will not latch if the truck and plow are not properly aligned.



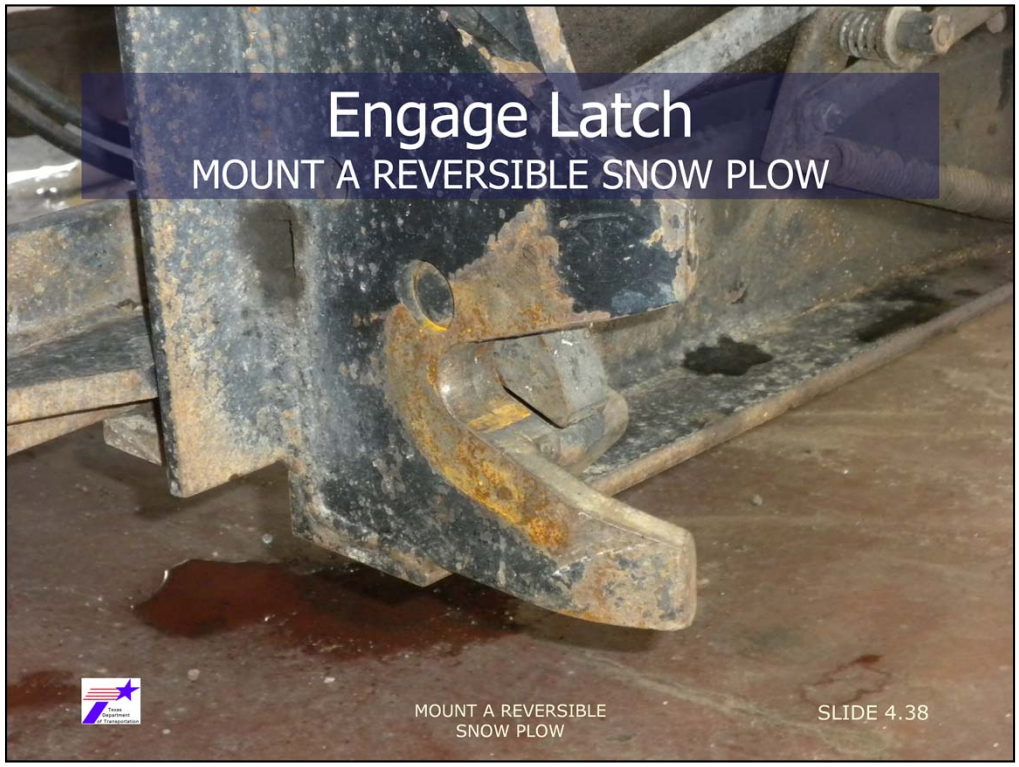
Instructor Notes: Present the following key points.

Mounting is complete when the latch is engaged.

This may happen sharply, and the latch lever will automatically "snap" into place.

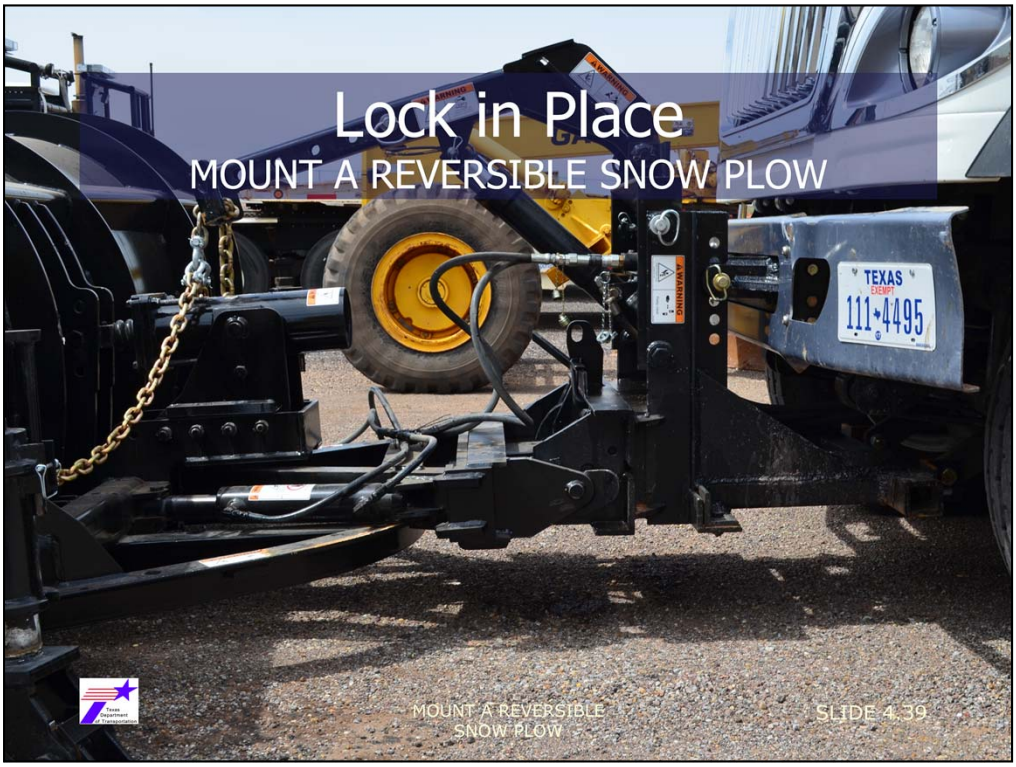
Or, if the alignment is not precise, some maneuvering of the plow may be necessary.

Mounting is NOT complete until the latch engages.



Instructor Notes: Present the following key points.

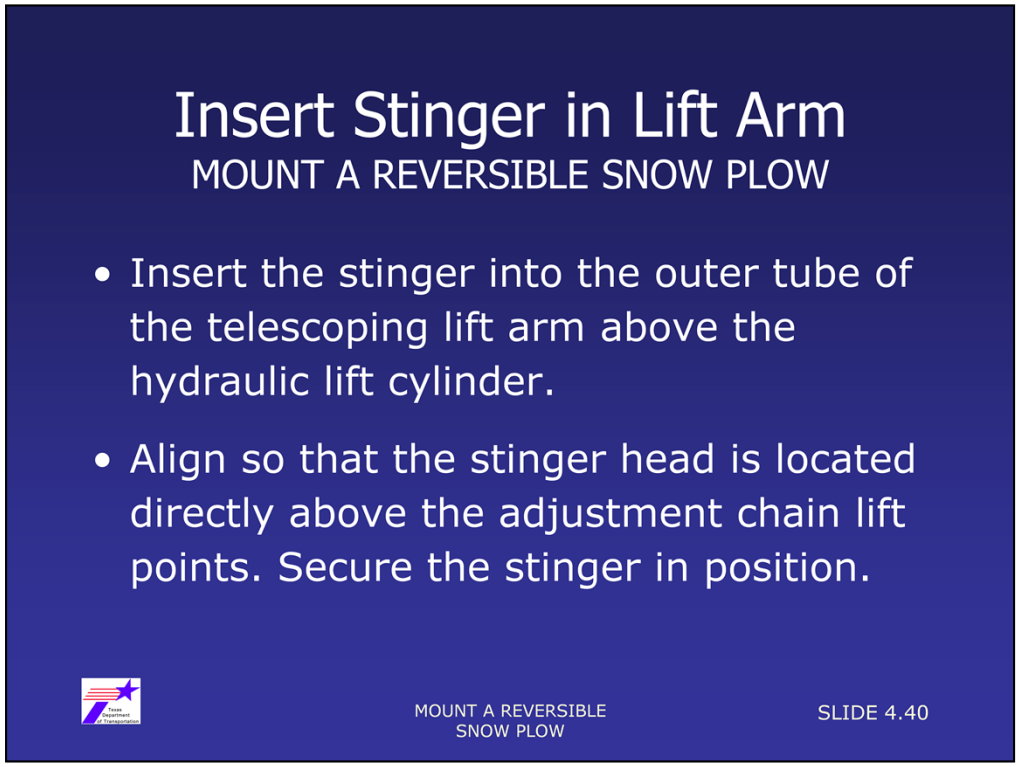
Close up view of the latch mechanism on a quick hitch assembly.



Instructor Notes: Present the following key points.

NOTE that the plow frame and hitch assembly should be horizontal – as shown in this image – so that plowing forces are transmitted directly through the plow frame, to the hitch, to the truck.

If the push frame is not horizontal, this may result in extra blade wear, or excessive tripping of the plow trip mechanism (compression spring assembly).



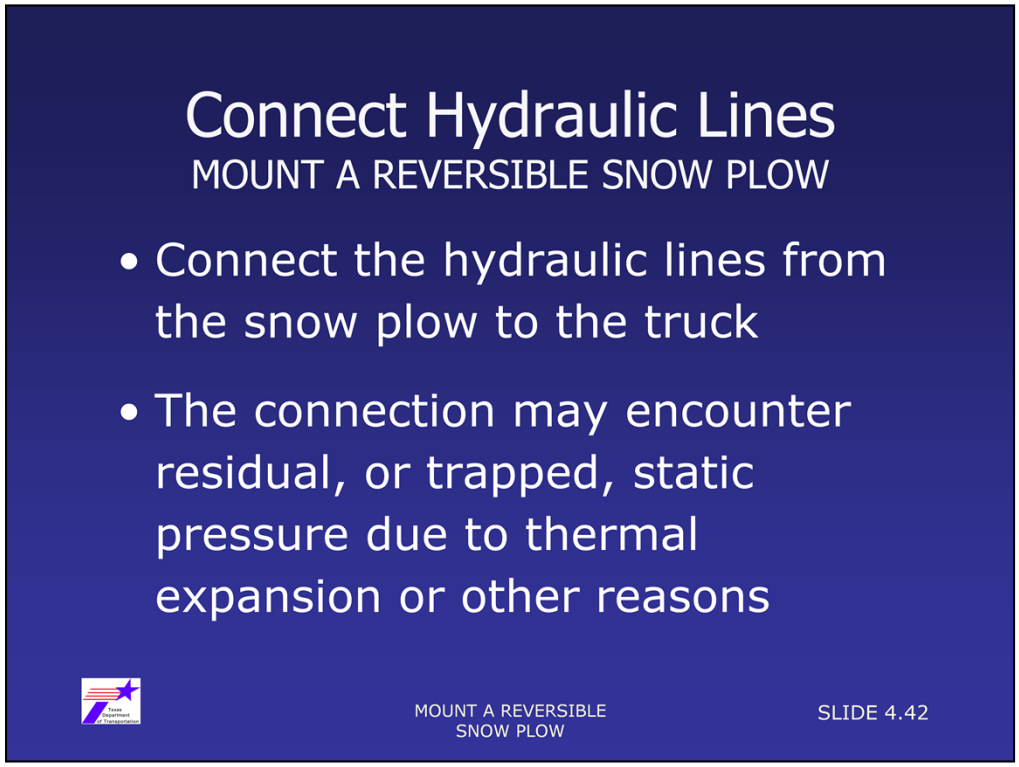
Instructor Notes: Present the following key points.

The stinger is used to raise and lower the plow via the telescoping lift cylinder.



Instructor Notes: Present the following key points.

Note the lift chains connected to the stinger.

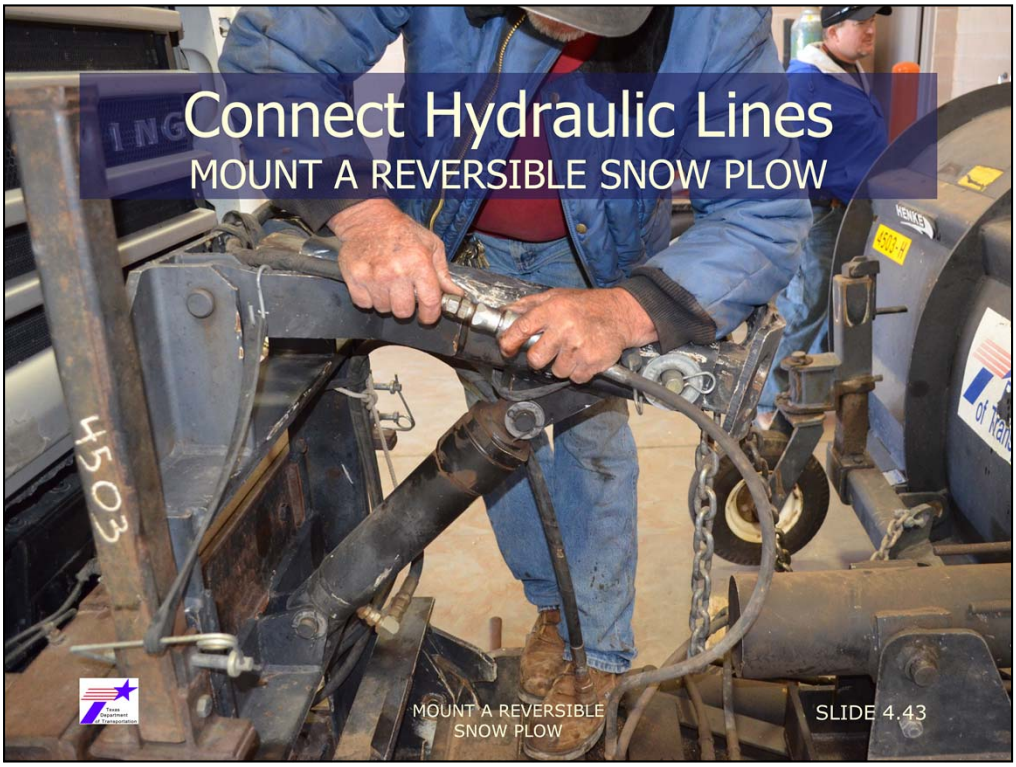


Instructor Notes: Present the following key points.

Snow plows are operated hydraulically.

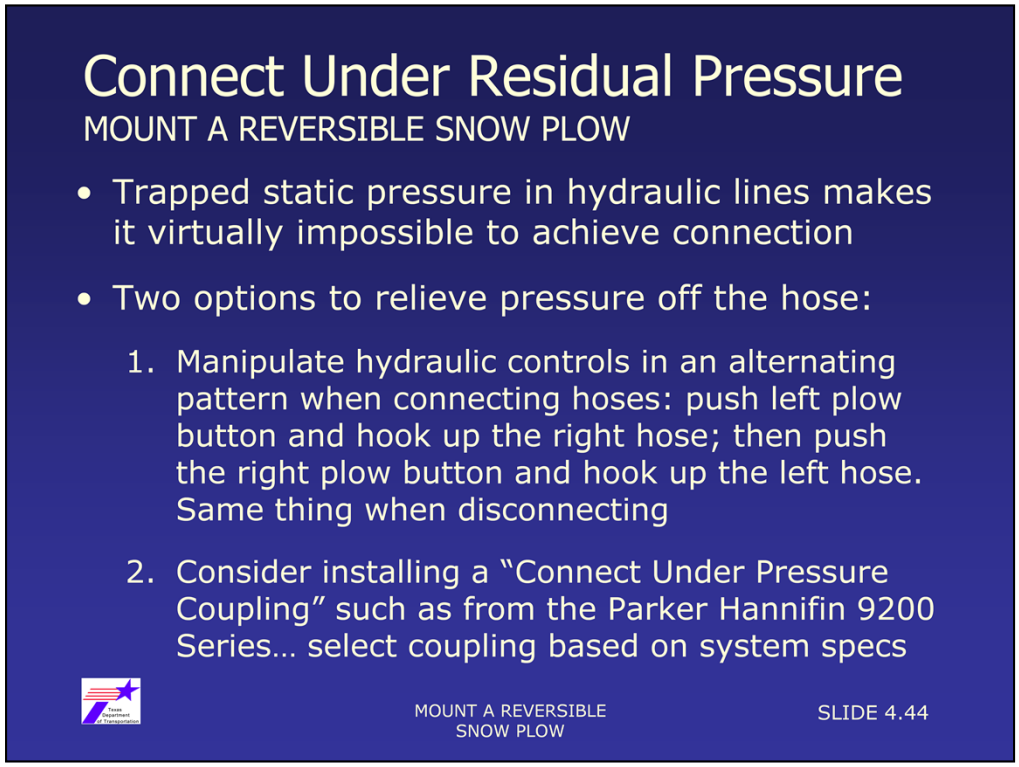
As with any hydraulic equipment, the connection may encounter residual or trapped static pressure due to thermal expansion or other reasons.

One way or another, this pressure will have to be released to facilitate connecting the plow to the truck.



Instructor Notes: Present the following key points.

Ideally, the connection will be a straightforward matter.

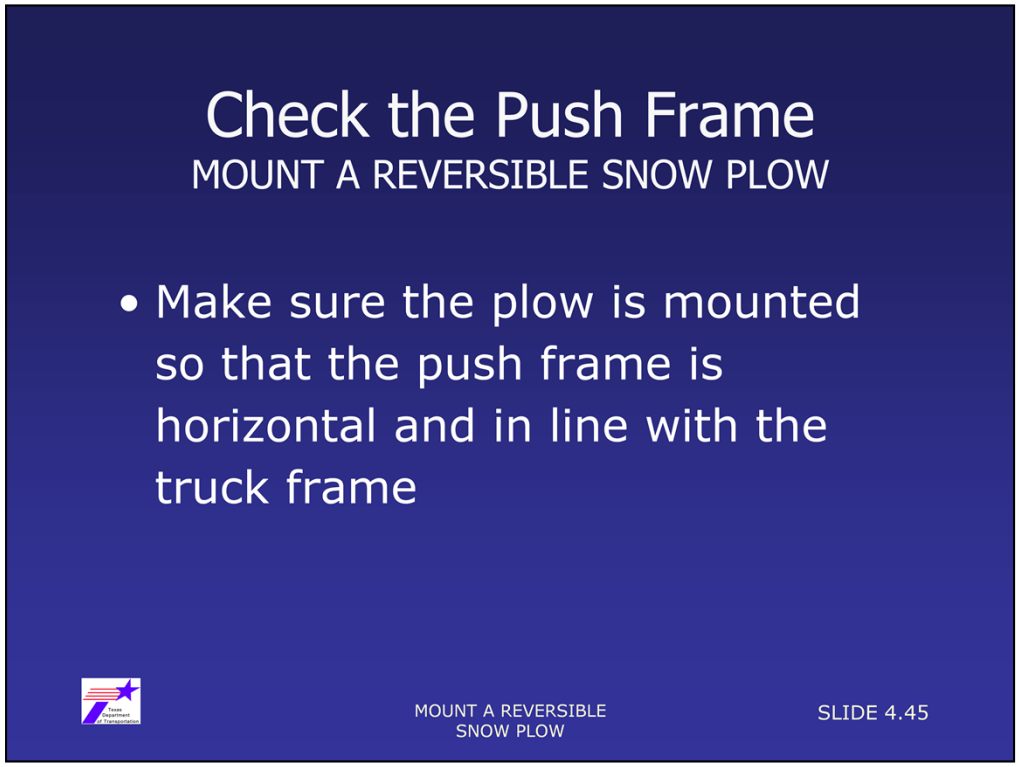


Instructor Notes: Present the following key points.

This slide identifies two alternatives for dealing with trapped static pressure in the hydraulic lines of the snow plow. Static pressure is a real issue, and it is a frequent occurrence when working with snow plows.

In addition to the corrective measures mentioned above, some plows are fitted with a button on the back of the control box that energizes an electrical solenoid valve located inside the pump/reservoir/control valve assembly mounted on the front of the truck. By depressing this button, it releases the hydraulic pressure.

If these methods are not available, or if they don't work, a tried and true option is to break open the fittings to physically relieve pressure in the lines. This requires tools and one consequence is that hydraulic oil will spill on the ground. SAFETY First… wear safety glasses, gloves, etc.



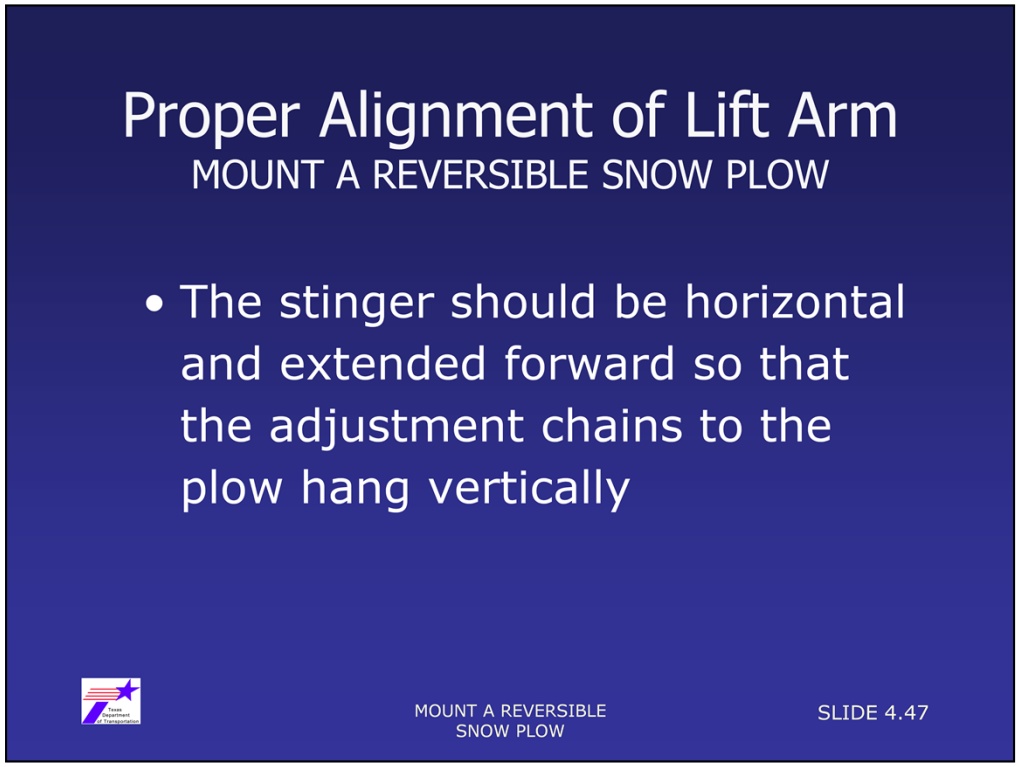
Instructor Notes: Present the following key points.

The push frame should be horizontal and in line with the truck frame.



Instructor Notes: Present the following key points.

A good example where the push frame is horizontal and in line with the truck frame.



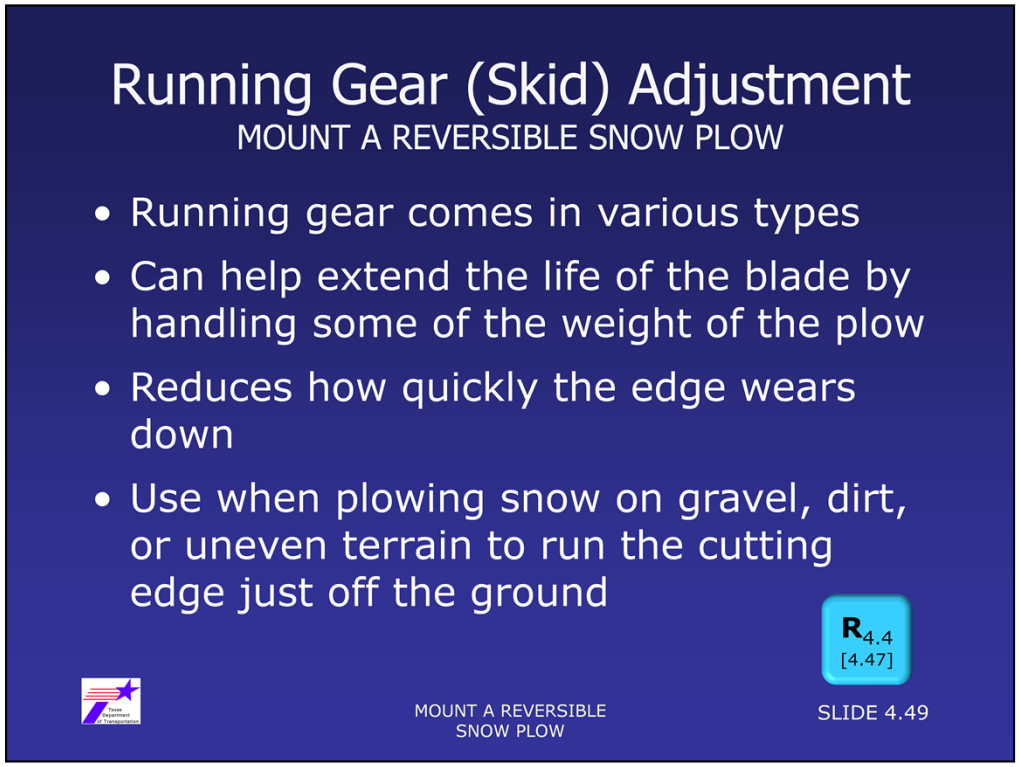
Instructor Notes: Present the following key points.

The stinger should be horizontal and extended such that the plow adjustment chains hang vertically.



Instructor Notes: Present the following key points.

A good example where the stinger is horizontal and extended such that the plow adjustment chains hang vertically.

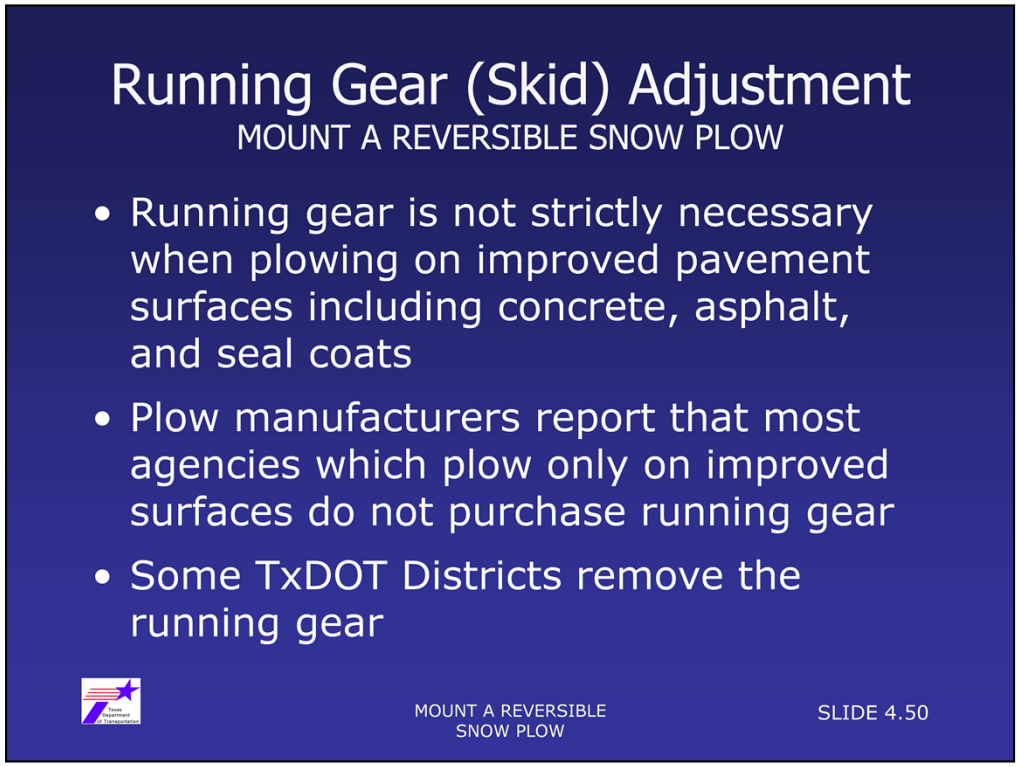


Instructor Notes: Present the following key points.

Running gear is part of the snow plow.

These are some of the reasons why snow plows have running gear.

NOTE reference R4.4 for additional information.



Instructor Notes: Present the following key points.

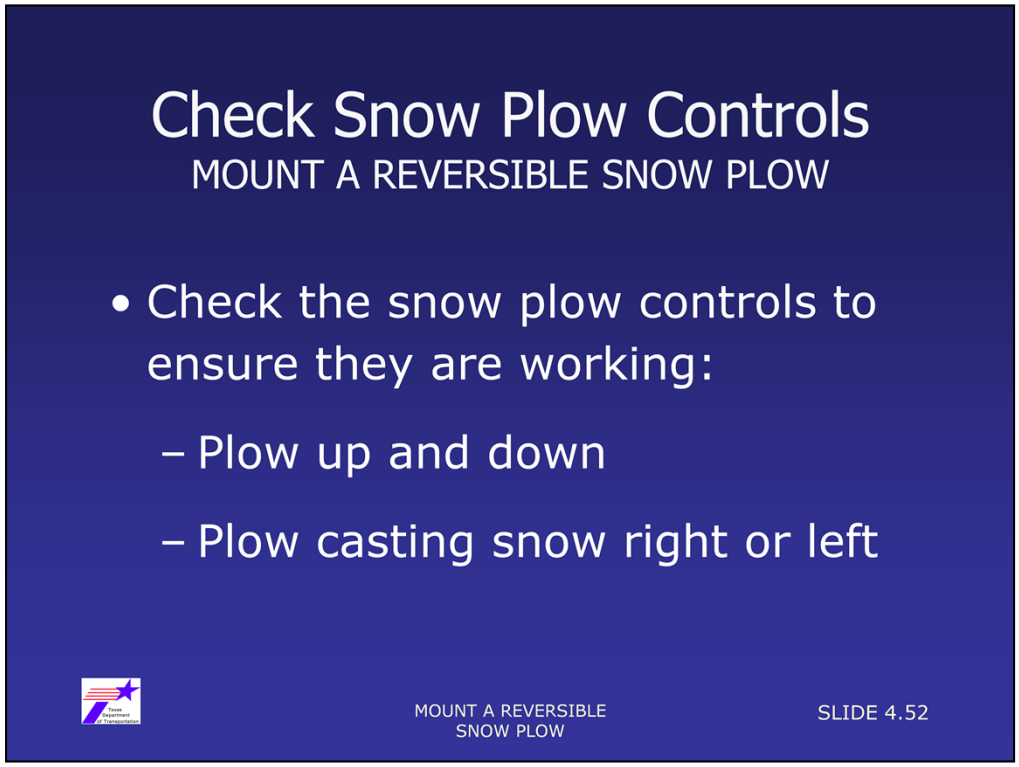
TxDOT rarely uses their running gear because all of TxDOT's roads are improved surface roads.

In some TxDOT Districts, they remove the running gear from the plow.



Instructor Notes: Present the following key points.

This is the “skid shoe” type running gear on a new Henke snow plow.



Instructor Notes: Present the following key points.

These are the basic controls for a reversible snow plow.



Instructor Notes: Present the following key points.

The controls should be checked to confirm functionality.



Instructor Notes: Present the following key points.

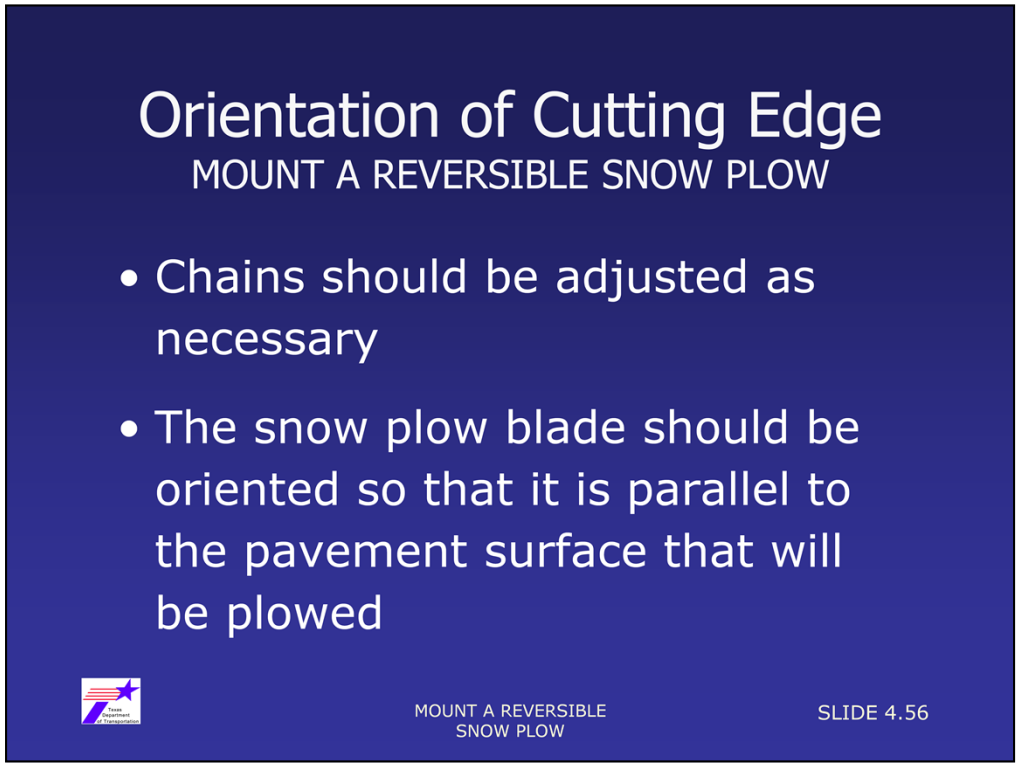
Proper lighting is important. .. So the operator can see what she/he is plowing, and so the traveling public can see the plow.



Instructor Notes: Present the following key points.

Plow lights are typically mounted on the hood, so they are located above the top of the plow.

The snow plow will obscure and render the truck headlights ineffective.



Instructor Notes: Present the following key points.

The cutting edge, or plow blade, must be oriented properly for plowing snow.



Instructor Notes: Present the following key points.

The plow chains should be adjusted so that the plow can follow the contours of the road in the direction in which you are plowing snow.



Instructor Notes: Present the following key points.

Plow blades should be regularly checked for wear.

Blades should be adjusted to make sure the will wear down evenly.



Instructor Notes: Present the following key points.

This image shows a plow blade that has been run along the crown of the road, causing uneven blade wear.

Note that more blade exists near the end of the moldboard than in the middle portion.

Uneven blade wear can result in expensive damage to the moldboard.



Instructor Notes: Present the following key points.

This field exercise discusses how to mount a reversible snow plow.

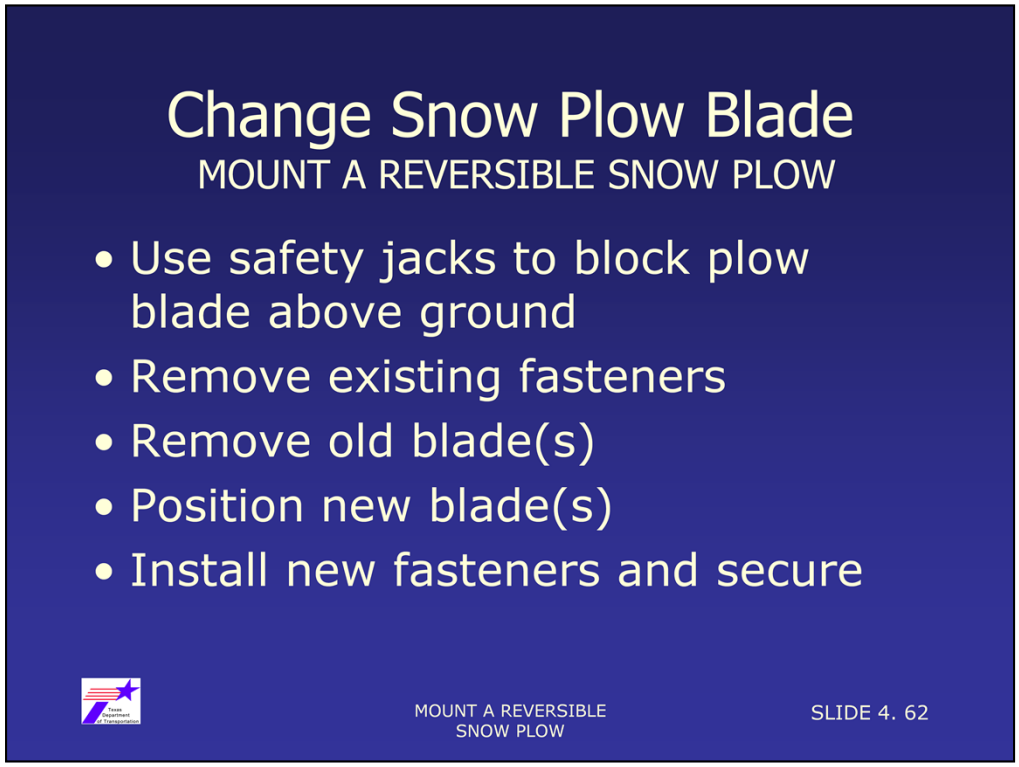
In Districts with snow plows, this exercise will be done as part of the class. Note reference R4.5 for detailed information.

In Districts that do not have snow plows, this exercise can be omitted. Use the time to catch up or get a little ahead of schedule.



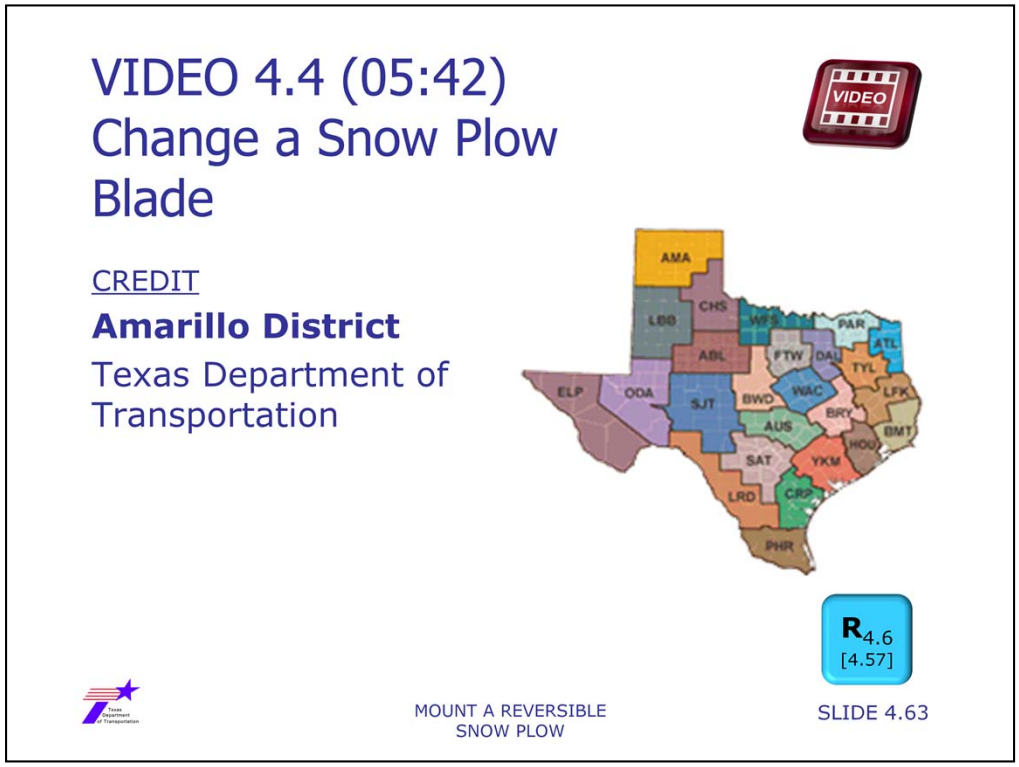
Instructor Notes: Present the following key points.

One event-related task which your supervisor will ask you to do is to change a snow plow blade.



Instructor Notes: Present the following key points.

These are the basic steps for changing a snow plow blade. Normally this is done in a maintenance garage, but it can be done out on the road if necessary.



Instructor Notes: Present the following key points.

This video presents one way to change a snow plow blade.

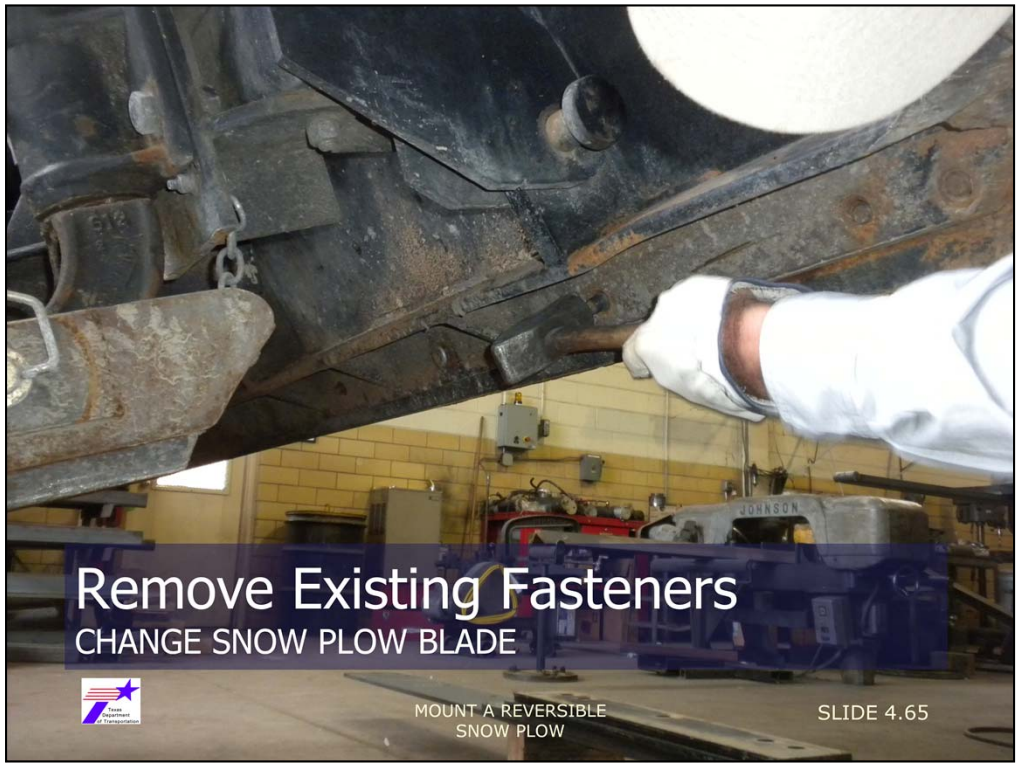
Credit for this video goes to the AMARILLO District. This video features Rocky Andrews and Scott Wilcox as the maintenance personnel who are changing the blade.

Note that the script is provided (reference R4.6).



Instructor Notes: Present the following key points.

SAFETY FIRST. Always block the plow, when changing a blade, to prevent a crushing accident.



Instructor Notes: Present the following key points.

Remove fasteners.



Instructor Notes: Present the following key points.

Plow bolts are frequently damaged with use, and will bind up during removal.

It may be necessary to cut bolts away with a cutting torch.



Instructor Notes: Present the following key points.

The existing blade, or blade set, will need to be removed in sections.



Instructor Notes: Present the following key points.

Replacement blades should be available from your inventory.

Your supervisor will guide you on the types and numbers of blades used in your District.



Instructor Notes: Present the following key points.

Some districts use carbide blades, as shown here. These carbide inserts dramatically improve the life of the blade set.



Instructor Notes: Present the following key points.

This image shows full-length, mild steel plow blades. These come in typical lengths of 10ft, 11ft and 12ft.



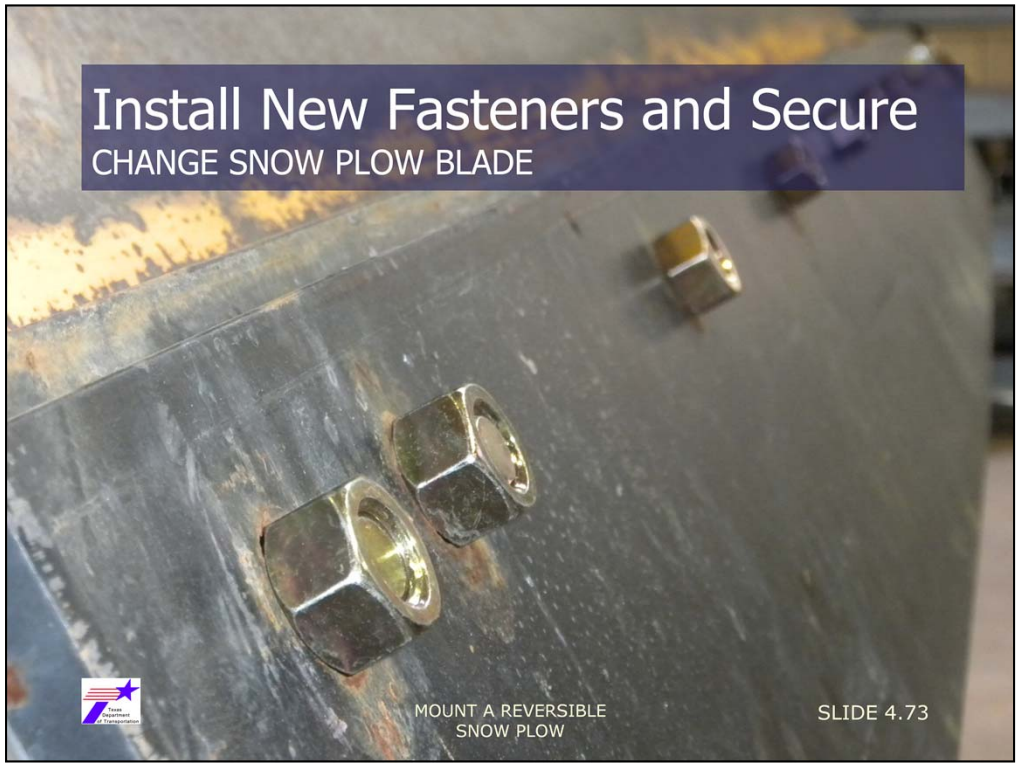
Instructor Notes: Present the following key points.

The new blade or blade set needs to be positioned on the moldboard.



Instructor Notes: Present the following key points.

Use new plow bolts to secure the blade(s) to the moldboard.



Instructor Notes: Present the following key points.

Lock washers are not necessary on the plow bolts, and in fact are not desirable.

Plow bolts should be tightened to secure the blade to the moldboard.



Instructor Notes: Present the following key points.

This series of slides identifies some of the critical components of a snow plow which require maintenance.



Instructor Notes: Present the following key points.

Plow manufacturers think in terms of "in-season" maintenance and "off-season" maintenance.

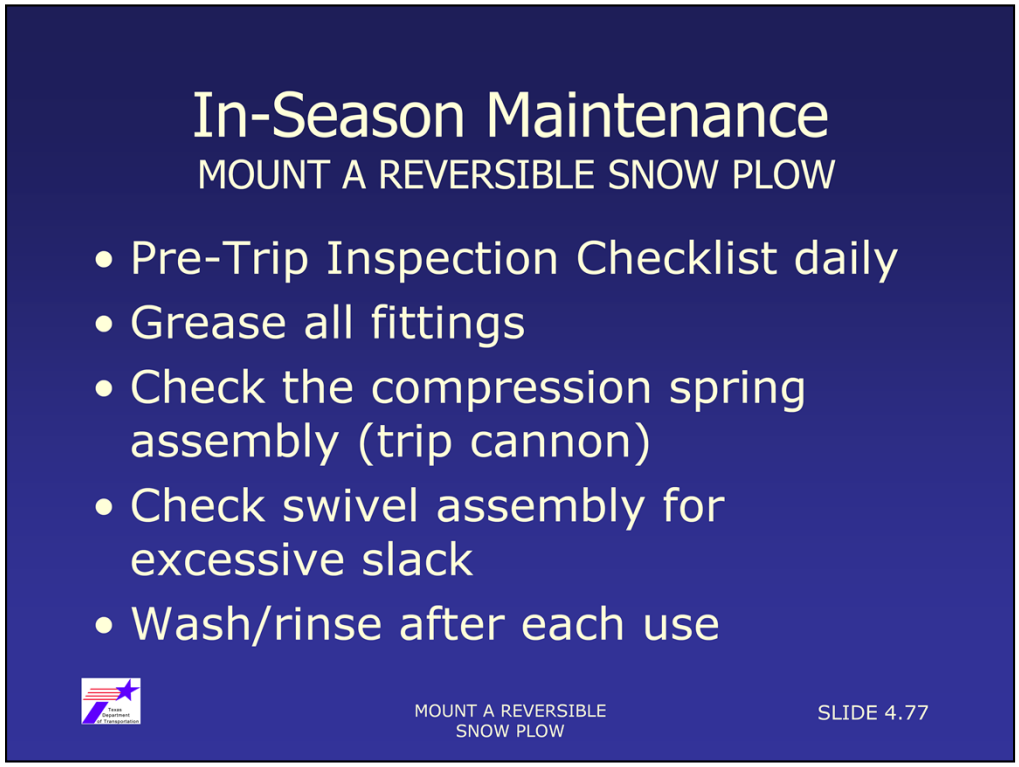
Off-season maintenance tasks are identified here.



Instructor Notes: Present the following key points.

It is good practice to read and follow the User's Manual for the snow plow you are working with.

Your Supervisor or your maintenance shop will have these.



Instructor Notes: Present the following key points.

In-season maintenance tasks are identified here.

The goal is to keep the plow functional and in service during the winter weather season.

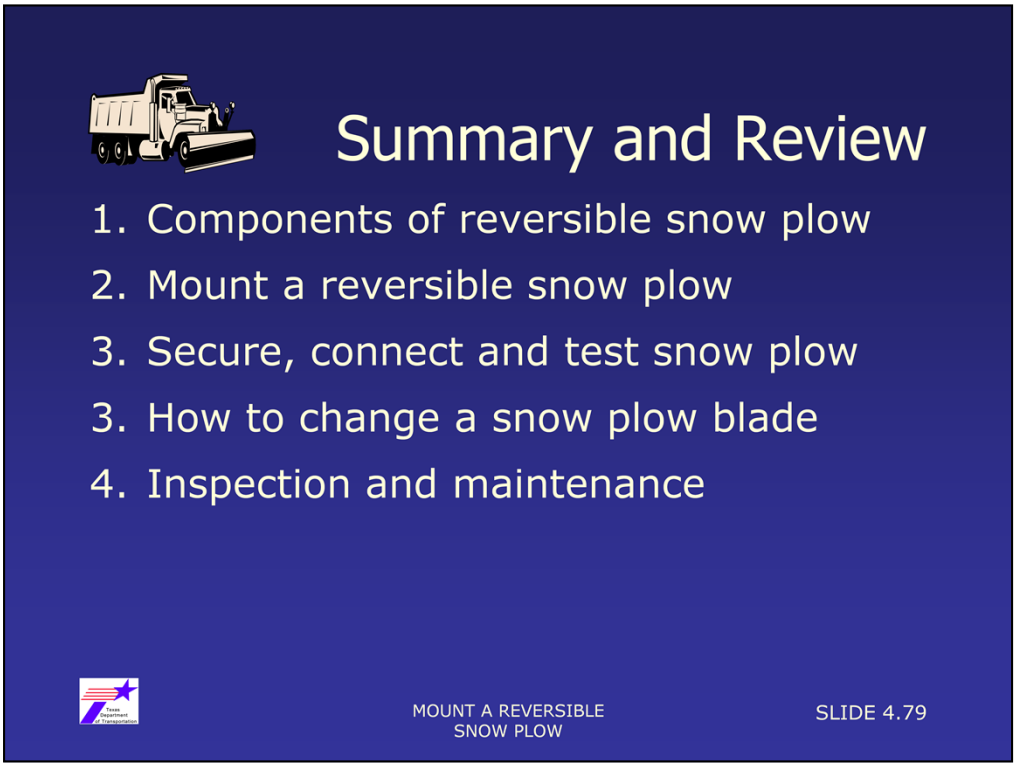
When a plow goes out of service, this dramatically affects the fleet, because this also takes the truck out of service (for plowing).



Instructor Notes: Present the following key points.

TxDOT has a pre-trip checklist for snow plows, to help with performing the preventive maintenance inspection for the snow plow.

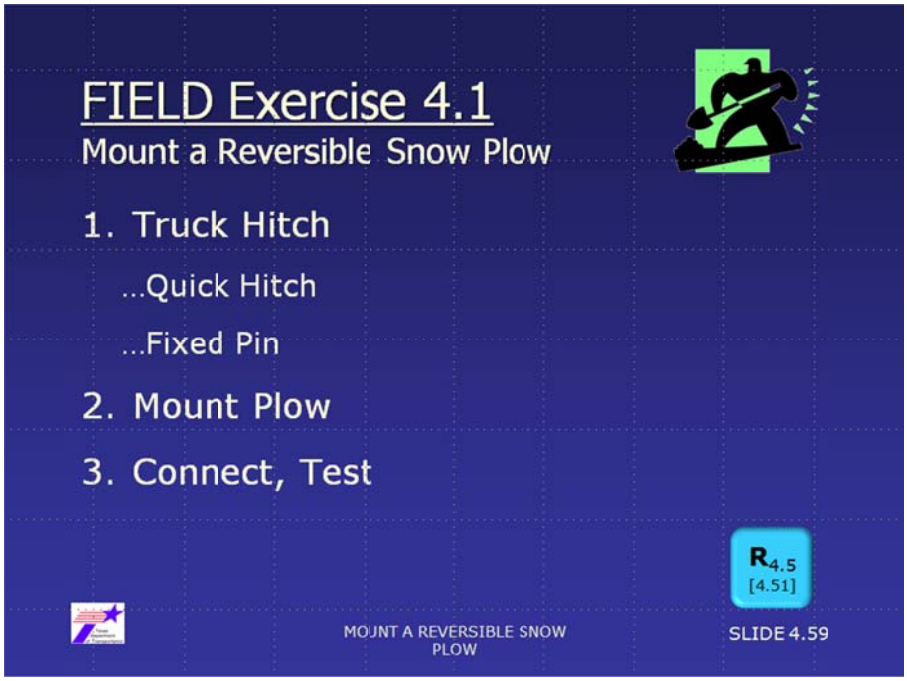
We will discuss the pre-trip checklist in Module 5.



Instructor Notes: Present the following key points.

PINK SHEETS!

Answer each question.


FIELD Exercise 4.1
Mount a Reversible Snow Plow
1. Truck Hitch
...Quick Hitch
...Fixed Pin
2. Mount Plow
3. Connect, Test
R4.5
[4.51]
MOUNT A REVERSIBLE SNOW PLOW
SLIDE 4.59

VIDEO 4.1. TXDOT SNOW PLOW OPERATION (01:00)

SCRIPT

TxDOT uses snow plows to remove snow from the roadway surface.

Because our climate is such is that snow most frequently occurs in the Texas panhandle, that is where most of the snow plowing happens at TxDOT, but on occasion, snow falls in other districts.

This particular video, showing multiple snowplows operating in tandem, was taken on a stretch of freeway in Fort Worth.

Winter weather is no respecter of schedule. TxDOT snow plow operations sometimes require night shifts.

This snow plow operation is clearing part of a divided highway, plowing snow into the median.

The goal is to clear the road and keep traffic moving.

VIDEO 4.2. REVERSIBLE SNOW PLOW (01:09)

SCRIPT

The most universally used piece of snow removal equipment is the reversible plow, which can be mounted on a wide range of trucks as well as motor graders.

As it name implies, the reversible plow is fully adjustable so that it can be move snow to the left or right as well as straight ahead.

In cab adjustments on the reversible plow include raising and lowering the plow and turning the plow to the left and to the right.

The location and appearance of the controls in the truck you operate may be different from these but the basic functions will be the same, raising and lowering, turning left and right.

All reversible plows are equipped with a trip mechanism which allows the plow to tip forward to reduce damage to the plow and truck if an immovable object is hit. The trip is reset by putting the plow on the ground and backing up the truck.

VIDEO 4.3. MOUNT AND INSPECT A REVERSIBLE SNOW PLOW (04:45)

SCRIPT

We'll start by mounting the reversible plow, the most commonly used plow.

When mounting the reversible plow, it is preferable that there be two people present; one person to drive the truck and the second person to guide the truck driver into position.

Each plow is fitted for a specific truck. Many shops stencil the truck number on the plow so you can quickly identify the correct plow for your truck.

When mounting a reversible plow, first raise the plow with a chain hoist. Some shops use floor jacks; others have jacks permanently attached to raise the plow.

Even with the plow raised to the proper height, a pinch bar is helpful in moving the plow slightly to line up mounting holes so plow pins can be inserted.

Make sure you also insert the safety or retainer clips at the end of each pin.

Next, hook the cable pulley to the lift cylinder and insert the life pin and safety clip.

Finally, you are ready to hook up the hydraulics. But before you do, make sure to shut off the truck engine.

Hydraulic power comes from oil forced through the lines at tremendous pressure. To hookup the hydraulics, simply switch the female coupling from the truck to the plow and the plow coupling to the truck.

With the plow mounted and resting on the ground, you are now ready to begin your pre-season check.

Remember to never move in or around a plow when it is raised. If the hydraulics fail, a raised plow would drop and you could be seriously hurt.

Take a close look at the plow life. Make sure that there is enough slack in the lift cable or chain so the blade completely touches the garage floor and will be able to come into contact with the roadway.

Inspect the life cable or chain. Look for cuts or frays in the cable, or for badly worn or broken links in the chain.

Look over the entire plow for any cracks or broken welds. If you find any, point them out to your shop mechanic.

Both the lift and reverse cylinders should also be checked to see that they are operating correctly and all hydraulic fittings are tight and free from leaking.

Check the condition of the hydraulic hoses too. Look for cuts or serious abrasions that may weaken the hose and lead to leaks.

Again, never check the hydraulic hoses when the truck engine is running. If there is a small hole in the line and the engine is running, the stream of fluids can shoot so hard it can slice your skin like a knife.

Next, check for proper plow trip adjustment. A faulty or improperly adjusted trip can cause a lot of damage to the plow and truck if an immovable object is hit.

Check the plow blade to make sure it is not cracked or excessively worn. Some plow blades have a carbide insert in the bottom to help resist wear. If the carbide insert is visible, the carbide is still doing its job to slow the wear on the blade.

If the carbide is merely worn through, either replace the blade, or be aware that the blade will wear much more quickly without the carbide.

The blade should be replaced when there us approximately two inches remaining between the bottom of the moldboard and the bottom of the blade.

Never wear the blade down to the point that the moldboard is on the roadway surface. This could result in an expensive moldboard repair or replacement.

Also, make certain the plow blade is tightly attached by checking the tightness of all nuts.

Also, replace any missing or broken bolts. When replacing bolts, always make sure the bolt is fully seated so the nut remains tight.

Grease all Zerks. Make sure reflectors are in place and in good condition on each end of the plow; amber reflectors on front; red reflectors on the back.

At the same time you are checking reflectors, make sure there is a red-orange flag in good condition and properly mounted at each of the plow.

If the plow has a plow shield, check to see that it is securely mounted.

Finally, check the plow controls to make sure that they are all functioning properly. Raise the plow to its full height. It should be high enough to clean obstacles you may encounter. The plow lift height can be adjusted by lengthening or shortening the lift cable or chain.

RUNNING GEAR FACT SHEET (HENKE SNOW PLOWS)

HENKE

Office: (913) 682-9000
Toll: (888) 682-9010
Fax: (913) 682-0300

Parts Department

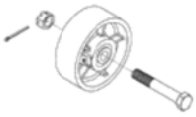
Runner Applications w/ Max Speed

Running gear is designed for recommended maximum plowing speeds. It is the conditions of operation that are important, a.k.a. 'application'. Follow these guidelines for proper service life:

Hitop Skid Shoe
- ✓ Max 25- 30 mph on gravel/dirt roads
- ✓ Can be used on concrete/asphalt, if cutting edge is bearing 50% of plow weight



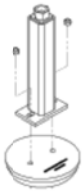
Steel Wheels
- ✓ Max 25 mph on hard, smooth road surface



Pneumatics
- ✓ Max 25-30 mph
- ✓ Acceptable on all surfaces, except for for soft (dirt) roads



Mushroom Shoes
- ✓ Max 25-30 mph on most smooth road surfaces, when the cutting edge is bearing 50% of plow weight
- ✓ Commonly recommended by Sales reps for rough roads w/ rocky surface, cattle grates, bad or no shoulder etc.



Runner Applications

Page 1 of 1

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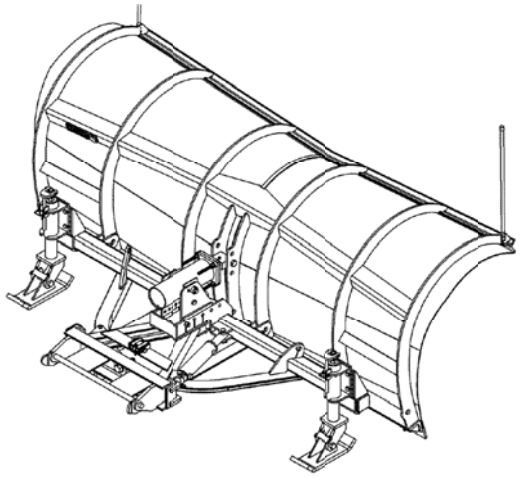
LEARNING EXERCISE 4.1

Mount a Reversible Snow Plow

Winter Weather Operations Training

Equipment Needed for this Exercise

1. Dump truck (6 CY or 10 CY capacity) fitted with snow plow mounting frame
2. Reversible snow plow
3. Floor jack, trailer jack, jack stands, pinch bar and wooden blocking, as required to properly position the snow plow for connection to the mounting frame
4. Hand tools as needed to make connections and adjustments



SNOW PLOW SAFETY

- Read all installation, safety and maintenance instructions completely before operating this equipment.
- Keep all personnel clear of moving parts while equipment is being operated.
- While operating this equipment, use common sense, use caution, be alert and be safety-conscious.

Learning Objectives

Upon completion of this field exercise, the learner will be able to:

1. Identify snow plow components
2. Mount a reversible snow plow on a dump truck
3. Inspect and maintain critical components on a snow plow
4. Change the blade on a snow plow

Description

A snow plow is an attachment for a 6 CY or 10 CY dump truck. Snow plows are used to mechanically remove snow and slush that have accumulated on the roadway. Snow plows are often used in conjunction with a chemical-based deicing strategy which breaks the bond between snow/ice and the road surface, allowing more efficient removal by plowing. Proper equipment, used effectively, can reduce the need for snow and ice control chemicals.

TxDOT almost exclusively uses the reversible snow plow for snow removal operations. Reversible snow plows are so called because the plow has the capability to orient the moldboard to cast snow either to the right (which is typical) or to the left while plowing.

Plow widths typically vary from 10 to 12 feet. In-cab toggle switches control the up and down movements of the reversible plow and facilitate casting of snow and ice to the right or to the left of the truck.

TxDOT uses several different makes and models of truck-mounted snow plows that vary in age. The mounting procedure for each snow plow is basically the same, with a few minor differences.

Each snow plow assembly includes a mounting frame, also termed a "truck hitch," that stays with and is fixed to the truck. The snow plow connects to this mounting frame. Because of the mounting process, each snow plow is mated or matched with a specific truck mounting frame and may not be used interchangeably with other trucks. Each snow plow and truck are clearly marked with the truck's equipment number which consists of a four-digit number followed by a dash and one capital letter (4503-H for example). As a piece of major equipment, the snow plow also carries its own equipment number.

A snow plow may be stored inside the maintenance section garage bay so it can be mounted, adjusted and serviced in a climate-controlled environment. Some maintenance sections store their plows outside.

Mounting a Reversible Snow Plow

Mounting a snow plow is a two-man operation. One man must operate the truck while the other acts as a spotter to direct and guide the operator through the process using hand signals.

For the purposes of this training, we will be mounting a Henke reversible snow plow on a truck fitted with a Henke quick link truck hitch. Henke plows feature an enclosed trip spring and 1" x 6" runners. This type and brand of snow plow appears to be the most common plow being currently used and purchased by the snow and ice districts in Texas.

1. Locate the appropriate snow plow for the dump truck by verifying that the equipment numbers match.

2. Ensure that the snow plow frame is blocked up or jacked up to the correct height to facilitate a smooth (bind free) connection with the latching mechanism on the truck hitch.

Note that in some maintenance sections, the snow plow frame is stored at the correct height for the truck during the snow plow removal process. Alternatively, operations personnel sometimes permanently install a trailer jack on the snow plow frame to allow easy adjustment of the snow plow frame height.

3. The spotter directs the operator to move the truck forward toward the snow plow. The mating rod of the snow plow frame is designed to engage the two latches on the quick link truck hitch.

4. The spotter directs the operator to approach the plow so that the snow plow frame is square to the truck mounting frame and is aligned with the latching mechanism on the truck hitch.

5. As soon as the plow frame mating rod has fully engaged the latches on the truck hitch, the locking lever on the truck hitch should automatically lock the snow plow to the truck hitch.

Note that if the locking lever has not moved into its locked position, the snow plow is not fully attached to the truck hitch.

6. The spotter inserts the stinger, which is normally stored with the snow plow when it is not attached to the truck, into the large square tube above the hydraulic lift cylinder on the truck hitch. The stinger must align with the proper hole set to lock the stinger in position.

Note that the hole position for the snow plow stinger should always be the same for the corresponding truck hitch/snow plow combination.

7. The spotter inserts the large pin through the appropriate hole set in the stinger and large square tube, and secures the pin at its end with an R-clip.

Note that the hydraulic lift cylinder that controls the up and down movement of the snow plow is now linked to the snow plow through the stinger. The attached chain loops through the stinger to a connection on each side of the snow plow frame.

8. The operator connects the hydraulic lines from the snow plow to the truck.

SAFTEY NOTE: Exercise caution when connecting hydraulic lines. Hydraulic lines should be connected either when the truck is not running or when the hydraulic pump that supplies power to the spreader is disengaged.

9. As applicable, the operator connects the electrical cable from the snow plow to the truck for any lights that may be part of the snow plow.

Note that it is common for snow plow lights to be permanently attached to the truck and powered directly from the truck's electrical system. In this situation, no electrical connection to the snow plow is required.

Checking and Adjusting the Snow Plow

Once the snow plow is mounted, various checks should be made to ensure proper plow alignment and function.

1. Check the push frame. The plow should be mounted such that the push frame is horizontal and in line with the truck frame. If the push frame is not horizontal, a shop adjustment to the mounting hitch will be necessary.
2. Check the stinger. The stinger should be horizontal and extended forward so that the adjustment chains to the plow hang vertically.
3. Check the snow plow controls to ensure that they are working properly:
   - Plow up and down
   - Plow casting snow right or left
4. Check the snow plow lights to ensure they are working properly.
5. Lift the snow plow blade off the ground. Check the reveal (space) between the bottom of the snow plow blade and the pavement surface.
6. Check the orientation of the cutting edge. The snow plow blade should be parallel to the pavement surface that will be plowed. If the blade is not parallel to the road surface, the snow plow will need to be adjusted to conform to the pavement surface. This may be accomplished by adjusting the length of the chains that attach to the stinger and connect to the back of the snow plow on both sides.

Changing a Snow Plow Blade

Snow plow blades are the cutting edge of the plow. The blades are attached to the lower part of the moldboard and should be monitored frequently for proper mounting and excessive wear. Snow plow blades should be replaced before damage occurs to the moldboard. One rule of thumb is to replace the blade if there is less than 1½inches (two fingers) of blade remaining.

Most TxDOT districts use standard-duty steel snow plow blades. Alternatively, some use steel blades with carbide inserts (carbide blades) alone or in conjunction with a standard-duty steel blade. Wear grade carbide inserts resist deterioration caused by blade downpressure and abrasion which results in a cutting edge that will last up to 5 times longer than a standard steel blade.

Changing a snow plow blade is a two-man operation. For the purposes of this training, we will describe how to replace a standard-duty steel blade. Carbide snow plow replacement blades come in 3-ft and 4-ft sections; whereas, the standard duty (mild steel) snow plow blades come as one full-length blade.

Equipment Needed to Change a Snow Plow Blade:

1. Dump truck (6 or 10 CY capacity) with snow plow mounted on the truck
2. Full length or multi-section steel snow plow blade set
3. Floor jack, trailer jack, jack stands and wooden blocking to support the snow plow while changing the blade
4. Pinch bar to help move or lift snow plow components
5. Impact tool with sockets, wrenches and other hand tools as needed to replace the snow plow blade
6. Replacement snow plow fasteners (bolts and nuts) as needed
7. Spud wrench and/or drift punches to line up the holes in the moldboard with the holes in the snow plow blade

Steps for Changing a Snow Plow Blade:

1. If available, drive the truck into a mechanic's garage bay where there is a paved floor surface, compressed air and the proper tools for the job.
2. Use the hydraulic lift cylinder on the truck mounting frame to lift the plow to a comfortable working level, say, 15" to 18" above the floor surface.
3. Using safety jacks or equivalent, securely support the bottom of snow plow so that the blade is safely above the ground.
4. Remove the existing fasteners from the blade and moldboard.
5. Remove old blade(s).
6. Position new blade and line up the holes. Fasten with bolt and nut at each end to hold in place. Repeat as necessary for each section of a multi-section blade. If necessary, use a spud wrench or drift punches to line up the holes.

7. Install remaining fasteners and tighten securely.

8. Raise snow plow and remove jacks and blocking that supported the snow plow during the blade replacement operation.

Special Equipment Maintenance and Fleet Management Requirements

Snow and ice control operations are very demanding on equipment. Cold weather, a corrosive environment, impact loadings, over-loadings and increased potential for collisions with other vehicles or roadside features are some of the factors that increase equipment stress. As a result, particular attention has to be given to maintaining and repairing mobile snow and ice control equipment.

The routine maintenance schedule recommended by the equipment manufacturer should be regarded as the absolute minimum requirement for mobile snow and ice control equipment. More frequent lubrication and inspection schedules usually result in greater up time. Strategic pre-operational and post-operational inspections should be conducted for each shift to help identify small problems, that if not corrected, can result in large or expensive repairs.

The following equipment inspections and maintenance activities on a snow plow assembly will maximize equipment performance and minimize down time.

Pre-Storm Activities

Before a storm strikes, be sure to:

- Perform a Snow Plow Inspection Checklist
- Check blade and moldboard on snow plow for proper mounting and excessive wear
- Mount snow plow on the truck and make the necessary adjustments to ensure proper operation
- Check hydraulic hoses and fittings for leaks and excessive wear
- Check snow plow attachment to ensure all connections are tight
- Check snow plow for fatigue cracks
- Perform a visual check for leaks
- Check controls in cab to make sure blade will go side to side for easy snow removal
- Install snow plow lights to maximize visibility while plowing snow at night
- Service and/or adjust trip chain mechanism as needed to ensure proper operation when plowing snow

During the Storm Activities

While using the equipment during the storm:

- Keep constant check on snow plow blade wear to protect the moldboard
- Perform an occasional walk around to check for any problems that may arise (lights, leaks, tires, wiper blades, mirrors, etc.)
- Monitor hydraulic oil levels to assure proper operation of the snow plow

Post-Storm Activities

Once the storm is over, be sure to:

- Clean and wash equipment as necessary
- Check all hydraulic lines and fittings for wear and leaks
- Make sure equipment is ready for next storm event
- Remove and store attachments as directed by the maintenance section supervisor
- Check snow plow for fatigue cracks
- If necessary, install new blade on snow plow

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VIDEO 4.4. CHANGE A SNOW PLOW BLADE (05:42)

SCRIPT

The cutting edge, or blade, of a snow plow is a wear part, and it must be changed from time to time.

The blade changing operation involves several steps, and it should be said at the outset that this video shows one way to change a blade, a method which is both safe and efficient. We realize there are other ways, and you will want to follow the instructions of your supervisor.

Blade changing can be done on the road in an emergency, but it is always preferable to change the blade in the shop. Not only is it warmer and drier, it is also a safer work environment.

The snow plow can be raised for convenience. As a safety precaution to prevent crushing, always block the heavy steel plow such as is being done here with the safety jacks.

With the snow plow properly and safely positioned, remove the plow bolts that secure the blade to the moldboard. Here this is being done with an impact wrench and a hammer.

A word about when to change the blade.

The key thing that determines when it is time to change your snow plow blade is if the blade is worn down enough such that further plowing will get into the moldboard. The blade must be changed before this happens.

Back to blade removal. Oftentimes, plow bolts are worn or misshapen such that the nuts cannot be removed. If so, the bolts will need to be cut out with a torch.

Use care when driving bolts out of the moldboard.

The carbide blade is removed in sections. In this case, the Flink plow moldboard is 10 feet wide, so the carbide blade consists of two 3-foot sections on the ends and one 4-foot section in the middle. Moldboard widths of 10 feet, 11 feet, and 12 feet are typical, and can be accommodated with the proper blade sections.

Notice that although the blade is pinned for safety purposes, it does not readily fall off, but has to be pried loose. This is because asphalt has worked its way between the moldboard and the blade while plowing, and the asphalt kind of glues the blade to the moldboard.

But don’t count on this. Safety first. Always pin the blade sections so they do not fall away during removal.

Once the carbide blade is removed, it is time to remove the mild steel blade, which is the full width of the moldboard, or 10 feet. This is pried loose also, and once removed, the exposed moldboard surface should be cleaned in preparation to receive the new blade.

For the replacement blades, we will be using a blade set consisting of two blades, a carbide blade and a mild steel blade.

The blade replacement approach being recommended here is to tack weld plow bolts for each end of the three carbide blade segments. These tack-welded bolts provide a means to temporarily support the blade until both the carbide blade and the mild steel blade can be placed and secured.

It is recommended that the carbide blade be installed first, directly on the moldboard, where it will provide the greatest wear. The blade needs to be oriented properly, so that the blade angle matches the moldboard orientation when plowing.

Sometimes the tack-welded bolts require adjustment. Again, make sure the blade is oriented correctly.

After the three carbide blade sections are placed on their pins, install the mild steel blade over the carbide blade. This will be the front of the blade set.

Notice that the mild steel blade is 8 inches high, whereas the carbide blade is only 6 inches high. This means that, during plowing immediately following blade replacement, the mild steel blade will quickly wear down to match the carbide blade, at which time the two blades will work and wear together.

Snow plow bolts for the blades are secured with nuts. Lock washers are not required and in fact are not recommended, as the use of washers can result in premature loosening of the plow bolts.

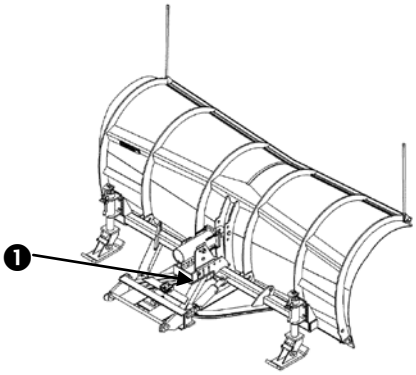
Note that the nuts are placed in front of the blade, rather than behind the moldboard. This makes for better access to the nuts, and a quicker installation, without any significant negative effect on snow plowing.

Once the nuts are placed, they are tightened. Usually it is necessary to back up the bolts when doing so.

With the bolts installed and secured, the blade change is complete. You may remove the safety jacks, and return the plow to service.

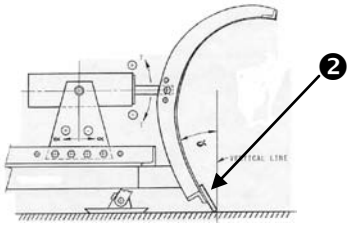
Class Exercise – Review Questions
Module 4 – MOUNT A REVERSIBLE SNOW PLOW

MNT812 Winter Weather Operations Training



1. Identify component ❶ in the reversible snow plow drawing.
   A. Swivel plate assembly
   B. Moldboard assembly
   C. Hitch assembly
   D. Spring trip assembly

The correct answer is D.



2. Identify component ❷ in the reversible snow plow drawing.
   A. Trip cannon
   B. Blade
   C. Running gear
   D. Stinger

The correct answer is B.

3. [True or False] So long as the hitch mechanisms are the same, any snow plow can be mounted on any dump truck.
   A. True
   B. False

This statement is FALSE.

Each snow plow is matched to one particular truck.

4. [True or False] Mounting the snow plow is complete when the trip cannon "trips."
   A. True
   B. False

   This statement is FALSE.

   The trip cannon has nothing to do with mounting the snow plow. Mounting the snow plow is complete (in one sense) when the truck hitch fully engages the plow mounting pins.

5. [True or False] The chains which hang from the stinger (lift arm) should be adjusted so that the snow plow blade is parallel to the pavement surface you will be plowing.
   A. True
   B. False

   This statement is TRUE.

   That is what the chains are for.

6. [True or False] When changing the snow plow blade, always use safety jacks to support the plow frame.
   A. True
   B. False

   This statement is TRUE.

   SAFETY FIRST!!!

7. [True or False] When installing a two-blade set (carbide and mild steel), the mild steel blade goes on first, directly against the moldboard.
   A. True
   B. False

   This statement is FALSE.

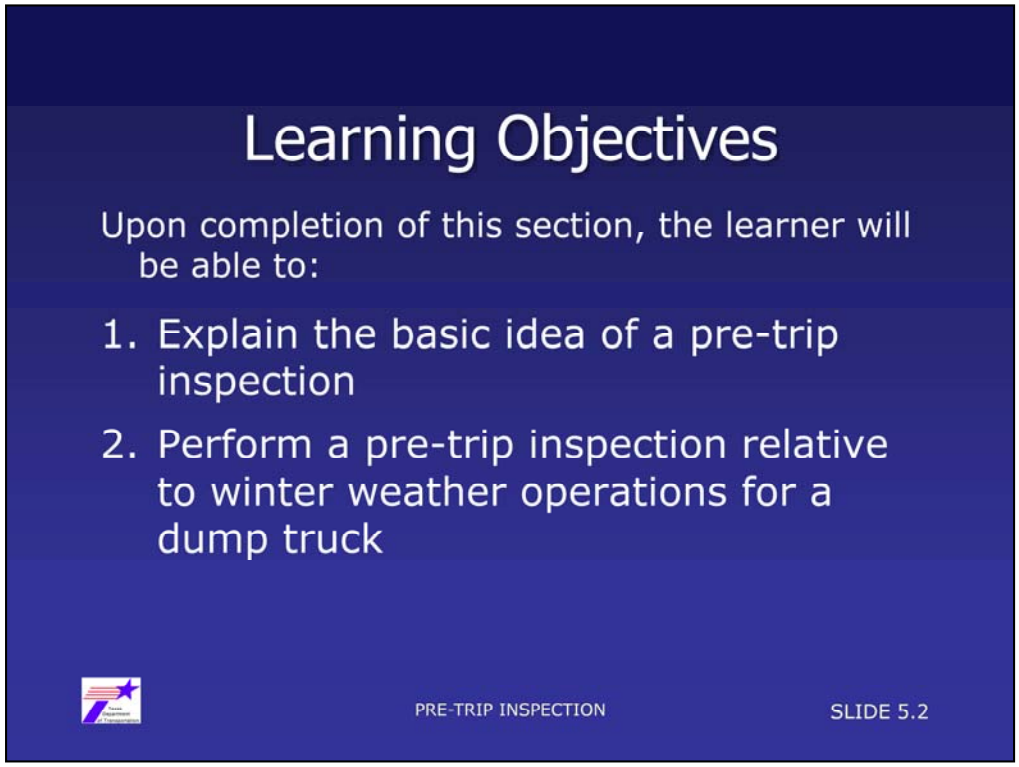
   The carbide blade (which comes in sections) should be placed directly against the moldboard, which is where it will be the most beneficial.



Instructor Notes: Present the following key points.

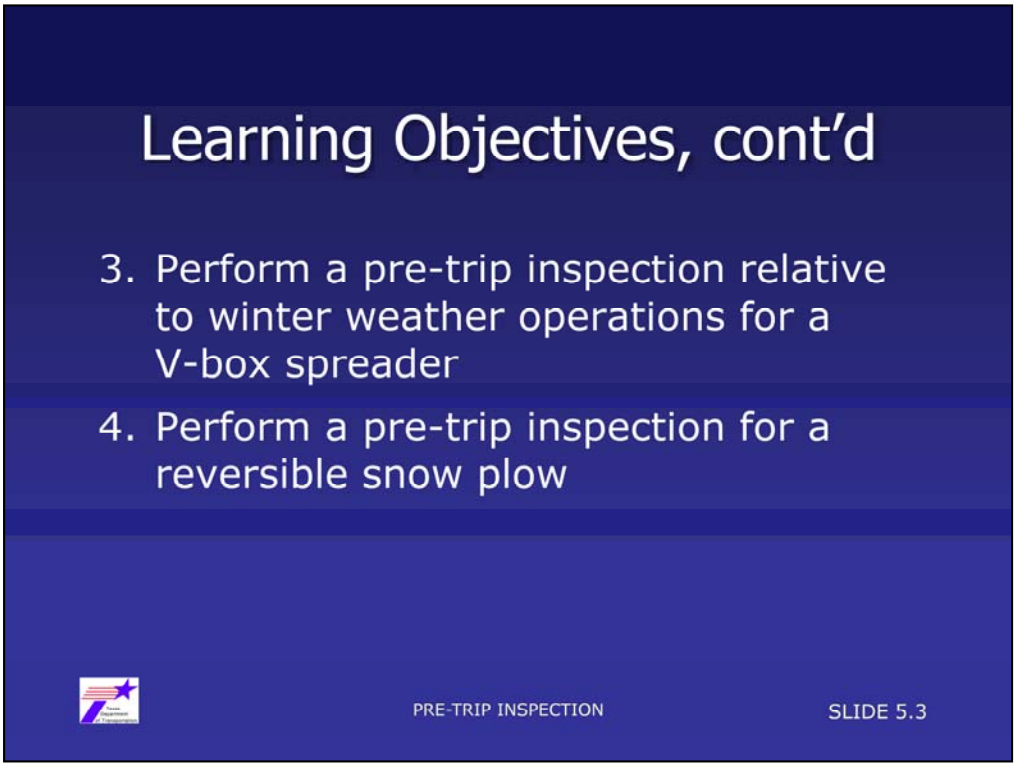
The pre-trip inspection is a pre-event activity, usually done by the operator at the beginning of his/her shift during winter storm response.

In this module we will discuss pre-trip inspections for dump trucks, V-box spreaders, and snow plows.



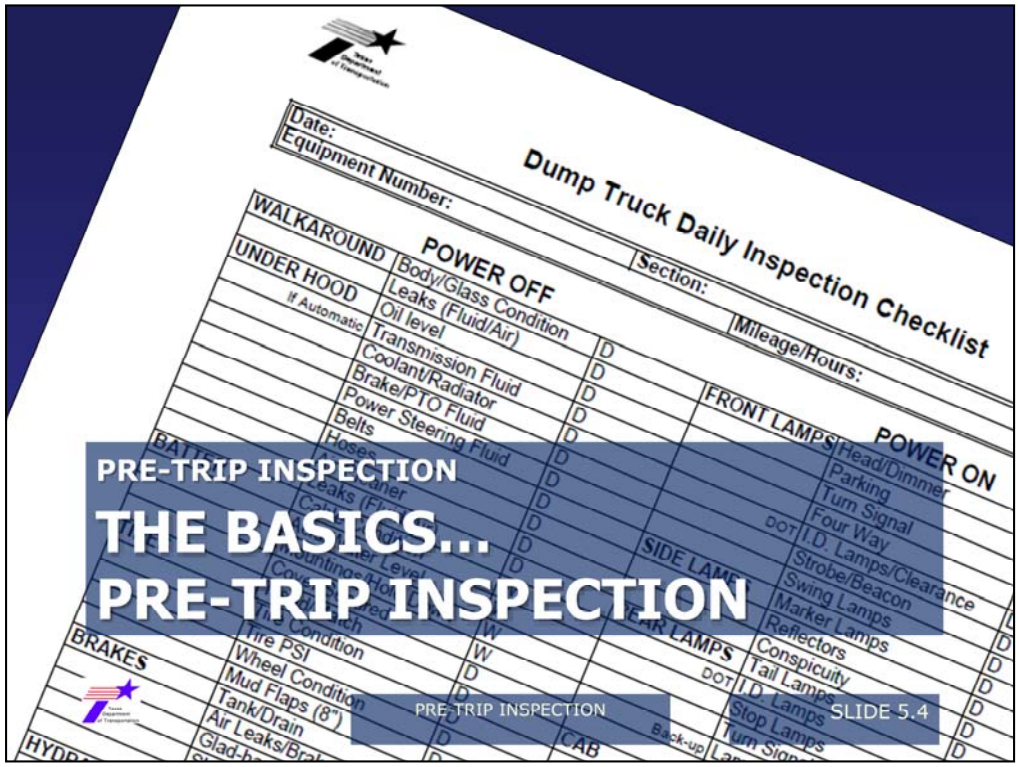
Instructor Notes: Present the following key points.

Note the learning objectives.



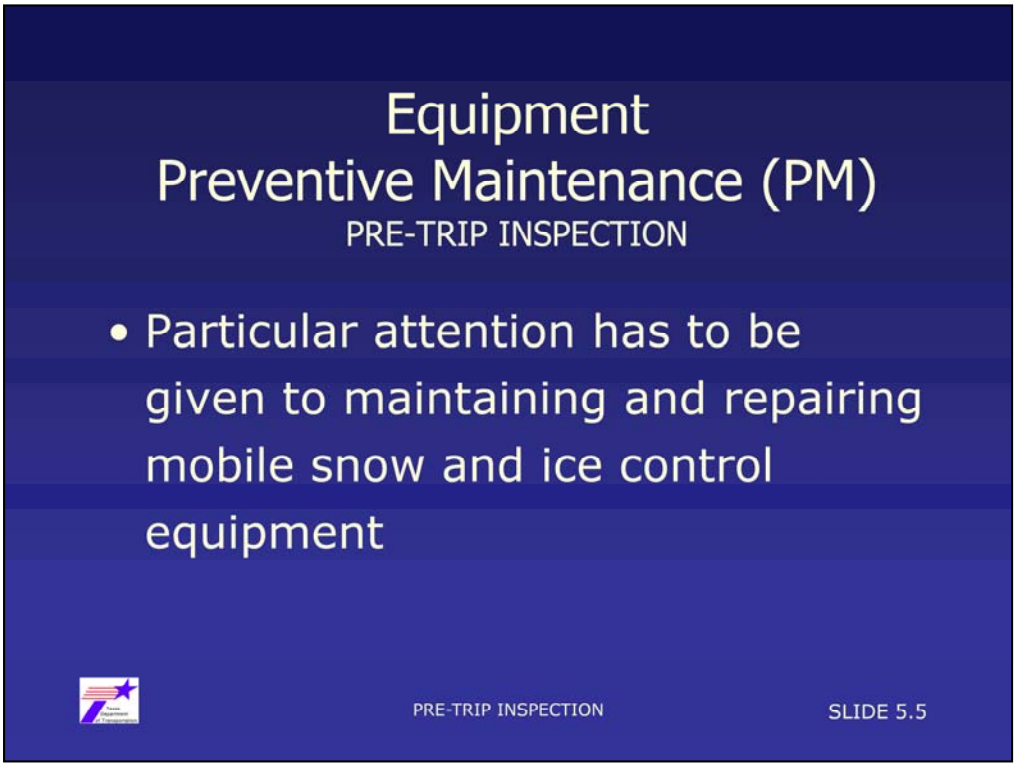
Instructor Notes: Present the following key points.

Note the learning objectives.



Instructor Notes: Present the following key points.

THE BASICS.



Instructor Notes: Present the following key points.

As maintenance operations personnel, you will have had some exposure to TxDOT's equipment preventive maintenance program.



Instructor Notes: Present the following key points.

Specifically, we are talking about preventive maintenance (PM) for winter weather equipment including dump trucks.



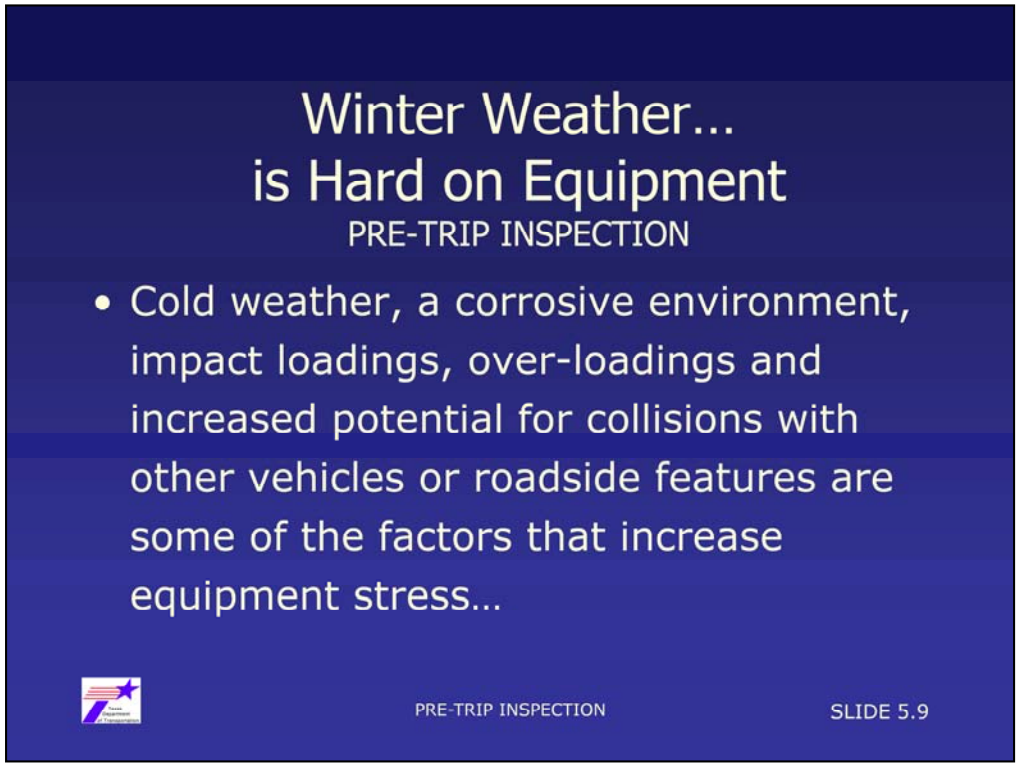
Instructor Notes: Present the following key points.

V-box spreaders.



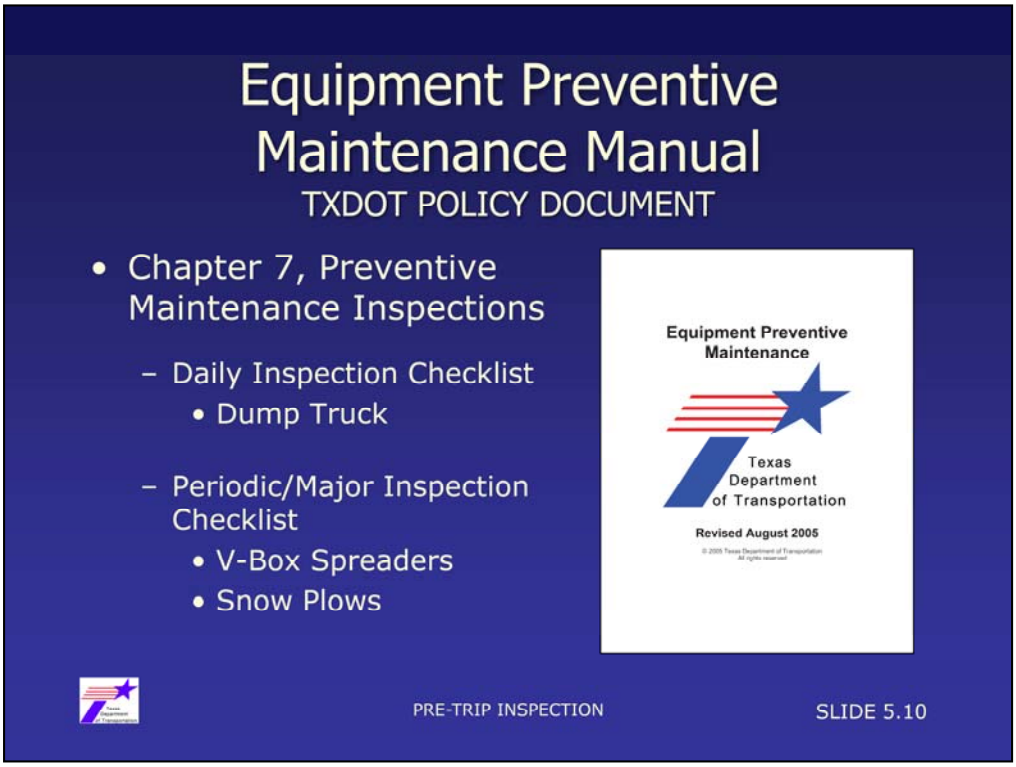
Instructor Notes: Present the following key points.

And reversible snow plows.



Instructor Notes: Present the following key points.

For a number of reasons, winter weather is hard on equipment.



Instructor Notes: Present the following key points.

Equipment preventive maintenance is formally discussed in TxDOT's Equipment Preventive Maintenance Manual.

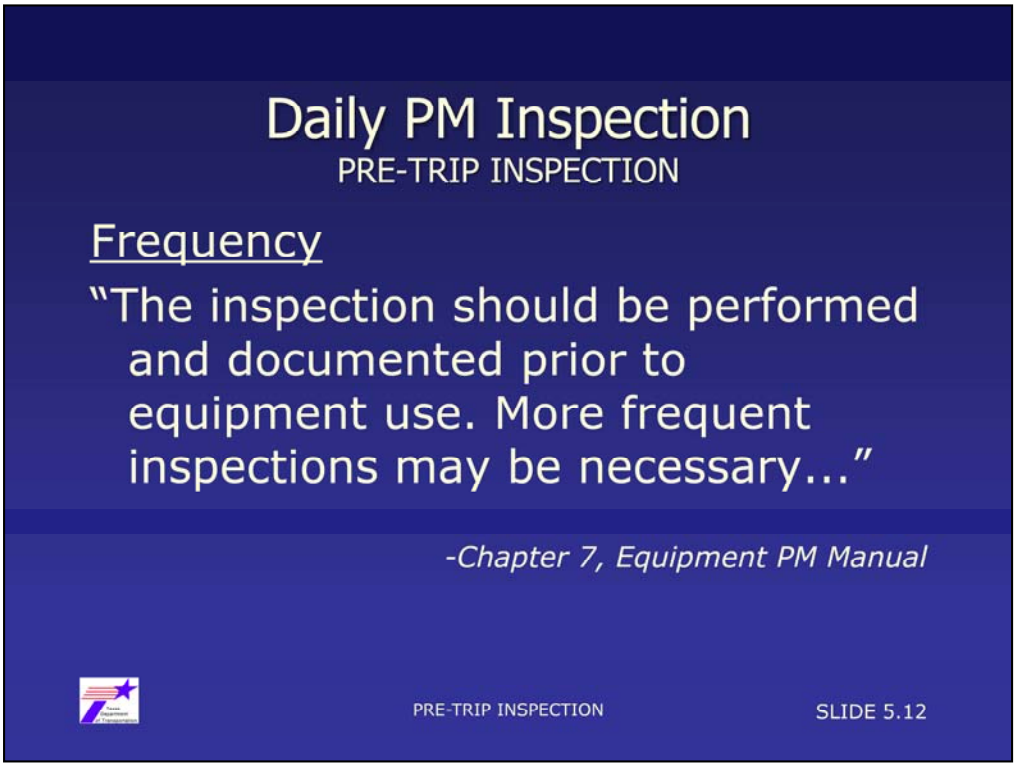
Chapter 7 of this manual discusses the preventive maintenance (PM) inspections, which we will refer to as "pre-trip" inspections.



Instructor Notes: Present the following key points.

Why do a pre-trip inspection?

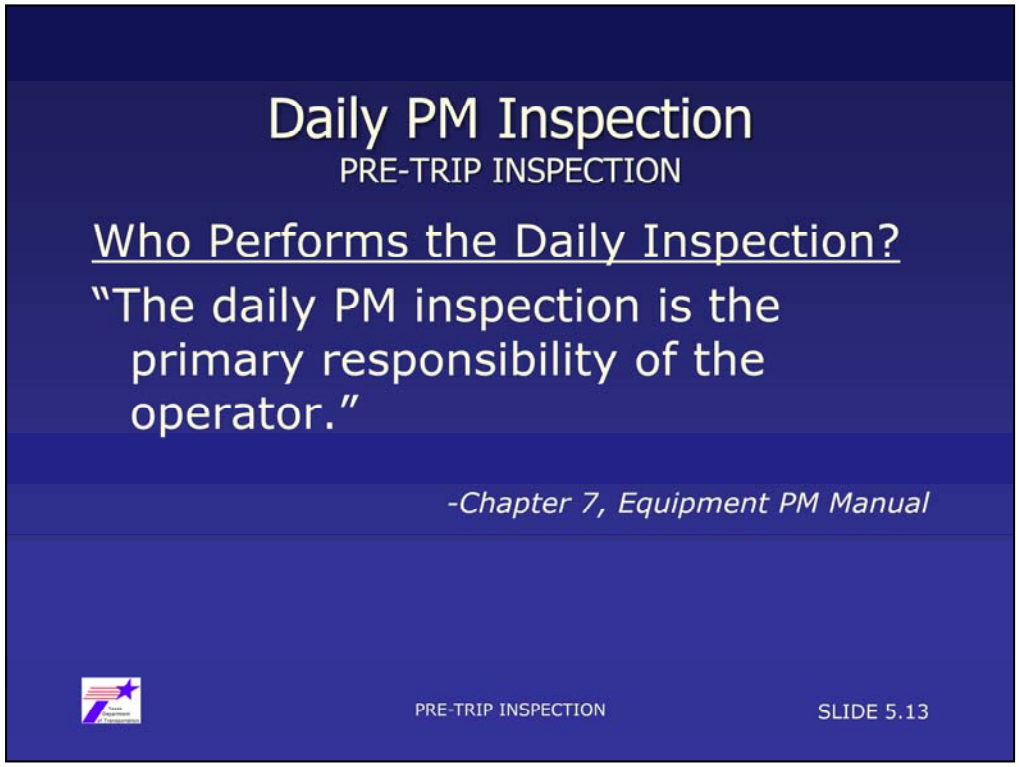
It is all about SAFETY. Note the reason(s) identified in the PM Manual.



Instructor Notes: Present the following key points.

How often do you do a pre-trip inspection?

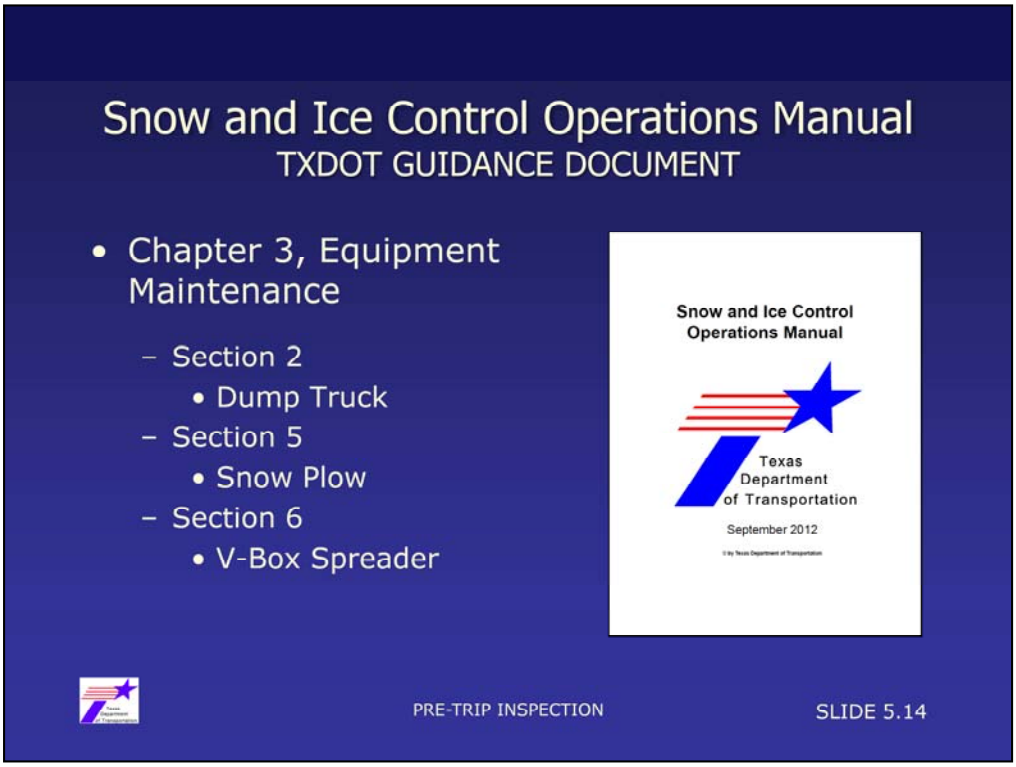
Typically, at the beginning of your shift. More frequent inspection may be necessary.



Instructor Notes: Present the following key points.

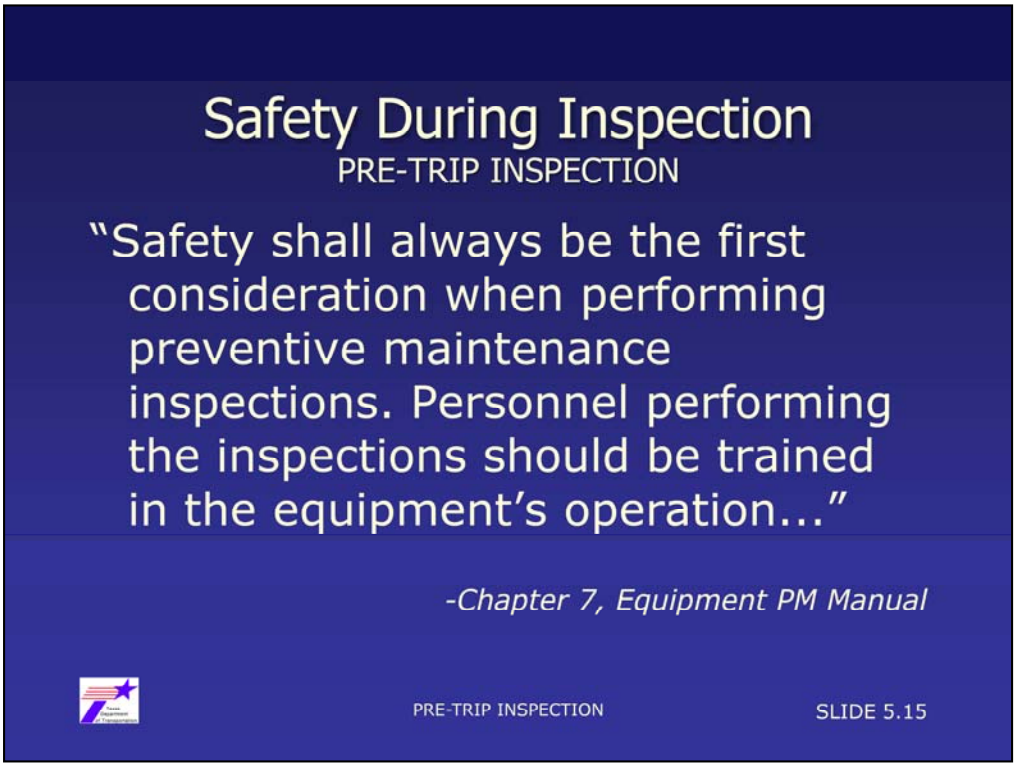
Who performs the pre-trip inspection?

While everyone at TxDOT, from the District Engineer to a newly-hired maintenance technician, is responsible to achieve an effective equipment preventive maintenance program, the pre-trip inspection is the primary responsibility of the operator.



Instructor Notes: Present the following key points.

TxDOT's Snow and Ice Control Operations Manual discusses winter weather aspects of the pre-trip inspection, as identified here.



Instructor Notes: Present the following key points.

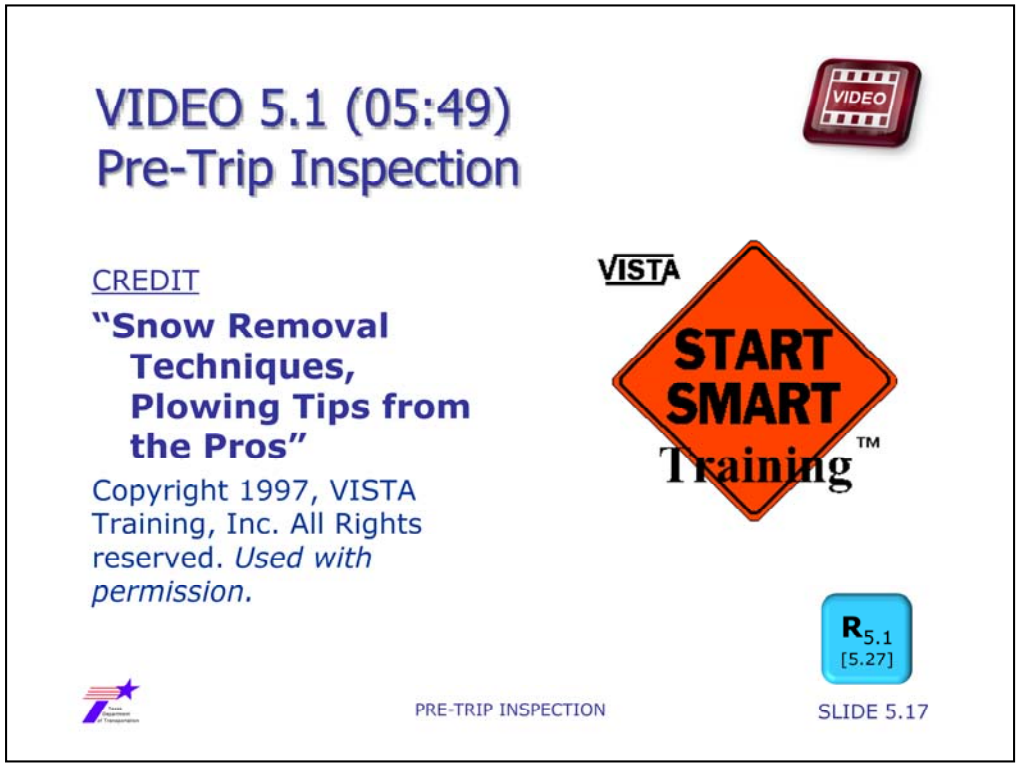
Safety is the first consideration when performing the pre-trip inspection.



Instructor Notes: Present the following key points.

A preventive maintenance, or pre-trip, inspection is intended to carefully evaluate the safety and functionality of the equipment.

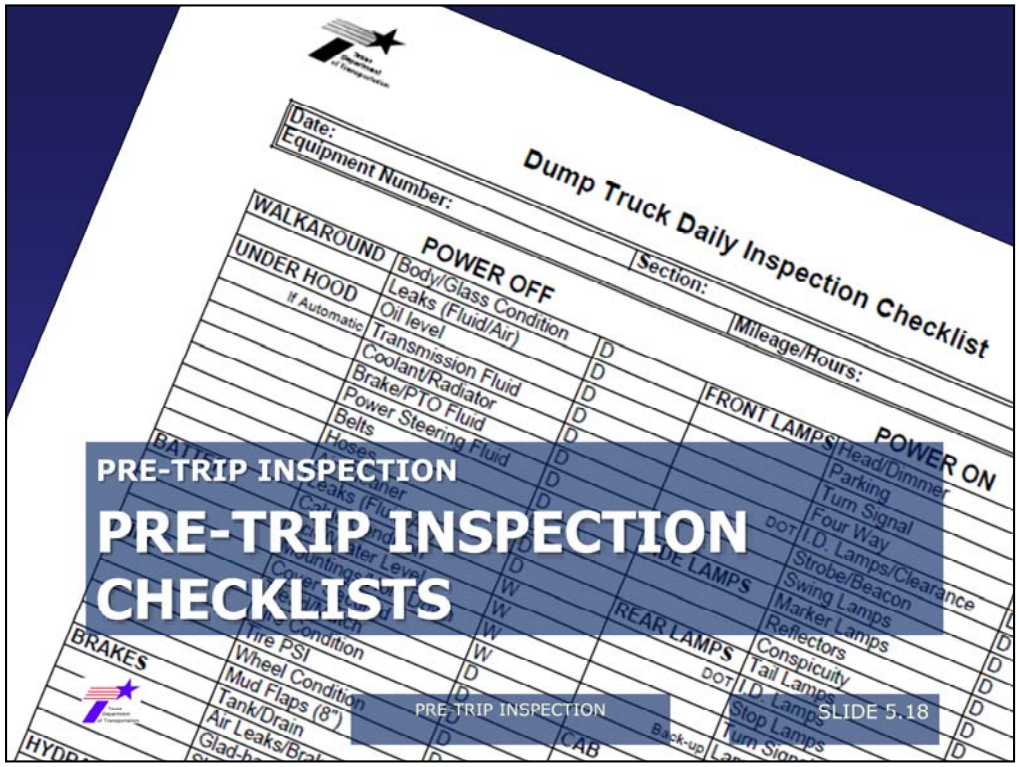
TxDOT provides checklists to aid in the inspection of the different kinds of equipment.



Instructor Notes: Present the following key points.

This video nicely summarizes the basic idea of a pre-trip inspection associated with winter weather operations.

This video is provided courtesy of Vista Training, Inc.



Instructor Notes: Present the following key points.

In this section, we introduce the actual pre-trip inspection checklists that TxDOT uses for its dump trucks, V-box spreaders, and snow plows.

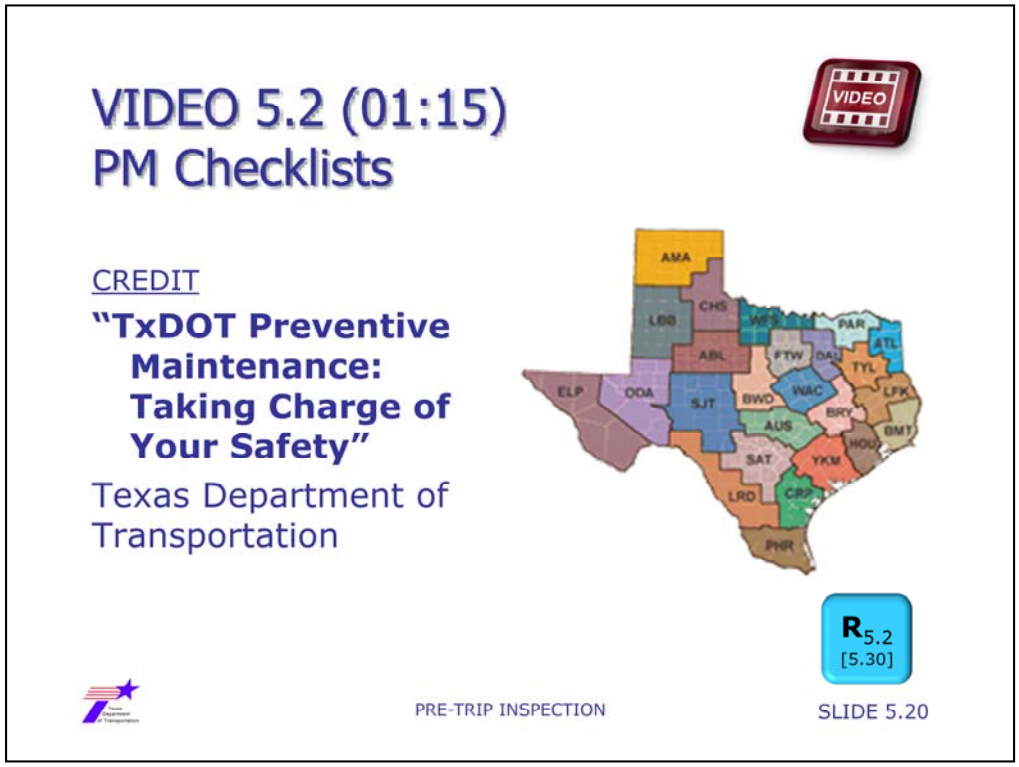


Instructor Notes: Present the following key points.

The Equipment Preventive Maintenance Manual presents the official TxDOT pre-trip checklists.

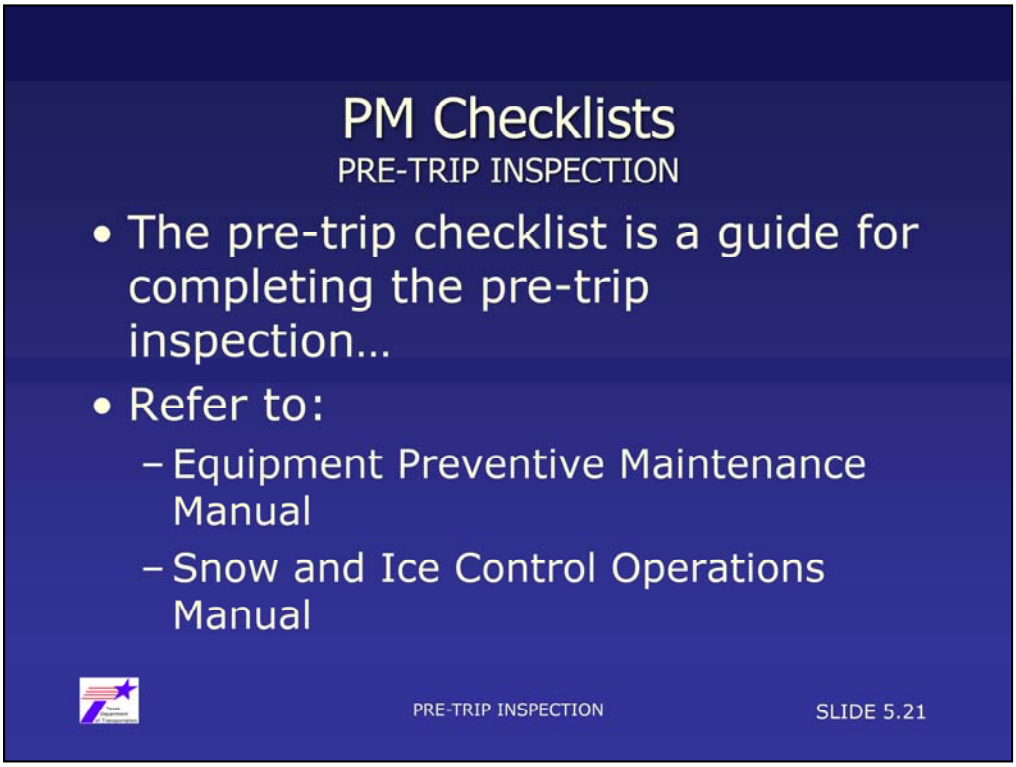
A DAILY inspection checklist exists for the dump truck.

PERIODIC/MAJOR inspection checklists exist for the V-box spreader and for the snow plow.



Instructor Notes: Present the following key points.

This film discusses the basics of using a pre-trip checklist at TxDOT.



Instructor Notes: Present the following key points.

Note that the pre-trip checklist is a guide for completing the pre-trip inspection. The inspection is the main thing.

You should inspect all pertinent aspects of your equipment, not just the items that appear on the checklist.



Instructor Notes: Present the following key points.

This is the current official DAILY PM checklist for the dump truck. It is included (R5.3).

In reviewing the checklist in R5.3, notice there are two versions. The first version, shown on p 5.31, is the current official version.

The second version, shown on page 5.32, is a DRAFT version that is currently being reviewed by TxDOT's equipment PM experts. This second version is helpful in that it not only identifies the PM items, but also it identifies what to look for.



Instructor Notes: Present the following key points.

The daily pre-trip checklist typically addresses three items:

1. UNDER the HOOD.



Instructor Notes: Present the following key points.

2. AROUND the VEHICLE.



Instructor Notes: Present the following key points.

3. IN the CAB.

One interesting point. If you carefully review the dump truck pre-trip checklist, you will find that NOWHERE does it say you are to check the heater/defroster.

But this is a key operational feature for winter maintenance operations. Be sure to not only follow the checklist, but also to think about and check everything else you may need, too.

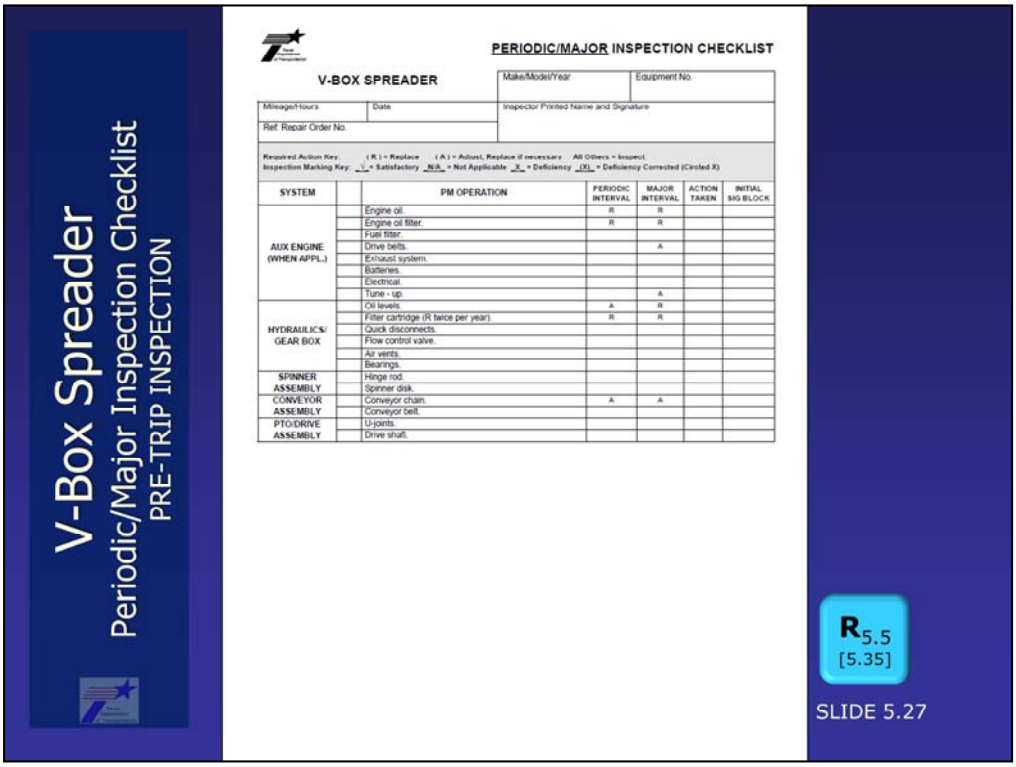


Instructor Notes: Present the following key points.

This video illustrates some of the key aspects of the pre-trip inspection for a dump truck, relative to winter maintenance operations.

More general, comprehensive, guidance on pre-trip inspections can be obtained from your Supervisor.

COMMENT: This video includes a brief statement about having chains available to pull stranded motorists out of Harm's way. TxDOT does *NOT* use chains. TxDOT uses recovery straps. You will want to mention this after the video.



Instructor Notes: Present the following key points.

This is the current official PERIODIC/MAJOR PM checklist for the V-box spreader. It is included (R5.5).

Although this is not a daily checklist, per se, it can and should be used daily when operating the V-box spreader.



Instructor Notes: Present the following key points.

Although not specifically identified on the pre-trip checklist, one thing that you must look for is that the spreader is adequately secured to the dump truck bed.



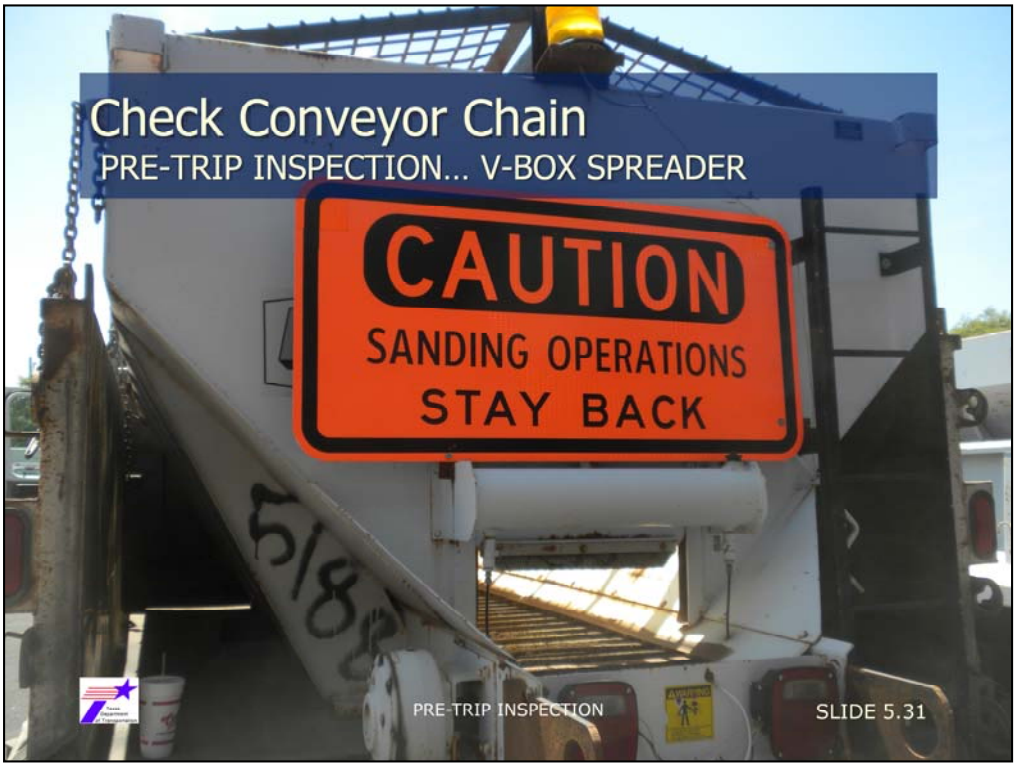
Instructor Notes: Present the following key points.

On the checklist.



Instructor Notes: Present the following key points.

On the checklist.



Instructor Notes: Present the following key points.

On the checklist.



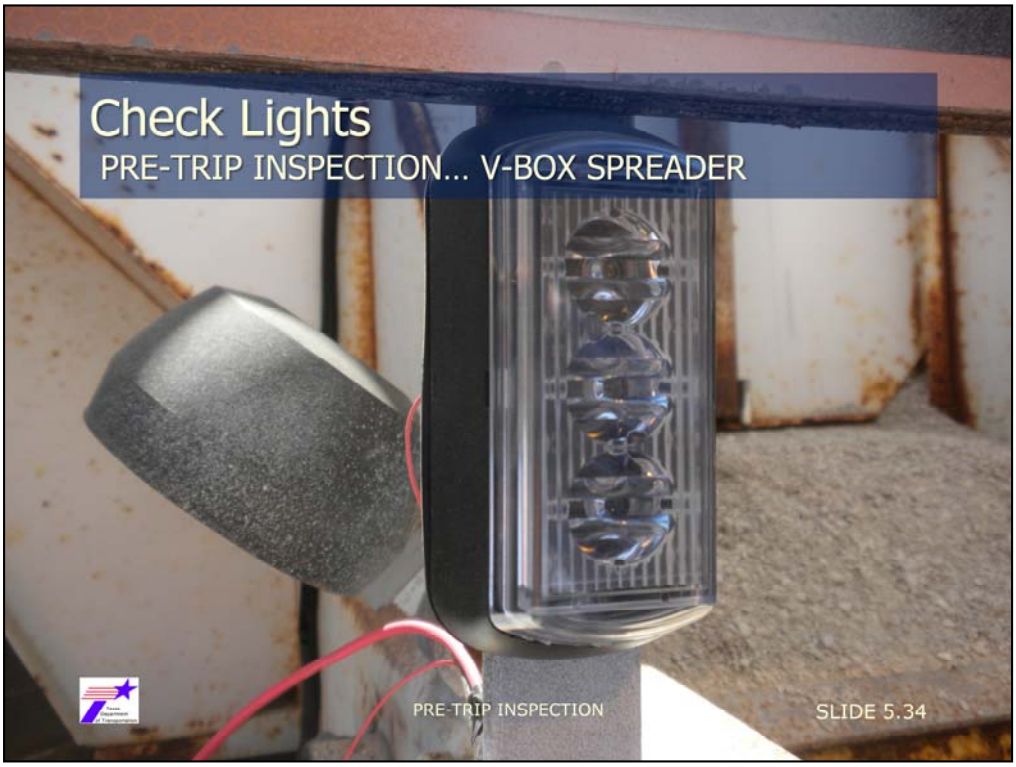
Instructor Notes: Present the following key points.

On the checklist.



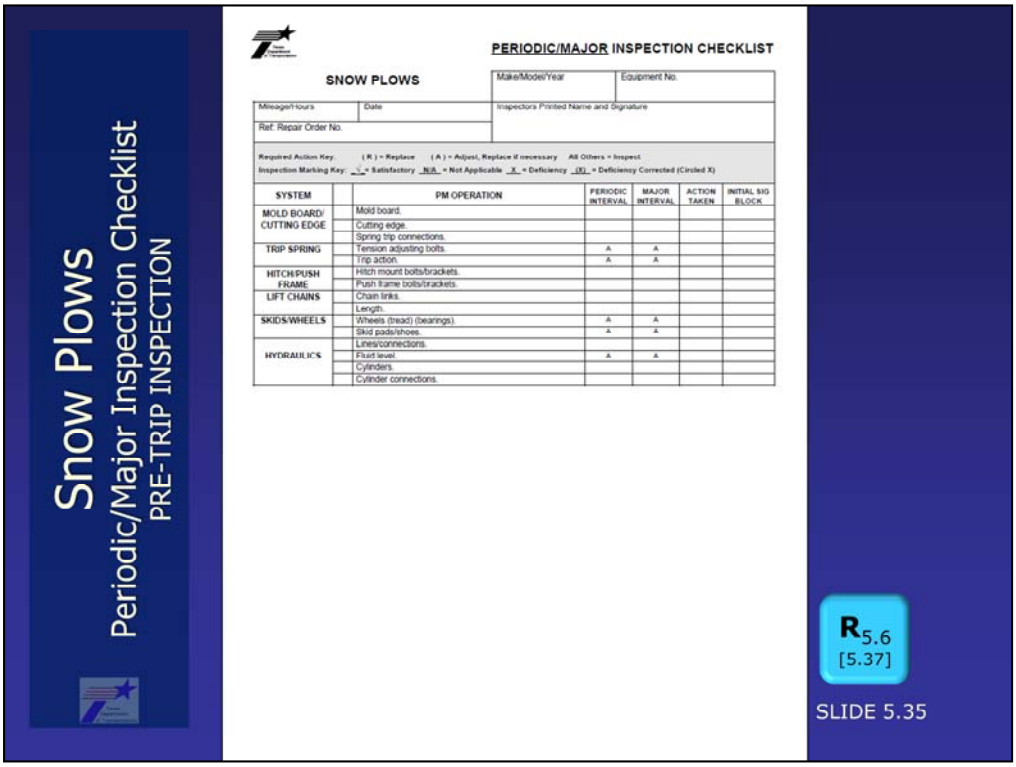
Instructor Notes: Present the following key points.

On the checklist.



Instructor Notes: Present the following key points.

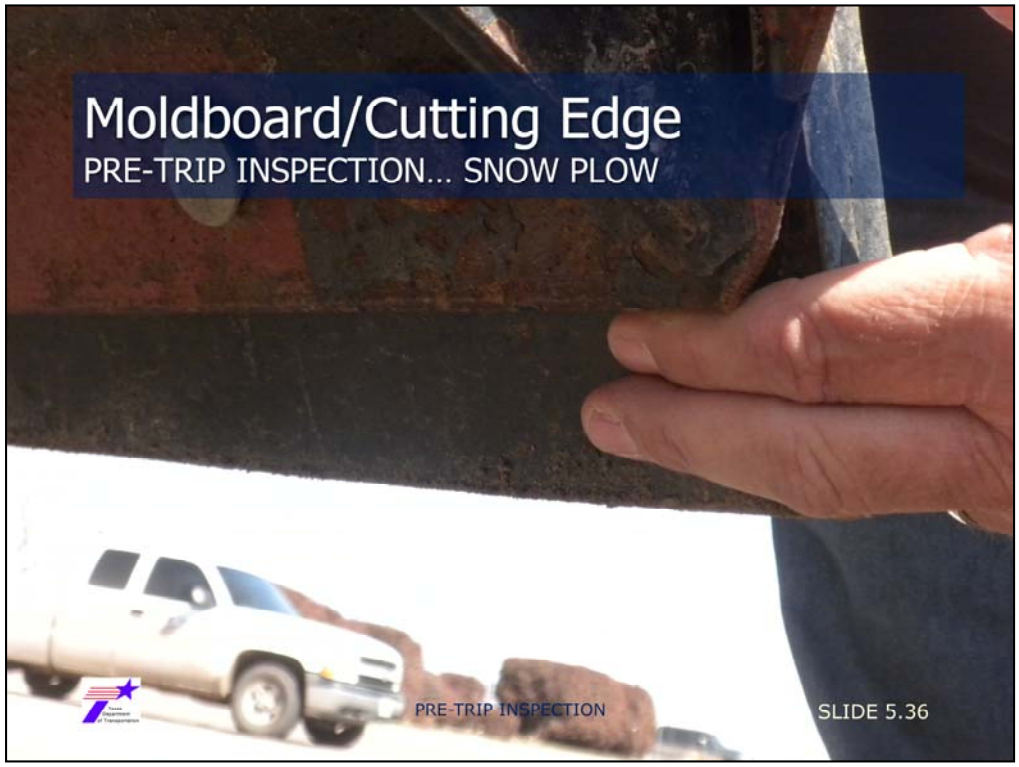
On the checklist.



Instructor Notes: Present the following key points.

This is the current official PERIODIC/MAJOR PM checklist for the reversible snow plow. It is included (R5.6).

Although this is not a daily checklist, per se, this checklist can and should be used daily when operating the reversible snow plow.



Instructor Notes: Present the following key points.

On the checklist.

Note that we discussed when to change the blade in Module 4.

We will provide additional detailed guidance about this in Module 10 when we discuss snow plow operation.



Instructor Notes: Present the following key points.

On the checklist.

Recall that the compression spring/trip cannon is a significant safety feature of the snow plow, to minimize damage to the plow and truck should you encounter a fixed object.



Instructor Notes: Present the following key points.

On the checklist.



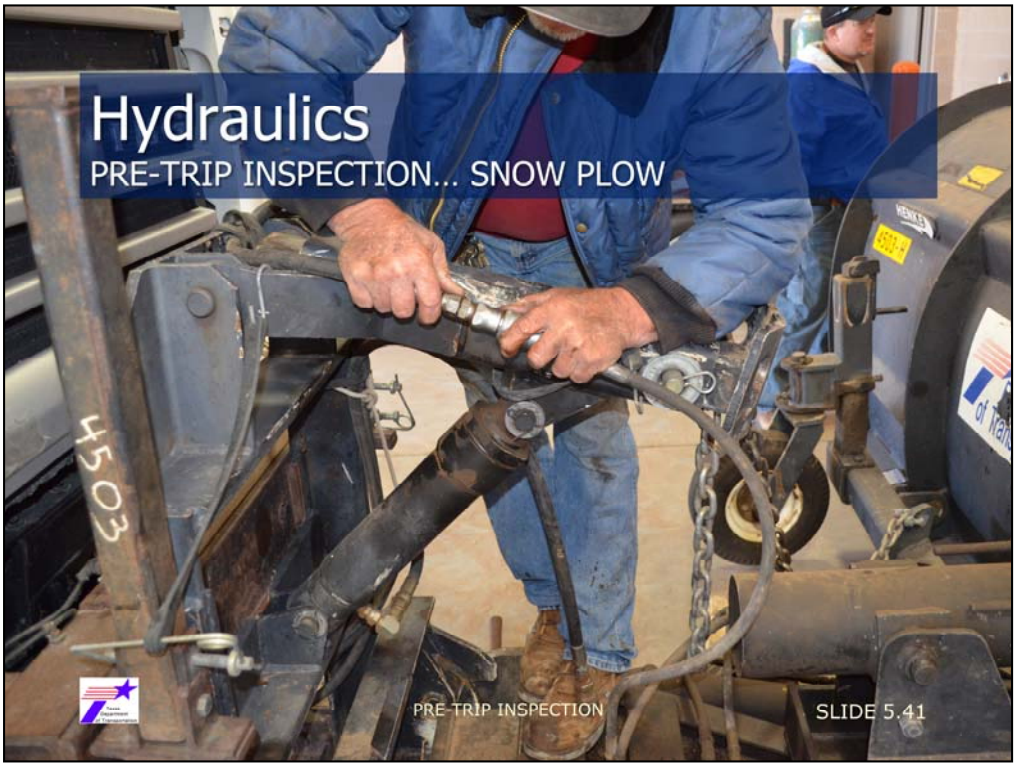
Instructor Notes: Present the following key points.

On the checklist.



Instructor Notes: Present the following key points.

On the checklist.



Instructor Notes: Present the following key points.

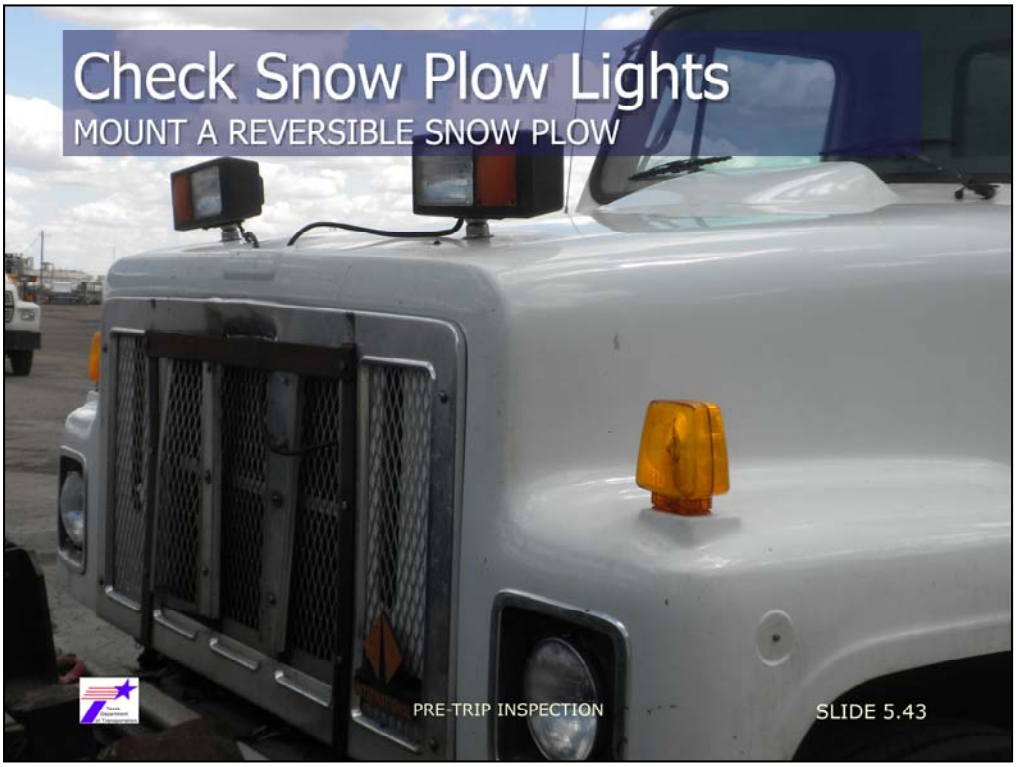
On the checklist.



Instructor Notes: Present the following key points.

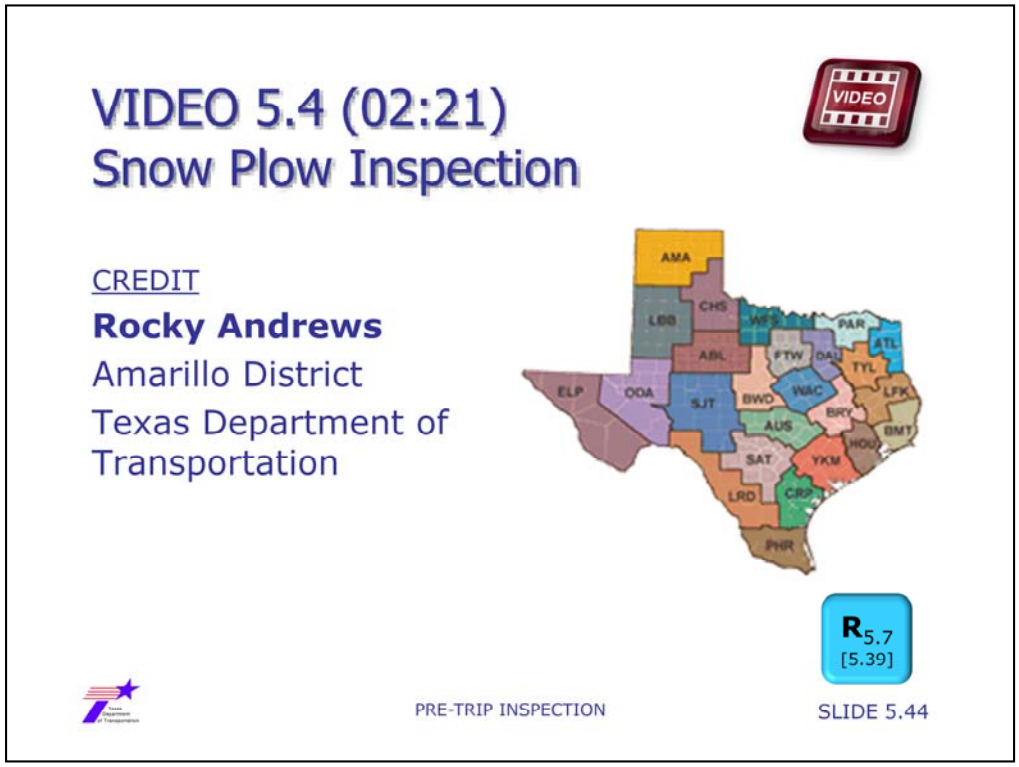
Although not specifically identified on the pre-trip checklist, one thing that you must check are the snow plow controls.

You want to make sure that the plow controls work and that the lift chains are adjusted so that the plow will function properly when plowing snow in either direction.



Instructor Notes: Present the following key points.

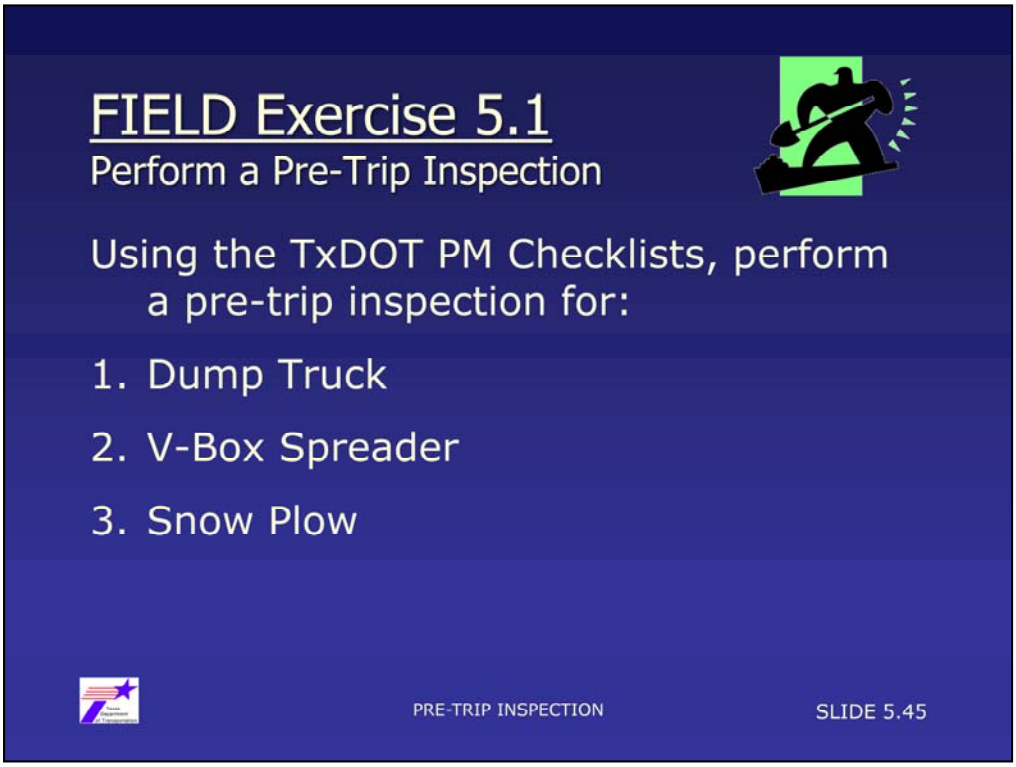
Lights are another key item, not specifically identified on the pre-trip checklist for snow plows, but necessary for safe operation.



Instructor Notes: Present the following key points.

This video presents how to do a pre-trip inspection for a snow plow.

The video features Mr. Rocky Andrews of the Special Jobs Crew, AMARILLO District.



Instructor Notes: Present the following key points.

Having been introduced to the idea of preventive maintenance for snow and ice operations, and provided with the checklists, it is now your turn.

Let's see if you can perform a pre-trip inspection.

As a group, the class will do a pre-trip inspection of the dump truck, V-box spreader, and snow plow. You have an extra set of checklists in your Student Manual for this purpose.

In this exercise, the class will divide up into three groups, with one group doing the pre-trip for the truck, one group doing the pre-trip for the V-box, and one group doing the pre-trip for the snow plow.

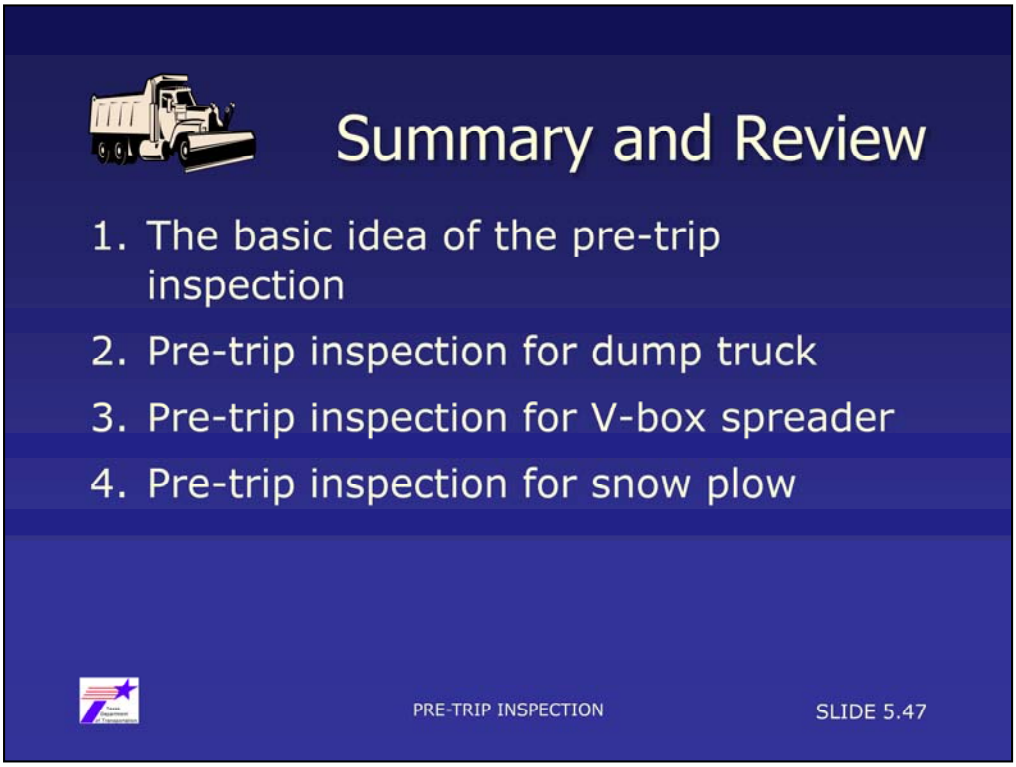
We will not run the engine. This is an engine-off pre-trip.

Note that the equipment has been pre-programmed with defects so that you will have some things to find. See if you can find them all.



Instructor Notes: Present the following key points.

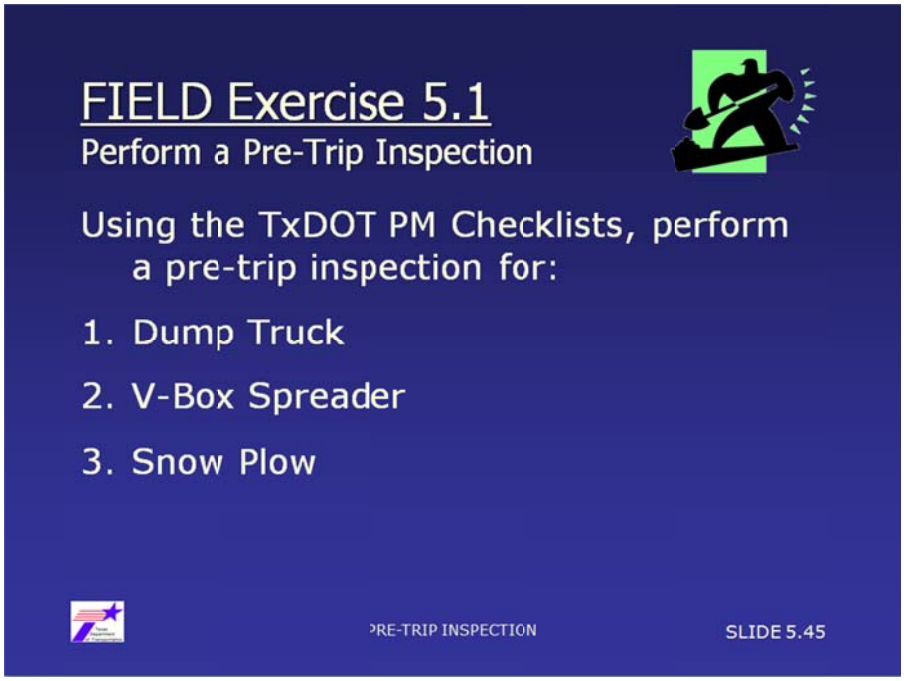
As always, SAFETY FIRST. Inspect safely.



Instructor Notes: Present the following key points.

PINK SHEETS!

Answer all questions.


FIELD Exercise 5.1
Perform a Pre-Trip Inspection
Using the TxDOT PM Checklists, perform a pre-trip inspection for:
1. Dump Truck
2. V-Box Spreader
3. Snow Plow
PRE-TRIP INSPECTION
SLIDE 5.45

VIDEO 5.1. PRE-TRIP INSPECTION (05:49)

SCRIPT

When roads are snow covered and icy, safety is your number one concern. After all, isn't that what snow plowing is all about?

Safety begins with a reliable vehicle. Inspecting your equipment thoroughly before and after use is an important part of your job.

Use a checklist. This helps make sure you don't miss something. Write up any problems you see so the shop can take care of them.

Your headlights do two jobs; they let you see and they let other see you. Make sure they are clean and not damaged. If they are loose in their holders, they are more likely to rattle around and burn out.

Take a look at the other exterior lights and reflectors on your truck. Make sure the turn signals and reverse lights and reverse alarms are working. Use a helper for this.

If you are inspecting a wheel loader or motor grader, the visibility issue is twice as important for you, because of the start and stop nature of your work and the fact that you are often working along the road's perimeter, your machine is more difficult to see.

Check your beacon and other warning devices. Check the plow edge markers. It's vital that you know at all times where the edge of that plow is.

The plow frame keeps the plow on your truck; make sure all pins, bolts, and connections are solid.

Inspect the blade and cutting edges for wear and damage. Look for cracks, broken or missing bolts or pins.

Generally, if you don't have at least two fingers left on the cutting edge, you should replace it. That cutting edge is critical to the quality of job you are able to do.

Your snow deflectors should be intact. When high-speed plowing, this prevents the snow from flying up over the plow and hitting the windshield.

The only thing between you and the road are your tires. Don't compromise your truck's traction. Make sure you've got good tread and check the tire pressure. Inspect the wheel lugs too.

Look behind the tire at the leaf springs and for steering pump hose leaks.

At the back of the truck once again check all your lights and reflectors.

See that the spreaders are in good working order. You want a good concentration of salt in the proper area. The auger should be running true. The tailgate should be pinned so that you don't dump a load behind you.

Check the hoses underneath for leaks or loose connections.

Check the dump box for any loose objects that could jam in the salt feeding system.

Open the hood or side panels. In addition to checking the engine oil, take a look around at the hoses, clamps, fuel injection lines; anything that could leak or come loose.

Check all the fluid levels. This includes the fuel level; check it visually at the tank and inside the cab. You never ever want to run out of fuel.

Check the other fluids levels including the oil, engine coolant, hydraulics, transmission, power steering, alcohol evaporation, and windshield washer levels.

Be careful climbing up into the cab, slipping on an icy step or grasping for a hand hold and losing your balance is no way to start your shift.

Once you are inside the cab, fasten your seat belt. Excuses like your back hurts or it's uncomfortable or its rusted shut don't cut it. If you want to prevent yourself from flying through the front windshield or if you have a desire to live to retirement age, wear your seat belt.

You can always spot a rookie operator because he's got his thumbs wrapped around the steering wheel. If your blade hits an expansion joint at a bridge or some other immovable object, the wheel can jerk and break or bruise your thumbs and cause you to lose control of the truck.

This is the correct was to hold the steering wheel on a truck plow.

Next, adjust the mirrors; and if they are heated, be sure the heater is working.

The windshield should be clean and wiper blades intact.

Make sure the heater and defroster are working and that you don't smell antifreeze in the cab. If you do, you may have a leaking heater core or hose on your hands.

Warm up the engine and the hydraulics and give your controls a run through. Test the operation of your truck's hydraulics. Do you have full control of your plow?

Test the brakes and the steering.

The last thing to do before you head out is to check your two-way radio communication. As one operator told us, you haven't been stuck in the storm 'til you've been stuck in a plow. How 'bout being stuck in a plow without a radio?

VIDEO 5.2. PM CHECKLISTS (01:15)

SCRIPT

Work at the Texas Department of Transportation requires employees to use many types of vehicles and equipment.

Everyone from the District Engineer to the Equipment Operator takes part in an effective preventive maintenance program. Of the 3 levels of inspections, we will focus on the routine or daily inspections performed by the equipment operator.

The routine PM Inspection is the operators best opportunity to ensure equipment safety and should be done at the beginning of each day.

This inspection is concerned with primarily with fuel, fluids, and beginning symptoms of more serious mechanical problems.

TxDOT developed a check list of items to be inspected each day. As you inspect the vehicle, place a check mark next to each item that passes. Mark unsatisfactory items with an x. Once the item is repaired, circle the x to indicate a passed inspection.

Form 2132
(5/2004)
DHT # 161535

Dump Truck Daily Inspection Checklist

Date:	Section:
Equipment Number:	Mileage/Hours:

POWER OFF			POWER ON		
WALKAROUND	Body/Glass Condition	D	FRONT LAMPS	Head/Dimmer	D
	Leaks (Fluid/Air)	D		Parking	D
UNDER HOOD	Oil level	D		Turn Signal	D
If Automatic	Transmission Fluid	D		Four Way	D
	Coolant/Radiator	D	DOT	I.D. Lamps/Clearance	D
	Brake/PTO Fluid	D		Strobe/Beacon	D
	Power Steering Fluid	D		Swing Lamps	D
	Belts	D	SIDE LAMPS	Marker Lamps	D
	Hoses	D		Reflectors	D
	Air Cleaner	D		Conspicuity	D
	Leaks (Fluid/Air)	D	REAR LAMPS	Tail Lamps	D
BATTERY	Cable Condition	W	DOT	I.D. Lamps	D
	Acid/Water Level	W		Stop Lamps	D
	Mountings/Hold Down	W		Turn Signal	D
	Cover Secured	W	Back-up	Lamp/Alarm	D
TIRES	Tread/Match	D		License Lamp	D
	Tire Condition	D	CAB	1st Aid Kit	D
	Tire PSI	D		Fire Extinguisher	D
	Wheel Condition	D		Warning Triangles	D
	Mud Flaps (8")	D		Seat Belts	D
BRAKES	Tank/Drain	D		WS/Windows	D
	Air Leaks/Brake On/Off	D		Wipers/Washer	D
	Glad-hands	D		Horn (Air & Electric)	D
	Slack Adjuster	W		Mirrors	D
	Emergency Brakes	D	WS/Sticker	SE/DOT Insp.due date	D
HYDRAULICS	Reservoir Level	D		Alt. Fuel Tax	D
	PTO Operation	D	Dump/Trk	Bed Lock Lamp	D
	Hose Condition	D	Air Brakes	Air Press.Buzzer&Lamp	D
	Cylinder Leakage	D		PTO Lamp	D
FRAME	Loose Bolts	W		Clutch Travel (Min. 1")	D
	Lift Cylinder & Pin	W		Loose Items	D
BED	Ladder	D	MISC.		
	Cover	D			
	Loose Cargo	D			
	Dumpbed safety bar	W			
PINTLE HOOK	Lube/Service/Adjust	D			
	Safety Pin	D			
	Backplate Security	D			

√ = Condition is safe for operation **X** = Discrepancy discovered **(X)** = Discrepancy repaired
D = Daily Inspection Items **W** = Weekly Inspection Items (to be completed on the first working day of the week).

Comments: _____

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Operator's Printed Name & Signature

Supervisors Signature of Release (if required)

Equipment PM Manual inspection checklist items are minimum standards and are meant to supplement the operator's manual. Districts may add inspection items as needed.

Pre-Trip Inspection Checklist All Trucks and Aerials Above 1 Ton

Equipment Number:	**Section:**
Equipment Type:	**Mileage/Hours:**

√ = Okay X = Needs Repair N/A = Not Applicable

Under Hood

Engine Oil	Check engine oil level and check under vehicle for evidence of leaks.	
Trans Fluid	Check transmission fluid level and check under vehicle for evidence of leaks.	
Power Steering Fluid	Check power steering fluid level and reservoir. Check hoses and lines for leaks.	
Brake/Clutch Master Cyl	Check brake / clutch fluid level and master cylinder. Check lines for leaks.	
Air Compressor	If applicable, check air compressor and air supply system.	
Radiator	Check coolant level, radiator condition and mounting, fan and shroud.	
Belts	Check belt conditon, tension and tension idler.	
Hoses	Check hose condition and routing. Check for loose clamps and leaks.	
Battery	Check battery, terminals, cables and hold down.	
Air Cleaner	Check restriction indicator, dust collector, filter housing and ducting.	

Around Vehicle

Lights	Check all lights, signals, strobes and reflectors.	
Markings	Check decals, equipment numbers, height & weight decals and conspicuity.	
Battery	Check battery terminals, cables, hold down device and covers.	
Tires	Check tires for proper air pressure, wear and matched height.	
Wheels	Check wheels for damage, cracks, loose and missing lug nuts.	
Hubs	Check hubs for loose bearings, oil level, water contamination and leaking seals.	
Mud Flaps	Check mud flaps for damage and correct height of 4" to 12" above ground.	
Exhaust	Check exhaust for damage and leaks.	
Hydraulic System	Check fluid level, pto, pump and valve operation, check for damage and leaks.	
Dump Bed / Hoist	Check safety props, cylinder, pins, ladders, tarps, tail gates and limit valves.	
Trailer Hitch	Check receiver, pintle and fifth wheel hitches for tightness, operation and wear.	
Crane / Winch	Check operation and inspect boom, cable and hooks for damage.	
Aerial	Check pedestal, boom and bucket for cleanliness, cracks, loose pins and rollers.	
	Check aerial and outrigger operation. Check harness and lanyard for damage.	
Auxillary Equipment	Check attenuators, herbicide rigs, water tanks and etc. per operators manual.	

In Cab

Instruments	Check instrument panel for proper operation of all gauges, indicators and lamps.	
Glass / Mirrors	Check windshield, wipers, and washer, all other glass and mirrors.	
Horn	Check electric and air horns for operation.	
Safety Equipment	Check seat belts, fire extinguisher, first aid kit, warning triangles and flags.	
Clutch	Check clutch for proper operation and 1" to 1-1/2" of free play.	
Brakes	Check service brakes and parking brake. If air brakes, check low air warning.	
	devices for proper operation. Check air lines, hoses and park brake valve for leaks.	
PTO / Bed Indicator	Check PTO and Bed Up indicator lamps for operation.	
Back up Alarm	Check operation.	
Appearance	Check vehicle for cleanliness, clutter and loose objects.	
Inspections	Check for current safety, aerial, crane inspections and alternative fuel decals.	

Comments: _____

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Operator's Name: _____ **Date:** _____

Operator's Signature: _____

VIDEO 5.3. PLOW TRUCK INSPECTION (04:49)

SCRIPT

Our plan here is to do a detailed inspection of the entire truck. Inside the cab from front to back and under the hood.

There are different models of trucks in each garage and the one you will be checking may be different than the model you will see in this video. However, the pre-season checklist is very similar for all trucks.

It's a good idea to plan to do your inspection after the truck has sat inside the garage, at least overnight, because we will be using the garage floor to help detect any oil and/or fluids leaks.

Lights are next on your checklist. Start with the amber warning lights mounted above the truck cab. These lights should be on at all times when the truck is operated with the snow plow or wing because this equipment makes the truck over-width. Make certain they work properly.

Brake lights; so they work when you depress the brake pedal? If there is no one else around to help you check, look for reflections on the garage door.

Headlights; turn them on and then get out of the cab to make certain both sets are working; the chassis headlights and the higher plow lights; and don't forget to check both high and low beams.

Turn signals; check both the left and right turn signals. You cannot always trust the dash indicator arrow; so the only sure way to ensure your turn signals are working properly is to get out of the truck and check both the front and back signals for correct operation.

Clearance lights; these mark the width of your truck for other drivers. Make sure those on the front of the cab are working as well as those at the front and rear corners of the dump box.

Sander light or lights; located on or underneath the back of the truck box; these light the spinner so you can see the material.

Strobe light; located at the back of the dump box; the strobe light helps make certain drivers can see the truck in poor visibility conditions.

Lastly, check to see that all reflectors are in place; amber to the front and red to the rear on all four corners of the truck body.

We are now on the home stretch of your truck pre-season inspection. Take a look inside the truck tool box; check first for tire cables or chains, pull them out and make sure they are in good condition.

It is also a good idea to mount then just to be sure they fit.

Also, make certain the tool box contains towing chains; extra plow and wing pins; extra pin safety clips and the tools you think you may need out on the road.

Check too that you have a hand shovel which can be in many places; but usually is attached or in a holder behind the cab or on the dump box.

Now check one last time inside the truck cab. Make sure the cab is clean and there are no loose items like pop cans, bottles or log chains in the cab.

Make sure you have a fire extinguisher that is properly mounted and fully charged; an ice scraper; a whisk broom or snow brush for cleaning snow off your lights and a flashlight.

Also on your checklist should be a first aid kit. Check the contents of the kit and replace any missing or damaged items; and the emergency reflector kit.

Climb back into the cab and try the safety belts making sure the lock works. Check the two-way radio and make certain the display or power light comes on. Check the dash lights and all of the gauges to make certain they are all working.

Go over the windshield and make sure it doesn't have serious pits, scratches or cracks. Report any problems to the shop mechanic.

And lastly, check the wiper blades. Tell the mechanic of you feel they need to be replaced. Also, make sure the wipers are working properly.

Your truck has numerous mounting brackets or supports that are bolted to your truck to support the snow removal equipment. Check all of these brackets to make sure they are secure and that all bolts are in place and tight.

One last thing to thoroughly check is your heating and defrosting system.

Back your truck out of the garage and turn on your heater with the engine running. Let the engine heat up and then make sure all fan speeds are operational and the heat provided by your heater and defroster are adequate.

With this thorough inspection completed, your truck should be in shape to meet the rigorous of the winter season.

PERIODIC/MAJOR INSPECTION CHECKLIST

V-BOX SPREADER

Make/Mode/Year	Equipment No.

Mileage/Hours	Date	Inspector Printed Name and Signature
Ref: Repair Order No.		

Required Action Key: (R) = Replace (A) = Adjust, Replace if necessary All Others = Inspect
Inspection Marking Key: √ = Satisfactory N/A = Not Applicable X = Deficiency (X) = Deficiency Corrected (Circled X)

SYSTEM		PM OPERATION	PERIODIC INTERVAL	MAJOR INTERVAL	ACTION TAKEN	INITIAL SIG BLOCK
AUX ENGINE (WHEN APPL.)		Engine oil.	R	R		
		Engine oil filter.	R	R		
		Fuel filter.				
		Drive belts.		A		
		Exhaust system.				
		Batteries.				
		Electrical.				
		Tune - up.		A		
HYDRAULICS/ GEAR BOX		Oil levels.	A	R		
		Filter carriidge (R twice per year).	R	R		
		Quick disconnects.				
		Flow control valve.				
		Air vents.				
		Bearings.				
SPINNER ASSEMBLY		Hinge rod.				
		Spinner disk.				
CONVEYOR ASSEMBLY		Conveyor chain.	A	A		
		Conveyor belt.				
PTO/DRIVE ASSEMBLY		U-joints.				
		Drive shaft.				

V-BOX SPREADER
PERIODIC/MAJOR INSPECTION CHECKLIST (Cont'd)

Inspection Remarks _____

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Review By _____

Repair Remarks _____

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PERIODIC/MAJOR INSPECTION CHECKLIST

SNOW PLOWS

Make/Model/Year	Equipment No.

Mileage/Hours	Date	Inspectors Printed Name and Signature
Ref: Repair Order No.		

Required Action Key: (R) = Replace (A) = Adjust, Replace if necessary All Others = Inspect

Inspection Marking Key: _√_ = Satisfactory _N/A_ = Not Applicable _X_ = Deficiency _(X)_ = Deficiency Corrected (Circled X)

SYSTEM		PM OPERATION	PERIODIC INTERVAL	MAJOR INTERVAL	ACTION TAKEN	INITIAL SIG BLOCK
MOLD BOARD/ CUTTING EDGE		Mold board.				
		Cutting edge.				
		Spring trip connections.				
TRIP SPRING		Tension adjusting bolts.	A	A		
		Trip action.	A	A		
HITCH/PUSH FRAME		Hitch mount bolts/brackets.				
		Push frame bolts/brackets.				
LIFT CHAINS		Chain links.				
		Length.				
SKIDS/WHEELS		Wheels (tread) (bearings).	A	A		
		Skid pads/shoes.	A	A		
HYDRAULICS		Lines/connections.				
		Fluid level.	A	A		
		Cylinders.				
		Cylinder connections.				

SNOW PLOWS
PERIODIC/MAJOR INSPECTION CHECKLIST (Cont'd)

Inspection Remarks _____

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Review By _____

Repair Remarks _____

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VIDEO 5.4. SNOW PLOW INSPECTION (02:21)

SCRIPT

Rocky: I guess there is a different terminology, some people call this a carriage, some of us call it a push frame. This can be called a push frame; but right here is where the plow separates from the truck.

So the carriage or the push frame on the truck needs to be looked at for cracks in the welds, broken places due to all the vibrations, and just normal wear and tear. So when you are doing your daily inspection you need to check all your pins, welds, and bolts and even back on the truck frame. You want to look back underneath there to make sure that your supports aren't bent, that you hadn't hit something and bent those. They actually bolt to the frame of the truck so you want to check where it bolts to the frame of the truck, make sure that those nuts are all good and tight. Check to make sure that's all the way it ought to be.

Rocky: Same thing on the carriage, or on the push frame on the plow. You got welds that need to be inspected, and your circle where it swivels left to right. You want to check your tension on this swivel bolt, this is the place that lets it swivel to meet the contours of the road. So you want it pretty snug but not so tight that it won't swivel.

Rocky: There is a fatigue crack right there I see that will need to be watched. That's probably okay for right now but when the storm is over and we're done; well, that's something that probably that needs to be looked at and sure need to keep an eye on it during the storm.

Bill: So like in pre-season that's something that would definitely be repaired getting ready for the next season. But should it be in the middle of a storm, you would not necessarily have to take it off of service. You would just watch it if it got more severe, you would do something about it.

Rocky: That's right.

Rocky: And then you want to come around to the front of your plow, and you want to check your cutting edges, make sure they're okay. Make sure the face of the plow doesn't have any big holes or damage to it.

An extra set of the pre-trip inspection checklists is attached, as follows:

- Dump Truck Daily Inspection Checklist (1 page)
- Pre-trip Inspection Checklist All Trucks and Aerials Above 1 Ton (1 page)
- V-Box Spreader… Periodic/Major Inspection Checklist (2 pages)
- Snow Plows… Periodic/Major Inspection Checklist (2 pages)

Texas Department of Transportation

Form 2132
(5/2004)
DHT # 161535

Dump Truck Daily Inspection Checklist

Date:	Section:
Equipment Number:	Mileage/Hours:

	POWER OFF			POWER ON	
WALKAROUND	Body/Glass Condition	D	**FRONT LAMPS**	Head/Dimmer	D
	Leaks (Fluid/Air)	D		Parking	D
UNDER HOOD	Oil level	D		Turn Signal	D
If Automatic	Transmission Fluid	D		Four Way	D
	Coolant/Radiator	D	DOT	I.D. Lamps/Clearance	D
	Brake/PTO Fluid	D		Strobe/Beacon	D
	Power Steering Fluid	D		Swing Lamps	D
	Belts	D	**SIDE LAMPS**	Marker Lamps	D
	Hoses	D		Reflectors	D
	Air Cleaner	D		Conspicuity	D
	Leaks (Fluid/Air)	D	**REAR LAMPS**	Tail Lamps	D
BATTERY	Cable Condition	W	DOT	I.D. Lamps	D
	Acid/Water Level	W		Stop Lamps	D
	Mountings/Hold Down	W		Turn Signal	D
	Cover Secured	W	Back-up	Lamp/Alarm	D
TIRES	Tread/Match	D		License Lamp	D
	Tire Condition	D	**CAB**	1st Aid Kit	D
	Tire PSI	D		Fire Extinguisher	D
	Wheel Condition	D		Warning Triangles	D
	Mud Flaps (8")	D		Seat Belts	D
BRAKES	Tank/Drain	D		WS/Windows	D
	Air Leaks/Brake On/Off	D		Wipers/Washer	D
	Glad-hands	D		Horn (Air & Electric)	D
	Slack Adjuster	W		Mirrors	D
	Emergency Brakes	D	WS/Sticker	SE/DOT Insp.due date	D
HYDRAULICS	Reservoir Level	D		Alt. Fuel Tax	D
	PTO Operation	D	Dump/Trk	Bed Lock Lamp	D
	Hose Condition	D	Air Brakes	Air Press.Buzzer&Lamp	D
	Cylinder Leakage	D		PTO Lamp	D
FRAME	Loose Bolts	W		Clutch Travel (Min. 1")	D
	Lift Cylinder & Pin	W		Loose Items	D
BED	Ladder	D	**MISC.**		
	Cover	D			
	Loose Cargo	D			
	Dumpbed safety bar	W			
PINTLE HOOK	Lube/Service/Adjust	D			
	Safety Pin	D			
	Backplate Security	D			

√ = Condition is safe for operation **X** = Discrepancy discovered **(X)** = Discrepancy repaired
D = Daily Inspection Items **W** = Weekly Inspection items (to be completed on the first working day of the week).

Comments:

Operator's Printed Name & Signature

Supervisors Signature of Release (if required)

Equipment PM Manual inspection checklist items are minimum standards and are meant to supplement the operator's manual. Districts may add inspection items as needed.

Pre-Trip Inspection Checklist All Trucks and Aerials Above 1 Ton

Equipment Number:	**Section:**
Equipment Type:	**Mileage/Hours:**

√ = Okay X = Needs Repair N/A = Not Applicable

Under Hood

Engine Oil	Check engine oil level and check under vehicle for evidence of leaks.	
Trans Fluid	Check transmission fluid level and check under vehicle for evidence of leaks.	
Power Steering Fluid	Check power steering fluid level and reservoir. Check hoses and lines for leaks.	
Brake/Clutch Master Cyl	Check brake / clutch fluid level and master cylinder. Check lines for leaks.	
Air Compressor	If applicable, check air compressor and air supply system.	
Radiator	Check coolant level, radiator condition and mounting, fan and shroud.	
Belts	Check belt condition, tension and tension idler.	
Hoses	Check hose condition and routing. Check for loose clamps and leaks.	
Battery	Check battery, terminals, cables and hold down.	
Air Cleaner	Check restriction indicator, dust collector, filter housing and ducting.	

Around Vehicle

Lights	Check all lights, signals, strobes and reflectors.	
Markings	Check decals, equipment numbers, height & weight decals and conspicuity.	
Battery	Check battery terminals, cables, hold down device and covers.	
Tires	Check tires for proper air pressure, wear and matched height.	
Wheels	Check wheels for damage, cracks, loose and missing lug nuts.	
Hubs	Check hubs for loose bearings, oil level, water contamination and leaking seals.	
Mud Flaps	Check mud flaps for damage and correct height of 4" to 12" above ground.	
Exhaust	Check exhaust for damage and leaks.	
Hydraulic System	Check fluid level, pto, pump and valve operation, check for damage and leaks.	
Dump Bed / Hoist	Check safety props, cylinder, pins, ladders, tarps, tail gates and limit valves.	
Trailer Hitch	Check receiver, pintle and fifth wheel hitches for tightness, operation and wear.	
Crane / Winch	Check operation and inspect boom, cable and hooks for damage.	
Aerial	Check pedestal, boom and bucket for cleanliness, cracks, loose pins and rollers.	
	Check aerial and outrigger operation. Check harness and lanyard for damage.	
Auxillary Equipment	Check attenuators, herbicide rigs, water tanks and etc. per operators manual.	

In Cab

Instruments	Check instrument panel for proper operation of all gauges, indicators and lamps.	
Glass / Mirrors	Check windshield, wipers, and washer, all other glass and mirrors.	
Horn	Check electric and air horns for operation.	
Safety Equipment	Check seat belts, fire extinguisher, first aid kit, warning triangles and flags.	
Clutch	Check clutch for proper operation and 1" to 1-1/2" of free play.	
Brakes	Check service brakes and parking brake. If air brakes, check low air warning.	
	devices for proper operation. Check air lines, hoses and park brake valve for leaks.	
PTO / Bed Indicator	Check PTO and Bed Up indicator lamps for operation.	
Back up Alarm	Check operation.	
Appearance	Check vehicle for cleanliness, clutter and loose objects.	
Inspections	Check for current safety, aerial, crane inspections and alternative fuel decals.	

Comments: _____

_____

Operator's Name: _____ **Date:** _____

Operator's Signature: _____

Texas Department of Transportation

PERIODIC/MAJOR INSPECTION CHECKLIST

V-BOX SPREADER

Make/Model/Year	Equipment No.

Mileage/Hours	Date	Inspector Printed Name and Signature
Ref: Repair Order No.		

Required Action Key: (R) = Replace (A) = Adjust, Replace if necessary All Others = Inspect
Inspection Marking Key: √ = Satisfactory N/A = Not Applicable X = Deficiency (X) = Deficiency Corrected (Circled X)

SYSTEM		PM OPERATION	PERIODIC INTERVAL	MAJOR INTERVAL	ACTION TAKEN	INITIAL SIG BLOCK
AUX ENGINE (WHEN APPL.)		Engine oil.	R	R		
		Engine oil filter.	R	R		
		Fuel filter.				
		Drive belts.		A		
		Exhaust system.				
		Batteries.				
		Electrical.				
		Tune - up.		A		
HYDRAULICS/ GEAR BOX		Oil levels.	A	R		
		Filter cartridge (R twice per year).	R	R		
		Quick disconnects.				
		Flow control valve.				
		Air vents.				
		Bearings.				
SPINNER ASSEMBLY		Hinge rod.				
		Spinner disk.				
CONVEYOR ASSEMBLY		Conveyor chain.	A	A		
		Conveyor belt.				
PTO/DRIVE ASSEMBLY		U-joints.				
		Drive shaft.				

V-BOX SPREADER
PERIODIC/MAJOR INSPECTION CHECKLIST (Cont'd)

Inspection Remarks _____

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Review By _____

Repair Remarks _____

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Texas Department of Transportation

PERIODIC/MAJOR INSPECTION CHECKLIST

SNOW PLOWS

Make/Model/Year	Equipment No.

Mileage/Hours	Date	Inspectors Printed Name and Signature
Ref: Repair Order No.		

Required Action Key: **(R) = Replace** **(A) = Adjust, Replace if necessary** **All Others = Inspect**

Inspection Marking Key: **_√_ = Satisfactory _N/A_ = Not Applicable _X_ = Deficiency _(X)_ = Deficiency Corrected (Circled X)**

SYSTEM		PM OPERATION	PERIODIC INTERVAL	MAJOR INTERVAL	ACTION TAKEN	INITIAL SIG BLOCK
MOLD BOARD/ CUTTING EDGE		Mold board.				
		Cutting edge.				
		Spring trip connections.				
TRIP SPRING		Tension adjusting bolts.	A	A		
		Trip action.	A	A		
HITCH/PUSH FRAME		Hitch mount bolts/brackets.				
		Push frame bolts/brackets.				
LIFT CHAINS		Chain links.				
		Length.				
SKIDS/WHEELS		Wheels (tread) (bearings).	A	A		
		Skid pads/shoes.	A	A		
HYDRAULICS		Lines/connections.				
		Fluid level.	A	A		
		Cylinders.				
		Cylinder connections.				

SNOW PLOWS
PERIODIC/MAJOR INSPECTION CHECKLIST (Cont'd)

Inspection Remarks _____

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Review By _____

Repair Remarks _____

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Class Exercise – Review Questions
Module 5 – PRE-TRIP INSPECTION

MNT812 Winter Weather Operations Training

1. [True/False] The pre-trip inspection, also known as the preventive maintenance (PM) inspection, is required as part of equipment preventive maintenance.
   A. True
   B. False

   This statement is TRUE.

2. At TxDOT, the pre-trip inspection is the primary responsibility of the:
   A. Shop Supervisor
   B. Equipment Operator
   C. Maintenance Supervisor
   D. Newest Employee

   The correct answer is B.

3. The main purpose of the pre-trip inspection is to:
   A. Document equipment use
   B. Minimize costs of major repairs
   C. Ensure operator and equipment safety
   D. Reduce time lost due to equipment breakdown

   The correct answer is C.

   All of the other items are important, but the key reason for pre-trip inspections is safety.

4. The TxDOT Equipment PM Manual has *daily* inspection checklists for the following:
   A. Dump truck
   B. V-box spreader
   C. Snow plow
   D. All of the above

   The correct answer is A.

   TxDOT's inspection checklists for V-box spreaders and snow plows are periodic checklists, not daily checklists.

5. [True/False] The "in cab" part of the pre-trip inspection for a dump truck should include checking the heater/defroster.
   A. True
   B. False

   This statement is TRUE.

   Note that "Check the heater/defroster" does not specifically appear on the checklist, but the pre-trip should include doing this.

6. [True/False] The pre-trip inspection for a V-box spreader should include checking that the unit is tied down properly.
   A. True
   B. False

   This statement is TRUE.

   Note that "Check for proper tie-down" does not specifically appear on the checklist, but the pre-trip should include doing this.

7. [True/False] The pre-trip inspection for a snow plow should include checking the controls for up-down and left-right.

   A. True

   B. False

   This statement is TRUE.

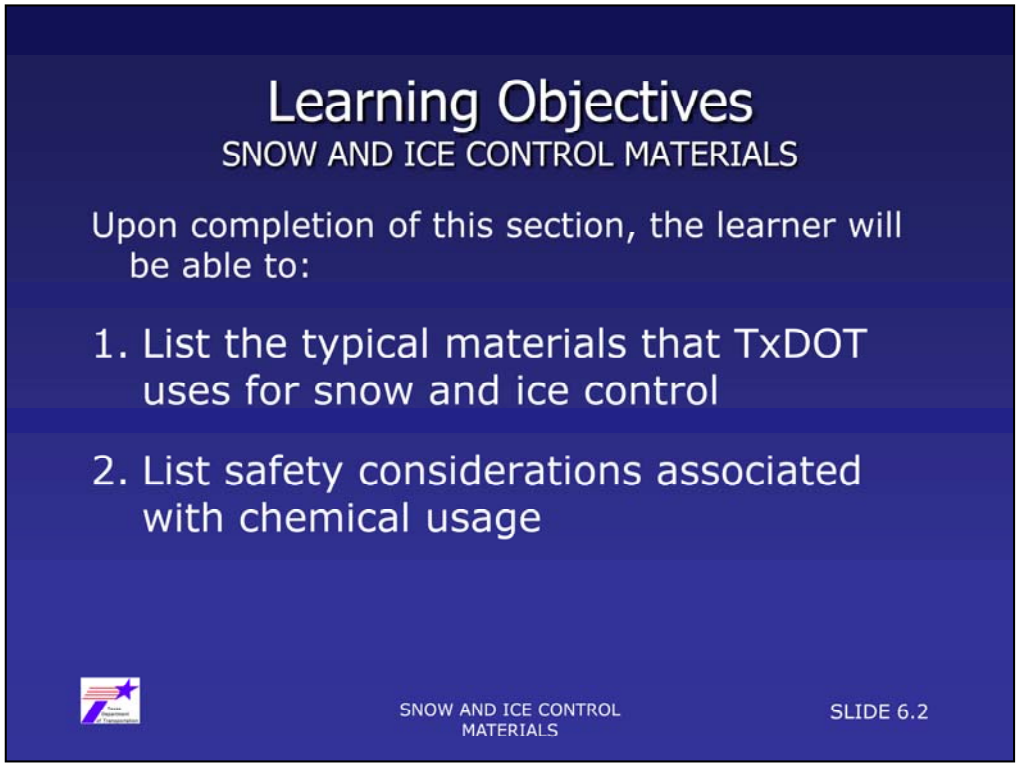
   Note that “Check controls” does not specifically appear on the checklist, but the pre-trip should include doing this.



Instructor Notes: Present the following key points.

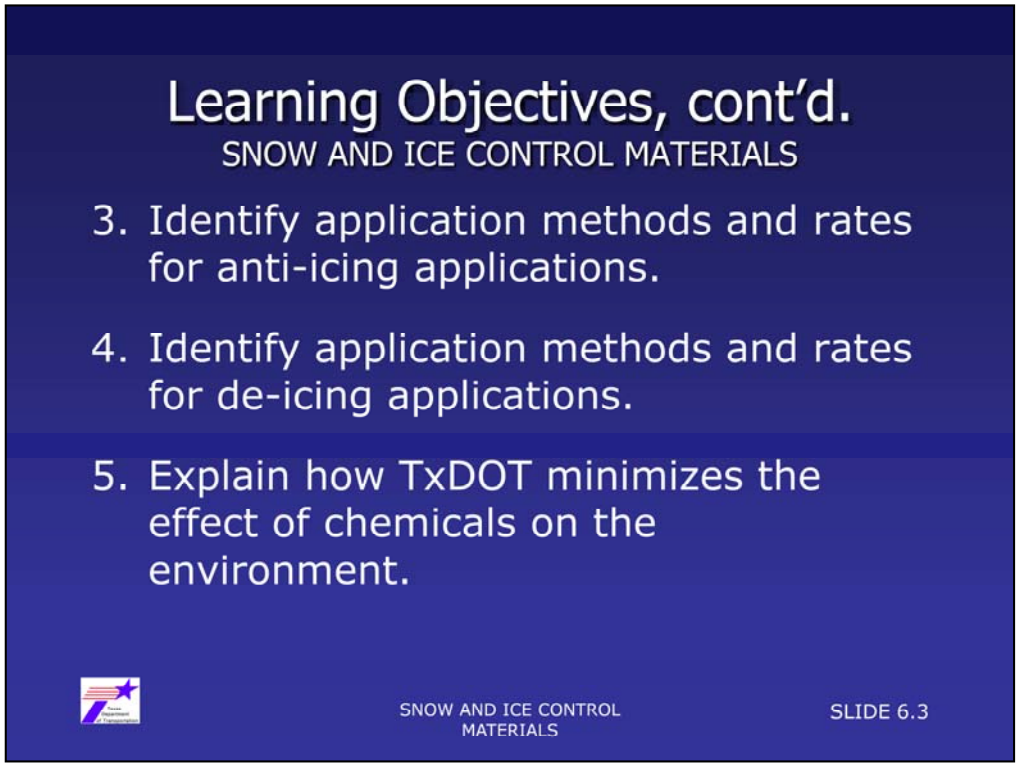
We briefly discussed snow and ice control materials in Module 2, Pre-Season Preparation.

Here, we will learn more about the chemicals that TxDOT uses, the goal being to facilitate safe, effective, and responsible use of these chemicals.



Instructor Notes: Present the following key points.

Note the learning objectives.



Instructor Notes: Present the following key points.

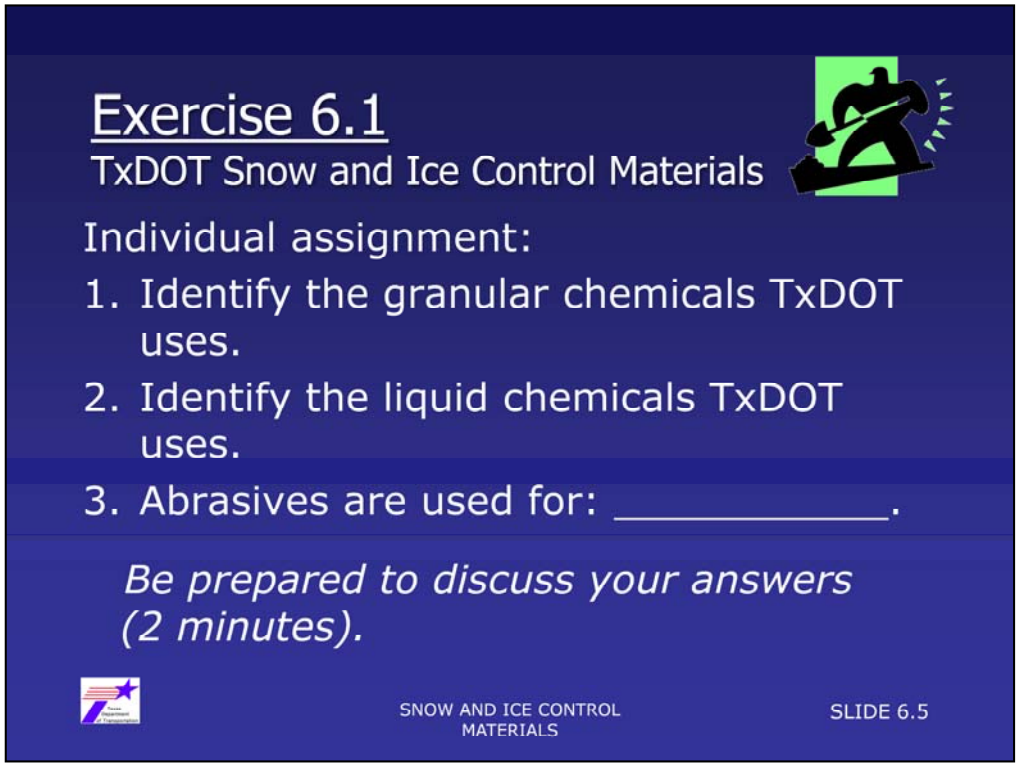
More learning objectives.



Instructor Notes: Present the following key points.

You will recall that snow and ice control materials fall into two basic classes:

CHEMICALS and ABRASIVES.



Instructor Notes: Present the following key points.

Do you remember which granular and liquid chemicals that TxDOT uses?

Do you recall why TxDOT uses abrasives?

Check your memory. You need to know this.



Instructor Notes: Present the following key points.

Recall that road salt is the most commonly-used granular chemical that TxDOT uses.

This slide shows salt in 50-lb bags, on a pallet with 50 bags (2500 pounds, total).

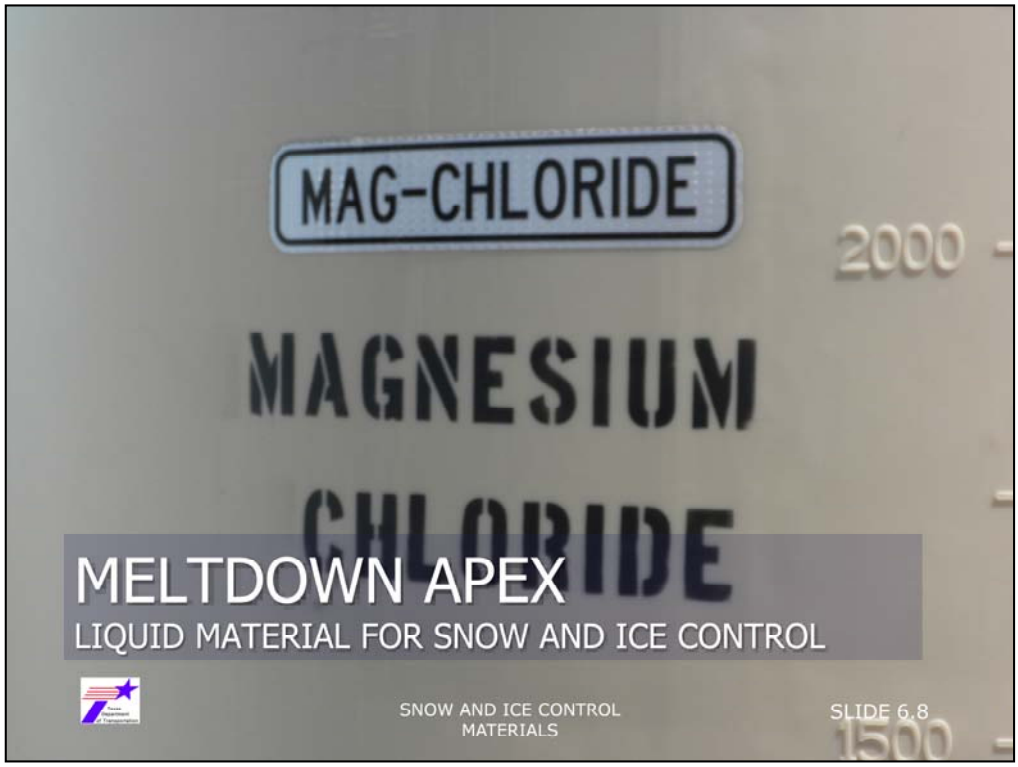
Salt also comes in 2500 pound super sacks, or in bulk.



Instructor Notes: Present the following key points.

Meltdown 20 is the second type of granular chemical that TxDOT uses.

Note that Meltdown 20 also comes in 50-lb bags, 2500-lb super sacks, or in bulk.



Instructor Notes: Present the following key points.

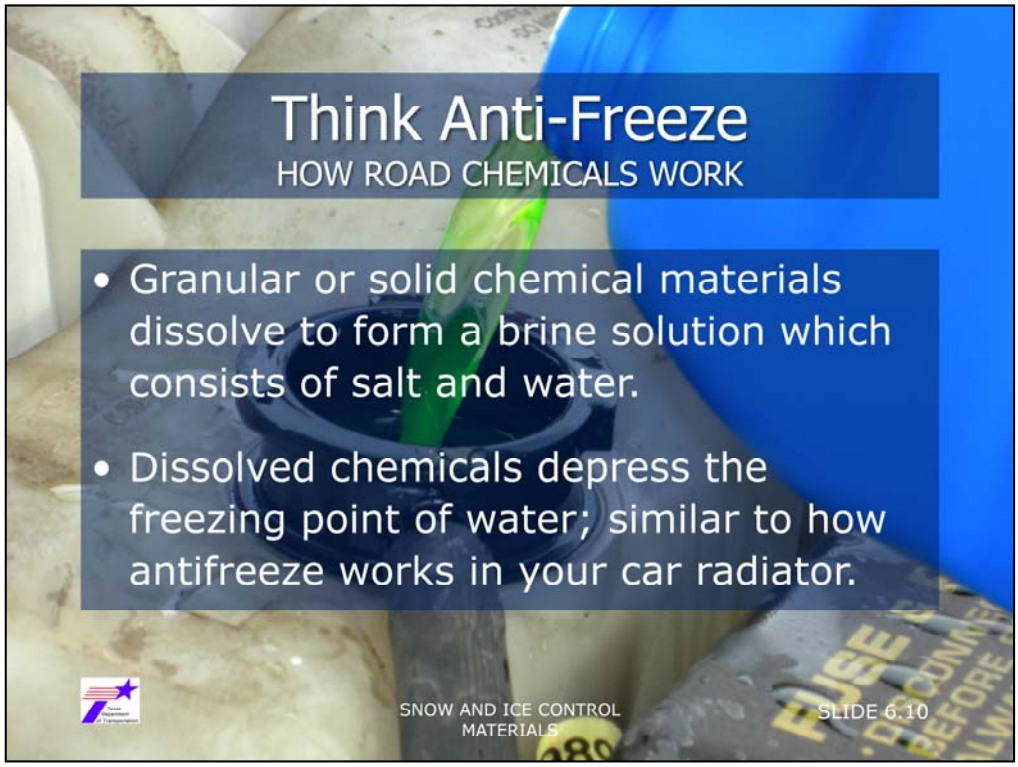
The most common liquid chemical that TxDOT uses is Meltdown Apex, which is a liquid form of magnesium chloride obtained from the Great Salt Lake in Utah.



Instructor Notes: Present the following key points.

Salt brine is homemade blend of road salt and water, mixed to achieve the required percentage dilution of 23 percent sodium chloride.

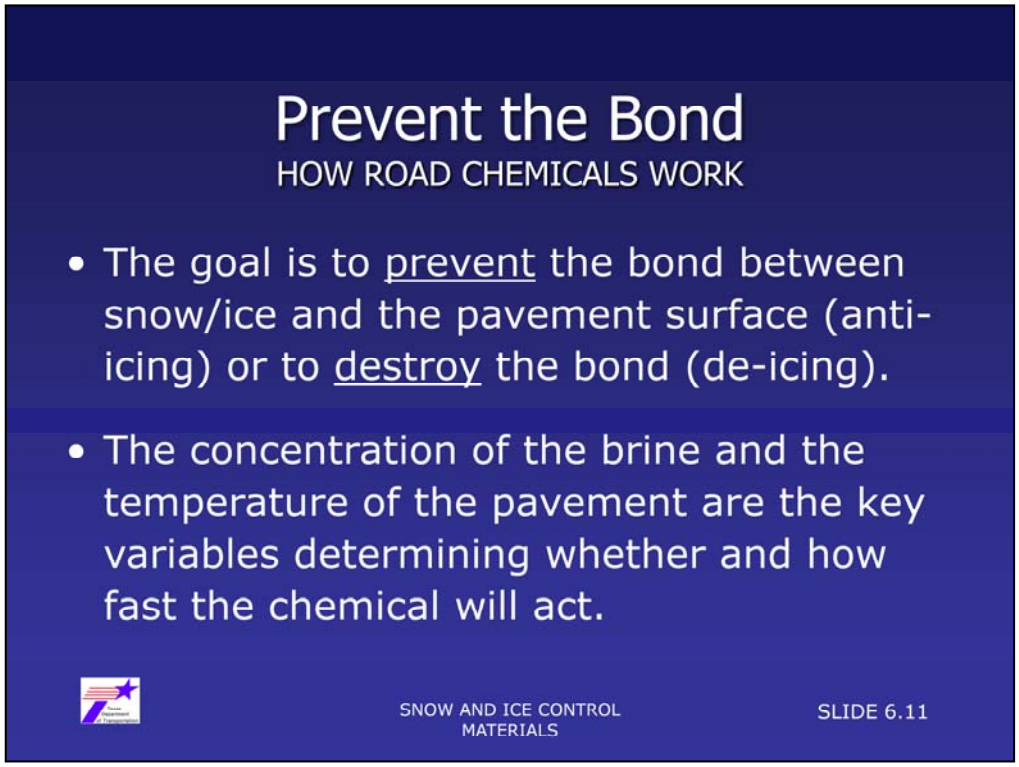
This photo shows a salt brine making tank in the Memphis Maintenance Section, CHILDRESS District.



Instructor Notes: Present the following key points.

How do these chemicals work?

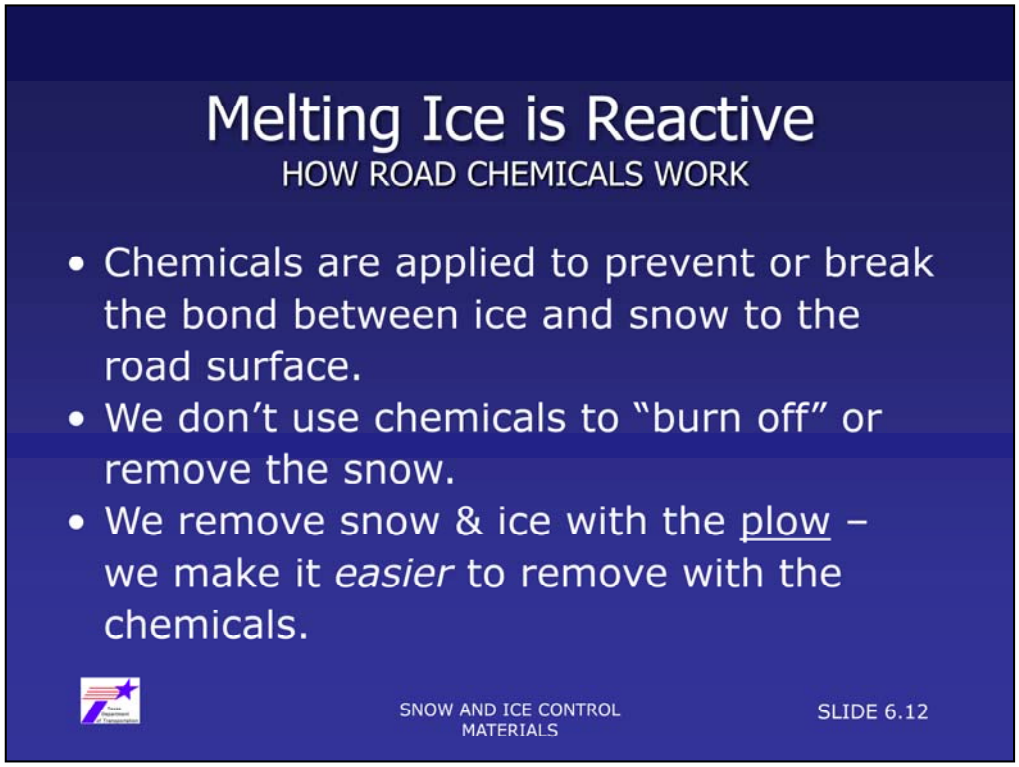
Think anti-freeze. These chemicals are considered freeze-point depressants.



Instructor Notes: Present the following key points.

Snow and ice control chemicals, such as road salt or Meltdown 20, or Meltdown Apex or salt brine, are used to prevent the bond between snow/ice and the road surface (anti-icing) or to destroy the bond between snow/ice and the road surface (de-icing).

As with anti-freeze in your engine, the concentration of the chemical matters.



Instructor Notes: Present the following key points.

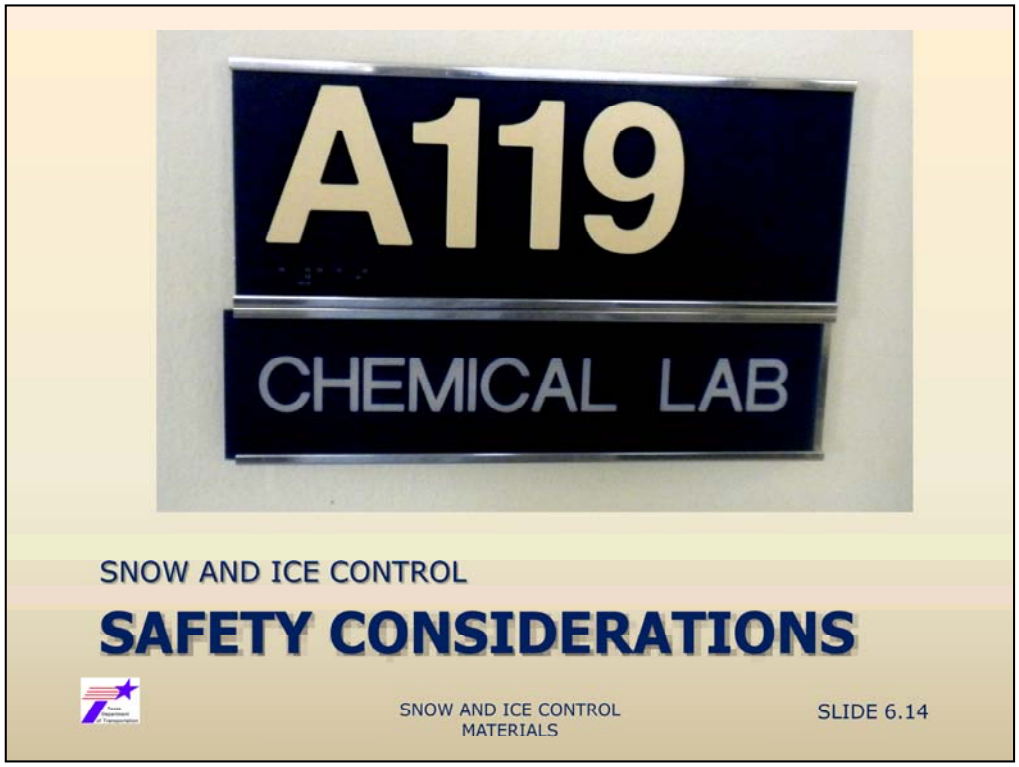
Note that chemicals are not used to burn off or remove snow and ice. Snow and ice are removed with a plow.

Chemicals are used to help make plowing easier and more effective.



Instructor Notes: Present the following key points.

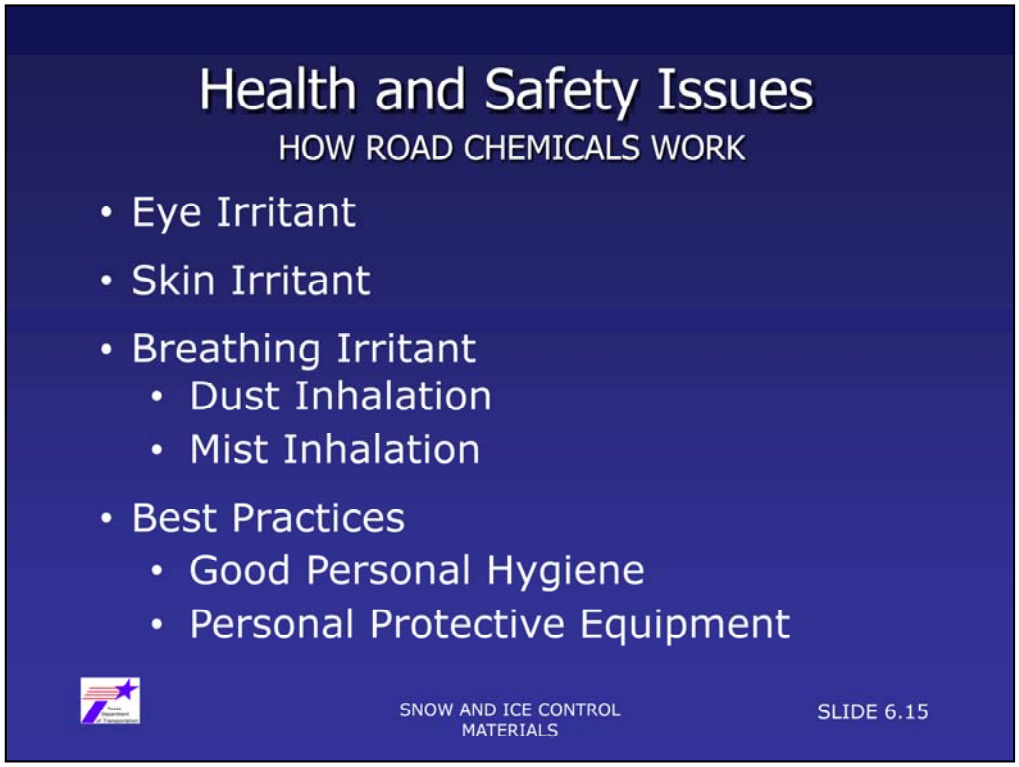
Properly used, snow and ice control chemicals work for you.



Instructor Notes: Present the following key points.

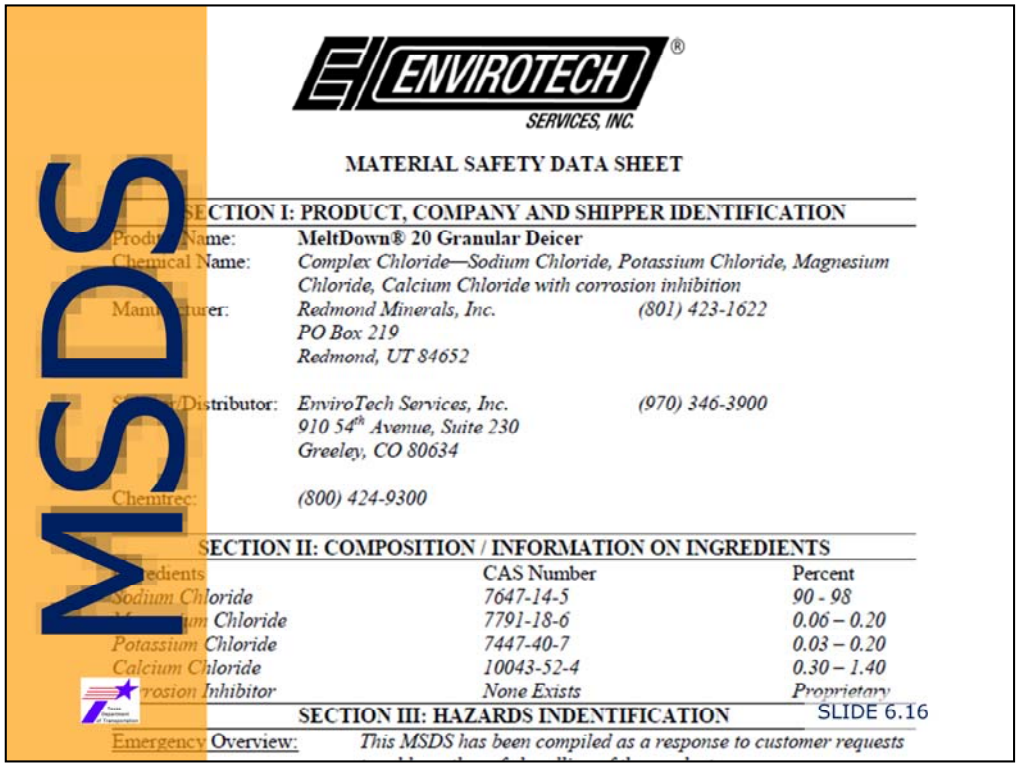
Chemicals are… chemicals. Safety considerations apply.

This image shows the door to the TxDOT chemical lab at the Materials and Test Division in Austin where they test snow and ice control chemicals.



Instructor Notes: Present the following key points.

This slide identifies some of the health and safety considerations associated with use of snow and ice control chemicals.

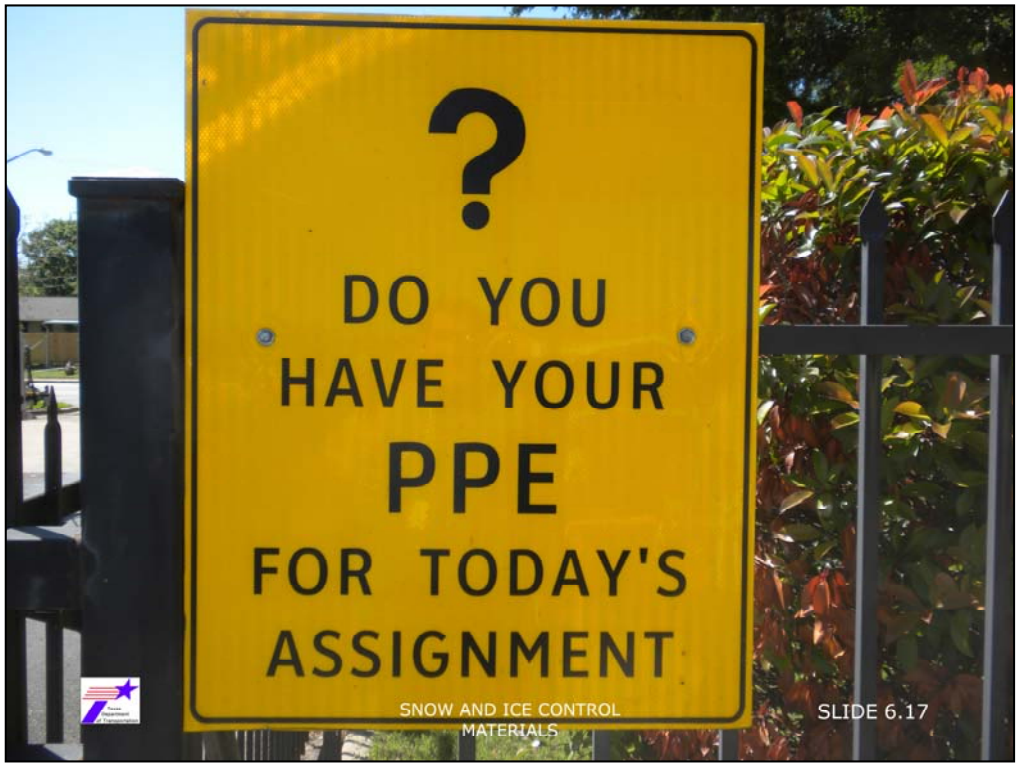


Instructor Notes: Present the following key points.

You will want to obtain the Material Safety Data Sheet (MSDS) for the chemicals you use.

This particular image shows part of the MSDS for Meltdown 20.

Your Supervisor will have a copy. Be sure to review the hazards identification section, and the requirements for personal protective equipment.



Instructor Notes: Present the following key points.

Obtain proper PPE.

Locate your PPE.

Use your PPE.



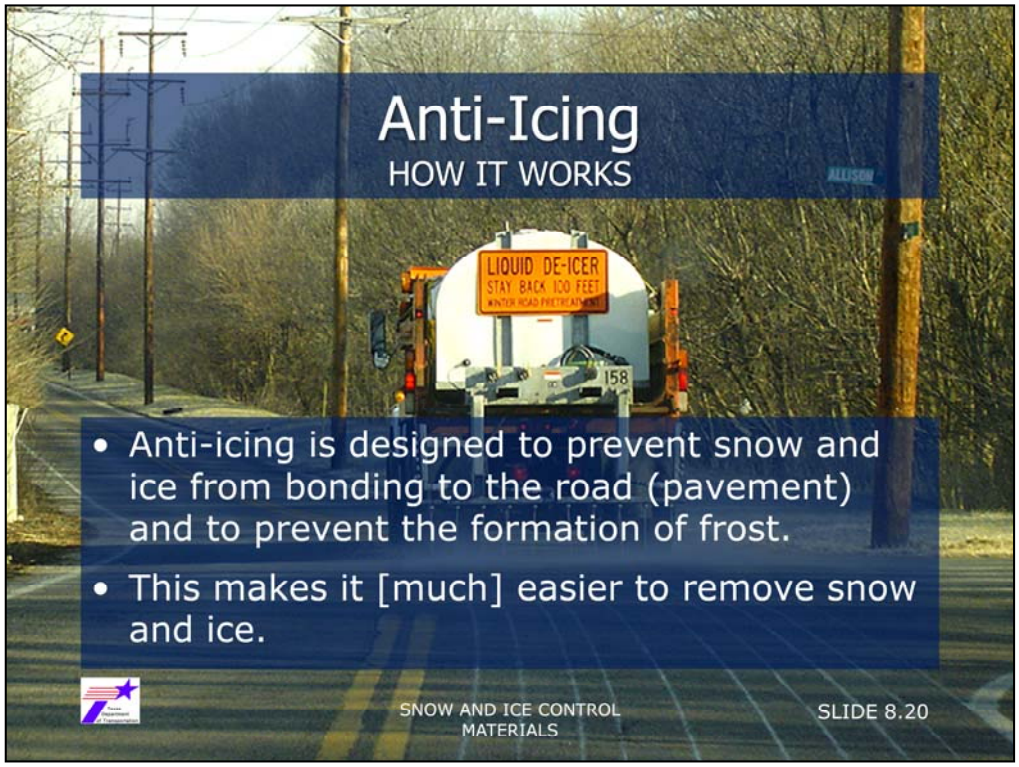
Instructor Notes: Present the following key points.

We will now more formally discuss anti-icing as a strategy that TxDOT uses for winter weather operations.



Instructor Notes: Present the following key points.

Recall that anti-icing is proactive in that chemical ("chemistry") is applied to the road surface before the storm to prevent snow and ice from bonding to the road surface.



Instructor Notes: Present the following key points.

This image shows how TxDOT maintenance forces apply anti-icing chemical using solid stream nozzles.

This operation relies on traffic to spread the chemical.

This aspect of the anti-icing practice differs from the Iowa DOT film you saw earlier (and another which you will view soon) that shows anti-icing using fan-type spray nozzles.

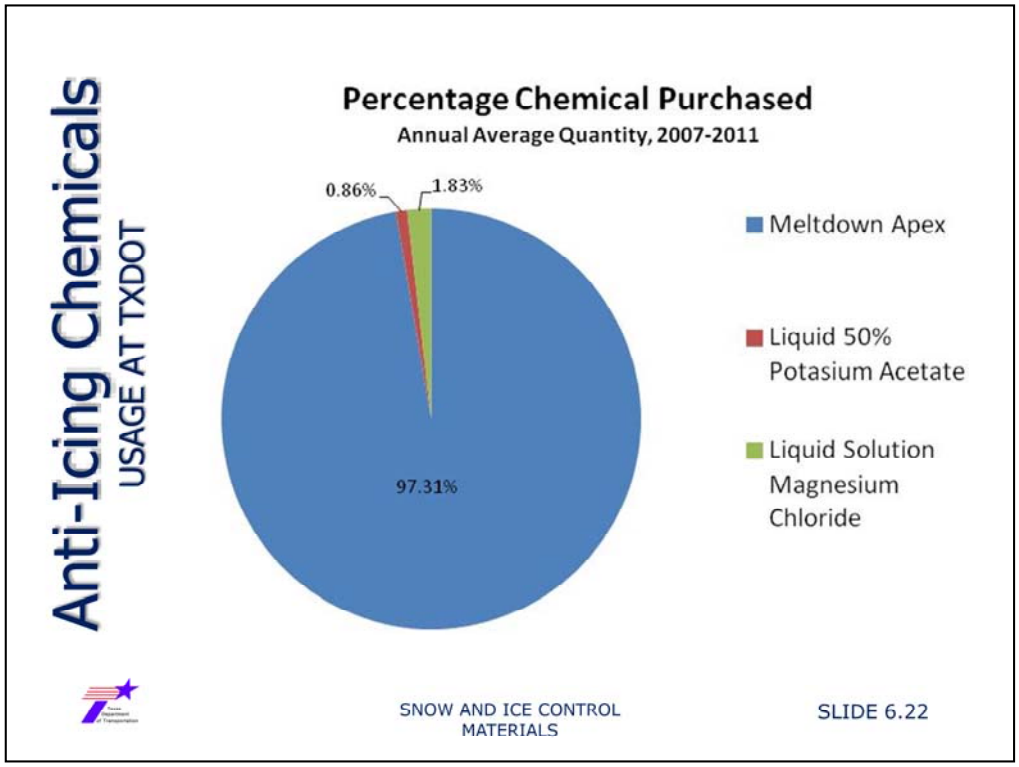
TxDOT does NOT use the fan-type nozzles for anti-icing for safety reasons. TxDOT only uses solid stream nozzles.



Instructor Notes: Present the following key points.

This film further describes the anti-icing process. Again, note that TxDOT does not use fan-type spray nozzles as shown here.

TxDOT only uses solid-stream nozzles.



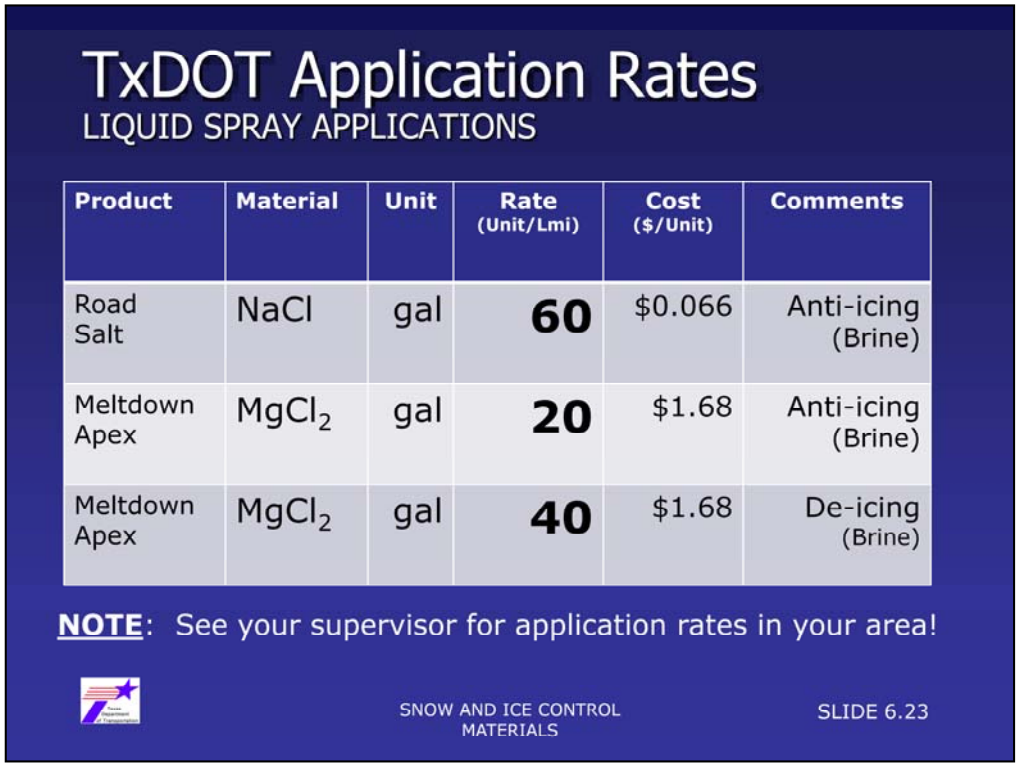
Instructor Notes: Present the following key points.

What type of chemicals does TxDOT use for anti-icing?

FIRST, it should be said that anti-icing is exclusively done using liquid spray application.

At this time, MELTDOWN APEX, which is a liquid form of magnesium chloride obtained from the Great Salt Lake in Utah, is the anti-icing chemical of choice. This chart shows TxDOT's average usage statewide, in terms of gallons of chemical purchased, during the past five years.

Brine is being used more and more, however.

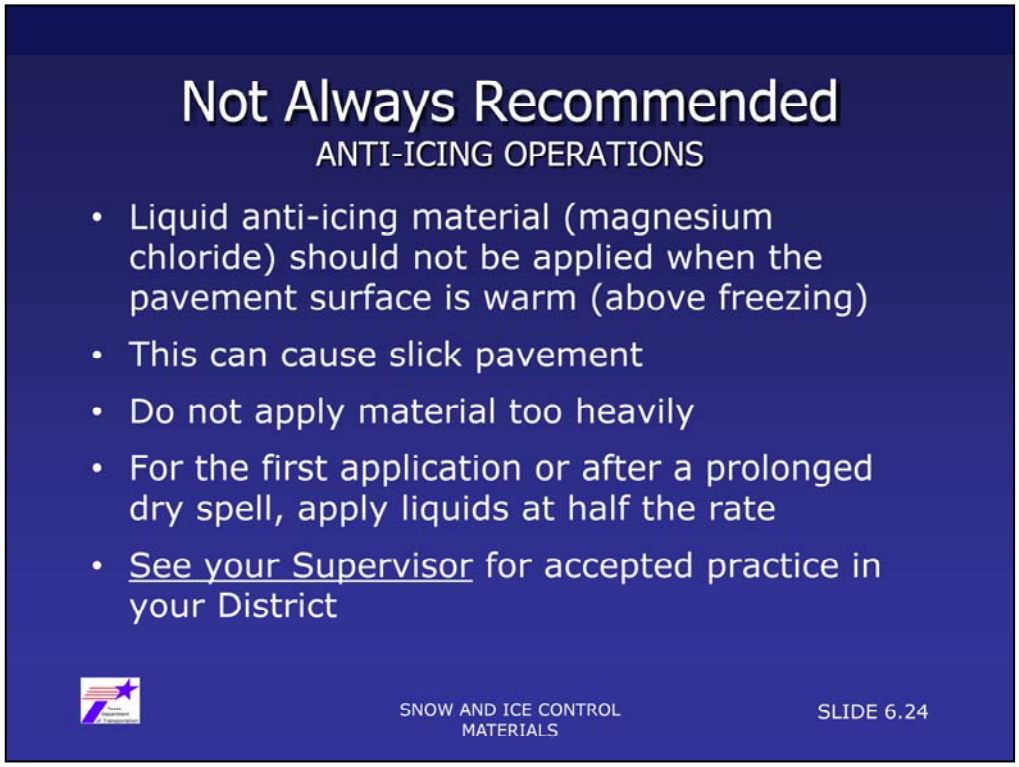


Instructor Notes: Present the following key points.

What are the anti-icing chemical application rates?

This table shows the basic manufacturer's guidance.

However, actual rates will vary based on many factors. Your Supervisor will have more specific guidance for your particular maintenance section.

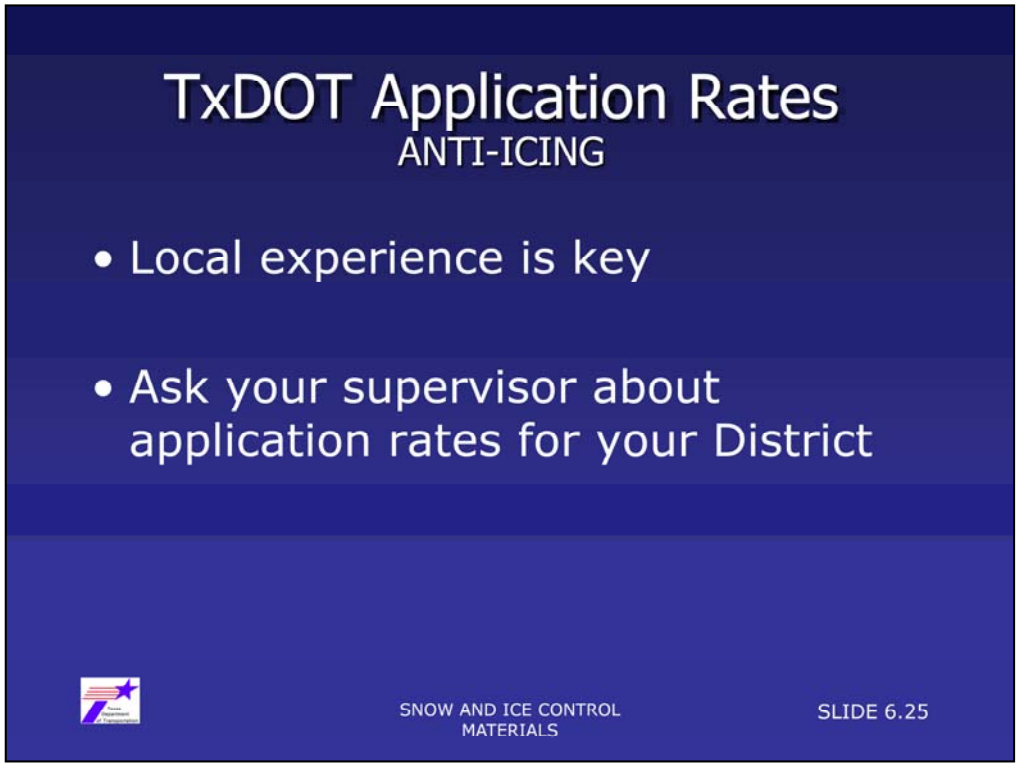


Instructor Notes: Present the following key points.

Anti-icing must be used responsibly. TxDOT has had some negative experience with anti-icing when the chemical is not used properly.

This slide provides the basic guidance for when (and when not) to use anti-icing chemical.

Your Supervisor will have specific guidance for your District.



Instructor Notes: Present the following key points.

As maintenance operations personnel, you will be expected to apply snow and ice control chemicals.

It is reasonable that you know what rates to apply at.

This training provides only basic “off the shelf” guidance. Your Supervisor will have specific information for your maintenance section.



Instructor Notes: Present the following key points.

In summary, anti-icing is a proactive winter weather roadway maintenance strategy, which, when used responsibly, can significantly improve effectiveness of your District's snow and ice operations.

Responsible use is the key.



Instructor Notes: Present the following key points.

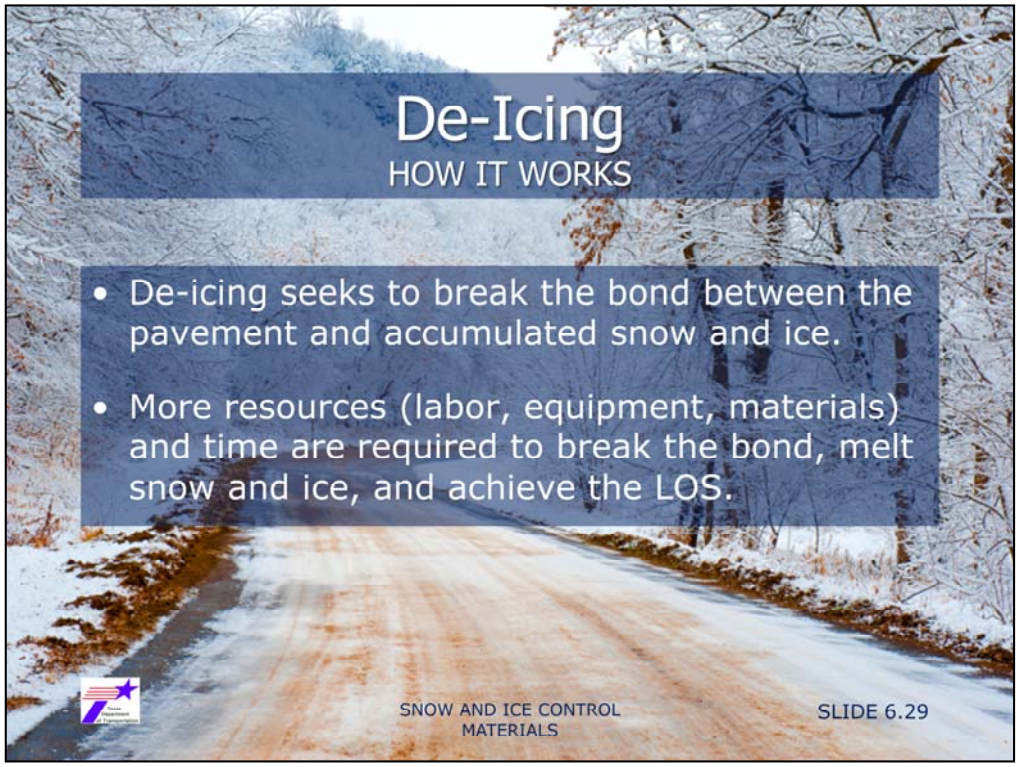
We will now more formally discuss de-icing as a strategy that TxDOT uses for winter weather operations.



Instructor Notes: Present the following key points.

Recall that de-icing is reactive in that chemical ("chemistry") is applied to the road surface after the storm starts.

In this case, the objective is for traffic to work the chemical down to the pavement surface where it can destroy the bond between snow and ice and the road surface.



Instructor Notes: Present the following key points.

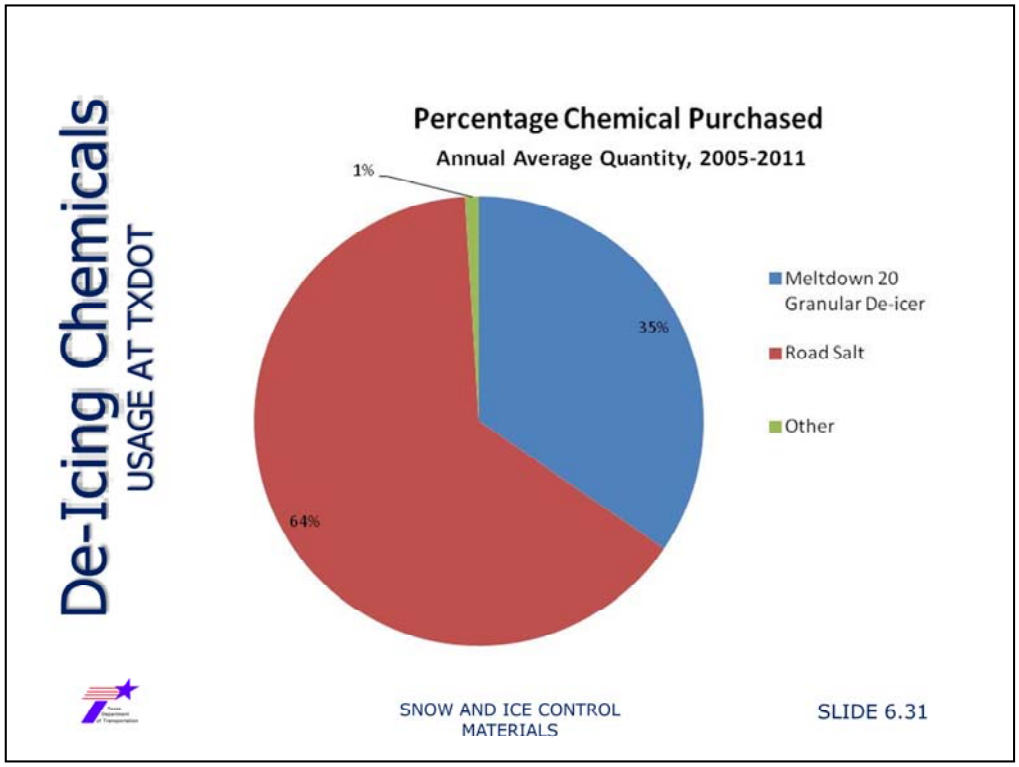
De-icing is used to break the bond between the pavement and accumulated snow and ice.

Compared to anti-icing, de-icing takes more resources (some say 4 to 10 times more) to achieve the same result.



Instructor Notes: Present the following key points.

This video provides a formal discussion of de-icing.



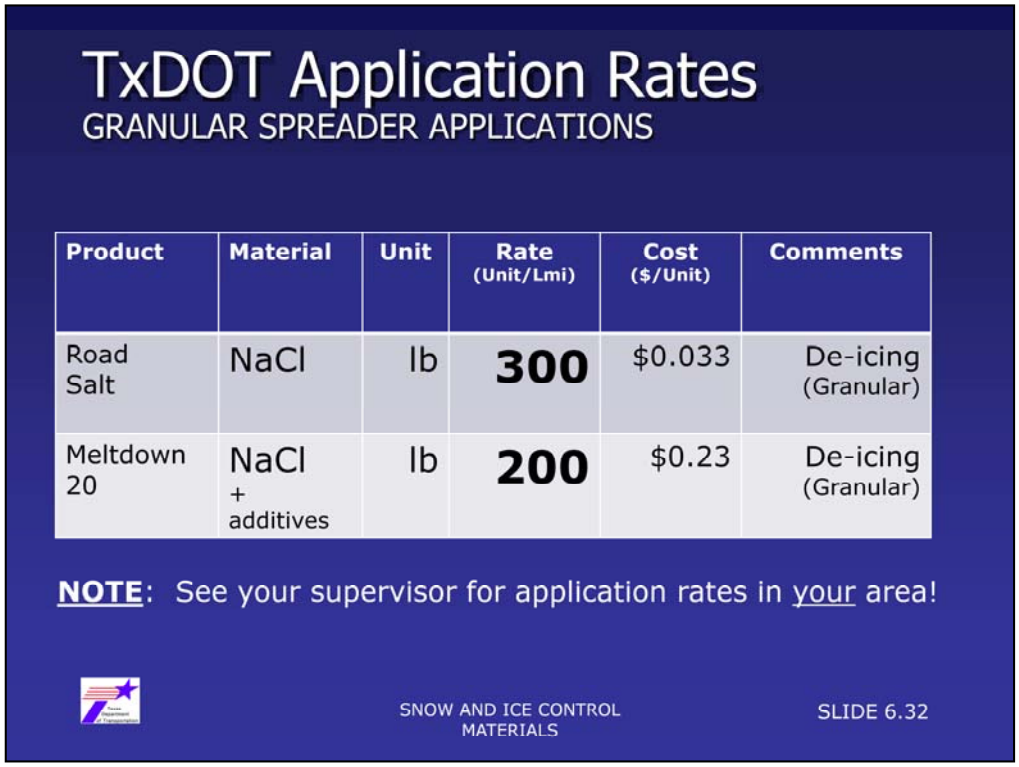
Instructor Notes: Present the following key points.

What type of chemicals does TxDOT use for de-icing?

FIRST, it should be said that de-icing is almost exclusively done using a dry granular application (V-box spreader). Liquid de-icing sometimes occurs but this is rare.

At this time, ROAD SALT is the de-icing chemical of choice, with 64 percent usage. This is followed by Meltdown 20, which is a type of road salt modified with performance enhancers, at 35 percent.

This chart shows TxDOT's average usage statewide, in terms of a percentage, based on pounds of chemical purchased during the past five years.

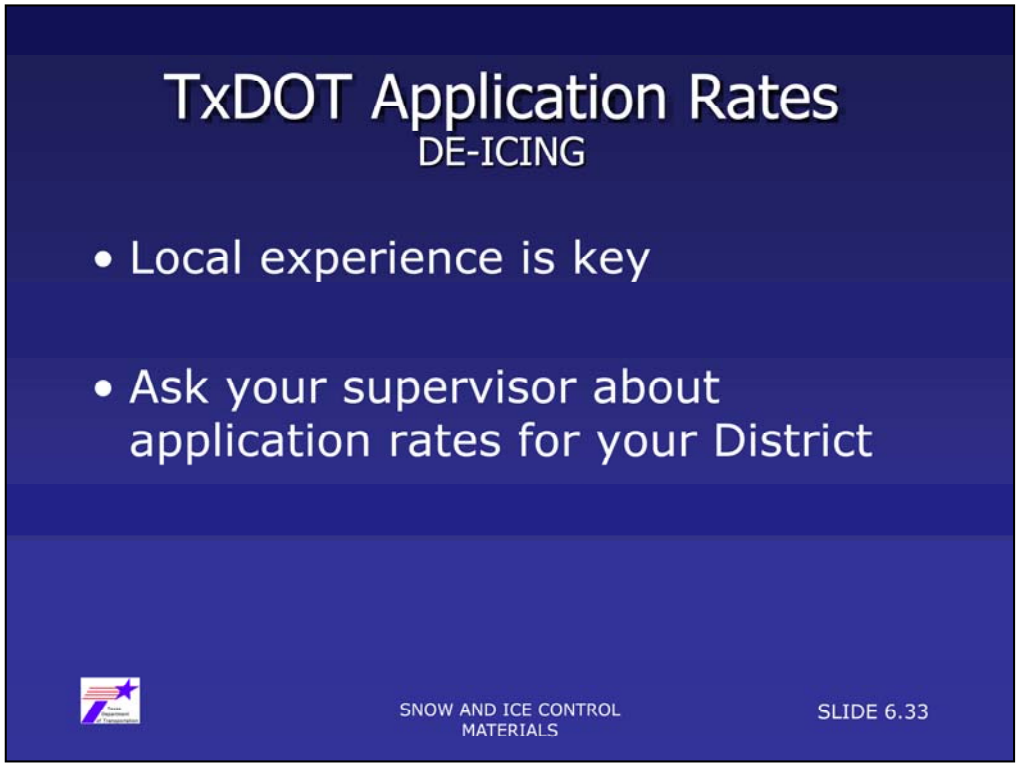


Instructor Notes: Present the following key points.

What are the de-icing chemical application rates?

This table shows the basic manufacturer's guidance.

However, actual rates will vary based on many factors. Your Supervisor will have more specific guidance for your particular maintenance section.



Instructor Notes: Present the following key points.

As maintenance operations personnel, you will be expected to apply snow and ice control chemicals.

It is reasonable that you know what rates to apply at.

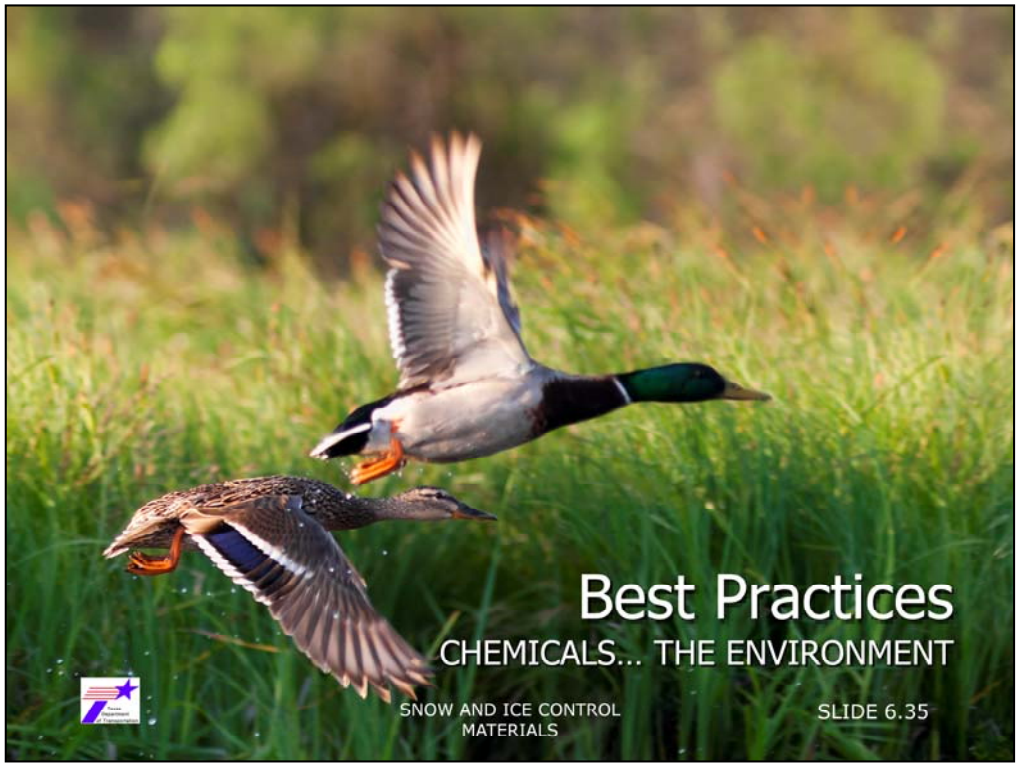
This training provides only basic “off the shelf” guidance. Your Supervisor will have specific information for your maintenance section.



Instructor Notes: Present the following key points.

In summary, de-icing is a reactive winter weather roadway maintenance strategy, which, when used responsibly, can significantly improve effectiveness of your District's snow and ice operations.

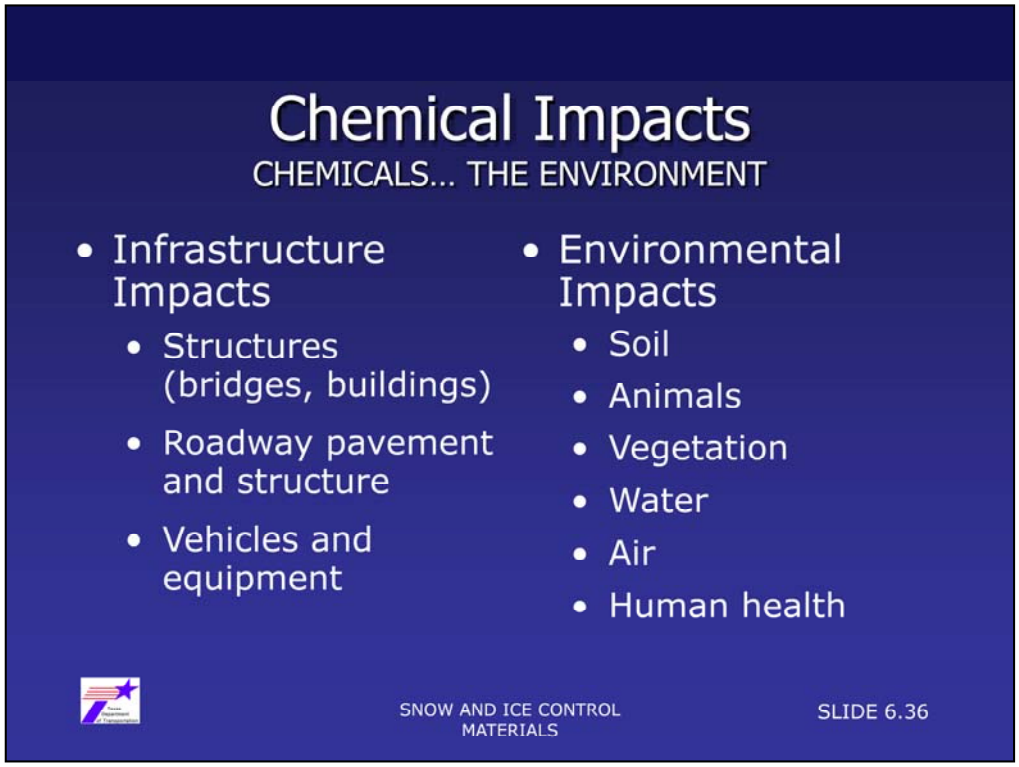
Responsible use is the key.



Instructor Notes: Present the following key points.

What is meant by “responsible use.”

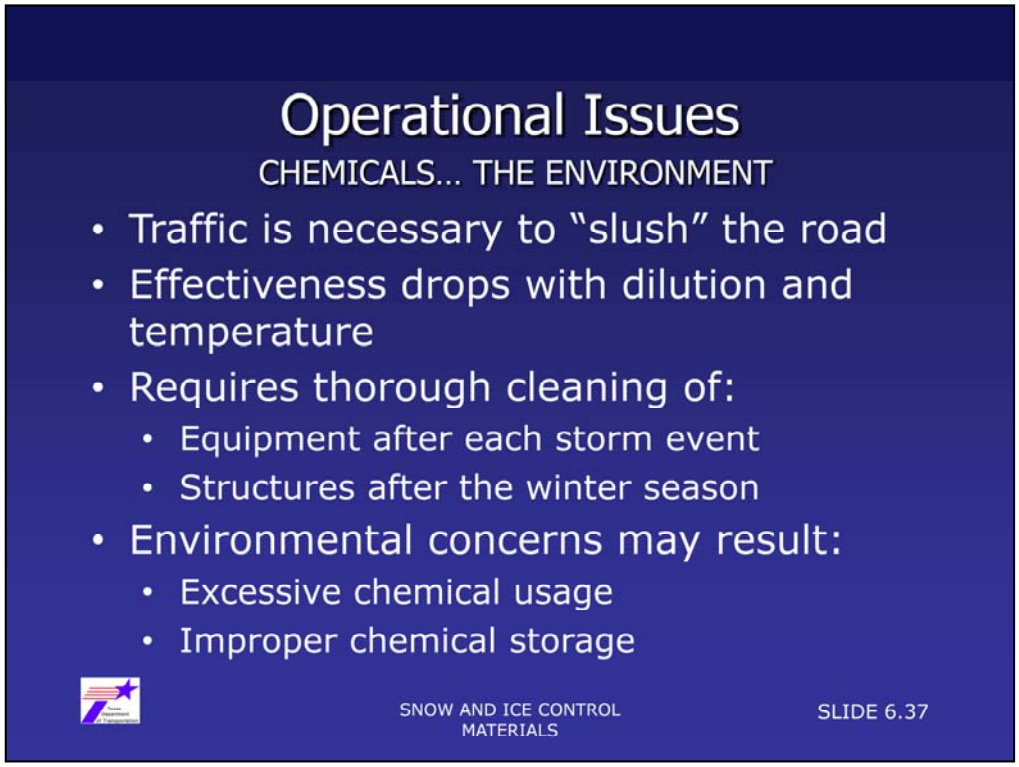
Simply put, this means you apply enough chemical to achieve level of service goals, but you do not apply more chemical than is necessary.



Instructor Notes: Present the following key points.

We have noted that snow and ice control chemicals are corrosive. These chemicals impact INFRASTRUCTURE and the ENVIRONMENT.

The key is to minimize the impacts while still facilitating reasonable traffic operations during winter weather.



Instructor Notes: Present the following key points.

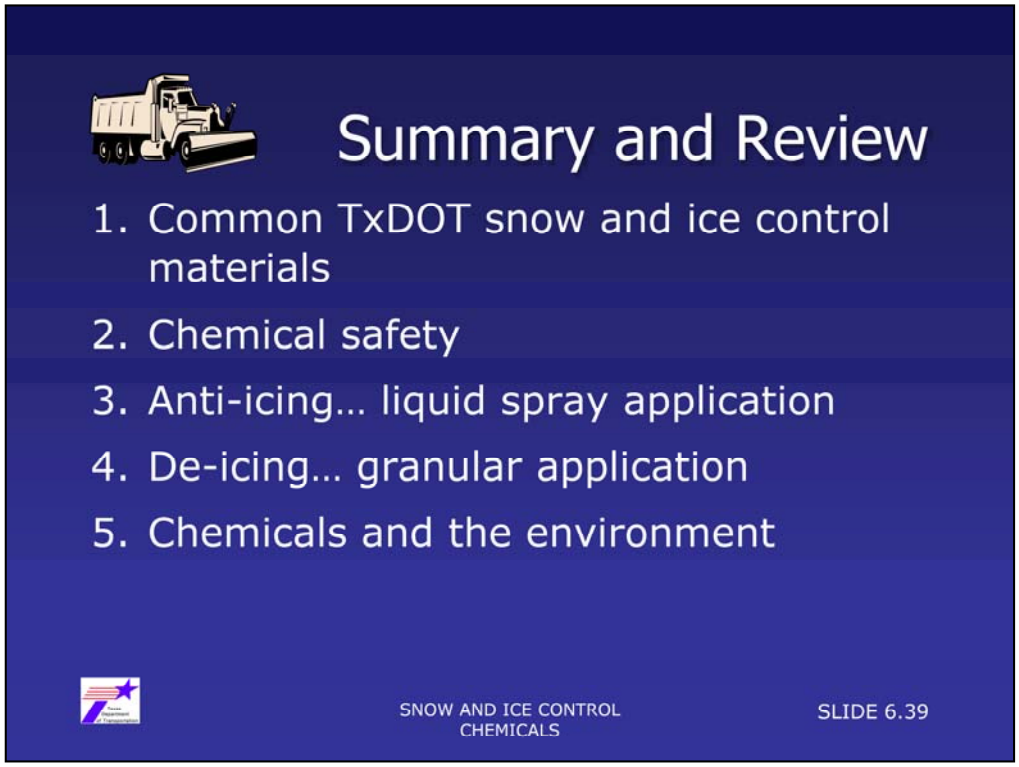
When using snow and ice control chemicals, these are some things to keep in mind.



Instructor Notes: Present the following key points.

Again, the goal is “responsible use.”

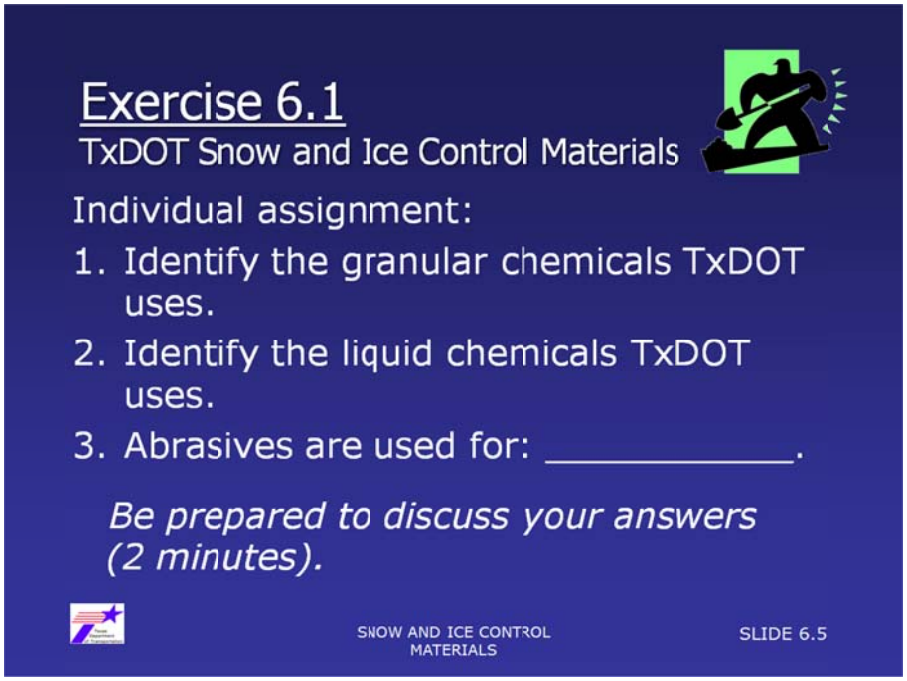
You apply enough chemical to achieve level of service goals, but do not apply more chemical than is necessary.



Instructor Notes: Present the following key points.

PINK SHEETS!

Answer each question.


Exercise 6.1
TxDOT Snow and Ice Control Materials
Individual assignment:
1. Identify the granular chemicals TxDOT uses.
2. Identify the liquid chemicals TxDOT uses.
3. Abrasives are used for: _____.
Be prepared to discuss your answers (2 minutes).
SNOW AND ICE CONTROL MATERIALS
SLIDE 6.5

VIDEO 6.1. ANTI-ICING OPERATIONS (02:12)

SCRIPT

As we discussed earlier, anti-icing is a road maintenance strategy that tries to keep the bond between ice and pavement surface from forming.

An anti-icing technique that is proven effective is the spreading of brine on the roadway before or at the very beginning of a storm.

By applying brine prior to a precipitation event, it adheres to the surface of the roadway and is ready to go to work when the rain or snow beings to fall. This speeds up the entire melting process and also makes roadways easier to plow. Even if the forecast precipitation does not fall, most of the salt will remain on the roadway ready to go to work when the next precipitation event occurs.

Brine application rates can range from 25 to 60 gallons per lane mile depending on conditions. Your supervisor will tell you what rates should be applied.

When applying brine, always be on the alert for rapidly declining pavement temperatures and rising winds. Be especially cautious when it looks like pavement temperatures will fall below 20 degrees and winds exceed 15 mph.

The keys to applying brine as an anti-icer are accurate weather forecasts, knowing the pavement temperatures, and understanding the de-icing chemicals you are using.

Carried out successfully, anti-icing procedures can provide a higher level of service to the traveling public and reduce total chemical use.

Anti-icing techniques are also being used to treat frost. When frost is predicted, brine applied in the afternoon is effective to prevent frost if there is no intervening precipitation.

However there are a few storms when any single strategy is adequate. You will find that it will not be unusual to start fighting a storm with anti-icing procedures, switch to de-icing, and before the storm ends, go back to using liquid chemicals.

Your supervisor is in charge of managing these transitions.

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VIDEO 6.2. DE-ICING OPERATIONS (03:06)

SCRIPT

De-icing and anti-icing chemicals like sodium chloride work by lowering the freezing point of water. The actual freeze point of a solution is governed by the concentration of salt in that solution.

It is this freezing point depression characteristic that makes de-icing chemicals so useful and why sodium chloride and calcium chloride are called freeze point depressants because they depress the freezing point temperature of water.

Anti-freeze in your vehicle is also a freeze point depressant. As we all know, water freezes at 32 degrees Fahrenheit. Straight anti-freeze freezes at 2 degrees. However, when you mix 50 percent anti-freeze with 50 percent water, the freeze point temperature of the mixture is lowered to minus 35 degrees.

Like anti-freeze, deicers are less effective when too little or too much is used.

When a solid deicer like salt is applied to an ice covered pavement, it must first dissolve and become a solution before melting can occur. The moisture can come from pre-wetting the salt or from moisture on the highway.

Calcium chloride, as we have learned, can draw moisture from the air to begin the melting process.

However, too much moisture can rapidly slow or halt the melting point process. Dilution of the solution quickly reduces melting power.

Dilution of the solution always takes place as melting occurs or additional precipitation falls. Whether it be in the form or rain or snow, dilution of solution may always be considered when applying dry and liquid de-icing chemicals.

When applying salt, the idea is to concentrate much of the chemical over the middle of the roadway so that as it begins the melting process, the melting liquid moves away from the crest of the roadway towards the outside.

It is important to keep as much of the material on the roadway as possible. Traveling too fast or having the spinner moving too fast can result in more material on the shoulders and in the ditch than on the roadway. Low spinner speed in recommended to concentrate materials on the highway.

The only exception is when treating intersections, use a higher spinner speed to spread material across the entire intersection.

Refer to the calibration chart for truck speed and auger speed for proper application rates.

As you have learned, the amount of salt that should be applied per lane mile can vary considerably depending on many conditions: pavement temperature, weather temperatures are rising or falling, the amount of traffic, the type of precipitation forecast, and the roadway characteristics. Whether it is a shaded cut along a grove of trees or a curve, your supervisor will let you know what rate to apply or offer you advice depending on the conditions.

Class Exercise – Review Questions
Module 6 – SNOW AND ICE CONTROL MATERIALS

MNT812 Winter Weather Operations Training

1. TxDOT primarily uses which of the following snow and ice control chemicals:
   A. Salt brine, Road salt, Meltdown Apex, Calcium chloride
   B. Meltdown 20, Meltdown Apex, Road salt, Salt brine
   C. Road salt, Potassium acetate, Meltdown 20, Meltdown Apex
   D. Freeze Guard, Salt brine, Meltdown 20, Road salt

   The correct answer is B.

2. Snow and ice control chemicals are known to cause health and safety issues for which of the following:
   A. Skin
   B. Eye
   C. Breathing
   D. All of the above

   The correct answer is D.

   SAFETY FIRST!!!

3. [True/False] Meltdown Apex can be applied either as a liquid (brine) or in dry granular form.
   A. True
   B. False

   This statement is FALSE.

   Meltdown Apex is magnesium chloride in liquid form. It is only applied as a liquid.

4. [True/False] For de-icing applications, Meltdown 20 is applied at an initial application rate of 200 pounds per lane mile.

   A. True

   B. False

   This statement is TRUE.

   It is general however (statewide average). Your Supervisor will tell you the actual application rate for your Maintenance Section.

5. [True/False] Road salt can be applied either as a liquid (brine) or in dry granular form.

   A. True

   B. False

   This statement is TRUE.

   Salt can be applied in dry granular form, or, it can be mixed with water to create a brine and applied in liquid form.

6. [True/False] You should always see your supervisor to obtain the proper chemical application rate for your particular Maintenance Section.

   A. True

   B. False

   This statement is TRUE.

7. [True/False] Because snow and ice control chemicals are highly corrosive, there is really nothing TxDOT employees can do to minimize their impact on infrastructure or the environment.

   A. True

   B. False

   This statement is FALSE.

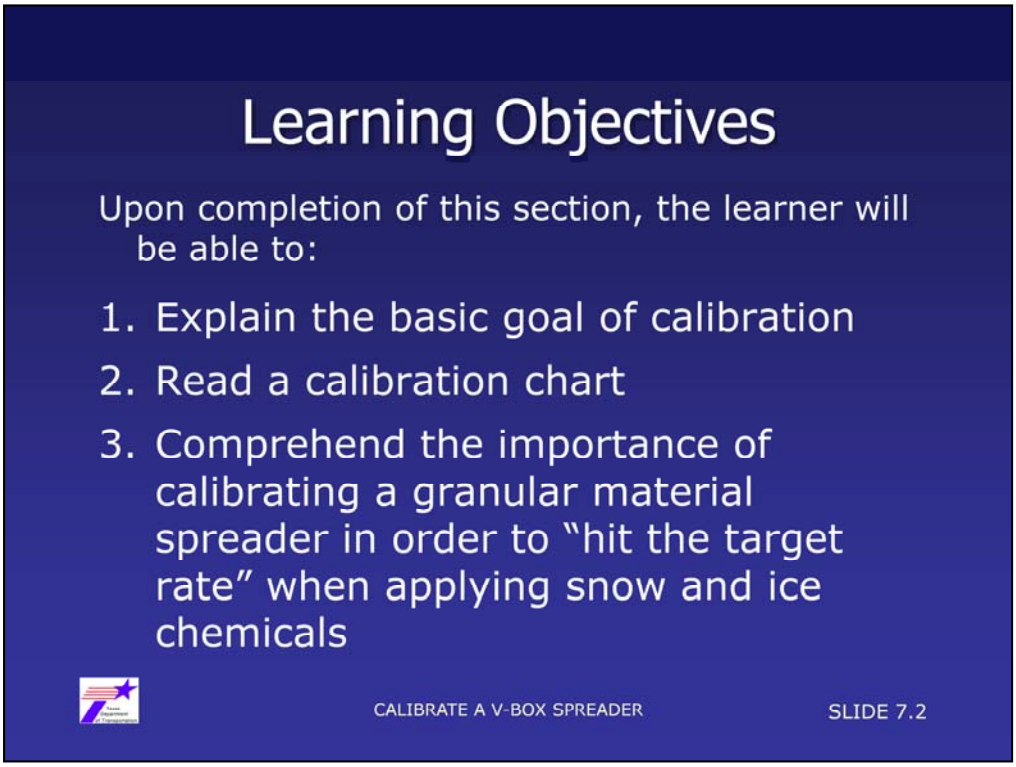
   TxDOT employees can do many things to achieve the responsible use of snow and ice control chemicals.



Instructor Notes: Present the following key points.

In this module, we will discuss how to calibrate a V-box spreader. This is typically considered a PRE-SEASON activity.

As we shall see, proper calibration plays a key role in effective winter maintenance operations.



Instructor Notes: Present the following key points.

Note the learning objectives.

It is important to emphasize that, although we will complete a calibration exercise for a V-box spreader as part of this module, being able to independently calibrate a V-box spreader is not an explicit objective for this training.

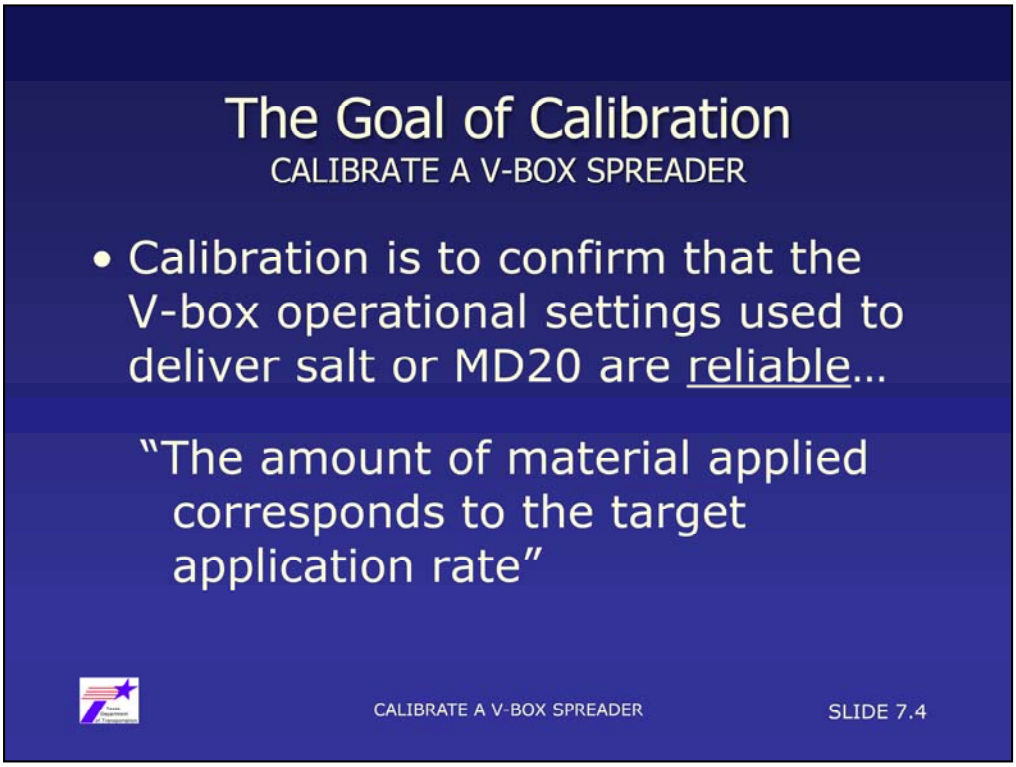
Your Supervisor will rely on you to help with the calibration in your maintenance section, but you will always work with a team to accomplish this. So when you see the calibration math a little later on, don't let that worry you. It is enough that you know people who can do the math. That is not a requirement for this class.

Note that we do expect you to be able to read a calibration chart.



Instructor Notes: Present the following key points.

Let’s discuss the calibration process.

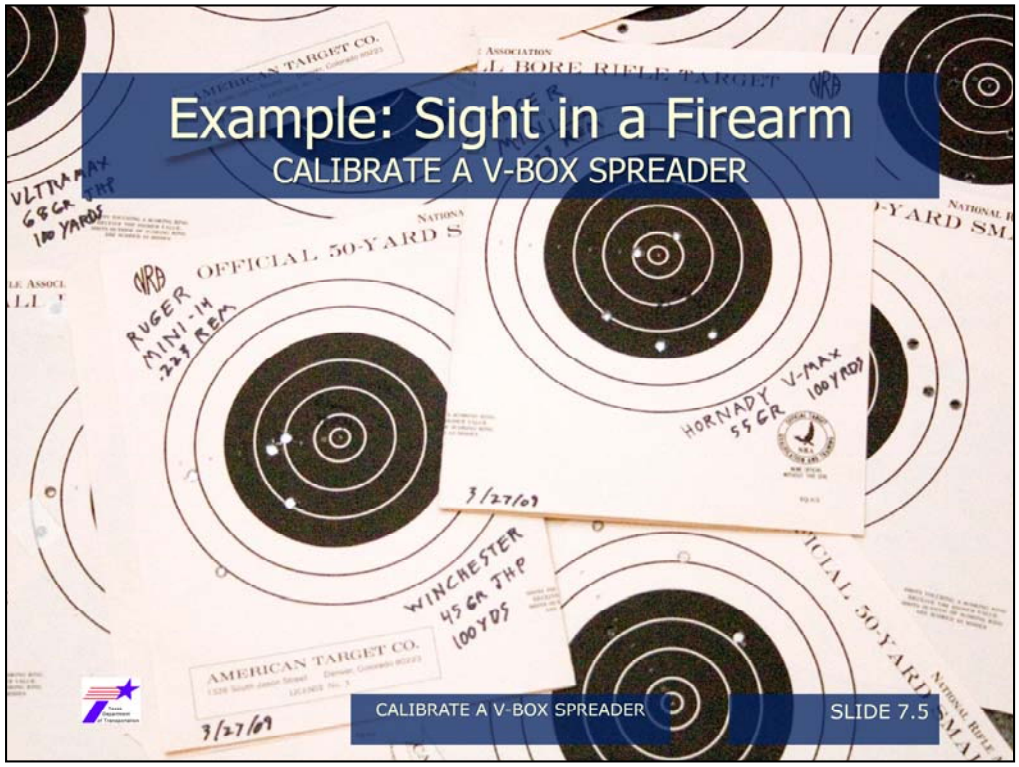


Instructor Notes: Present the following key points.

The goal of calibration is to confirm that the operational settings used for your V-box are reliable.

This means that if you set your V-box to deliver 300 pounds of material per lane mile, the setting is correct and you actually DO deliver 300 pounds per lane mile. Not 100 pounds, or 1000 pounds, or something else.

Reliability is why we calibrate.



Instructor Notes: Present the following key points.

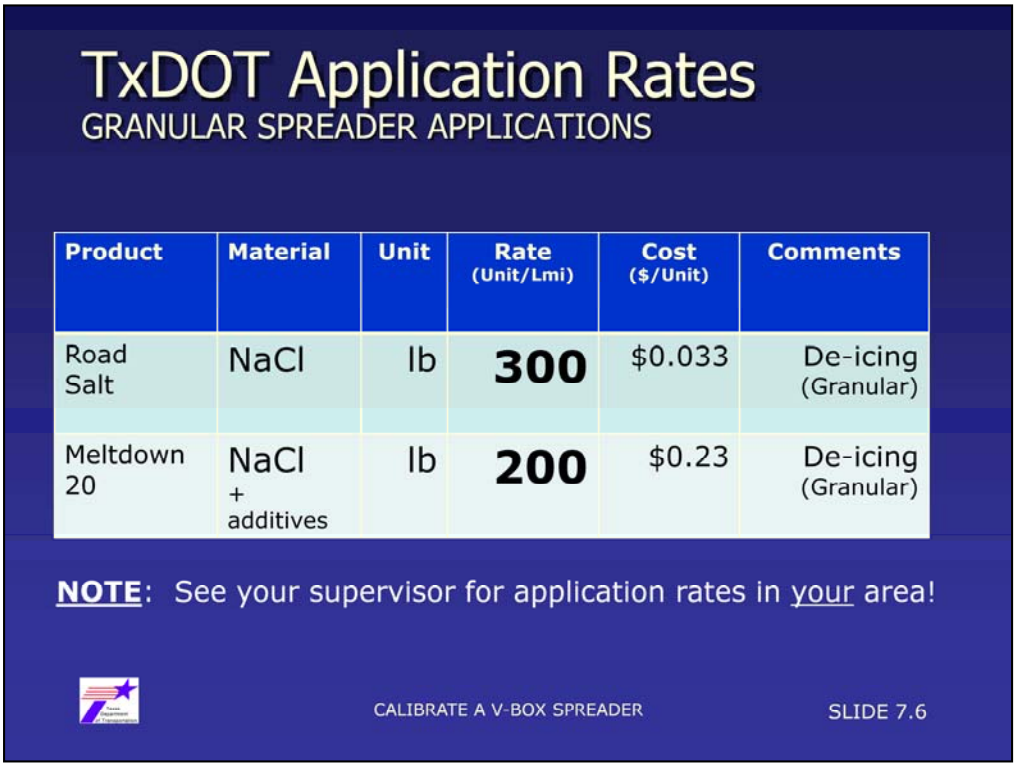
This is actually quite similar to why we sight in a firearm.

Say you are shooting the Ruger .223. In this case, you aim at the bull's-eye, but you hit low and to the left. This means you need to adjust the sights.

You always want to hit what you aim at.

Calibrating a V-box spreader is like this. If you intend to apply 200 pounds per lane mile of Meltdown 20, that is what you need to apply. Not more (which would be wasteful) or less (which would be ineffective).

Calibration enables you to do this.

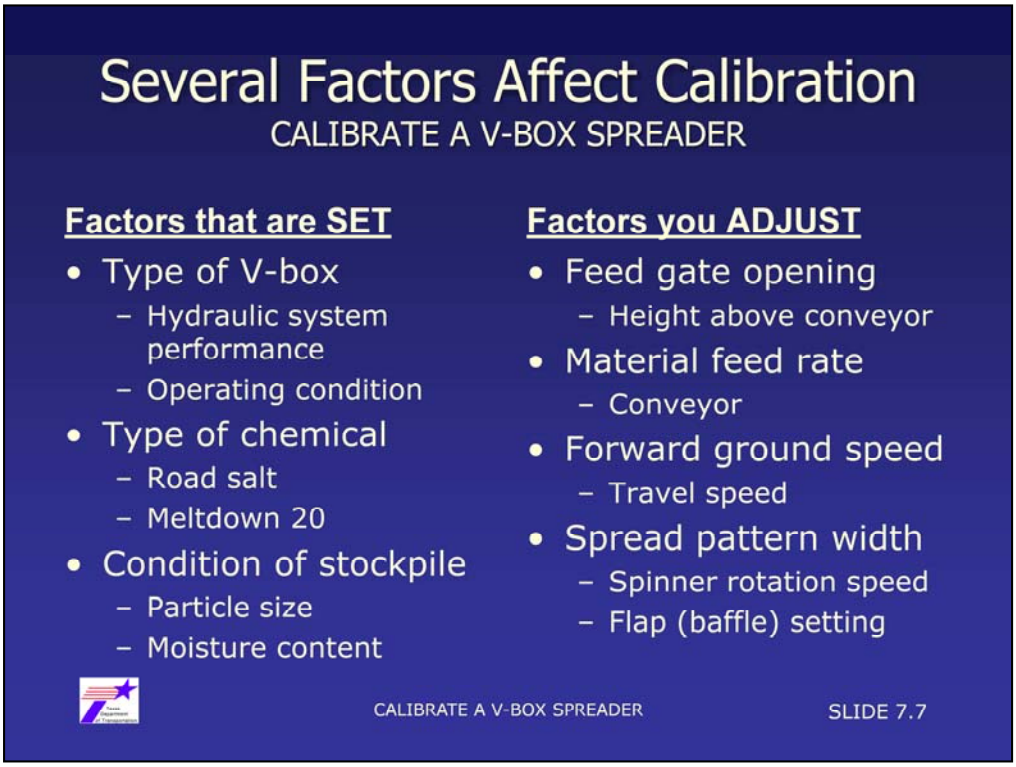


Instructor Notes: Present the following key points.

Recall that these are the standard application rates for granular chemicals. These then, as adjusted by your Supervisor, become the target rates for your application.

The question is, what operational settings do you use to achieve this? At what speed?

Many variables need to be defined and set.

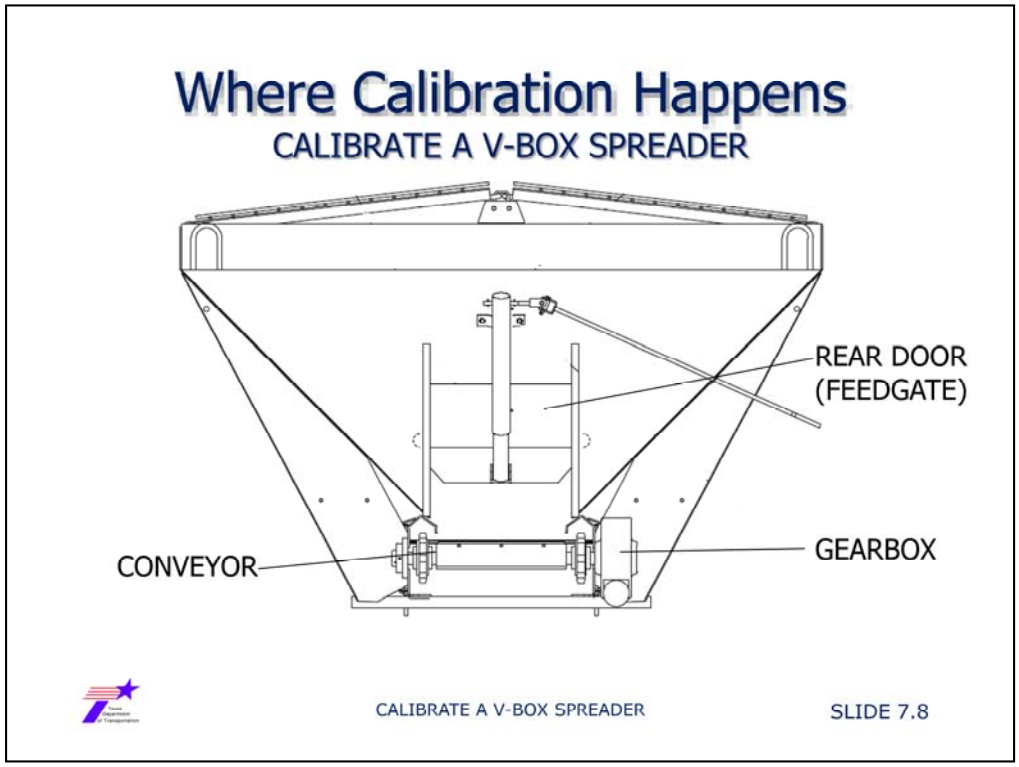


Instructor Notes: Present the following key points.

This slide identifies two sets of factors relative to calibration: (1) those factors that are SET and which you cannot do anything about, and (2) those factors which you can adjust.

Spend some time reviewing these. Comment on each of the factors in each column.

In particular, note that once you set the feed gate opening height and calibrate for the material feed rate (conveyor speed), the main variable left for the operator is the forward ground speed. Weather and roadway conditions often dictate what can be achieved here.



Instructor Notes: Present the following key points.

Calibration happens in the rear of the V-box.

In particular, you will be setting the rear door (feed gate) opening height and measuring the conveyor shaft rotational speed.



Instructor Notes: Present the following key points.

Adjusting the feed gate opening can usually be accomplished using a crank-type lever.

Some V-boxes have scales on the feed gate. In other cases, you will need to use a steel tape to measure the opening height.

Either way, the feed gate opening height is something that must be set and measured for calibration.



Instructor Notes: Present the following key points.

The feed gate opening height directly influences the amount of material that the conveyor delivers to the road.

A higher gate opening means more material. A lower gate opening means less material.

Your Supervisor will normally have an idea about what types of feed gate openings are typical for the snow and ice control materials you use in your maintenance section.



Instructor Notes: Present the following key points.

The conveyor (feed rate) controls establish how fast the conveyor goes.

The conveyor speed therefore also directly impacts the amount of material delivered to the road.

A fast conveyor delivers more material. A slow conveyor delivers less.

Note the “lane width” control. This adjusts the spinner rotational speed. To control bounce and scatter of the granular material on the roadway, the spinner rotational speed is usually set fairly low. We will not be adjusting the spinner rotational speed in this calibration exercise.



Instructor Notes: Present the following key points.

If the feed gate opening is set, and you have established your conveyor speed settings, all that is left to do is to drive a pre-set ground speed in order to deliver the proper amount of granular material to the road surface.



Instructor Notes: Present the following key points.

Up to now, we have basically ignored lane coverage.

Lane coverage has to do with the flap openings on the spinner chute assembly, and the spinner rotational speed.

Slow spinner rotational speeds are recommended to minimize loss of material due to bounce and scatter. The goal is to keep the chemical on the roadway where it can do some good… not waste the material in the bar ditch.



Instructor Notes: Present the following key points.

The spinner control governs the rotational speed.

High means faster rotation. Low means slower rotation.



Instructor Notes: Present the following key points.

As has been noted, when the flaps are lowered (choked down), this pretty much restricts the granular material application to one lane.

If the flaps are raised to horizontal, this wide-open arrangement can facilitate treatment of up to three lanes at one time.



Instructor Notes: Present the following key points.

Recall that the objective of a granular material (de-icing) operation is to deliver the target rate of material to the road surface.

Not too much. Not too little.



Instructor Notes: Present the following key points.

How does one calibrate a V-box spreader?

We should say at the outset that, at the time this course was developed, TxDOT has not done this very much.

It has been realized that calibration is necessary, but granular material spreader calibration has not been done in very many maintenance sections.

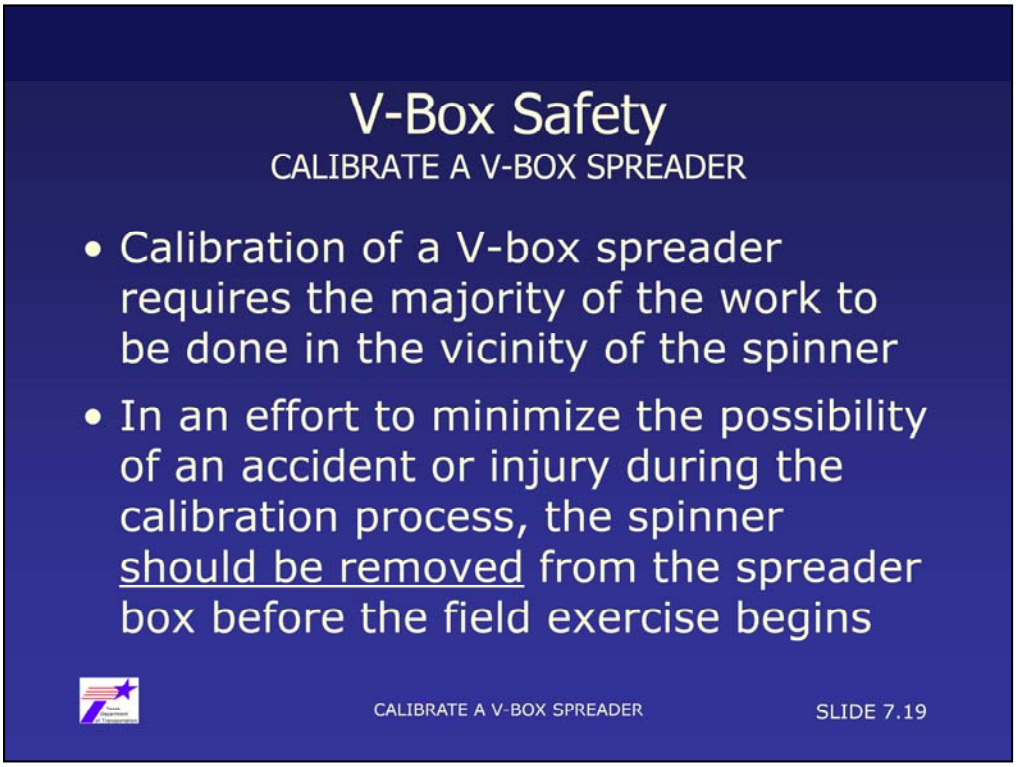
The process described in this training will explain a basic method for calibration.



Instructor Notes: Present the following key points.

Recall that V-boxes have several moving parts, and these can be dangerous. Red means "… death or serious injury" can result.

CALIBRATE SAFELY.



Instructor Notes: Present the following key points.

Because calibration happens at the rear of the V-box, in the direct vicinity of the conveyor and the spinner, specific attention must be given to calibration safety.

One way to achieve a safer calibration environment is to remove the spinner. That is the preferred approach recommended here.

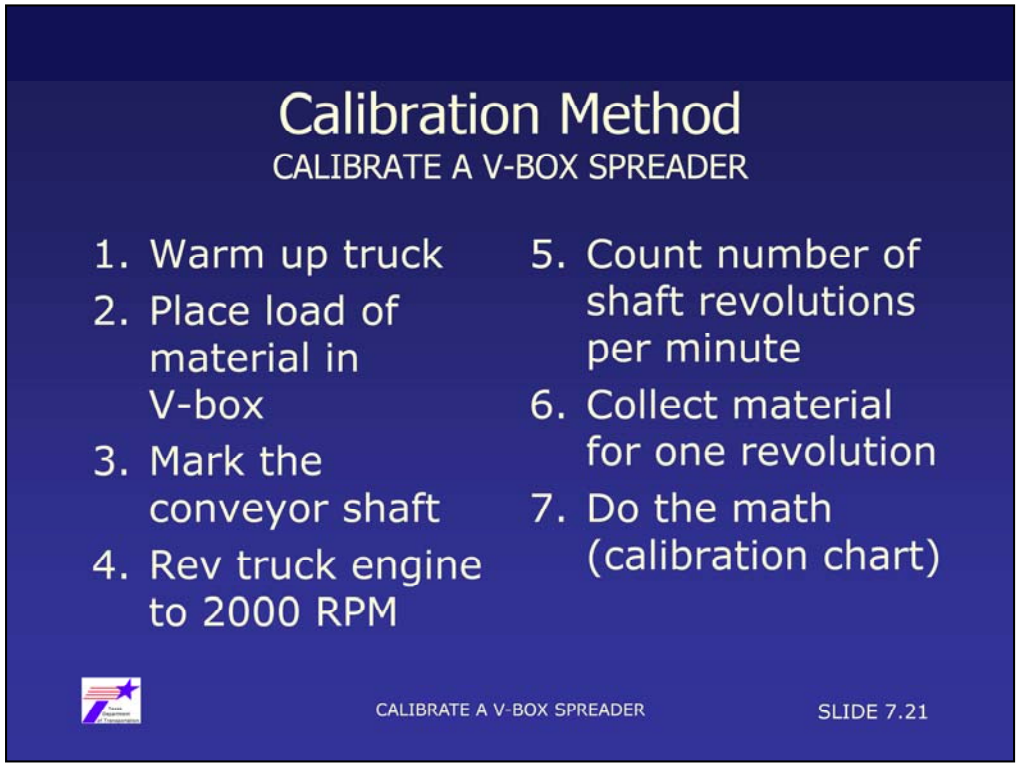
Other safe ways exist to calibrate the V-box which do not require removal of the spinner. For example, the spinner can be left in place, and you can spread a large tarpaulin beneath the spinner to catch material from the spinner chute. Thus calibration can be performed with minimal risk of being harmed by the spinner.

Whichever method is selected, SAFETY FIRST!



Instructor Notes: Present the following key points.

The approach recommended in this training is to remove the spinner prior to calibration.



Instructor Notes: Present the following key points.

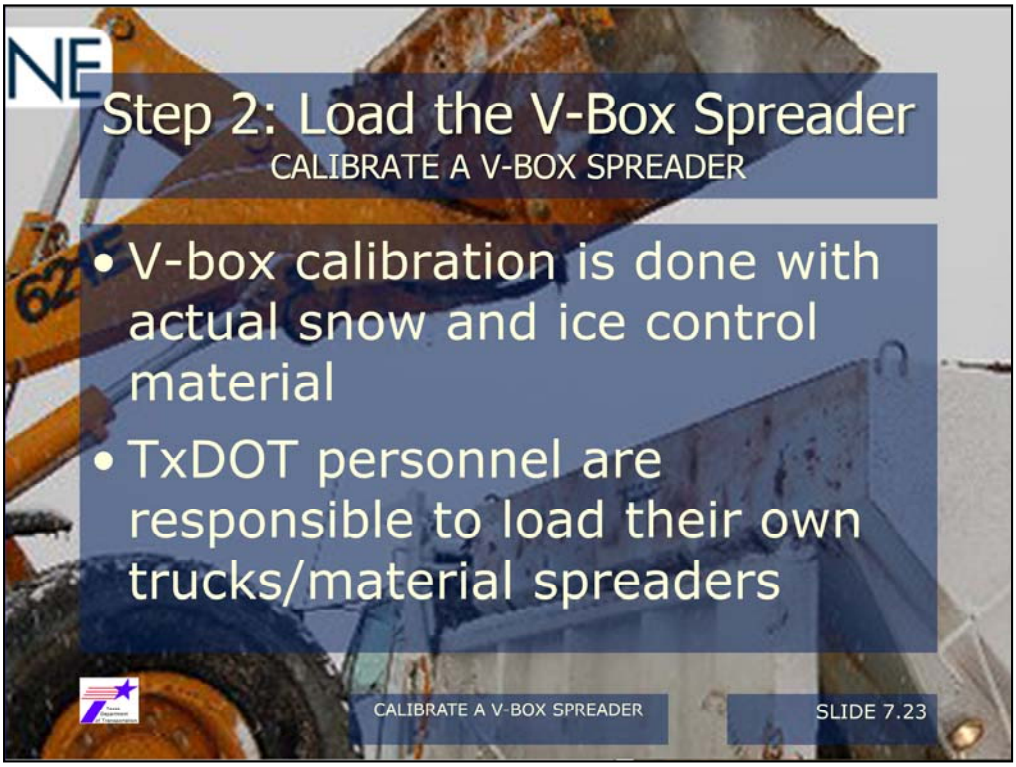
This slide briefly summarizes the calibration steps.

We will go through these in some detail, step by step.



Instructor Notes: Present the following key points.

Because TxDOT V-box spreaders rely on the truck's hydraulic system to operate the conveyor and the spinner, it is necessary to warm up the truck to operational conditions prior to calibration.

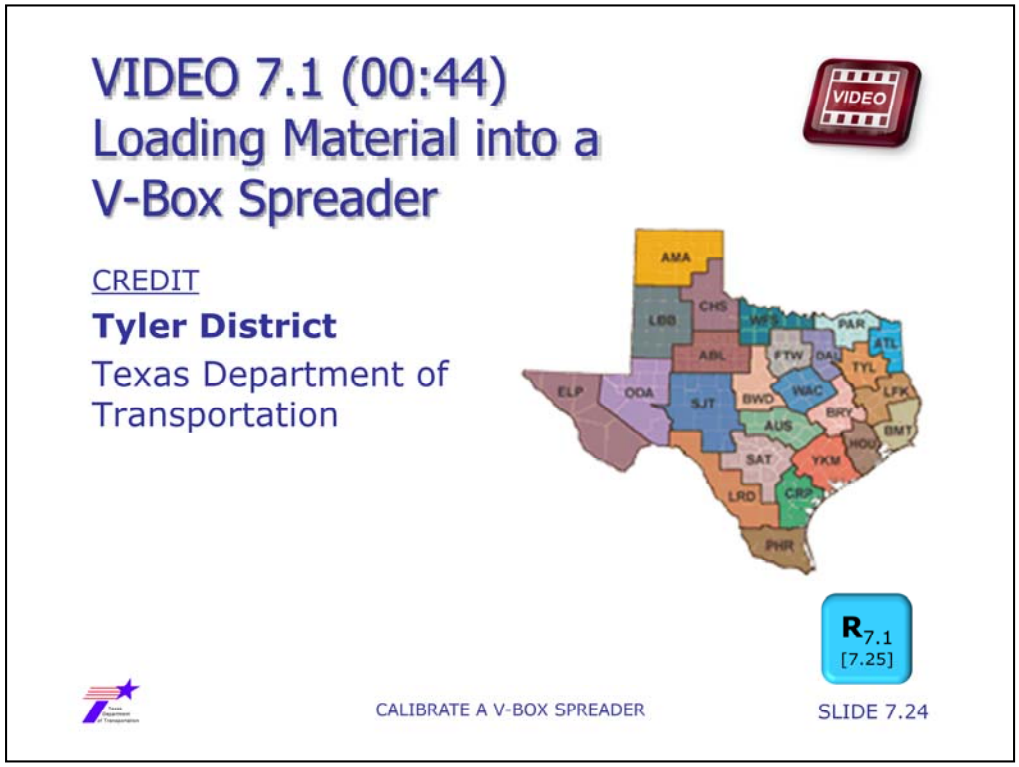


Instructor Notes: Present the following key points.

The V-box spreader needs to be loaded.

For real calibration activities, V-box calibration should be done using the actual material that will be applied to the roadway. Thus, if your maintenance section uses Meltdown 20 for de-icing, then you should calibrate with Meltdown 20.

For this learning module in this training course, however, we need not be so restrictive. For reasons of safety and economy , it is acceptable to do the calibration exercises with road salt or abrasives.



Instructor Notes: Present the following key points.

This brief film summarizes the process of loading the V-box spreader.



Instructor Notes: Present the following key points.

The next step in the calibration process is to mark the conveyor shaft so that you can count the number of revolutions per minute for specified conveyor settings.



Instructor Notes: Present the following key points.

During calibration, the truck RPM should ideally match those during actual operations. This is to achieve proper hydraulic fluid flow.

The actual operational engine speed varies, typically from 1500 RPM to 1800 RPM. A reasonable target is 1600 RPM.



Instructor Notes: Present the following key points.

Calibration requires that you count the number of revolutions of the conveyor shaft per minute for each operational setting on the conveyor control knob.

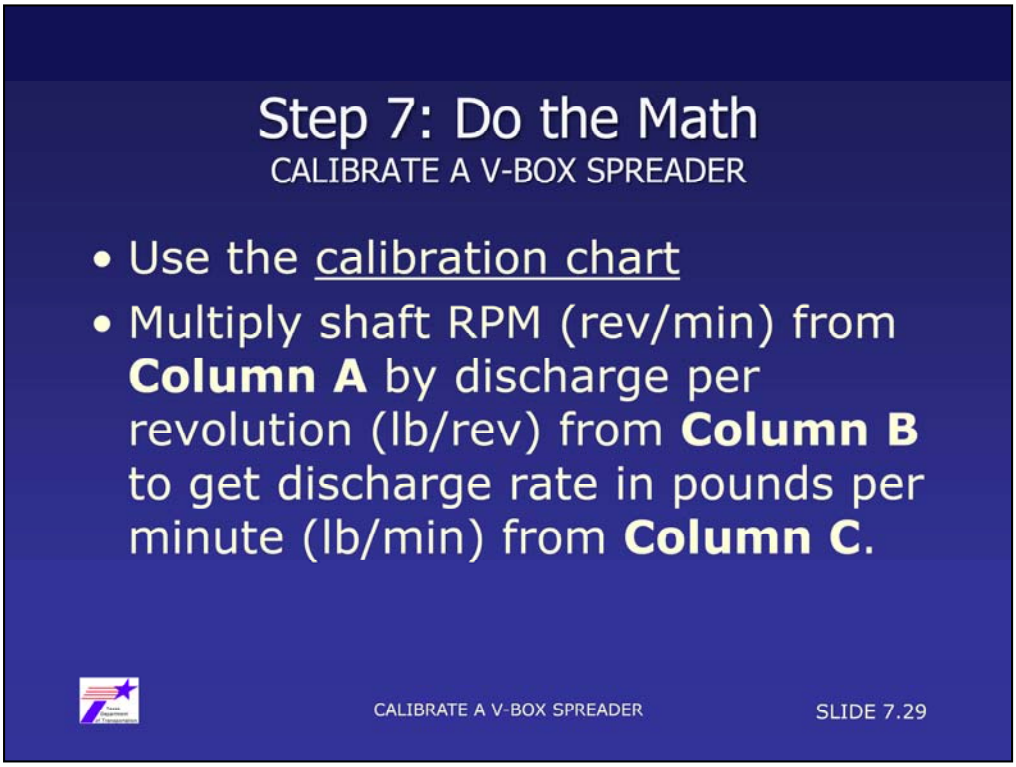


Instructor Notes: Present the following key points.

While you are counting revolutions of the conveyor shaft, you will also be collecting material from the back of the conveyor.

This material is weighed to determine the amount of material per revolution of the conveyor shaft, which is more or less constant.

Working near the back of the conveyor to catch this material is the main reason why is usually cleaner and better to remove the spinner during calibration.

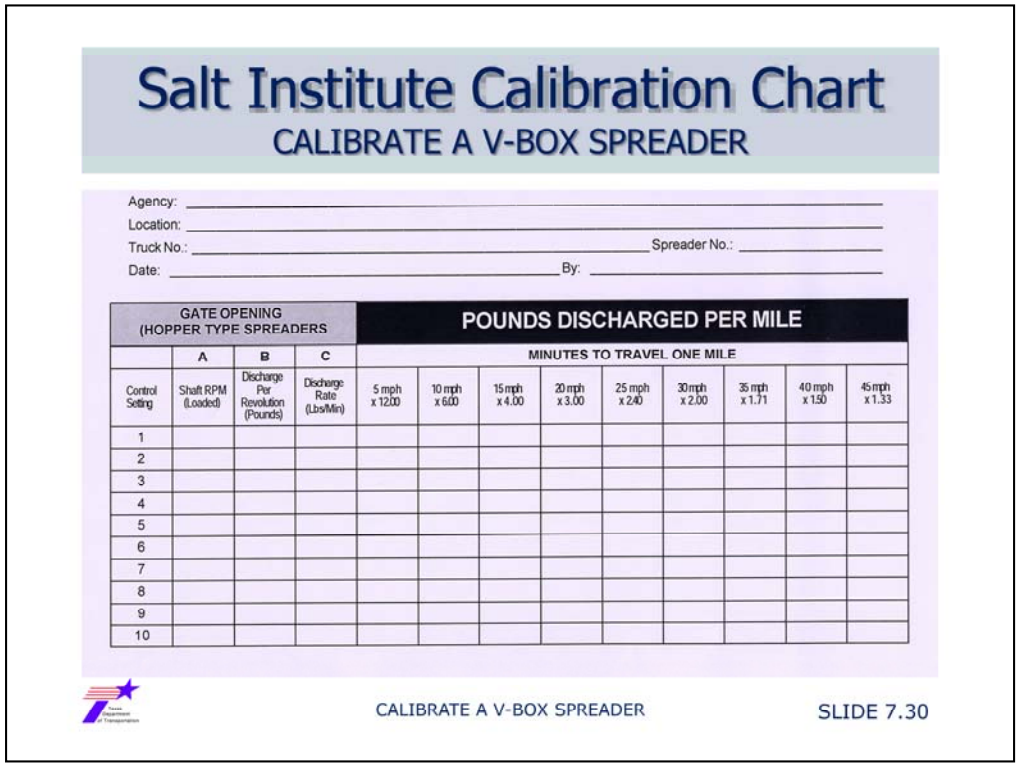


Instructor Notes: Present the following key points.

With the conveyor shaft revolutions corresponding to each control setting determined, and the amount of material delivered by one revolution of the shaft also known, you can “do the math” to calibrate the V-box spreader.

Hand calculations are reasonably straightforward.

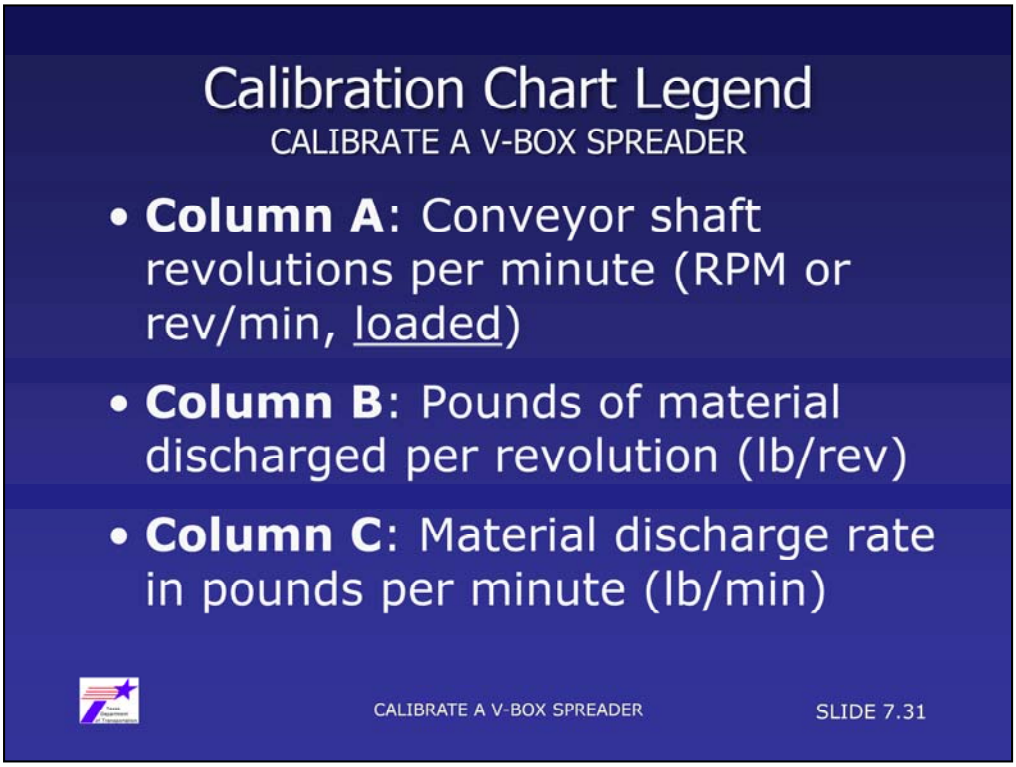
However, TxDOT also has a Microsoft Excel spreadsheet, obtained from the Salt Institute, which they use to auto-calculate and create the calibration chart.



Instructor Notes: Present the following key points.

This is a typical calibration chart (blank version). This particular chart is provided by the Salt Institute, but it can be used to calibrate any type of granular material – salt, Meltdown 20, or abrasives. The calibration method is the same.

Completion of this calibration chart is the goal of the calibration exercise. With a calibration chart, the operator will be able to know what conveyor settings to use, for a given truck speed, to deliver a specified target amount of snow and ice control chemical to the roadway surface.



Instructor Notes: Present the following key points.

You may have noticed that the left part of the calibration chart contains three columns… A, B and C.

The first two columns (A and B) represent measured data obtained from the calibration chart.

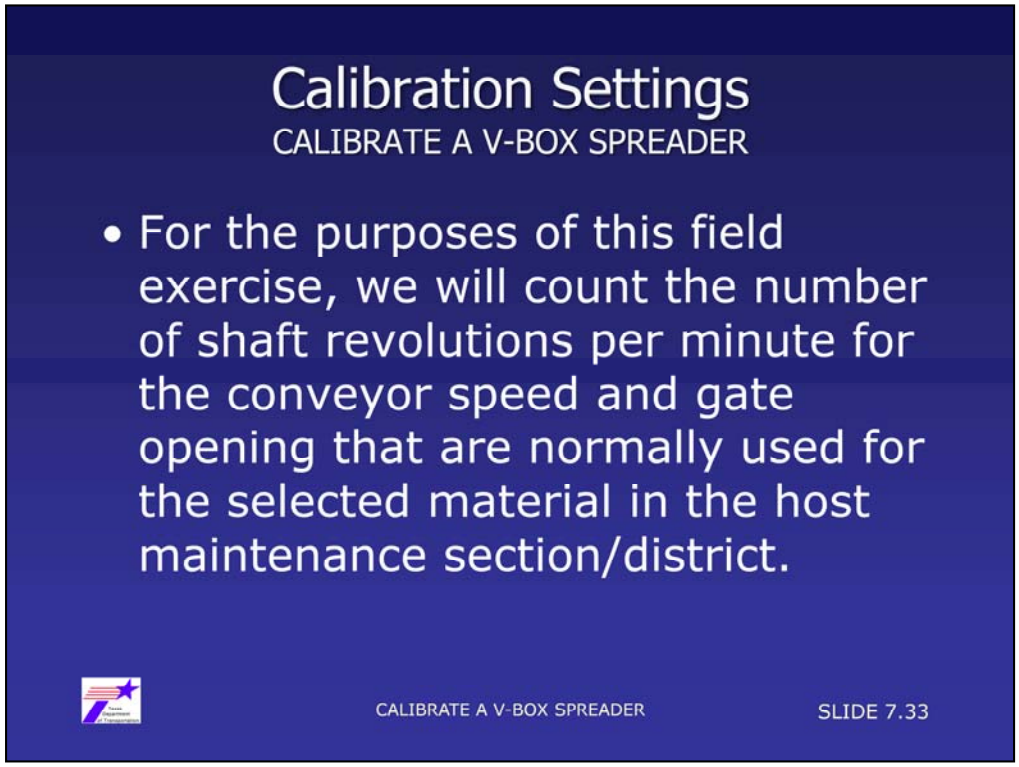
Column C is calculated from Columns A and B. All the speed columns derive from Column C.

This means that the calibration exercise essentially consists of (A) measuring the revolutions per minute of the conveyor shaft (Column A) for each control setting, and (B) measuring (weighing) the amount of material for one revolution of the conveyor.



Instructor Notes: Present the following key points.

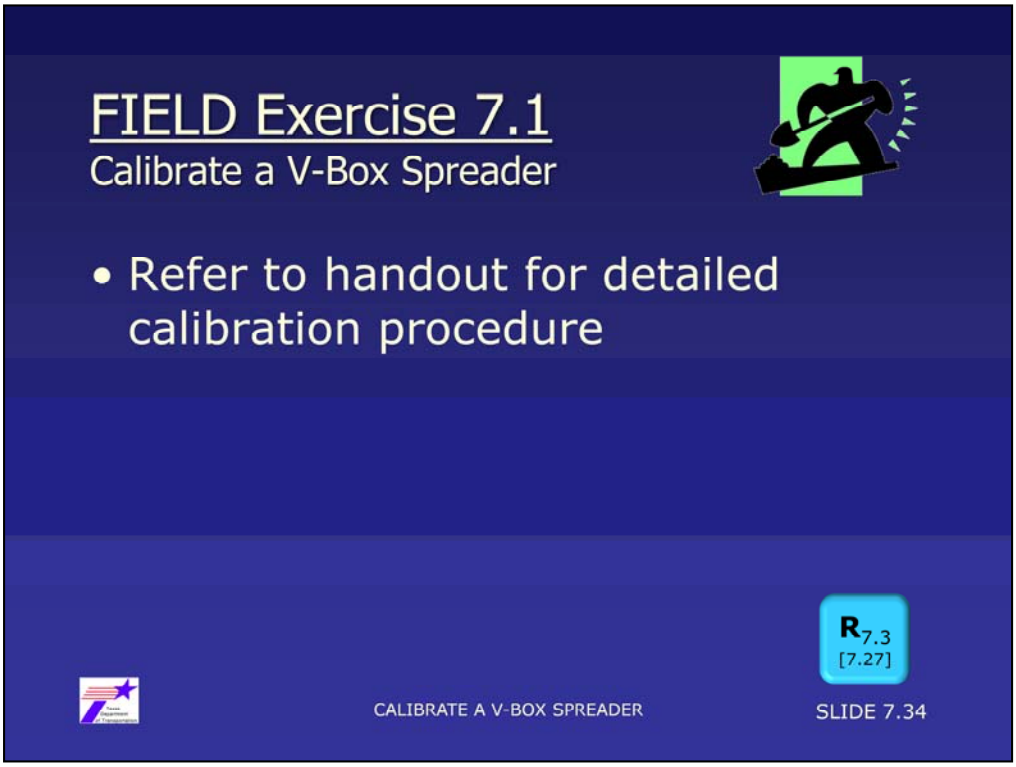
This video provides an overview of the V-box spreader calibration process.



Instructor Notes: Present the following key points.

Note that for this exercise, we will set the feed gate opening at one particular height.

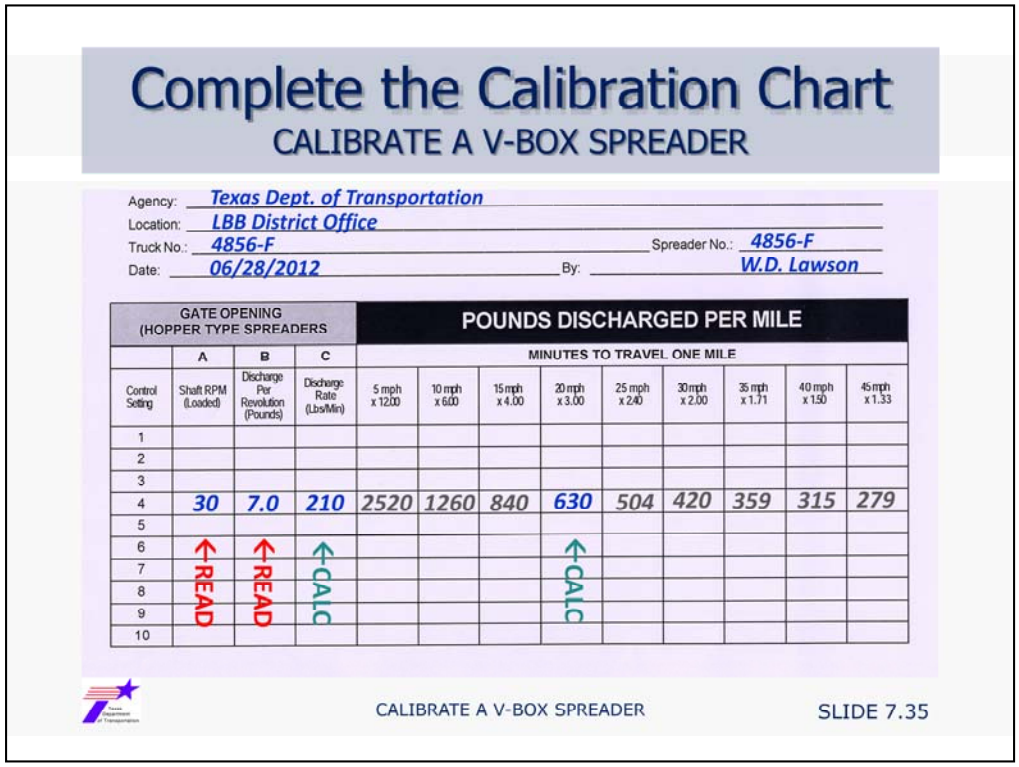
We will also only obtain data for three speed settings (low -1, medium -4, high -9), rather than each and every setting (typically 9 to 11, max).



Instructor Notes: Present the following key points.

GREEN SHEET.

Reference R7.3 presents the entire calibration process in detail.



Instructor Notes: Present the following key points.

This image of the calibration chart illustrates how calibration is accomplished.

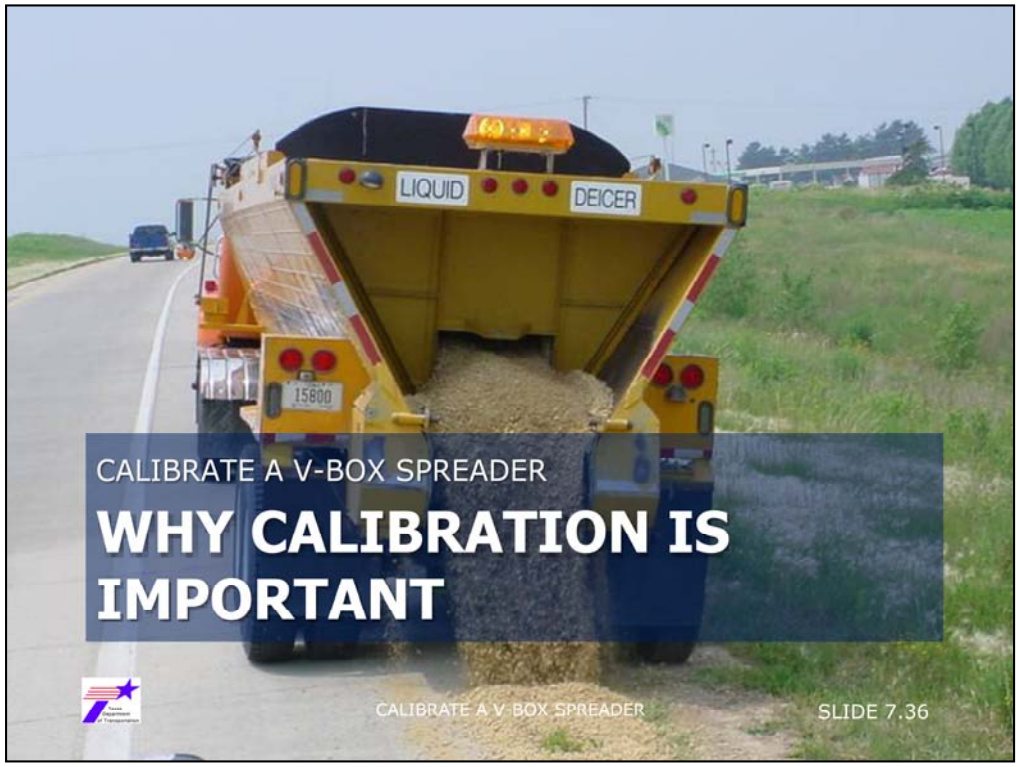
The field exercise (just completed) yields data for Column A and Column B.

These two columns multiplied together yield Column C.

With Column C populated, values for the remaining columns to the left can be calculated, which identify the pounds of material delivered per ONE lane mile at the stated speed for that particular control setting.

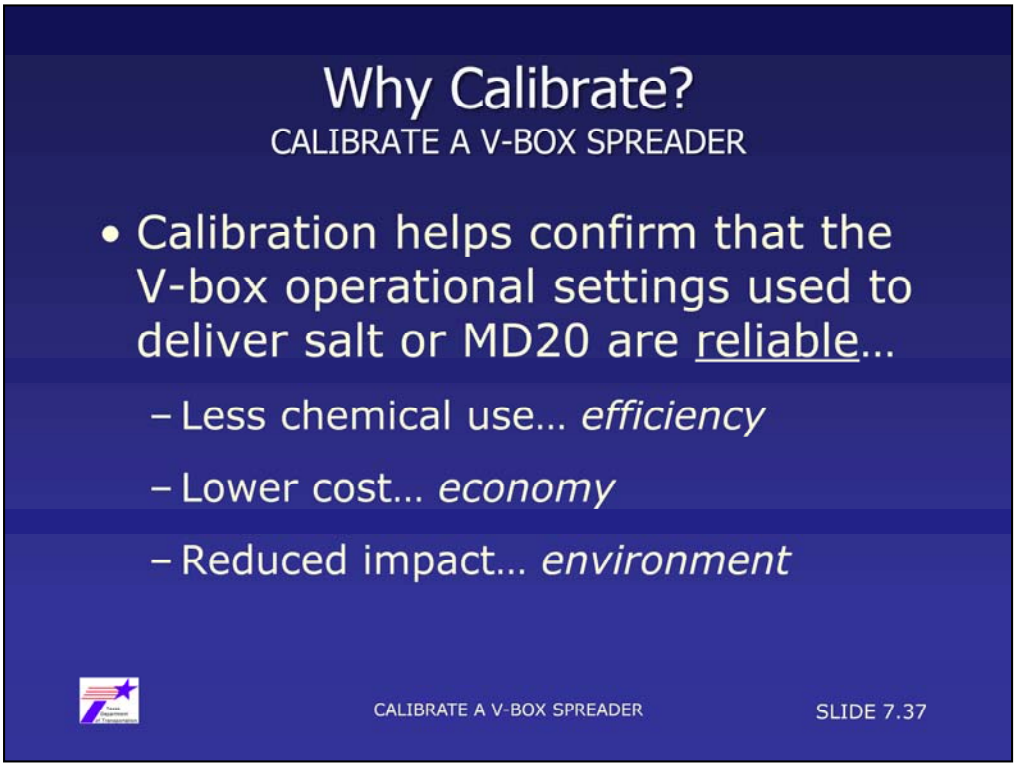
A complete calibration chart will have values for all 10 control settings.

COMMENT: The calibration chart only applies to ONE gate opening, and for ONE lane.



Instructor Notes: Present the following key points.

From the exercise, some of the reasons why calibration is important should be apparent.



Instructor Notes: Present the following key points.

To summarize, calibration is beneficial in terms of:

EFFICIENCY
ECONOMY
THE ENVIRONMENT

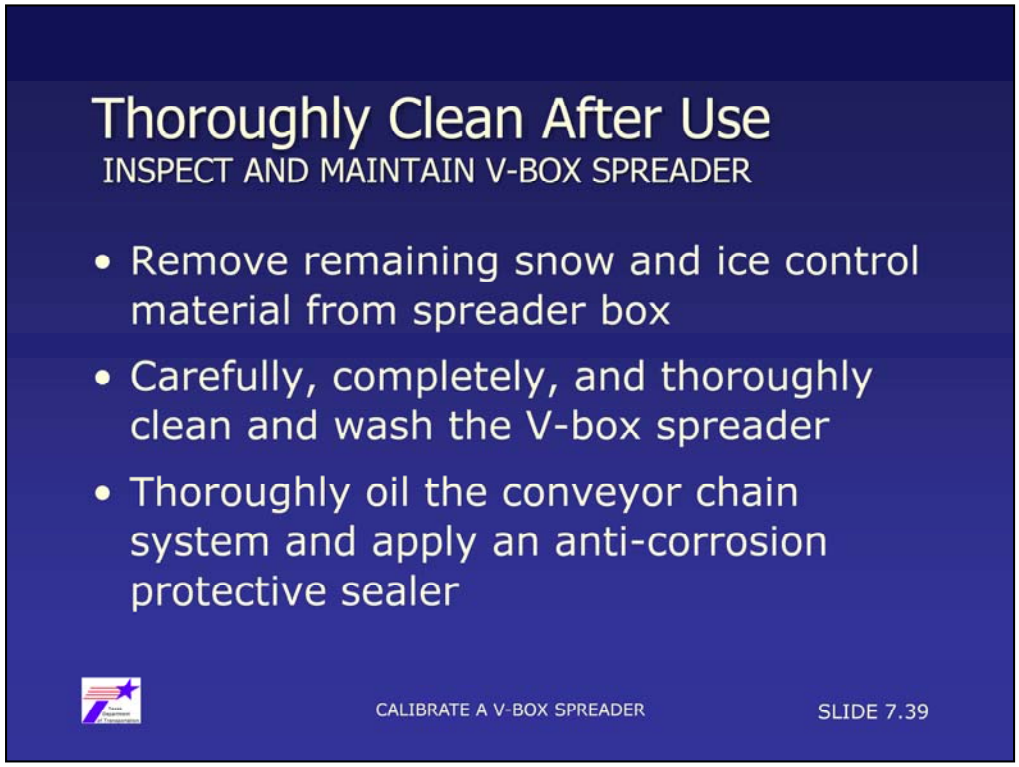
It makes sense.



Instructor Notes: Present the following key points.

It is helpful to think about how much salt or Meltdown 20 actually goes on the road when you are applying at the target rate. You should develop a practical "feel" for what this looks like.

This brief film shows how much salt gets delivered to one square foot of pavement when applied at the target rate. It is less than you might think!



Instructor Notes: Present the following key points.

As has been noted, snow and ice control chemicals are corrosive!

The V-box spreader should be cleaned after use with metal surfaces protected from corrosion.



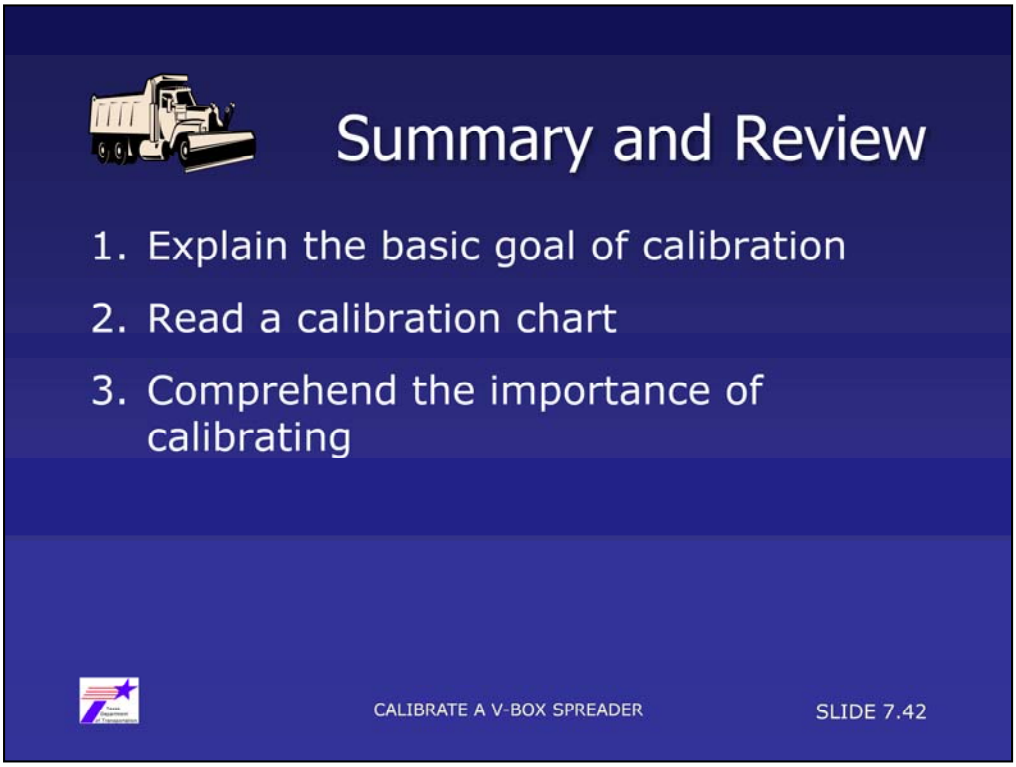
Instructor Notes: Present the following key points.

Do not stow your equipment this way.



Instructor Notes: Present the following key points.

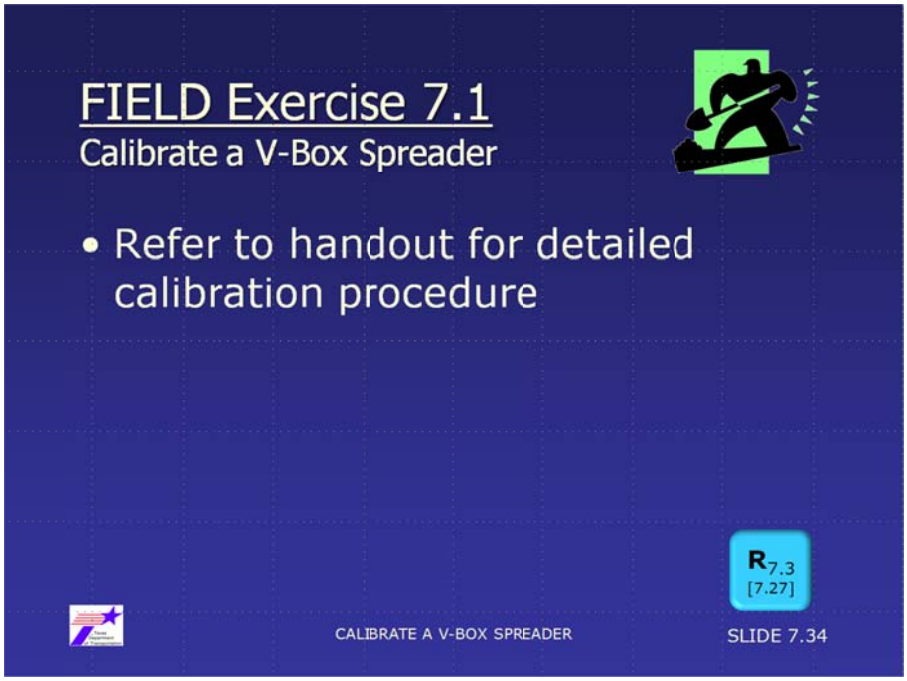
The snow and ice control chemicals are corrosive!



Instructor Notes: Present the following key points.

PINK SHEETS!

Answer all questions.


FIELD Exercise 7.1
Calibrate a V-Box Spreader
• Refer to handout for detailed calibration procedure
R7.3 [7.27]
CALIBRATE A V-BOX SPREADER
SLIDE 7.34

VIDEO 7.1. LOADING MATERIAL INTO A V-BOX SPREADER (00:44)

SCRIPT

The front end loader is another type of equipment used for winter weather operations.

Whether the snow and ice control material is road salt or Meltdown20, or an abrasive such as ice chatt, the material first has to be loaded into the V-Box.

At TxDOT, the truck operator not only operates the V-Box, but also is responsible to load the V-Box. Under winter conditions, this requires care and caution.

With the truck properly loaded and checked, the operator may proceed with de-icing operations.

VIDEO 7.2.CALIBRATE A V-BOX SPREADER (02:17)

SCRIPT

Since no 2 spreaders are exactly alike, each one must be calibrated before winter. The salt institute has an easy calibration method. First, some salt is placed in the spreader to put weight on the auger or conveyor. Next, the end of the auger or conveyor shaft is marked. Now, the number of complete turns the shaft makes in one minute at each setting of the auger or conveyor control are counted. This figure is recorded.

With a V-Box, the gate opening must be recorded because the calibration will only be correct for only that particular size opening. A sample calibration at one control setting will help explain how to calibrate.

At setting 4 for example, the shaft might make 5 revolutions. With a piece of canvas or other suitable material or container, the salt discharged by just one complete turn of the shaft is collected.

Let's assume that 50 pounds of salt is discharged in one turn of the shaft, this figure will not change no matter how fast or slow the shaft turns. To find out how much salt is discharged per minute, the number of pounds is multiplied by the number of turns per minute. At settling 4, it's 5 times 50, 250 pounds.

If we know how much salt is discharged per minute and how many minutes it takes to go one mile, it is easy to determine the salt discharge per one mile.

Charts are available that translate miles per hour into minutes required to travel one mile. For example, it takes 2 minutes to go one mile if the speed is 30 mph. That's 2 minutes worth of salt or 2 times 250, 500 pounds per mile.

The calibration card should be placed in the truck and kept there and a duplicate should be filed in the office.

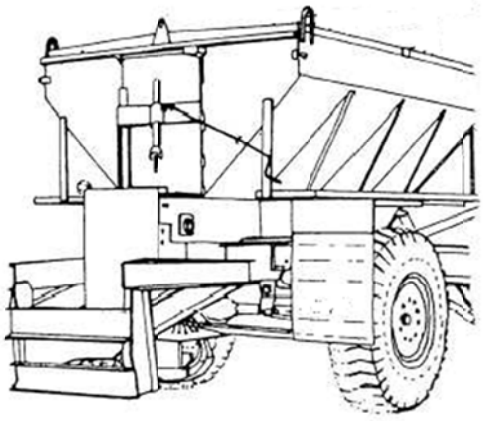
LEARNING EXERCISE 7.1

Calibrate a V-Box Spreader

Winter Weather Operations Training

Equipment Needed for this Exercise:

1. Dump truck (6 CY or 10 CY capacity) with V-box spreader
2. Low-profile (flat) scale with 150-pound capacity for weighing granular material
3. Granular material collection device (bucket, container, tarp or other suitable vessel)
4. Chalk, pen or other suitable marker for marking the end of the conveyor shaft
5. Stop watch or watch with second hand
6. Calibration form, pencil, eraser, and calculator



V-BOX SAFETY

- Read all installation, safety and maintenance instructions completely before operating this equipment.
- Keep all personnel clear of moving parts while equipment is being operated.
- While operating this equipment, use common sense, use caution, be alert and be safety-conscious.

Learning Objectives

Upon completion of this field exercise, the learner will be able to:

1.) Calibrate a V-Box spreader

2.) Comprehend the importance of calibrating a granular material spreader in order to "hit the target rate" when applying snow and ice chemicals

Introduction

When you compare the relatively insignificant cost of spreader calibration to the benefits that result from this activity, it's easy to see why annual calibration is one of the most cost-effective

ways to optimize your maintenance section's usage of snow and ice control materials. Along with the correct application technique, proper calibration is the first step towards reduced chemical use, greater efficiency, and increased cost effectiveness.

Regardless of the type of spreader being used, it is extremely important to calibrate the system to ensure that the desired quantity of material is actually being applied to the road. In this field exercise, we will look at getting the "right amount" of material on the road by ensuring that your spreader has been properly calibrated.

Spreader Calibration Procedure

Calibration of spreaders is simply calculating the number of pounds of material discharged per mile at various spreader control settings and truck speeds. This is accomplished by first counting the number of conveyor shaft revolutions per minute, measuring the material discharged in one revolution, then multiplying the two to obtain the discharge rate, and finally, multiplying the discharge rate by the minutes it takes to travel one mile.

Keep in mind that different materials will spread at different rates at the same setting, so spreaders must be calibrated with the material that will be used. If your maintenance section uses more than one type of snow and ice control material, a calibration must be performed for each material.

With hopper-type spreaders, specific gate openings must be calibrated. The "gate opening" must be measured from the floor of the conveyor to the bottom edge of the gate. Each spreader must be calibrated individually; even the same models can vary widely at the same setting.

A sample **Calibration Chart** from the Salt Institute is provided (see Page 7.30). The calibration calculations may also be performed on a computer after the input information is obtained in the field; a calibration form is available in Microsoft Excel format. The Maintenance Division has a copy of this spreadsheet.

With reference to the **Calibration Chart**, the following columns define the material discharge rate:

- **Column A**: Conveyor shaft revolutions per minute (RPM or rev/min, loaded)
- **Column B**: Pounds of material discharged per revolution (lb/rev)
- **Column C**: Material discharge rate in pounds per minute (lb/min)

Calibration, then, consists of *measuring* data for Column A and Column B and *calculating* the quantity in Column C. Once Column C is determined, it is possible to calculate the pounds of material delivered at various speeds (the other columns in Figure 1).

Calibration Steps

1.) Warm up the truck so that the hydraulic oil is at normal operating temperature with the spreader system running.

2.) Place a partial load of material in the V-Box (road salt or Meltdown 20).

3.) Mark the shaft end of the conveyor to measure rotation.

4.) Rev truck engine to operating RPM (at least 2000 RPM). It would be best to match the RPM that corresponds to the normal speed at which the selected material is distributed on the road.

5.) Count the number of shaft revolutions per minute at each spreader control setting, as shown on the **Calibration Chart**. Record your answer.

For the purposes of this field exercise, we will count the number of shaft revolutions per minute for the conveyor speed (auger control setting) and gate opening that are normally used for the selected material in the host maintenance section.

6.) Collect material for one revolution of the shaft and weigh. Be sure to deduct the weight of the container.

For greater accuracy you may collect snow and ice control material for several revolutions of the shaft and divide the total weight by the number of turns to get the weight for one revolution. This can be accomplished at idle or at very low engine RPM.

7.) Multiply shaft RPM (rev/min) from Column A by discharge per revolution (lb/rev) from Column B to get discharge rate in pounds per minute (lb/min) from Column C. Then, multiply discharge rate (lb/min) by the number of minutes to travel one mile at various truck speeds to get pounds discharged per mile (lb/mile).

Example Problem

Determine weight of material discharged per mile (**lb/mile**) given 30 shaft revolutions per minute (RPM or rev/min) and 7.0 pounds of material discharged per revolution (lb/rev) at a truck speed of 20 miles per hour (mph).

Material Discharged/Mile (lb/mile) = [(30 rev/min)(7 lb/rev)(60 min/hr)] ÷ (20 miles/hr)

Material Discharged/Mile (lb/mile) = **630 lb/mile**

Comment about Spinner Rotation Speed and Flap Settings

This calibration procedure assumes that all material delivered by the conveyor into the spinner chute will be delivered to one lane of roadway. However, the spinner rotation speed and flap settings can also be adjusted. If the flaps (also called “baffles”) are opened wide and the spinner speed is high, it is possible to spread material to three lanes of roadway. This means that a definitive calibration of the amount of material delivered per lane mile must also account for the flap settings and spinner rotational speed.

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												

SOURCE: The Salt Institute

VIDEO 7.3. SALT APPLICATION RATE COMPARRISON (01:10)

SCRIPT

The DOT has a variety of salt and sand spreaders. Most have spinners to spread materials on the roadway.

Proper calibration of chemical application equipment is critical and must be done at least once a year for each mix you will be spreading.

Whenever a spreader is worked on it should also be recalibrated for each mix. Check with your supervisor on the method for calibration.

Refer to the calibrations chart for truck speed and auger speed for proper application rates.

If you apply salt at the rate of 300 lbs per lane mile and it all stays on the roadway, a square foot of pavement may look something like this.

Approximately 3 grains of salt weighing .0047 lbs./sq. ft. at the rate of 100 lbs/lane mi. a square foot of pavement would have this amount of salt, about 1 grain weighing .0015 lbs/sq. ft.

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Class Exercise – Review Questions
Module 7 – CALIBRATE A V-BOX SPREADER

MNT812 Winter Weather Operations Training

1. [True/False] It is best practice for each V-box spreader in your Maintenance Section to be calibrated every year.
   A. True
   B. False

   This statement is TRUE.

   Not everyone one does this, but it is a best practice.

2. [True/False] It is not possible to use a V-box spreader that has not been properly calibrated.
   A. True
   B. False

   This statement is FALSE.

   You absolutely can use a non-calibrated V-box, just like you can shoot a gun that has not been sighted in. But doing so is not a good idea.

3. The primary goal of the V-box spreader calibration process is to:
   A. Promote safety
   B. Eliminate waste
   C. Ensure reliability
   D. Save money

   The correct answer is C.

   The other items are important, but calibration is about ensuring reliability.

4. [True/False] Because V-box spreader calibration is done in the maintenance yard in a controlled way, equipment safety considerations do not really apply.

   A. True

   B. False

   This statement is FALSE.

   SAFETY FIRST!!!

5. [True/False] Reliable V-box spreader calibration means calibrating with the same kind of snow and ice control material that you use on the road in the winter.

   A. True

   B. False

   This statement is TRUE.

   This is the recommended practice.

6. [True/False] Calibration of the V-box spreader involves all of the following factors:

   - Feed gate opening (height)
   - Material feed rate (conveyor setting)
   - Forward ground speed (truck speed)
   - Spread pattern width (spinner rotation and flap settings)

   A. True

   B. False

   This statement is TRUE.

7. [True/False] A separate calibration chart is required for each feed gate opening.

   A. True

   B. False

   This statement is TRUE.

   Typically, you identify the feed gate openings for each snow and ice control material you use, and perform a separate calibration for each opening.

CALIBRATION CHART (US)

Agency:	Texas Department of Transportation												
Location:	Southeast Maintenance Section												
Truck No:	TRK 4856-F			Spreader No:	TRK 4856-F								
Date:	28-Jun-12			By:	John Operator								
Gate Opening	**1.5** (inches) (Hopper Type Spreaders)			**DISCHARGE RATE** (pounds discharged per mile)									
	A	**B**	**C**	**TRAVEL SPEED AND COMPUTATION MULTIPLIER ( )**									
Control Setting	Shaft RPM (Loaded)	Discharge per Revolution (pounds)	Discharge per Minute (lb) (A x B)	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	1.3	18.5	24.1	289	144	96	72	58	48	41	36	32	
2	2.0	18.5	37.0	444	222	148	111	89	74	63	56	49	
3	3.2	18.5	59.2	710	355	237	178	142	118	101	89	79	
4	4.6	18.5	85.1	1,021	511	340	255	204	170	146	128	113	
5	5.8	18.5	107.3	1,288	644	429	322	258	215	183	161	143	
6	6.6	18.5	122.1	1,465	733	488	366	293	244	209	183	162	
7	7.9	18.5	146.2	1,754	877	585	438	351	292	250	219	194	
8	9.1	18.5	168.4	2,020	1,010	673	505	404	337	288	253	224	
9	9.8	18.5	181.3	2,176	1,088	725	544	435	363	310	272	241	
10	11.0	18.5	203.5	2,442	1,221	814	611	488	407	348	305	271	
11	12.5	18.5	231.3	2,775	1,388	925	694	555	463	395	347	308	

THE ACTUAL APPLICATION RATE (POUNDS PER LANE MILE) **ON THE HIGHWAY IS THE DISCHARGE RATE DIVIDED BY THE NUMBER OF LANES BEING TREATED**

Use the example TxDOT Calibration Chart (opposite page) to answer the following questions:

8. Winter road conditions on a rural FM Road are such that you can safely drive 15 miles per hour. Your flaps are down so that you only treat one lane per pass. To achieve a target material application rate of 350 pounds per lane mile, set your conveyor on:
   A. Control setting 3
   B. Control setting 4
   C. Control setting 6
   D. Control setting 7

   Questions 8 through 10 are based on the Calibration Chart on the opposite page. This is a fictitious chart, yet it is realistic for the gate opening shown. This chart was developed to give you practice in reading the calibration chart.

   The correct answer is B.

   To read the chart, identify the 15mph column. Find the value closest to 350 pounds. Read the control setting for this value.

9. Same as problem 8, but now you treat two lanes per pass, driving your truck down the middle of the road. This requires that you open the spinner flaps some and increase the spinner rotation speed. To achieve a target material application rate of 350 pounds per lane mile, set your conveyor on:
   A. Control setting 3
   B. Control setting 6
   C. Control setting 9
   D. Control setting 11

   The correct answer is C.

   To read the chart, identify the 15mph column. But here, since you are covering two lanes, you must apply twice as much material; that is, 2 x 350= 700 pounds. Find the value closest to 700 pounds. Read the control setting for this value.

10. Winter road conditions on a freeway are such that you can safely drive 20 miles per hour. Your flaps are wide open and your spinner rotational speed is high so that you treat three lanes per pass. To achieve a target material application rate of 200 pounds per lane mile, set your conveyor on:

    A. Control setting 3

    B. Control setting 5

    C. Control setting 7

    D. Control setting 10

    The correct answer is D.

    To read the chart, identify the 20mph column. But here, since you are covering three lanes, you must apply three times as much material; that is, 3 x 200= 600 pounds. Find the value closest to 600 pounds. Read the control setting for this value.

    NOTE: If you were using a different material for this particular application (compared to the application for Questions 8 and 9), you would need to use a different chart.

11. [True/False] This particular chart only applies to the spreader/truck combination identified, for the stated gate opening.

    A. True

    B. False

    This statement is TRUE.

12. [True/False] This particular chart would not apply to other trucks or spreaders, or even to this same truck/spreader with a different gate opening. You would have to obtain a different chart.

    A. True

    B. False

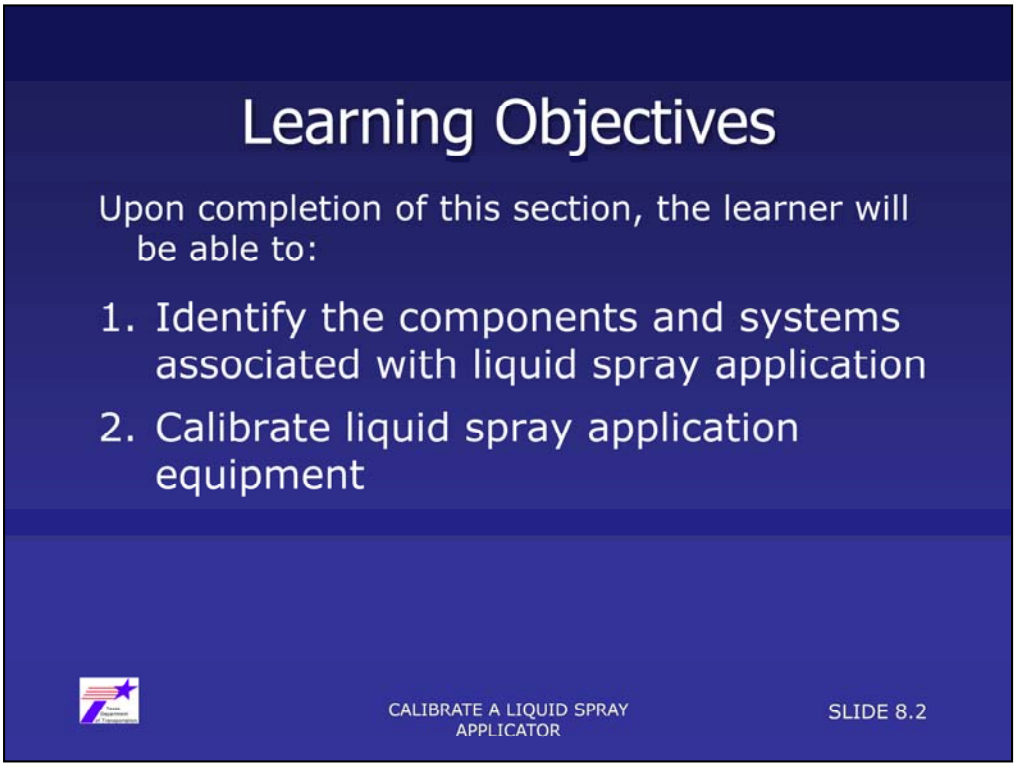
    This statement is TRUE.



Instructor Notes: Present the following key points.

In this module, we will discuss how to calibrate a liquid spray application rig. This is typically considered a PRE-SEASON activity.

As we shall see, proper calibration plays a key role in effective winter maintenance operations.

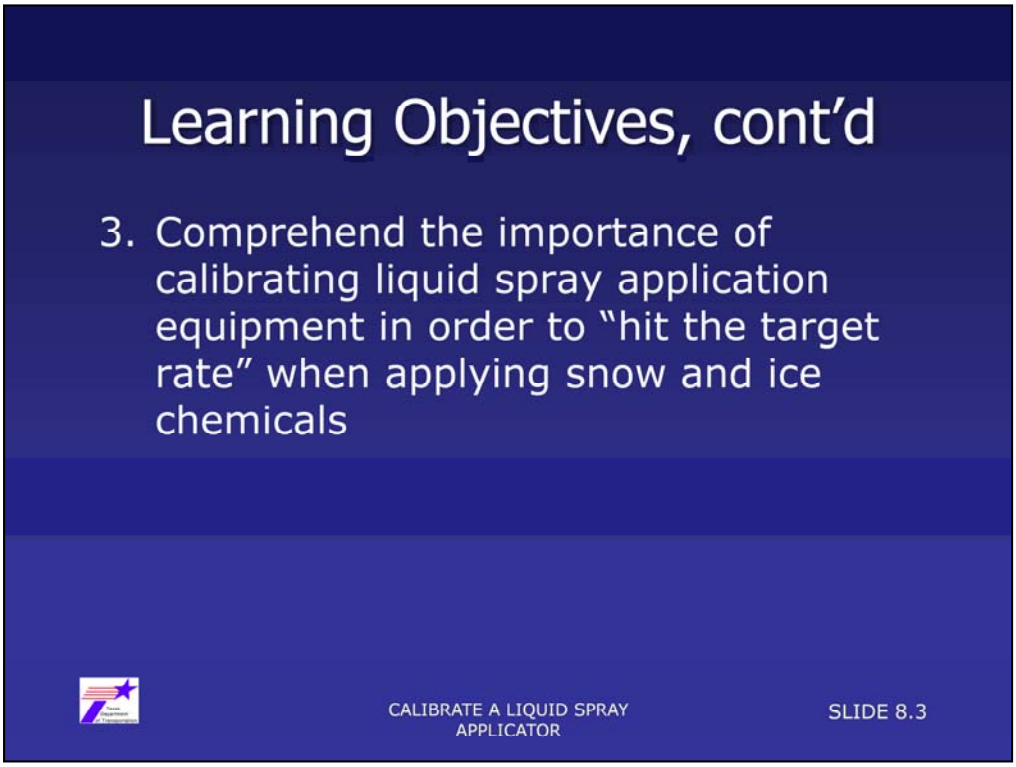


Instructor Notes: Present the following key points.

Note the learning objectives.

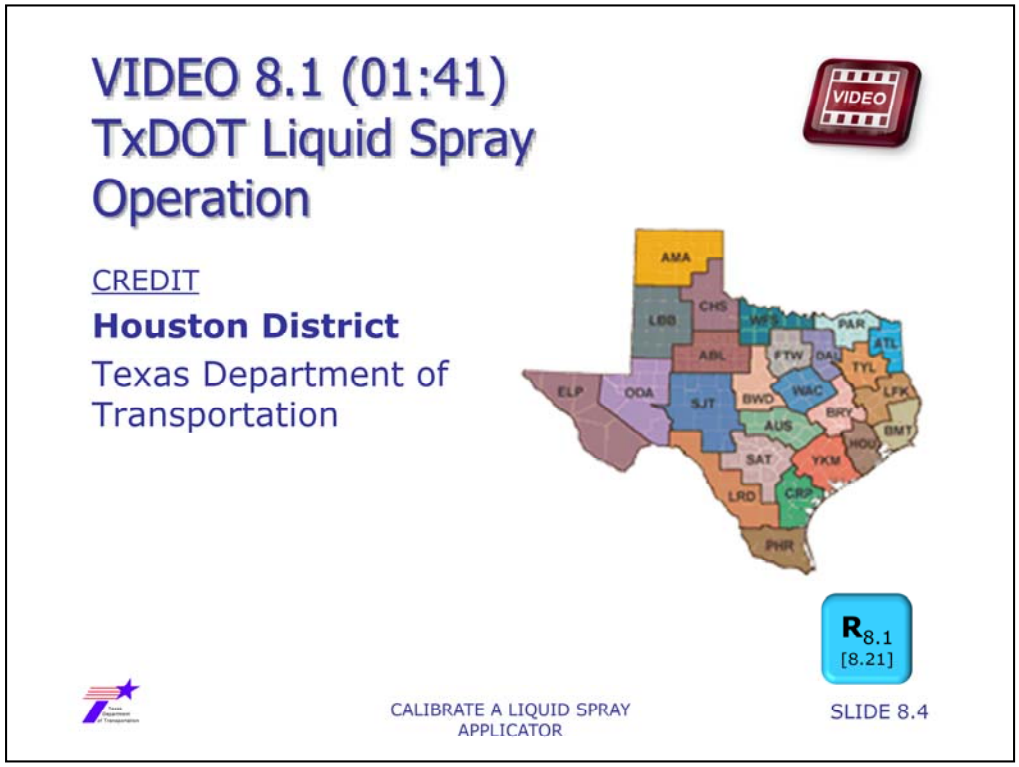
It is important to emphasize that, although we will complete a calibration exercise for a liquid spray application rig as part of this module, being able to independently calibrate a liquid spray rig is not an explicit objective for this training.

Your Supervisor will rely on you to help with the calibration in your maintenance section, but you will always work with a team to accomplish this. So when you see the calibration math a little later on, don't let that worry you. It is enough that you know people who can do the math. That is not a requirement for this class.



Instructor Notes: Present the following key points.

Understanding the calibration process is the key.



Instructor Notes: Present the following key points.

This film, from the Houston District, shows TxDOT liquid spray application rigs in action.



Instructor Notes: Present the following key points.

Let’s discuss the calibration process.

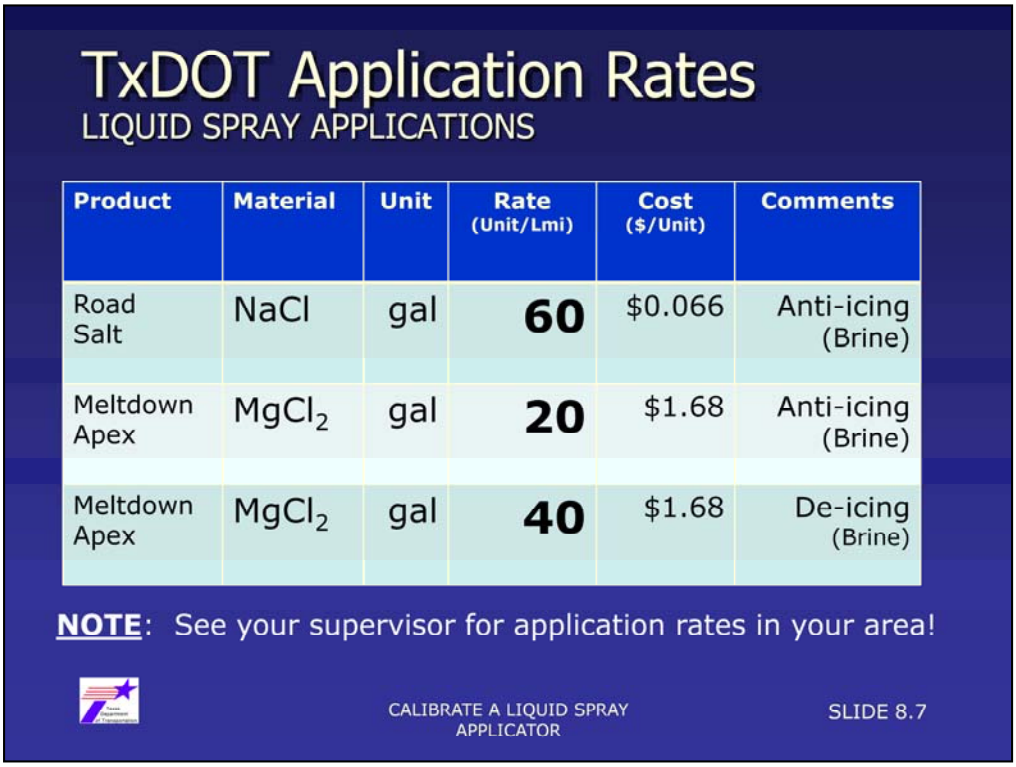


Instructor Notes: Present the following key points.

The goal of calibration is to confirm that the operational settings used for your liquid spray rig (nozzle size, delivery pressure, and ground speed) are reliable.

Reliability is why we calibrate.

As discussed for the V-box spreader, this is similar to why we sight in a firearm. We want to be able to hit the target (application rate).

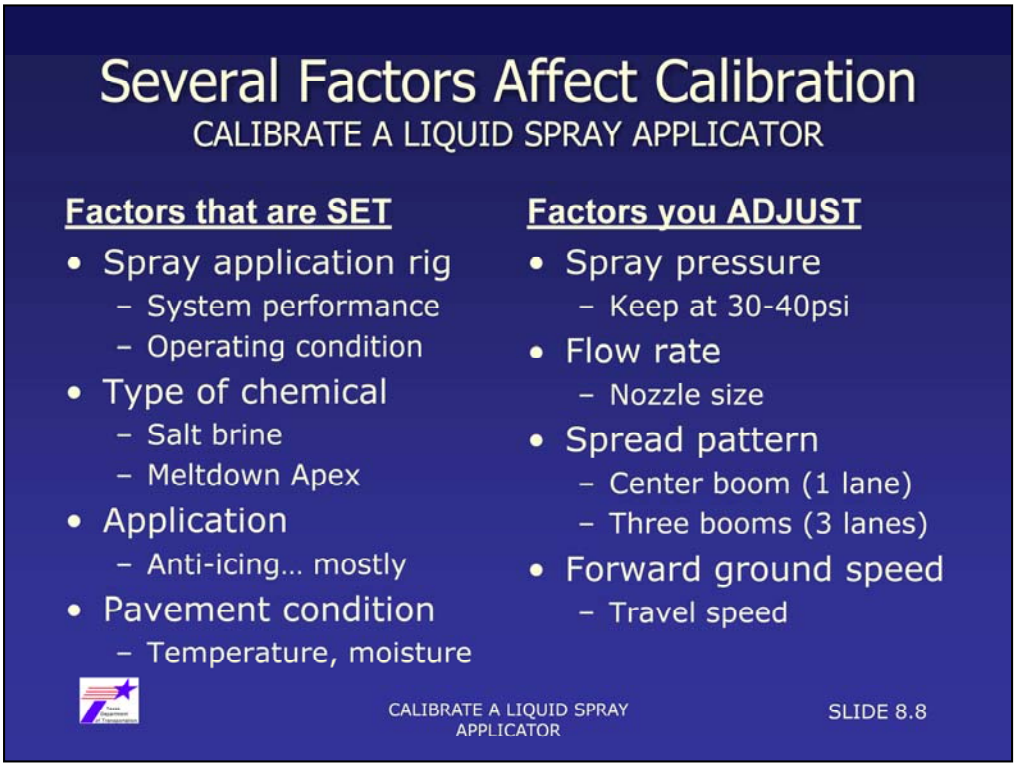


Instructor Notes: Present the following key points.

Recall that these are the standard application rates for liquid chemicals. These then, as adjusted by your Supervisor, become the target rates for your application.

The question is, what operational settings do you use to achieve this? At what speed?

Many variables need to be defined and set.

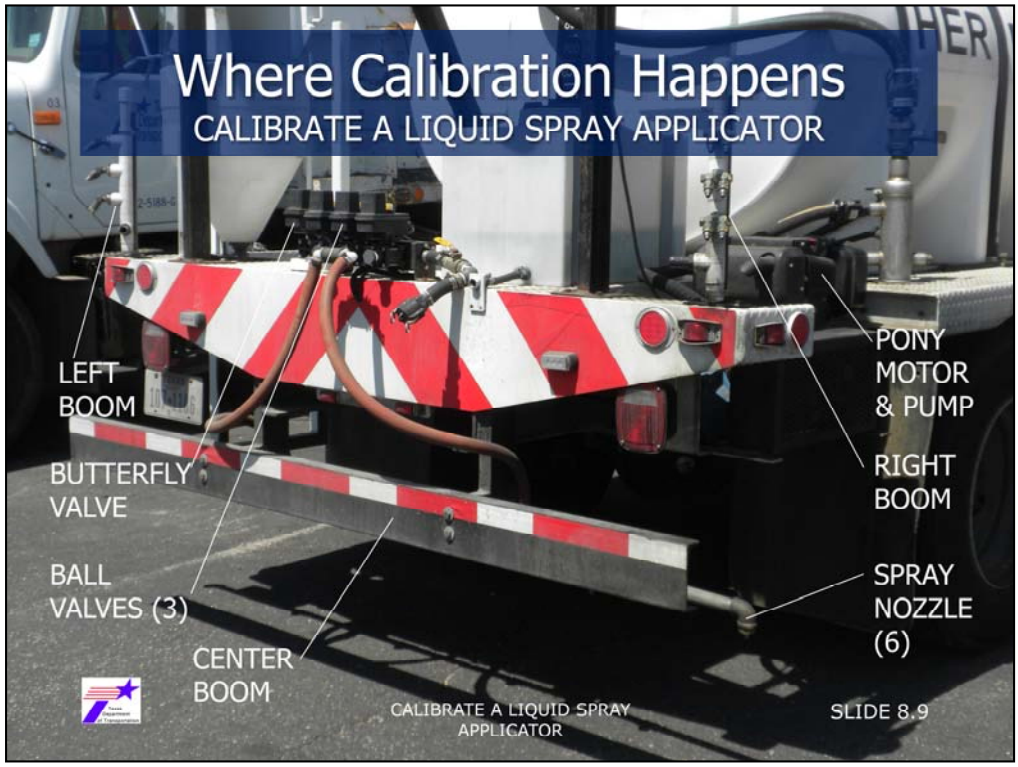


Instructor Notes: Present the following key points.

This slide identifies two sets of factors relative to calibration: (1) those factors that are SET and which you cannot do anything about, and (2) those factors which you can adjust.

Spend some time reviewing these. Comment on each of the factors in each column.

In particular, note that once you set the nozzle size, define the spread pattern, and establish the pressure at which you deliver chemical through the system, the main variable left for the operator is the forward ground speed. Weather and roadway conditions often dictate what can be achieved here.

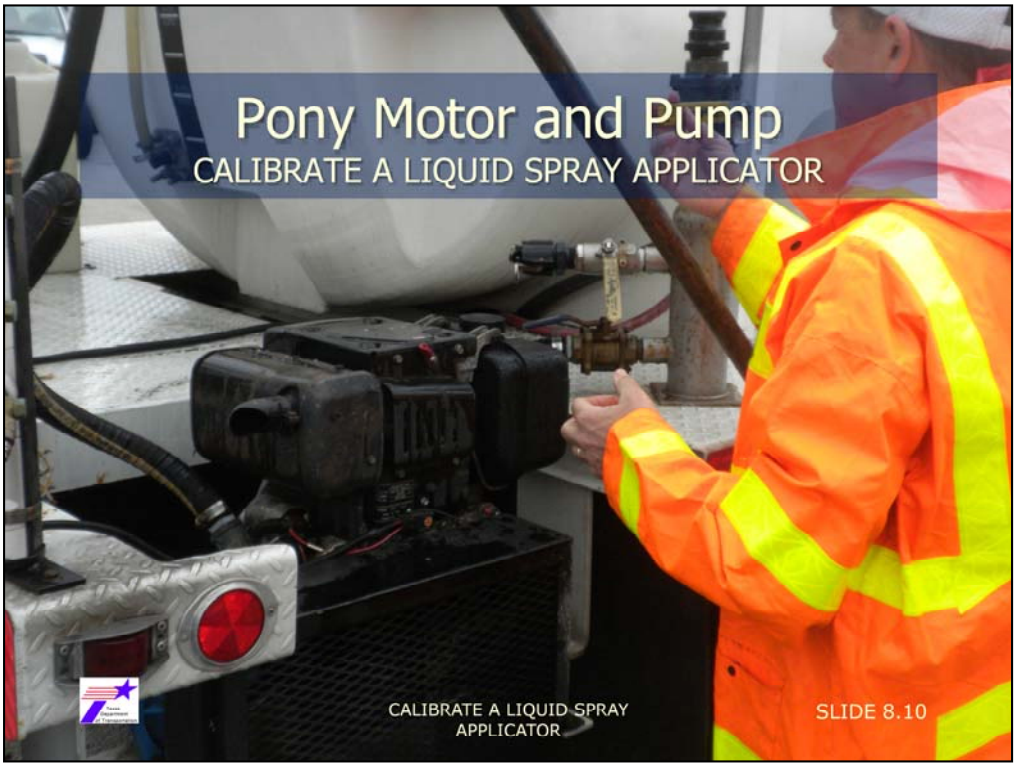


Instructor Notes: Present the following key points.

Calibration happens in the rear of the liquid spray application rig.

Note the specific components identified in the image.

Name and explain each one, working from the pony motor (power source that operates pump which generates flow) to the butterfly valve (regulator) to the ball valves, to the boom(s).



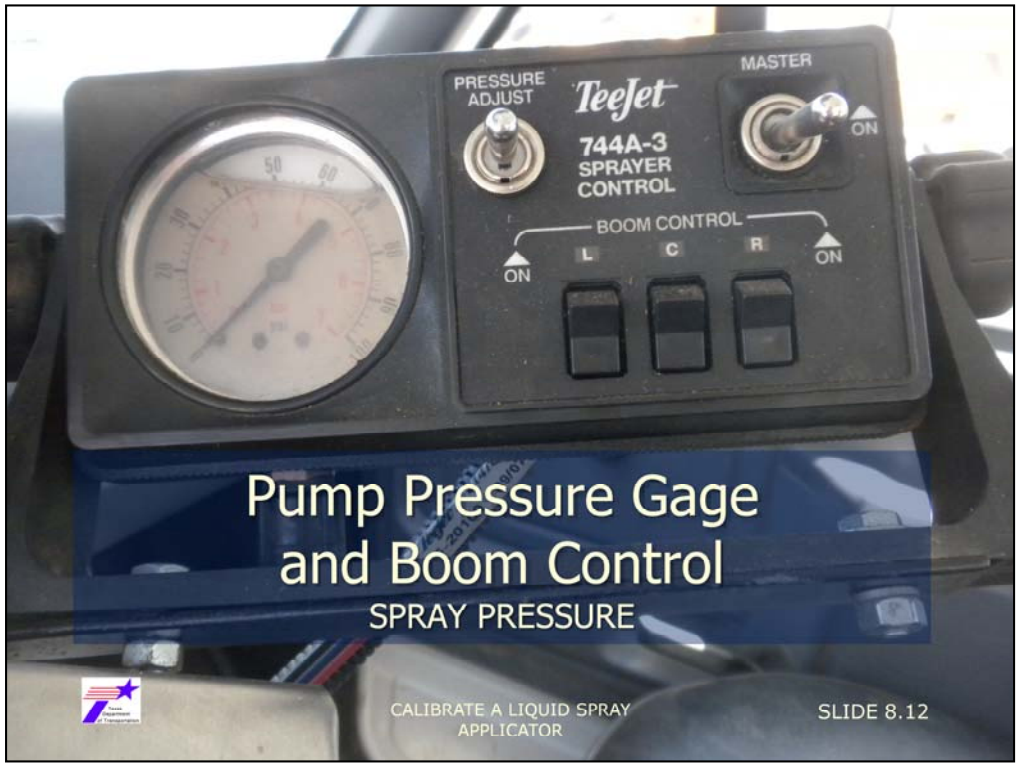
Instructor Notes: Present the following key points.

The pony motor is the power source that generates system pressure. It runs the pump which is what produces flow.



Instructor Notes: Present the following key points.

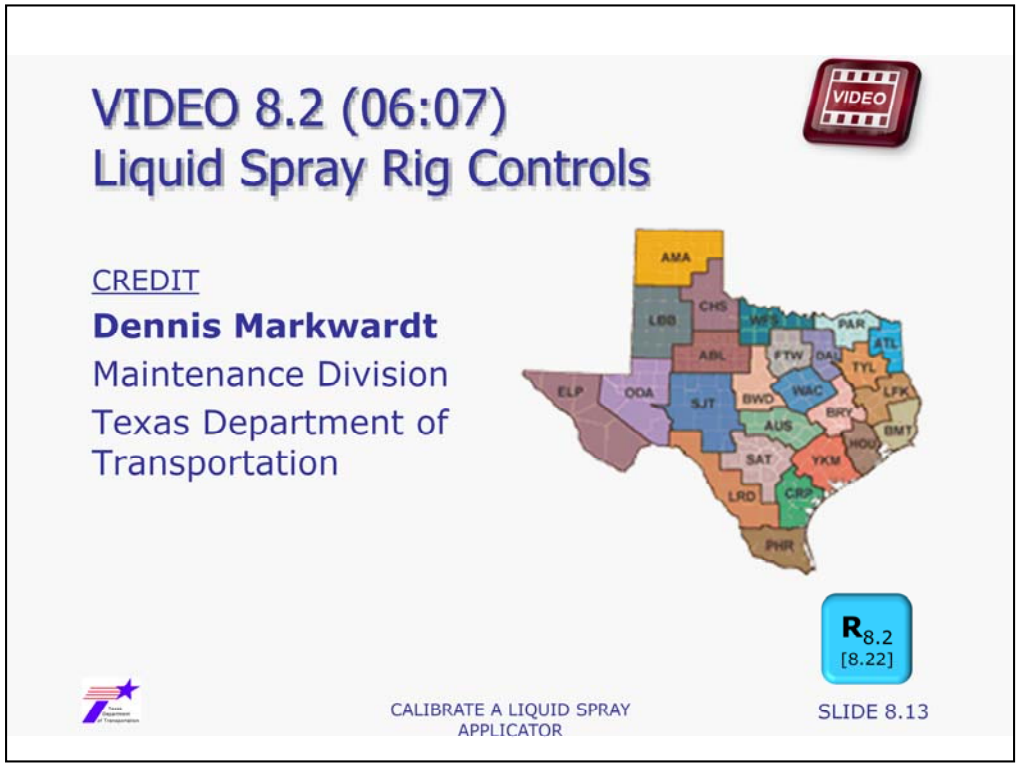
The on-off (ignition) switch and the speed control (throttle) for the pony motor are located in the cab, typically on the floorboard.



Instructor Notes: Present the following key points.

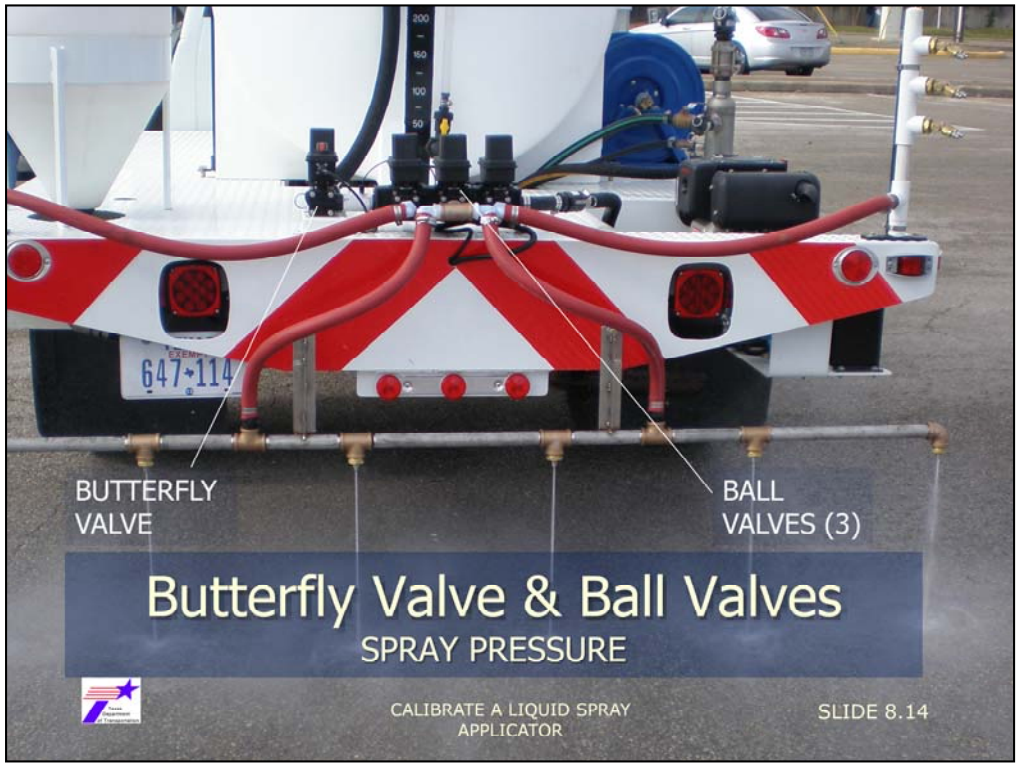
The pressure gage and boom controls are also located here.

These are specific to the snow and ice control function. Separate controls exist for the herbicide function.



Instructor Notes: Present the following key points.

This video, featuring Mr. Dennis Markwardt of the TxDOT Maintenance Division, provides an introduction to the controls for the liquid spray application rig.



Instructor Notes: Present the following key points.

Note the butterfly valve and the ball valves in the image.

The butterfly valve regulates system pressure. An operational control for this exists in the cab.

The ball valves direct flow to the various booms, either the center, or two, or all three.

All valves need to be tested to confirm functionality.

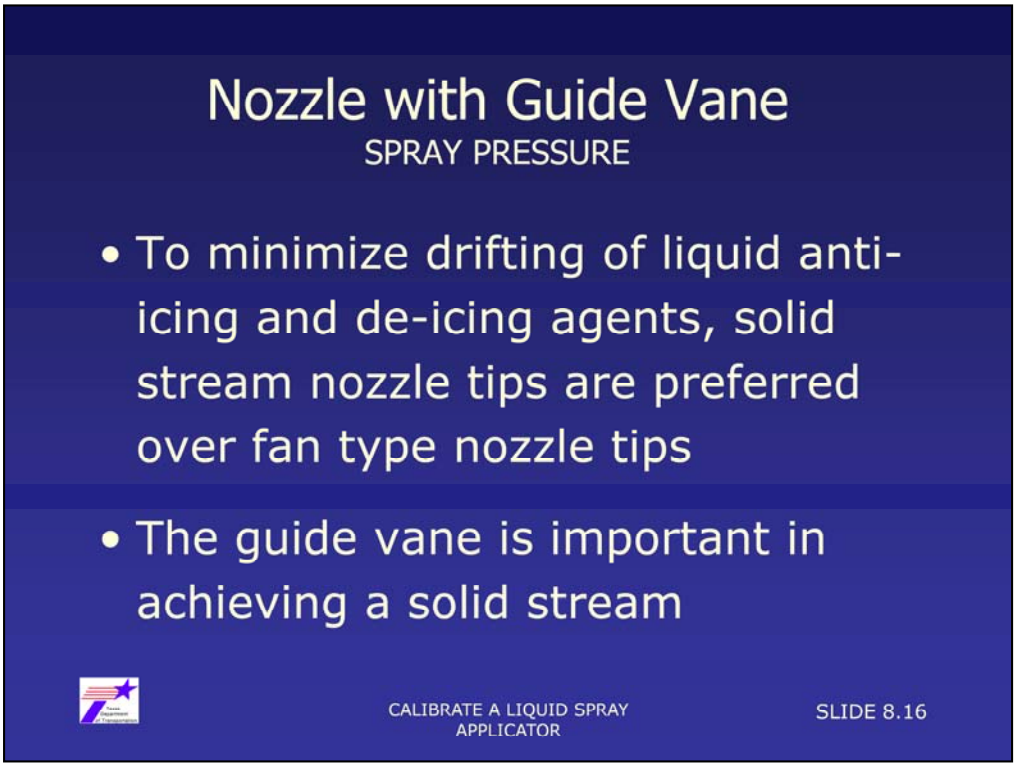


Instructor Notes: Present the following key points.

TxDOT uses solid stream nozzles for application of anti-icing chemicals.

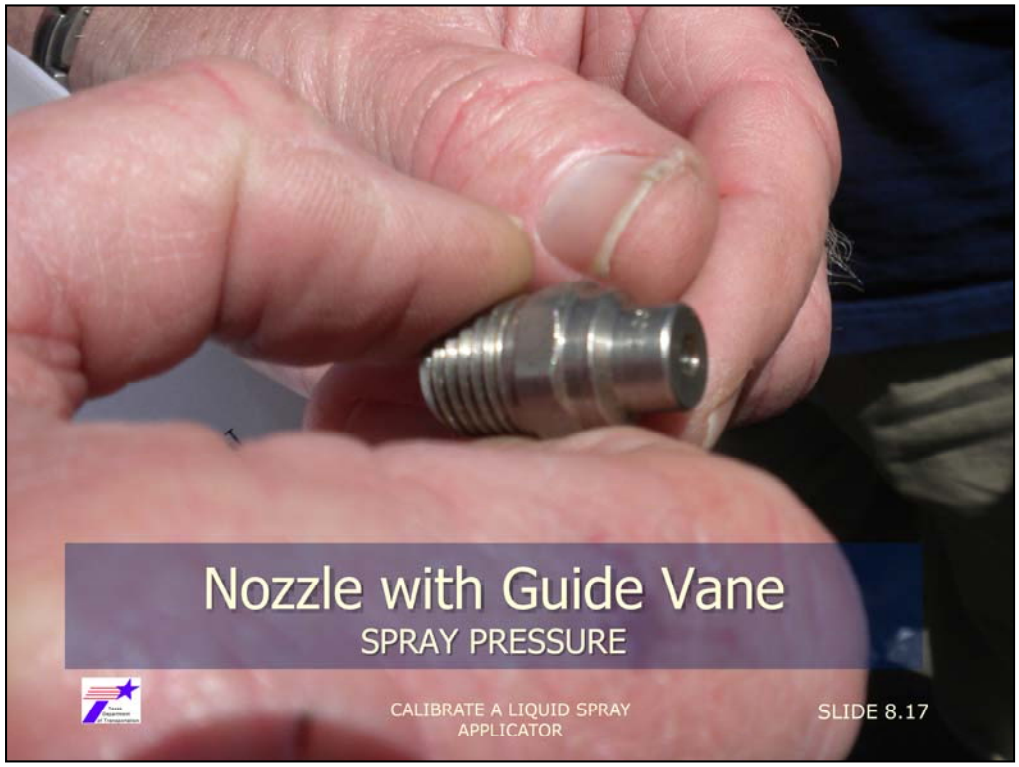
All nozzles in the system should be the same size.

Different nozzle sets are required for different types of chemical (Meltdown Apex vs. salt brine), because of the different application rates.



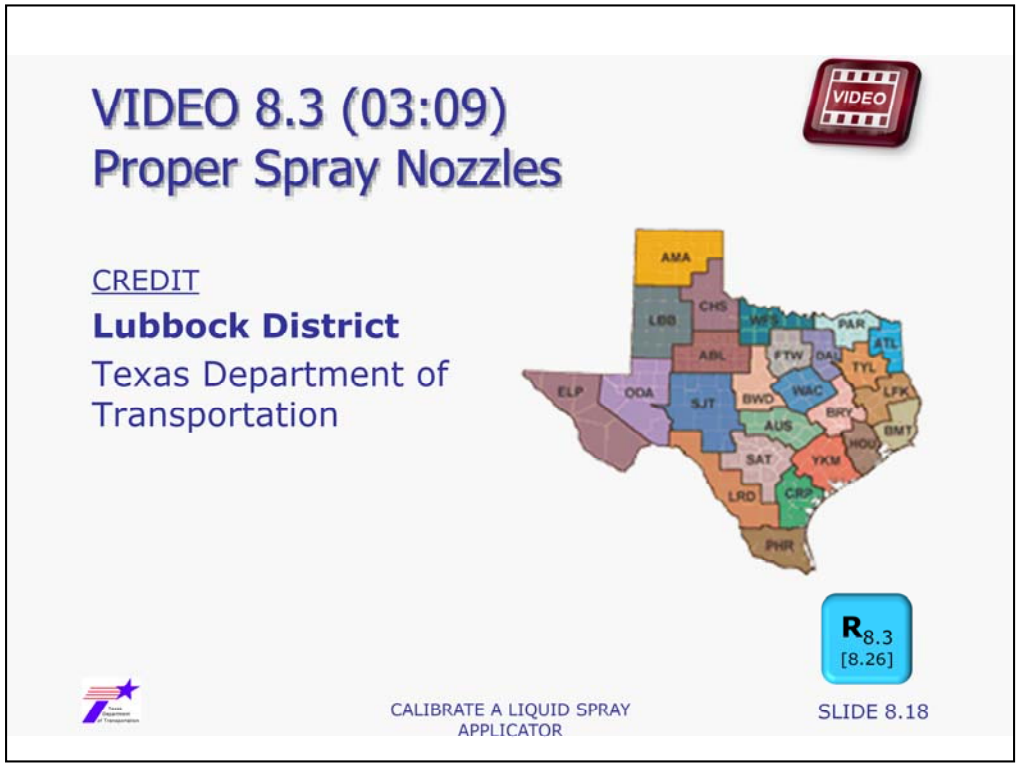
Instructor Notes: Present the following key points.

Not only does TXDOT use solid stream nozzles, to prevent drift while applying chemical to the road at speed, the nozzles should have a guide vane insert.



Instructor Notes: Present the following key points.

Use the guide vane in the nozzle.



Instructor Notes: Present the following key points.

This film explains the difference between nozzles with a guide vane, and those without a guide vane.



Instructor Notes: Present the following key points.

TxDOT liquid spray application rigs often are modified herbicide rigs. The herbicide booms are in the front of the vehicle. The snow and ice chemical booms are in the rear of the vehicle.

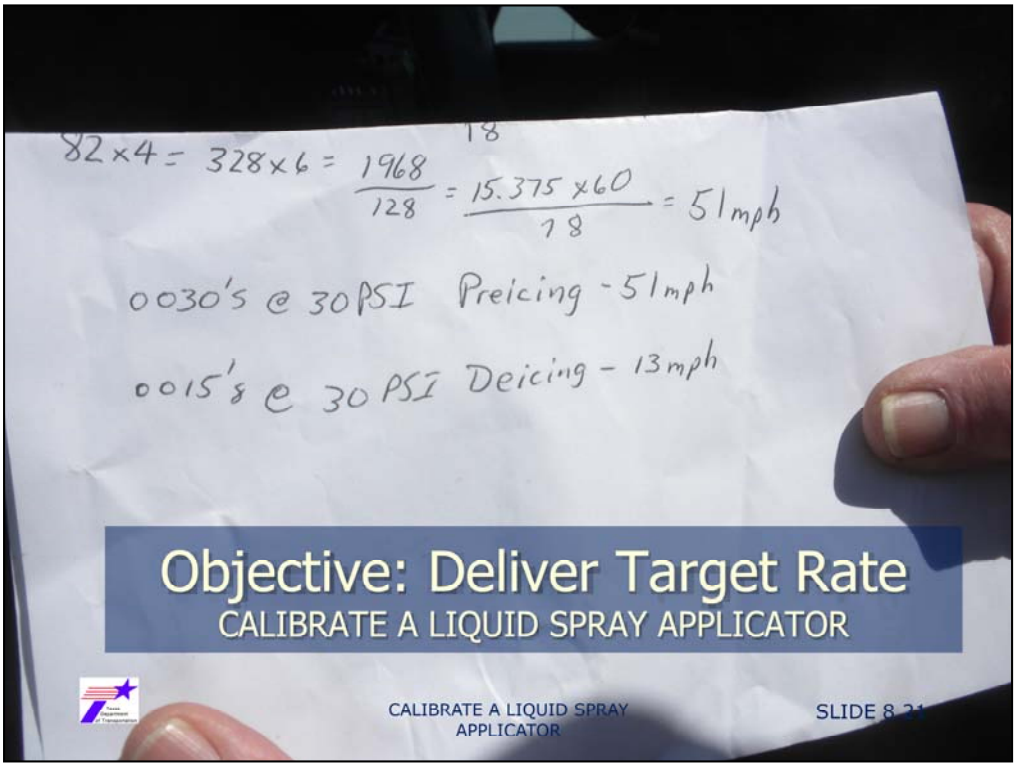
The liquid spray rig operation may only treat one lane, which typically will only use the center boom.

Or, the operation may treat up to three lanes, which would require use of the left, center and right booms. Boom adjustment to achieve an adequate spread pattern will need to be confirmed.



Instructor Notes: Present the following key points.

Forward ground speed is typically the primary goal of the calibration process. Since anti-icing is done in traffic, this speed is set with consideration to the type of application and traffic conditions, as well as the chemical being used.



Instructor Notes: Present the following key points.

With the correct nozzles in place, the boom spread pattern set, and the type of chemical known, the liquid spray rig operator will set the system pressure to the designated value and will travel at the designated speed.

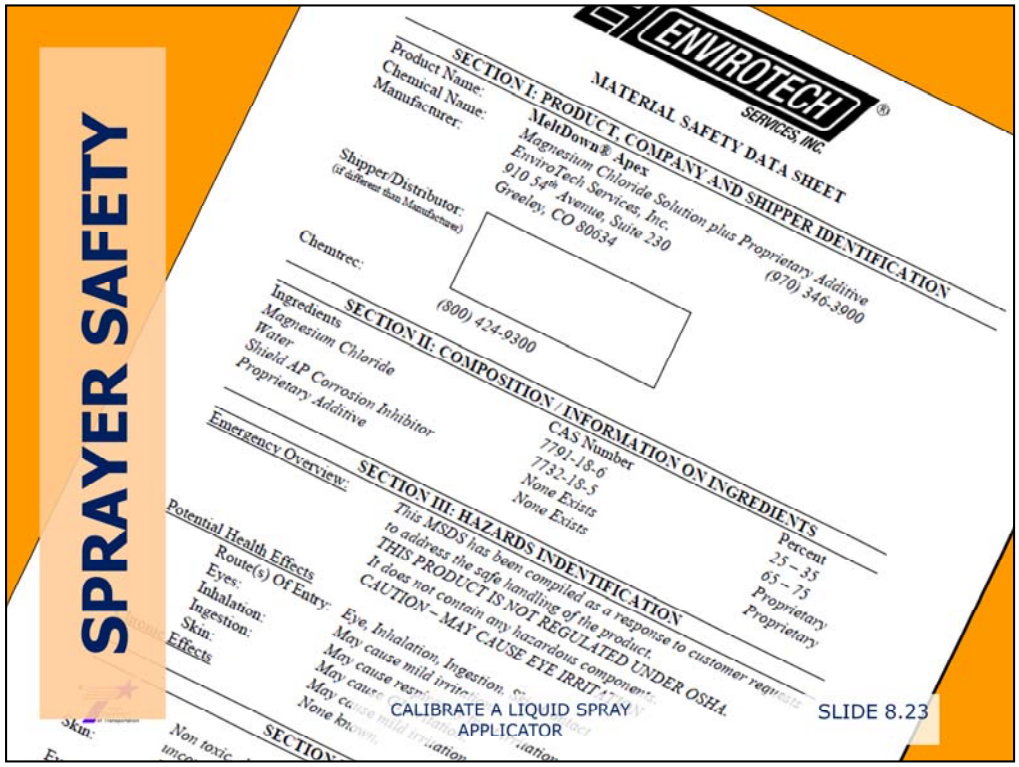
If the liquid spray rig is properly calibrated, this should deliver the correct amount of chemical to the roadway surface.

That is what calibration is about.



Instructor Notes: Present the following key points.

We will now discuss the calibration process.

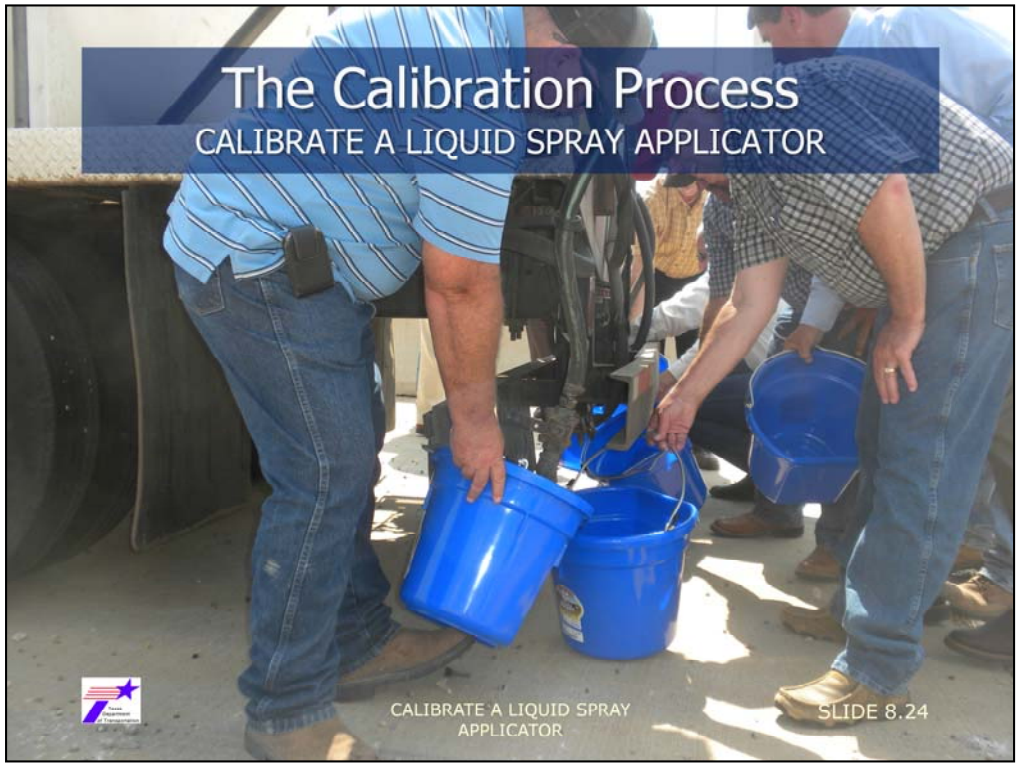


Instructor Notes: Present the following key points.

SAFETY FIRST.

Know the chemicals you will be using, read the MSDS for these chemicals, and use proper PPE.

Calibrate safely.

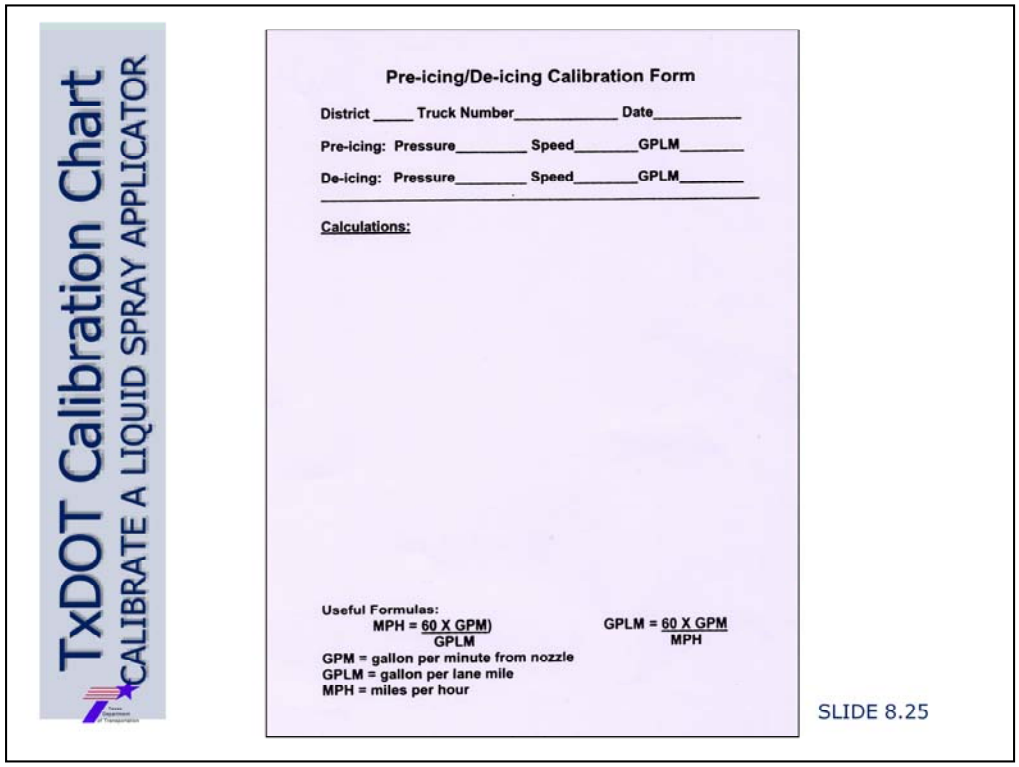


Instructor Notes: Present the following key points.

The calibration process for liquid spray application rigs is actually very straightforward.

If the system is configured correctly and you confirm that all components – the motor, pump, valves, nozzles, etc. – are in good working condition, calibration is as follows:

1. Set your system pressure to a target value.
2. Operate the system for 15 seconds.
3. Capture the flow volume from each nozzle during this 15 second period (the blue buckets shown in the image).
4. Measure the flow volume in ounces, and record for each nozzle.
5. Do the math.



Instructor Notes: Present the following key points.

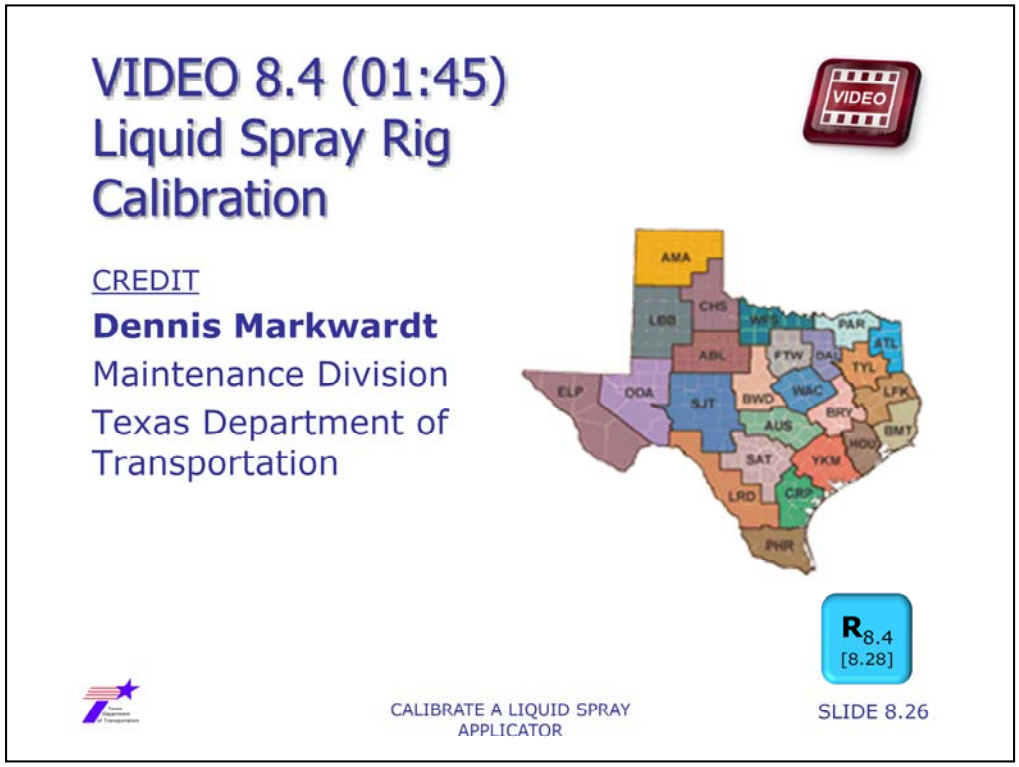
This image shows the liquid spray rig calibration form.

Note the “useful formulas” at the bottom of the page.

GPM is calculated based on the volume of flow you capture from the nozzles during the calibration exercise, using the buckets, at the pressure you designate.

GPLM is the target application rate (your supervisor will tell you this).

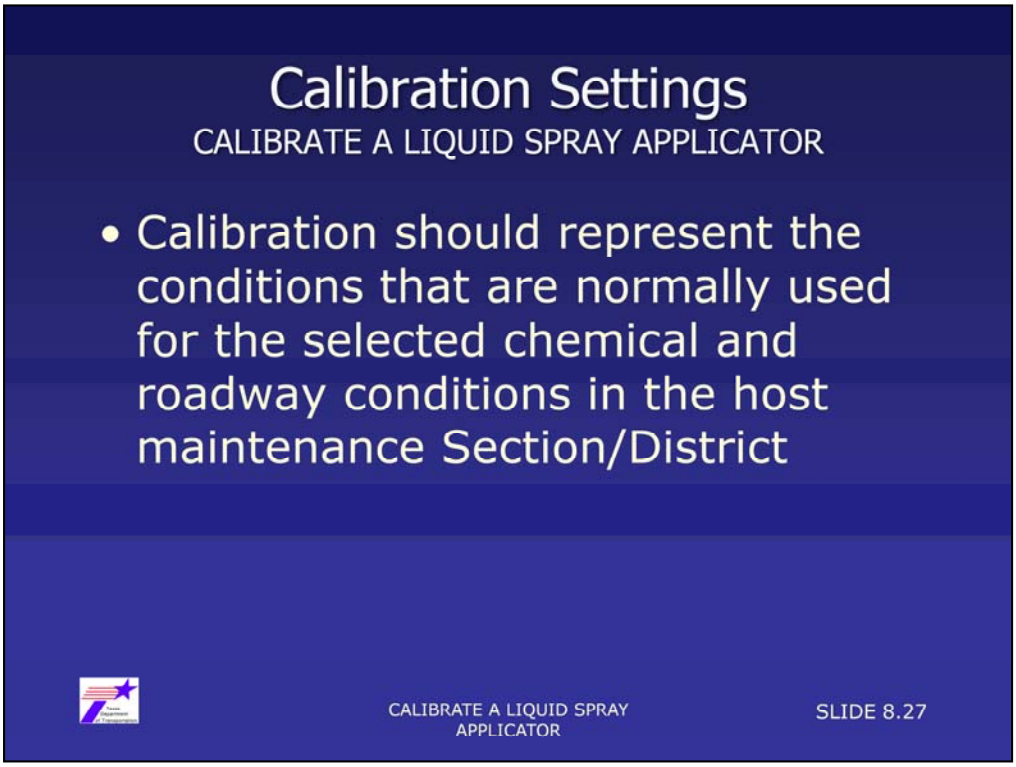
MPH is the application speed for the vehicle. This is what the operator needs to know.



Instructor Notes: Present the following key points.

This video, featuring Mr. Dennis Markwardt of the TxDOT Maintenance Division, explains how most of the effort associated with liquid spray rig calibration is devoted to getting the equipment ready and making sure that all system components are operational.

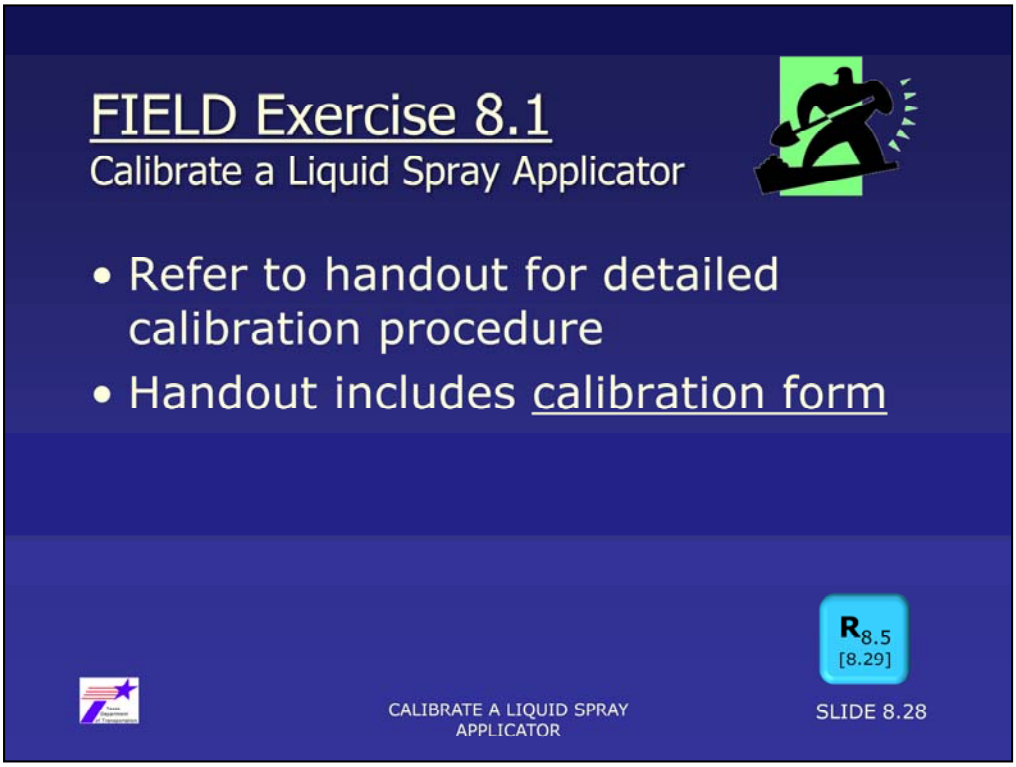
After that, in Dennis' words, "Calibration is easy."



Instructor Notes: Present the following key points.

As we prepare to do the calibration exercise, we will select calibration settings specific to this District.

NOTE that for this learning exercise, we will calibrate using water. Actual calibration would require use of the chemical.

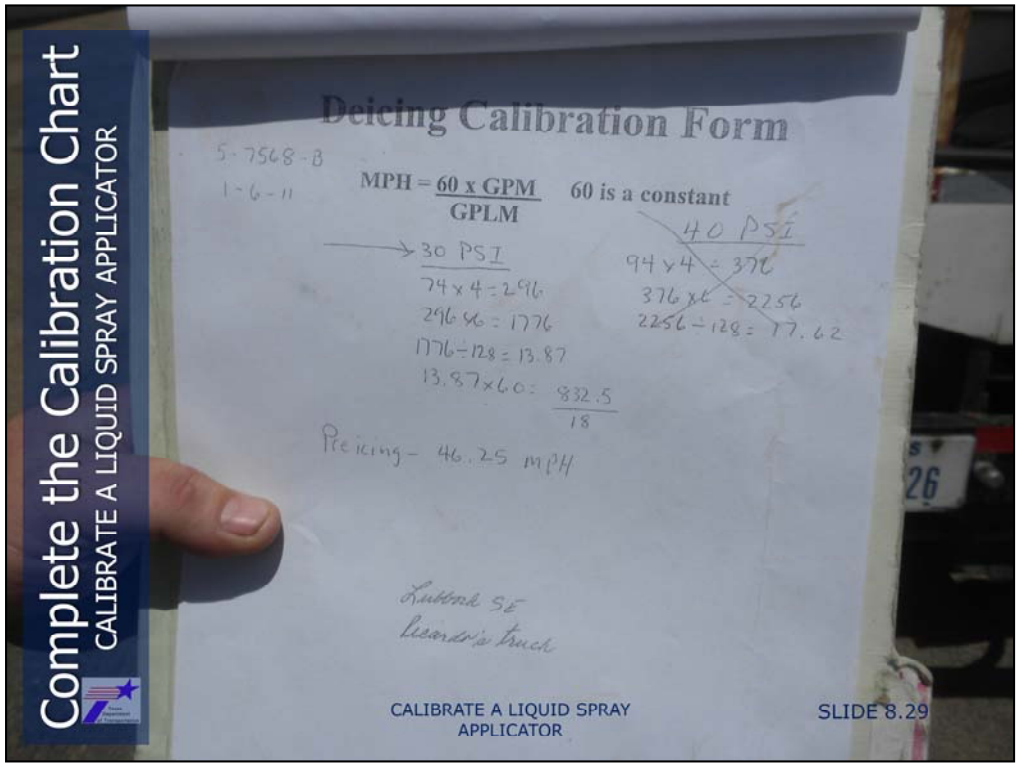


Instructor Notes: Present the following key points.

GREEN SHEET.

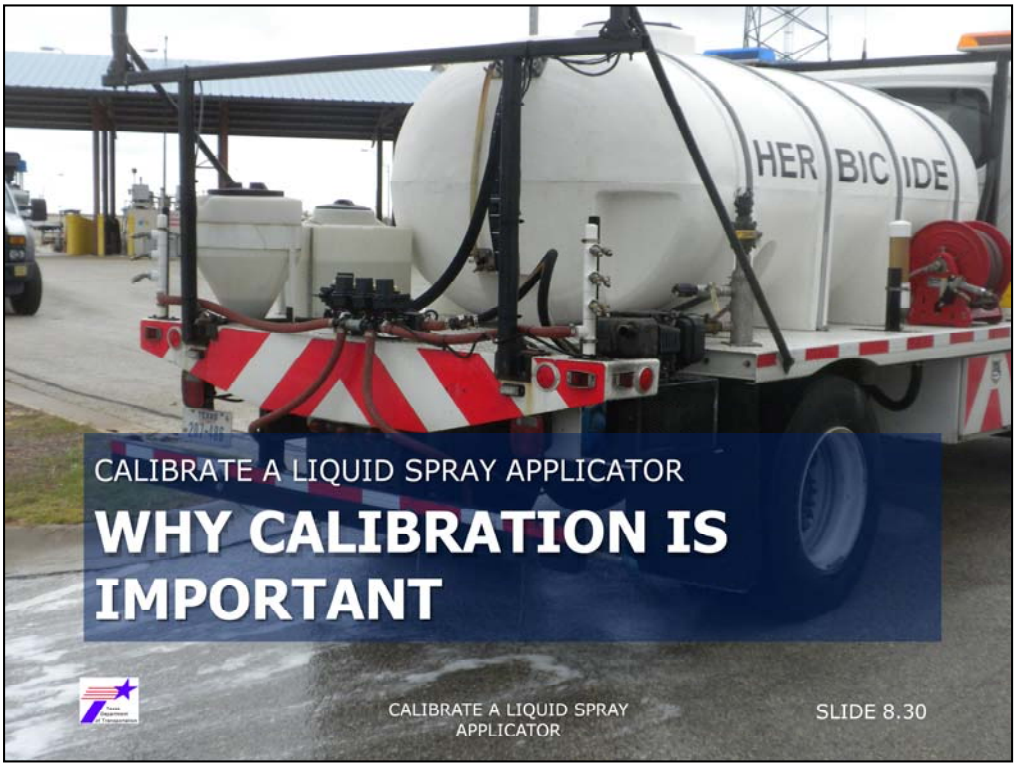
The calibration exercise will collect GPM data for the nozzles, from which you can calculate MPH.

Reference R8.5 presents the full calibration process in detail.



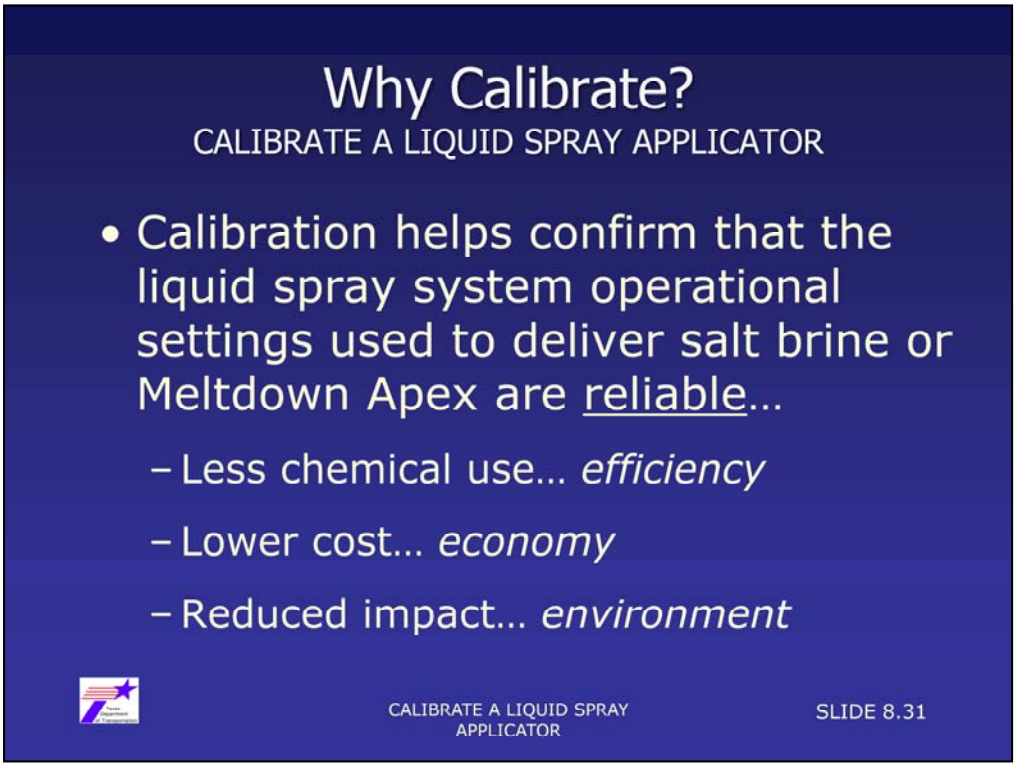
Instructor Notes: Present the following key points.

With data gathered from the calibration exercise, we can do the math and evaluate the settings for the liquid spray rig.



Instructor Notes: Present the following key points.

From the exercise, some of the reasons why calibration is important should be apparent.



Instructor Notes: Present the following key points.

To summarize, calibration is beneficial in terms of:

EFFICIENCY
ECONOMY
THE ENVIRONMENT

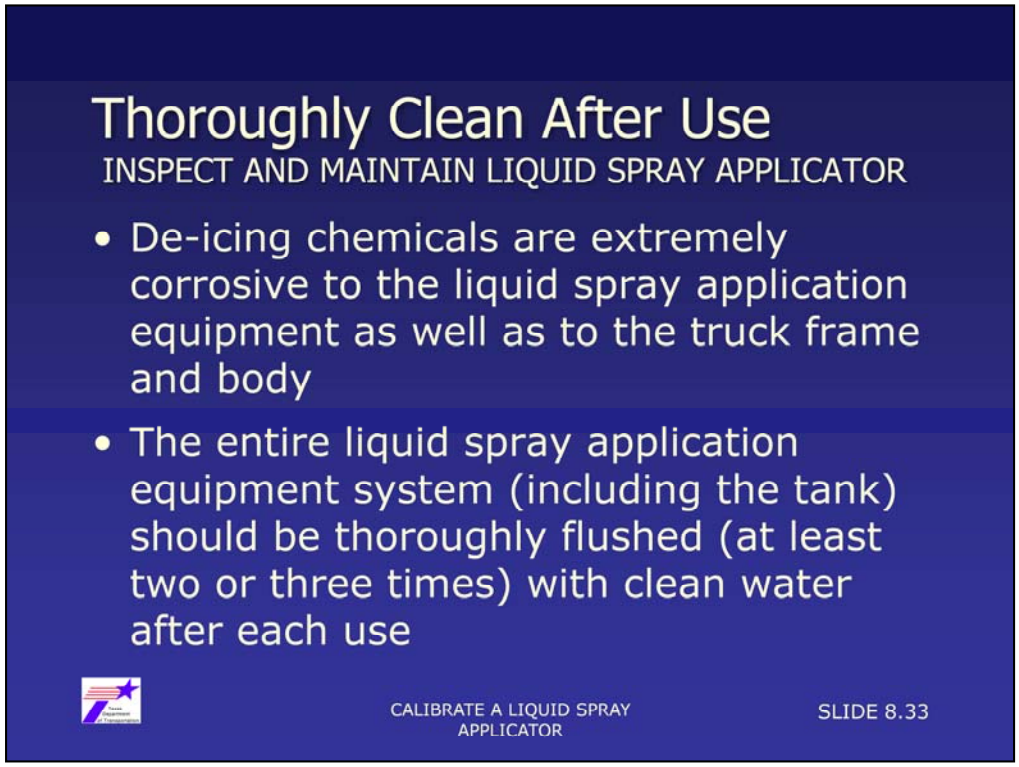
It makes sense.



Instructor Notes: Present the following key points.

TxDOT is moving toward calibrating equipment every season.

This is necessary because of normal wear and tear, corrosion, and usage factors that will affect system performance.



Instructor Notes: Present the following key points.

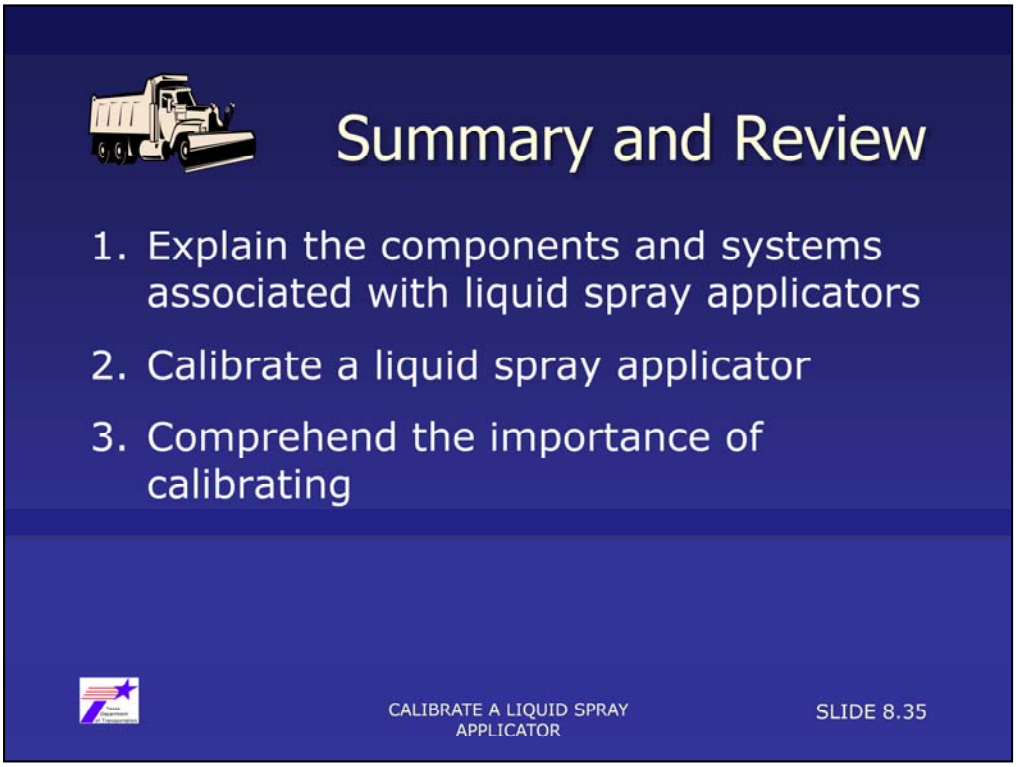
As has been noted, snow and ice control chemicals are corrosive!

The liquid spray application rig should be thoroughly flushed and cleaned after use. This includes metal surfaces (the truck frame and bed) which should be protected from corrosion.



Instructor Notes: Present the following key points.

The snow and ice control chemicals are corrosive!



Instructor Notes: Present the following key points.

PINK SHEETS!

Answer all questions.


FIELD Exercise 8.1
Calibrate a Liquid Spray Applicator
• Refer to handout for detailed calibration procedure
R8.5
[8.29]
CALIBRATE A LIQUID SPRAY APPLICATOR
SLIDE 8.28

VIDEO 8.1. TXDOT LIQUID SPRAY OPERATION (01:41)

SCRIPT

This video, taken in the Houston District, shows TxDOT liquid spray rigs that have been converted for anti-icing applications.

The process begins with filling the tanks of the liquid spray rigs with anti-icing chemical.

For a heavy traffic operation, it is necessary to plan the application and to communicate the plan. For safety purposes, everyone on the team needs to know his or her role.

Roadway maintenance operators in metropolitan areas often apply anti-icing chemicals in a tandem operation which includes multiple spray rigs, multiple support vehicles, and in some cases, assistance from the highway patrol.

TxDOT mostly uses magnesium chloride, known as Meltdown Apex, as its anti-icing chemical.

The idea behind anti-icing is to place chemical on the road before the storm so that frost or black ice will not form on the roadway surface. This applies especially to bridges, overpasses, ramps, and known trouble spots.

The spray rigs are equipped with three booms and can apply chemical up to three lanes at a time.

Depending on the calibration, anti-icing chemical is applied in traffic, at speeds of about 30 to 45 miles per hour. Safety first! The support vehicles help protect both the spray rig and the traveling public.

VIDEO 8.2. LIQUID SPRAY RIG CONTROLS (06:07)

SCRIPT

Dennis: Alright.

This is the controller for the de-icing boom. You basically have three switches on here, one for each of the different boom sections: left, center, right. You also have a master switch that you can just turn them all on or off at one time.

Dennis: Now, when you are out there spraying say, for example, they are spraying on the center one, and they turn on the left one, your pressure is going to drop.

Bill: Yep.

Dennis: And to adjust that pressure, you just hold that pressure switch up and it will close that butterfly valve and your pressure will get back up. And you know, really what I want people spraying at is at 40 psi.

Bill: Yeah.

Dennis: And that's exactly what those nozzles are set for, say it's a 0030G is set for 3 gallons a minute for 40 psi so we try to always run it at 40 psi. If you turn all three of them on, your pressure will really drop so that butterfly valve you can adjust it to get that pressure back up.

Bill: And do the best you can.

Dennis: Do the best you can. This controls the independent engine in the back (pony motor).

Bill: I see.

Dennis: Okay. Of course, your on and off switch, but this controls the RPM's so if you are not getting enough pressure to run all three of them, you can jack the RPM's up on that motor and get more output on the pump.

Bill: I see. I see.

Dennis: Once you get plenty of output, you leave it alone.

Bill: And by the engine, you are talking to the pony motor back there?

Dennis: Yes sir.

Bill: Gotcha. That is running that pump back there.

Dennis: Yes sir.

Bill: Okay.

Dennis: Now if you are out there spraying in the center lane and you know you are about to turn on another boom section, it's good to go ahead and flip that switch a little earlier and start raising that pressure because that butterfly valve has a slow delay on getting that pressure back up. So it will already start closing when you flip that other switch on, and you don't have as big of a pressure drop that way.

Bill: Gotcha.

Dennis: Guys really have to be paying attention what they are going to be doing with that pressure switch also. And like I said, we try to spray at 40 psi. If this pressure drops to 20 psi, we are not even going to get that close to the right rate of product; so it is really important trying to maintain that pressure. So when it comes to maintaining this truck, that butterfly valve is very important on how that boom is going to work. A lot of people say, I want to run my pump slow or fast; I personally like to run it fairly fast to make sure I have plenty of fluid.

Bill: Yeah.

Dennis: These motors can run all day long with it.

Bill: Yeah. You would like to run it really fast and choke it down on the butterfly valve. Is that what you are saying?

Dennis: Yes sir. I would rather have enough pressure back there and enough fluid that I can operate everything off of this.

Bill: Yeah.

Dennis: And not have to worry about "Oh gosh, I need to jack this down then I need to do this."

Bill: There are only so many knobs that you need to be messing with when you are driving down the road.

Dennis: Yes sir. So when it comes to maintaining this system, whenever they are done spraying mag chloride or brine, I don't care what it is, they need to especially rinse. They really need to rinse these trucks, not just once, not just run some water through it, they need to run water through it 2 or 3 times and make sure that material is cleaned out good.

Bill: Yeah.

Dennis: This we read speed with.

Bill: Okay.

Dennis: And the main reason is because I mean look right now, the speedometer says we are doing 4 mph.

Bill: Right, gotcha.

Dennis: So what we do is we calibrate this calc-an-acre.

Bill: What did you call that?

Dennis: This is a calc-an-acre.

Bill: A calc-an-acre.

Dennis: Yes sir.

Bill: Okay.

Dennis: And all it does for us is read speed. Now farmers can use it to calculate how many acres they sprayed that day and that kind of stuff but when we spray, we vary our boom widths so it can't calculate that for us but we do use it to read accurate speed, and that is our main goal here. You know we tell someone to drive 10 mph and then all of a sudden, they drive 8, there is 20 percent messing up already.

Bill: Right.

Dennis: So it is really important to drive the right speed. We really try to hammer it into these guys to really try to drive that right speed.

Bill: Gotcha.

Dennis: Now on de-icing or anti-icing, you know it says apply 15 to 20 gallons per lane mile. So I try to calibrate these trucks at 18 gallons per lane mile. That way we have a little come and go and still be able to put out the right amount of product without causing us problems or grief.

Bill: So then whether you are spraying mag chloride, which most people are, or whether you are spraying brine, the controls are the same but if you are using only mag chloride you might have a different nozzle configuration back here than if you are using brine because you are using a higher flow rate for the treatment.

Dennis: One thing I try to tell people if you are going to be setting up, whether it be brine or mag chloride, I ask them, "What speed do you want to make that application at?" For example, I have some guys that want to put it at about 45 mph on a pre-treatment. I have other guys that want it at 20 mph. Well to accomplish that, all you really need to do is make sure you get the right nozzles back there. Make sure all the nozzles are the same but make sure the right nozzles are back there so you can make that application at those speeds.

Bill: Right, so if you know your chemical, and you know what rate you are supposed to use, then you select your nozzle. Then you can back in what rate you need (and you know what rate you want), you can kind of match the nozzles to the chemical and the rate; is kind of the way it works.

Dennis: And the speed.

Bill: And the speed.

Dennis: So for example, I had a guy in one district that said, "All I am doing is interstate, 100 percent, I am never on an off ramp or anything, only interstate. Can you set me up at 55 mph so I do not get run over out there while doing a pre-treatment?" Sure, we just put him some bigger nozzles on there so he can put that volume out there and do that speed and do it safely.

VIDEO 8.3. PROPER SPRAY NOZZLES (03:09)

SCRIPT

This video discusses the importance of having the proper nozzles for your liquid spray application rig.

This close-up of the center boom shows the different nozzles and their configuration for an anti-icing application.

Here, Dennis Markwardt of the TxDOT maintenance division is removing one of the nozzles which he suspects does not have a required component, namely, a guide vane.

The idea is to compare nozzles that do not have a guide vane with those that do, so you can see the difference.

The problem is not that this nozzle is improperly sized. The problem is that the nozzle does not have a guide vane, which negatively affects its spray pattern.

Notice that the base opening for the nozzle without a guide vane is clear. You can see right through it.

TxDOT uses stainless steel, solid stream nozzles. The base of the nozzle threads into the spray boom. The orifice, or nozzle opening, is sized to provide a flow rate of 2 gallons per minute at 40psi pressure, which is normal for anti-icing applications using magnesium chloride.

This view shows the two types of nozzles size by side. The base of the one nozzle, which still has its brass adapter, is open. The base of the other nozzle has the small “X” in it. The “X” is the metal guide vane.

The nozzle with the guide vane is the one you want. It is designated “Double O Twenty Gee” or 0020G.

Dennis has assembled a parts catalog for these liquid spray rigs. Your supervisor will have a copy. You can purchase the correct nozzles - with the guide vane - by ordering the nozzles designated “Double O Twenty Gee”.

One of the checks for liquid application rigs is to make sure all nozzles are sized correctly. Nozzle size will vary by application, whether you are doing anti-icing, which is typical, or de-icing. Nozzle size also depends on the type of chemical you use, whether it is road salt (termed salt brine) or magnesium chloride.

Whichever your application, all nozzles should be the same size. Again, you want the nozzle with the guide vane.

Dennis is now going to replace one of the nozzles on the right boom, so you can see how the two types of nozzle streams compare.

From a distance, the nozzle streams look alike, but with a close-up view, you can really see the difference in the two nozzle streams.

The nozzle without the guide vane has a wider, more diffuse stream. This wide stream will not carry as well in the wind as you are driving down the road. In contrast, the nozzles with the guide vane have a solid, straight stream. The stream is more pure, or dense, so the liquid will carry farther.

The solid, pure stream is what you want.

VIDEO 8.4. LIQUID SPRAY RIG CALIBRATION (01:45)

SCRIPT

Dennis: Knowing what to look for and at least going out there and calibrating that thing one time a year before going out there is such an important factor. Even though they set these 2 years ago, things happen in 2 years. Like this thing here (referring to the nozzles on one of the side booms).

Bill: Because corrosion happens, among other things.

Dennis: Yeah but for even example here, somebody could have bumped that and shifted it back a little bit and that's why it is not covering out as far. You know, loosen that thing up and move it back in the right place and then reset those nozzles that will cover that other lane better.

Bill: Right.

Dennis: That's the kind of things that we need to look for every year and a lot of people just take it for granted (that things have not changed).

Bill: You look for that every year, the right coverage, the right nozzles, make sure that the RPM's on the pump are going the way they need and that it is properly adjustable; you look for the right kind of stream, not just the right size nozzle but the right kind of stream. The same size nozzles in the whole system, whether you are doing anti-icing or de-icing associated with the kind of application you are going to do and the rate that you are trying to hit. You look for the right kind of valves and that these are functioning right. You make sure your butterfly valve is working properly so that it operates.

Dennis: And then once all that is done, you calibrate it which takes about a minute. Everyone says you need to come calibrate it. Calibrating is easy, you just stick a bucket underneath there and get your gallons per minute and you are done.

Bill: Yeah.

Dennis: Your spray width is, you know, I got a formula there. And your spray width is all set and you just put in how many gallons per minute. You're catching it so it can tell you how fast to drive.

LEARNING EXERCISE 8.1

Calibrate Liquid Spray Application Equipment

Winter Weather Operations Training

Equipment Needed for this Exercise:

1. Liquid spray application unit (rig)
2. Hand tools as needed for repairs, component replacement and calibration
3. Appropriate buckets/containers to catch liquid from one or more nozzles during the calibration process
4. A graduated container that is capable of accurately measuring a volume of liquid up to 1.00 gallon
5. Stop watch or watch with a second hand or function (readout)



LIQUID SPRAY APPLICATION RIG SAFETY

- Read all installation, safety and maintenance instructions completely before operating this equipment.
- Keep all personnel clear of moving parts while equipment is being operated.
- While operating this equipment, use common sense, use caution, be alert and be safety-conscious.

Learning Objectives

Upon completion of this field exercise, the participant will be able to:

1. Identify basic components and systems associated with liquid spray application equipment
2. Calibrate liquid spray application equipment
3. Comprehend the importance of calibrating liquid spray application equipment in order to “hit the target rate” when applying snow and ice chemicals

Introduction

When you compare the relatively insignificant cost of calibration to the benefits that result from this activity, it is easy to see why calibration is one of the most cost-effective ways to optimize your maintenance section's usage of snow and ice control materials. Along with the correct application technique, proper calibration is the first step towards reduced chemical use, greater efficiency and increased cost effectiveness.

Regardless of the type of equipment being used, it is extremely important to calibrate the system to ensure that the desired quantity of material is actually being applied to the road. In this field exercise, we will look at getting the "right amount" of material on the road by ensuring that your liquid spray application equipment has been properly calibrated.

Liquid Spray Application Equipment

TxDOT uses liquid spray application equipment to spray herbicides during the spring and summer months and to spray liquid snow and ice control chemicals during the winter season. For the purposes of this training, we will limit our discussions to winter weather maintenance operations.

Liquid spray application equipment is used primarily for anti-icing treatments on selected roadways, bridges (overhead structures) and trouble spots. Anti-icing involves applying liquid chemicals in advance of a storm to prevent snow and ice from bonding to the pavement surface and to prevent the formation of frost.

Liquid spray application equipment is also used for deicing in some regions of the state in certain temperature, moisture and pavement conditions. Deicing involves applying chemicals to the road after a storm starts where snow and ice have already bonded to the pavement surface.

TxDOT currently uses two liquid snow and ice control materials. The most commonly-used chemical at the present time is Meltdown Apex which is a magnesium chloride ($MgCl_2$) based product. TxDOT also uses a sodium chloride (NaCl) brine solution which is produced by some of the snow and ice districts in the state.

Most of the TxDOT liquid spray application equipment in the state is comprised of herbicide rigs that have been retrofitted or modified for winter maintenance operations. TxDOT is also producing (fabricating) dedicated liquid spray application equipment for winter weather operations at their Camp Hubbard facility in Austin, Texas. They are currently producing self-contained truck-mounted rigs, trailer-mounted rigs and skid-mounted units that can slide into a 6 cubic yard or 10 cubic yard dump truck bed.

Equipment Selection and Maintenance

TxDOT personnel have indicated that the Meltdown Apex ($MgCl_2$) product is extremely corrosive to the liquid spray application equipment as well as to the truck frame and body. For this reason, corrosion resistant components (metals) such as stainless steel and brass

should be selected in the design and fabrication of this type of equipment to minimize the effects of corrosion.

Special attention should be given to components such as the pump, metal piping, fittings and spray nozzles. Metal tanks are no longer being used and have been replaced by poly (polymer) tanks or fiberglass tanks. Spray bars should be located as far back on the truck as possible to minimize chemical spray or drift from getting on the truck frame and body or on the liquid spray application system components.

Electrical and mechanical components such as valves and solenoids should be robust (durable) and capable of functioning in and around a corrosive environment.

To minimize drifting of liquid anti-icing and deicing agents, straight stream spray type nozzle tips are preferred over fan type nozzle tips.

All equipment should be thoroughly cleaned after each use to minimize the effects of the corrosive environment. This would include the truck as well as the liquid spray application equipment.

The entire liquid spray application equipment system (including the tank) should be thoroughly flushed (at least two or three times) with clean water after each use. In other words, all residual chemicals should be thoroughly flushed out of the system after each use.

Calibration of Liquid Spray Application Equipment

Liquid anti-icing and deicing application equipment should be calibrated at the beginning of every winter season. Application equipment that has been transferred to another truck, modified, or repaired should be recalibrated. Equipment should be monitored during use and recalibrated when performance appears questionable.

Calibration of winter weather liquid spray application equipment is a two-part process. The first part is often the most time consuming when compared with the second part (the actual calibration process).

The first part of the process consists of a thorough inspection of the liquid spray unit to verify that each component of the system is fully functional and that the system has been designed, modified, retrofitted and/or fabricated with top quality, fully-compatible corrosion resistant components that work together as a properly designed system to achieve the desired results.

Part 1 - System Inspection

The liquid spray application system should be inspected in advance of the actual calibration (Part 2) to verify that each component of the system is compatible and fully functional. The system inspection may require tools and spare parts, as follows

1.) Multimeter for checking voltage, continuity, etc.

2.) Wire nuts, electrical connectors, electrical tape and soldering gun to repair or replace electrical connections

3.) Petroleum jelly to coat electrical connections as needed

4.) Teflon tape or liquid Teflon

5.) An adequate supply of common components and replacement parts such as an extra pump, belt, ball valves and spray nozzles.

The system inspection consists of the following:

- Check system design and fabrication to ensure flow rates work from the pump to the ball valves to the nozzles; correct system components as needed.
- Check pump "pony" motor to verify that it has a rated horsepower that is adequate to "drive" the system in terms of flow rate and pressure for the desired vehicle speeds, material application rates and area to be treated.
- Check pump to verify that it is of adequate capacity to "drive" the system in terms of capacity, flow rate and pressure for the desired vehicle speeds, material application rates and area to be treated.
- Check the pump's rotational speed (RPM) control to ensure it is working properly; in most cases, this pump control can act as an additional pressure control mechanism.
- Inspect electronic ball valves, solenoids and the butterfly valve (pressure regulator) to ensure that they are consistent in terms of design, type and rating.
- Inspect electronic ball valves, solenoids and the butterfly valve (pressure regulator) to ensure that they are fully opening and closing as they should; this may require checking the voltages to each of the valves/solenoids to ensure they are correct and consistent for each valve.
- Inspect the nozzles to verify that they are the correct type and rating in terms of pressure and flow rate.
- All nozzles should be the same (consistent) throughout the center boom and throughout the side booms.
- Check nozzles to verify that a guide vane is present in each nozzle.

- Ensure that the nozzles are directed in a uniform spray pattern across the entire length of the boom.
- Inspect all electrical connections to verify that they are clean, tight and free of corrosion.
- Verify that all piping and fitting configurations are consistent throughout the system to ensure a consistent output at each nozzle and repair any leaks.
- Ensure that all pipe, fittings and component threads associated with pressurized connections are wrapped with Teflon tape or coated with liquid Teflon before each connection is made; pipe dope and Permatex are not suited for this type of application.

Part 2 - Steps to Calibrate a Liquid Spray Applicator

With the liquid spray application system fully functional, calibrate the system as follows:

1.) Set system pressure to approximately 40 pounds per square inch (psi) using the butterfly valve (pressure regulator) and the rotational speed (RPM) of the pony motor.

2.) Pressure is set from the pony motor first to supply an adequate amount of material; pressure while spraying is set from the butterfly valve which is located in the vicinity of the ball valves, pump and pony motor on the rear of the truck.

3.) Make sure all nozzles are consistent so they can be calibrated.

4.) Catch fluid out of one or more of the six nozzles on the center boom (rear spray bar) with appropriate buckets/containers.

5.) Allow fluid to spray out of the selected nozzle(s) for approximately 15 seconds and then multiply the amount (volume or weight) of fluid in the bucket by 4 to approximate the flow rate for the selected nozzle(s) in gallons per minute (GPM).

6.) Determine an average flow rate in gallons per minute (GPM) for all of the nozzles that were tested. Use the **Calculation Form** provided (see Page 8.35).

7.) Use the average flow rate in gallons per minute (GPM) to estimate how fast the truck driver should go in miles per hour (MPH) to attain the prescribed material application rate in gallons per lane mile (GPLM).

8.) Insert the average flow rate in GPM into the equation below to determine truck speed in MPH.

Equation:

$$MPH = [60(GPM)] \div GPLM$$

Equipment Inspection and Maintenance

The following liquid spray application equipment inspections and maintenance activities will maximize equipment performance and minimize down time.

Pre-Storm Activities

Well before a storm strikes, be sure to:

- Complete preventive maintenance checklist
- Adapt herbicide rig to spray liquid snow and ice control chemicals (when applicable)
- Flush tank to prevent contamination
- Service auxiliary motor
- Flush pump for correct operation
- Operate all systems to ensure correct operation
- Check all electrical components for correct operation
- Perform trial run with water to ensure correct operation
- Ensure spare parts are on truck

During the Storm Activities

While using the equipment during the storm:

- Perform occasional walk around to check for any problems (lights, leaks)
- Repair any problem as necessary to ensure correct operation of equipment

Post-Storm Activities

Once the storm is over, be sure to:

- Flush system
- Clean all equipment associated with liquid spray application
- For pump preservation; once pump is no longer used for the season, don't drain and let air in the pump – it will corrode. Keep the pump full of something; use antifreeze.
- Check all equipment for proper operation before next storm
- Service equipment as necessary to prepare for next storm

Pre-icing/De-icing Calibration Form

District _____ Truck Number_____ Date_____

Pre-icing: Pressure_____ Speed_____GPLM_____

De-icing: Pressure_____ Speed_____GPLM_____

Calculations:

Useful Formulas:

$$MPH = \frac{60 \times GPM}{GPLM}$$

$$GPLM = \frac{60 \times GPM}{MPH}$$

GPM = gallon per minute from nozzle
GPLM = gallon per lane mile
MPH = miles per hour

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Class Exercise – Review Questions
Module 8 – CALIBRATE A LIQUID SPRAY APPLICATOR

MNT812 Winter Weather Operations Training

1. [True/False] It is best practice to calibrate each liquid spray application rig in your Maintenance Section every year.

   A. True

   B. False

   This statement is TRUE.

2. [True/False] It is not possible to use a liquid spray application rig that has not been properly calibrated.

   A. True

   B. False

   This statement is FALSE.

   You absolutely can use a non-calibrated spray rig, just like you can shoot a gun that has not been sighted in. But doing so is not a good idea.

3. The primary goal of the liquid spray application rig calibration process is to:

   A. Promote safety

   B. Eliminate waste

   C. Ensure reliability

   D. Save money

   The correct answer is C.

   The other items are important, but calibration is about ensuring reliability.

4. [True/False] Because liquid spray application rig calibration is done in the maintenance yard in a controlled way, material safety considerations do not really apply.

   A. True

   B. False

   This statement is FALSE.

   SAFETY FIRST!!!

5. [True/False] Calibration of the liquid spray application rig should represent normal conditions for your Maintenance Section including the type of chemical, type of application, and typical roadway conditions.

   A. True

   B. False

   This statement is TRUE.

6. Calibration of liquid spray application equipment is a two-part process with the second part being the actual calibration. What is the *first* part of the calibration process?

   A. Inspect the liquid spray application system to verify the proper components including the pump, butterfly valve, ball valves, nozzle size, and nozzle stream

   B. Test the system to make sure each component is compatible and fully functional

   C. Set system pressure to approximately 40 psi by adjusting the speed of the pony motor and the opening of the butterfly valve (pressure regulator)

   D. All of the above

   The correct answer is D.

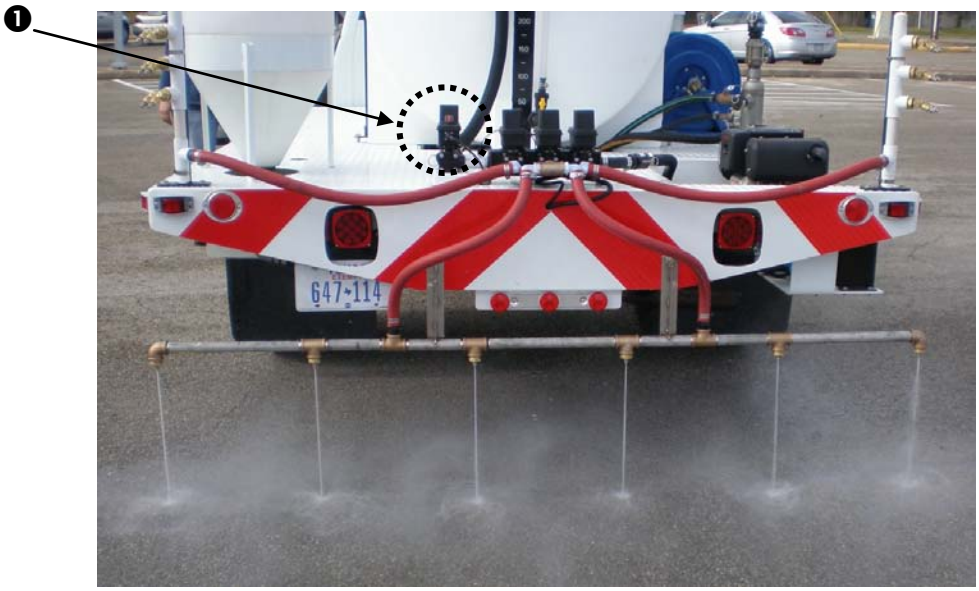
7. Identify the main purpose of component ❶ in the photo below.

   A. Regulates the system pressure

   B. Directs flow to the three different booms

   C. Generates flow in the system

   D. Discharges flow to the pavement



The correct answer is A.

Component 1 is the butterfly valve, and the purpose of the butterfly valve is to regulate system pressure.

8. [True/False] The calibration process for the liquid spray application rig is as follows:

   - Step 1. Measure the flow volume, in gallons, of one nozzle for one minute
   - Step 2. Multiply by the number of nozzles per lane (6, typical) - GPM
   - Step 3. Identify the target rate for your application - GPLM
   - Step 4. Using the formula, calculate the speed you must drive the spray rig to apply material at the target application rate - MPH

   A. True

   B. False

This statement is TRUE.

This is how it is done.

9. [True/False] The calibration process identified above applies whether you plan to operate all three booms, two booms, or just one. You always calibrate this same way.

   A. True

   B. False

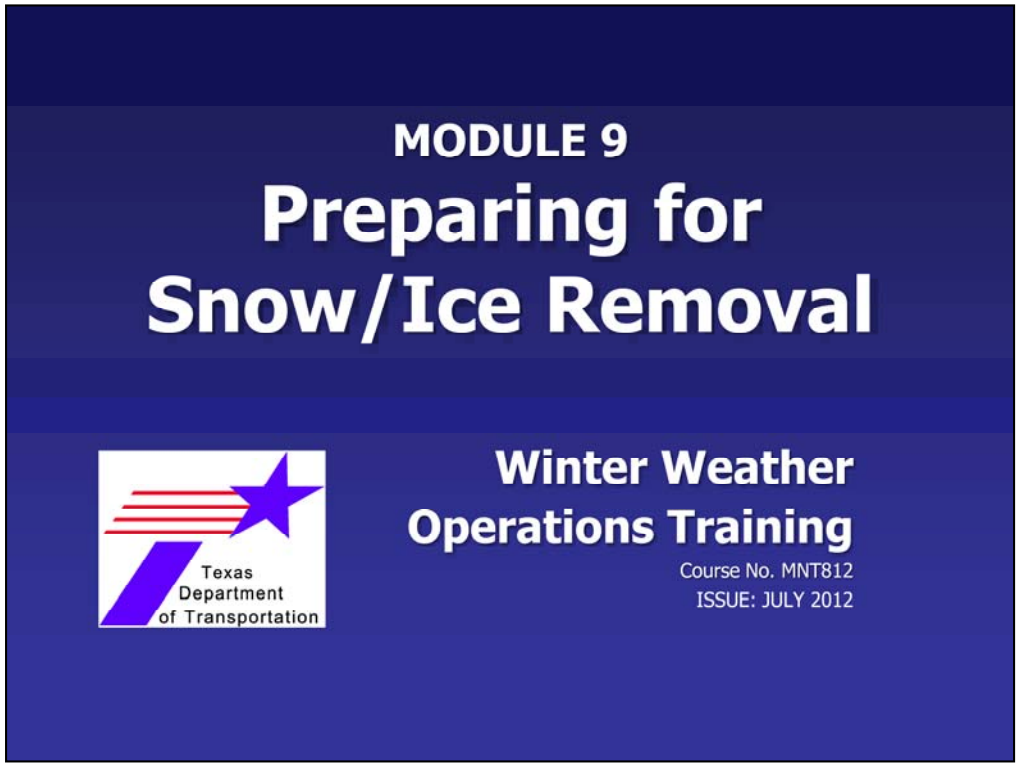
   This statement is TRUE.

10. [True/False] Different applications (anti-icing, de-icing) and different chemicals (Meltdown Apex, salt brine) each require their own calibration. Just repeat the process for each situation, starting at Step 1.

    A. True

    B. False

    This statement is TRUE.

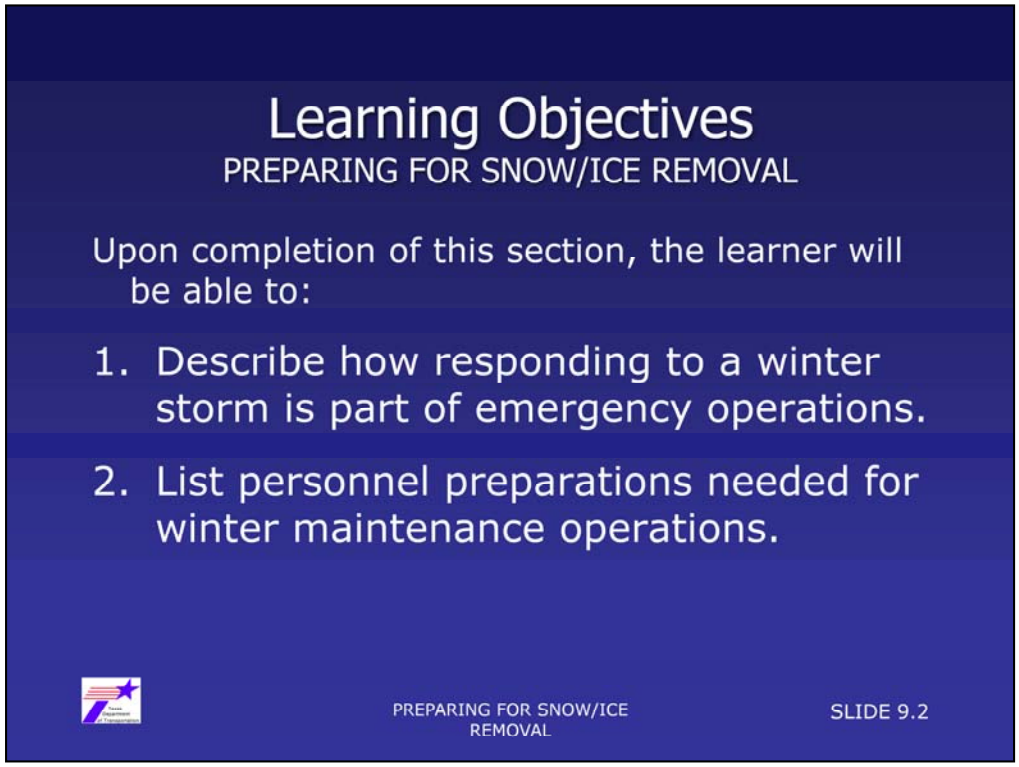


Instructor Notes: Present the following key points.

We have spent the first part of our instruction focusing on pre-season and pre-storm activities mostly related to snow and ice control materials and winter maintenance equipment.

Of course, it is people who make winter operations happen.

In Module 9, we turn our attention to preparing the maintenance employee for winter operations.

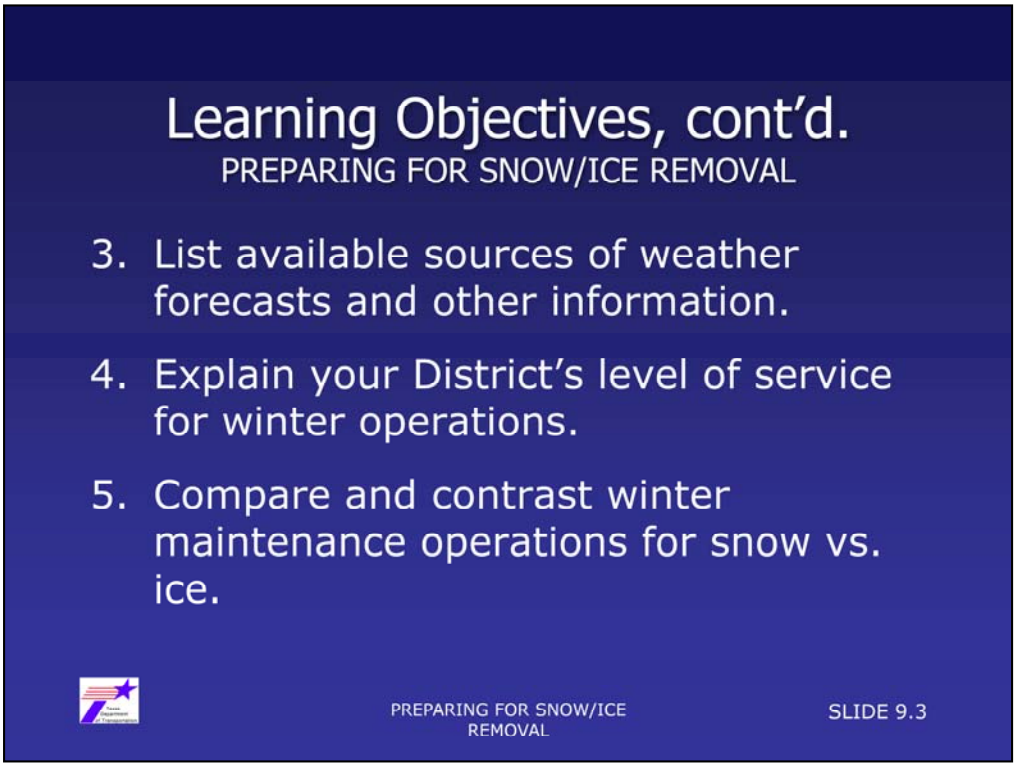


Instructor Notes: Present the following key points.

Note the learning objectives.

It is necessary that operations personnel have an understanding of the emergency nature of winter maintenance.

Various activities are necessary for operations personnel.



Instructor Notes: Present the following key points.

Learning objectives, cont'd…

3. We will discuss how it is important to keep an eye on the weather.

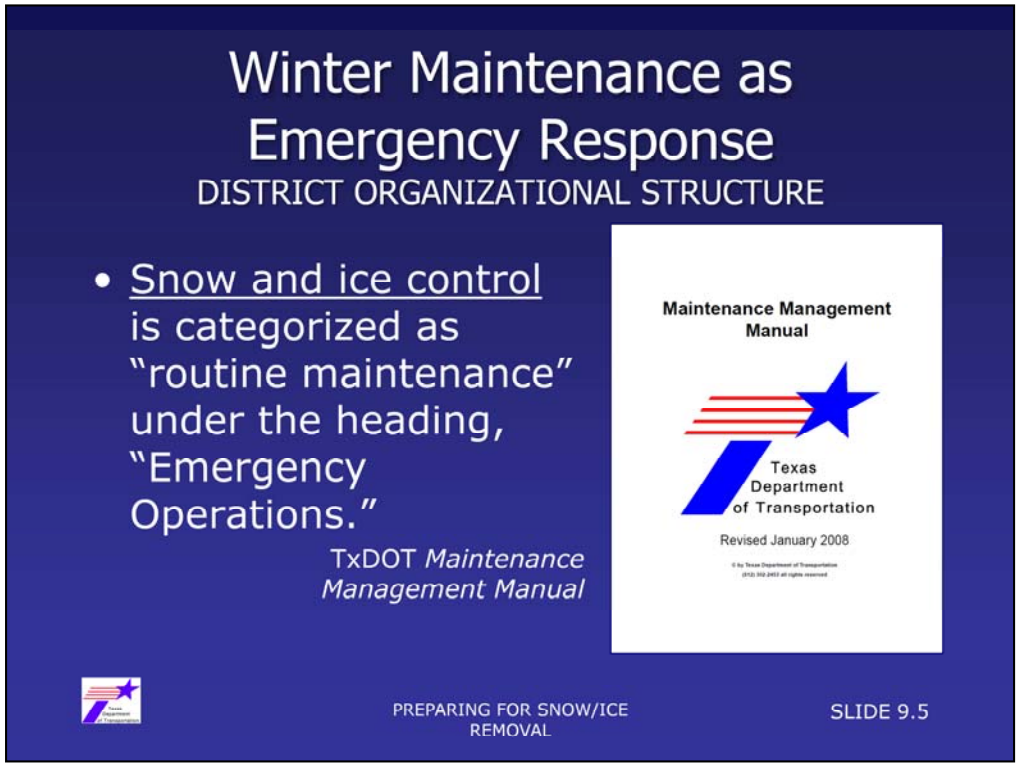
4. We will discuss the level of service for winter maintenance operations.

5. And finally, we will discuss the differences in maintenance operations for snow vs. ice.



Instructor Notes: Present the following key points.

We have commented that winter maintenance is part of emergency operations.



Instructor Notes: Present the following key points.

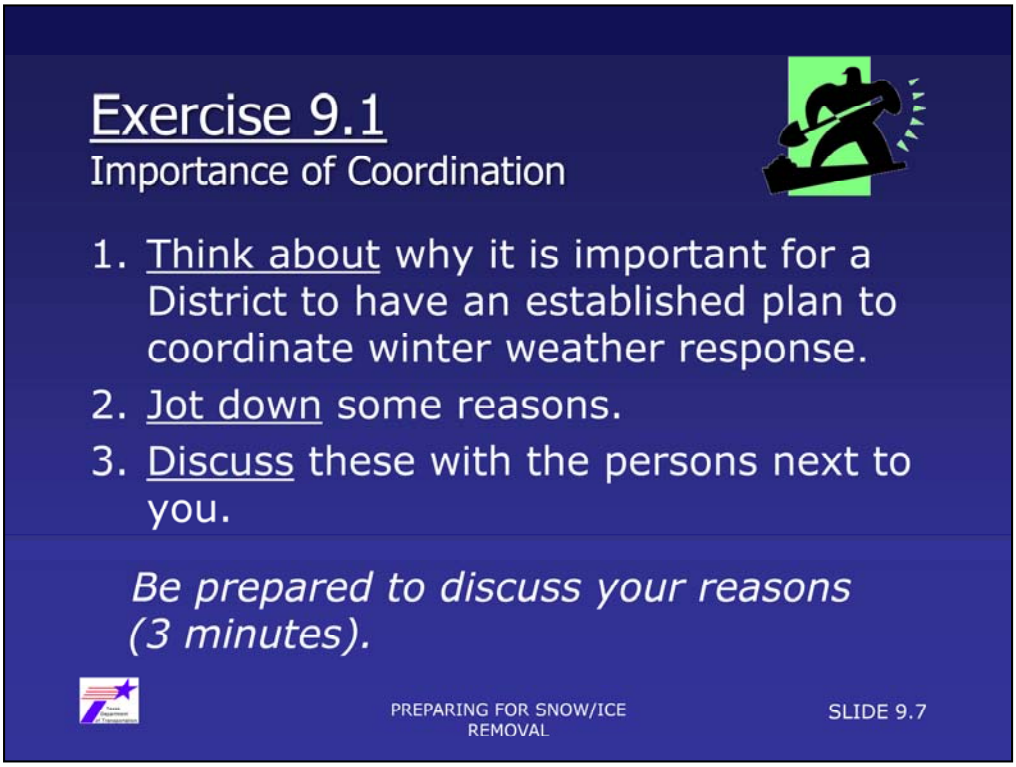
More specifically, the TxDOT Maintenance Management Manual states snow and ice control is "routine maintenance" which is part of "emergency operations."

By classifying snow and ice control as part of emergency operations, this facilitates administrative approval for the shift work, overtime, and other non-typical costs associated with responding to emergencies.



Instructor Notes: Present the following key points.

Further, because snow and ice control is classified as emergency operations, TxDOT is required to develop and distribute standard operating procedures for emergency preparation, response, and recovery, among other things.

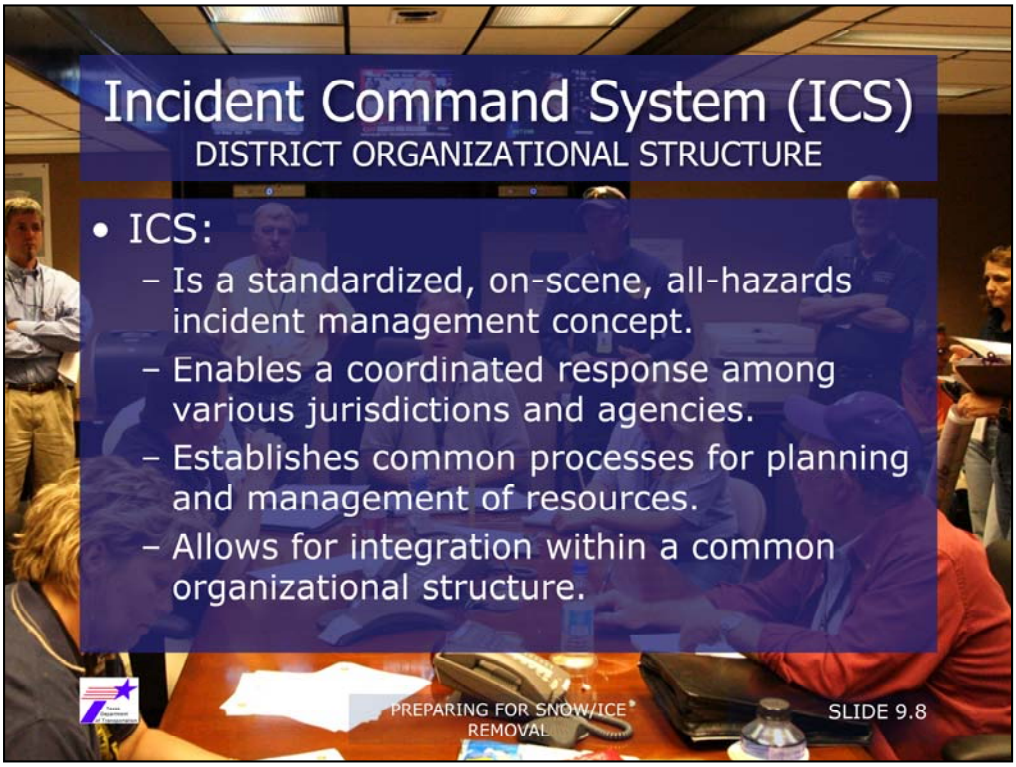


Instructor Notes: Present the following key points.

GREEN SHEET.

This exercise is intended to emphasize the planning and communication aspects of winter maintenance.

Do if the schedule allows.



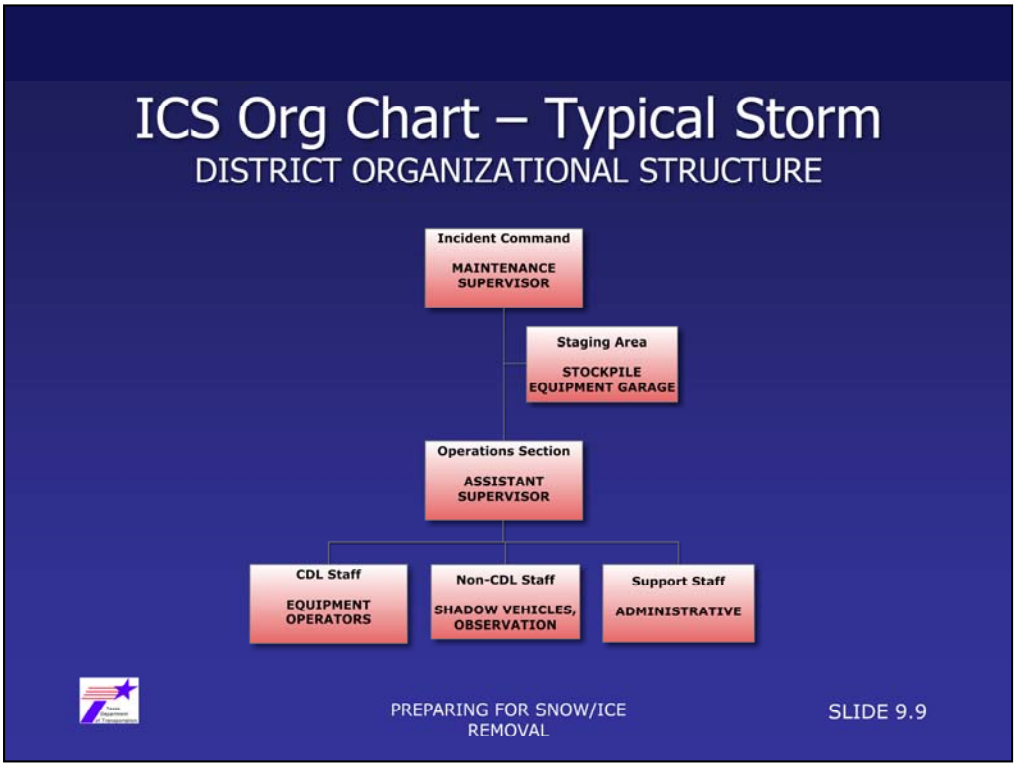
Instructor Notes: Present the following key points.

As you know, TxDOT responds to many types of emergencies including but not limited to hurricanes, wildfires, hazardous spills, winter weather, and more.

First responders to these types of emergencies, -- police, fire fighters, emergency medical professionals, and including TxDOT supervisory personnel, are trained in a formal emergency response program which is part of the National Incident Management System (NIMS).

One part of NIMS is the Incident Command System. The Incident Command System applies to all types of emergencies, including winter weather. This is to facilitate interaction among the necessary organizations who are responding to the emergency.

In the case of winter weather emergencies, for localized storms, the first line incident commander for TxDOT is your Maintenance Supervisor. Your Maintenance Supervisor will direct you in your snow and ice control operations while she/he coordinates with other first responders both within and outside the Department.



Instructor Notes: Present the following key points.

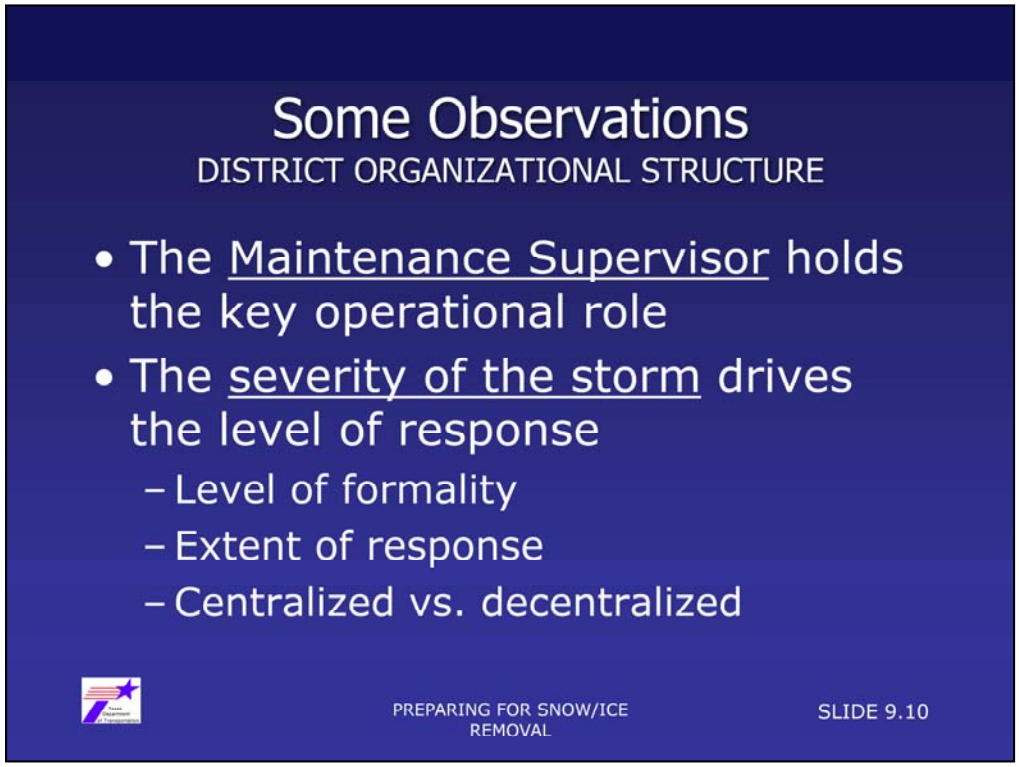
This chart captures the way that your maintenance section would be organized for emergency response, such as snow and ice control for a winter storm.

NOTE that the Maintenance Supervisor is the Incident Commander.

In a localized storm, that is the way the winter weather emergency will be managed; the structure will look like this.

However, if the storm is large so that it covers multiple maintenance sections or even multiple Districts, the Incident Commander might become your Director of Maintenance, or perhaps the District Engineer. The Incident Command System is flexible in this way.

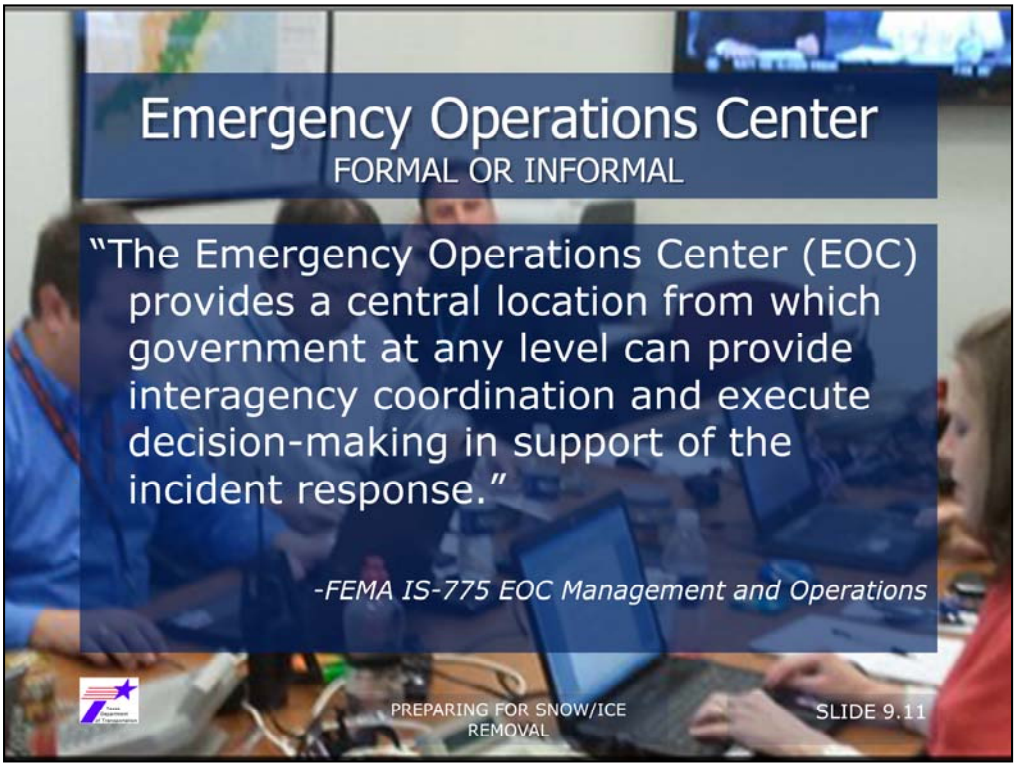
But no matter the size of the storm, your role as operations personnel will remain consistent. You will always respond to direction of your Maintenance Supervisor. Changes in command only occur up the line, not down.



Instructor Notes: Present the following key points.

Note that the Maintenance Supervisor holds the key operations role. The Maintenance Supervisor is responsible to direct operations personnel and to coordinate with other first responders up the line.

The more severe the storm, the more developed and formal the emergency response will become.



Instructor Notes: Present the following key points.

During severe winter storms, TxDOT maintenance personnel will activate the District Emergency Operations Center.

Normally, this will be a central room at the District headquarters, but the level of formality will vary.

In such cases, the Director of Maintenance will probably be serving as the Incident Commander.

As Incident Commander, the Director of Maintenance will be looking to your Maintenance Supervisor for road condition updates, the status of the storm, coordination issues, and related information. These will be facts "on the ground" out in your maintenance section.

Your Maintenance Supervisor will in turn be looking to you to provide this kind of information to him so it can be shared up the line.



Instructor Notes: Present the following key points.

Question: As operations personnel, what do you need to do to get ready for winter weather?

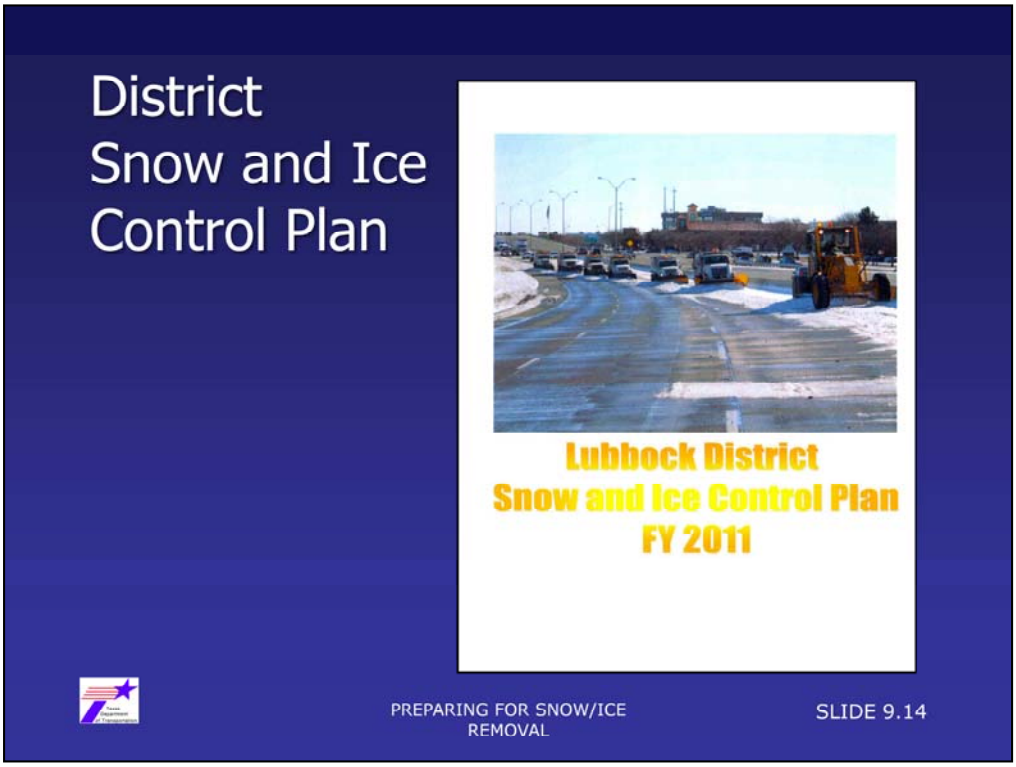
Answer: Several things, actually.



Instructor Notes: Present the following key points.

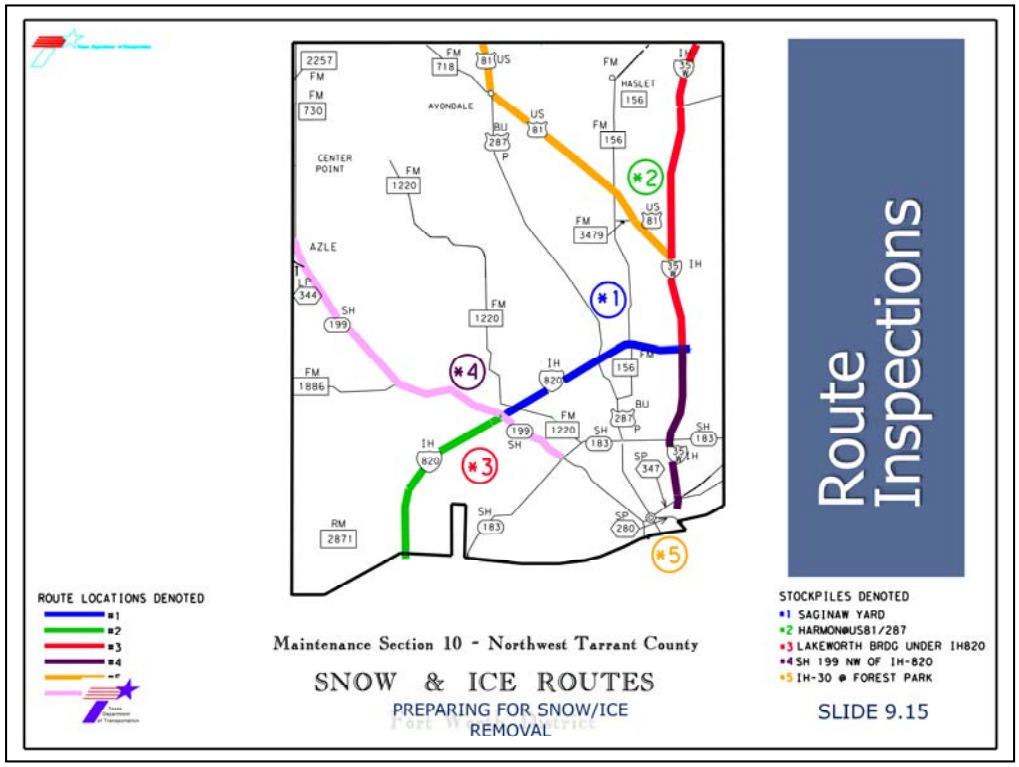
Begin by making sure to attend your Maintenance Supervisor's pre-season meeting. Typically this will be conducted in early fall.

Your supervisor will be wanting to make sure that your equipment, materials and YOU are ready.



Instructor Notes: Present the following key points.

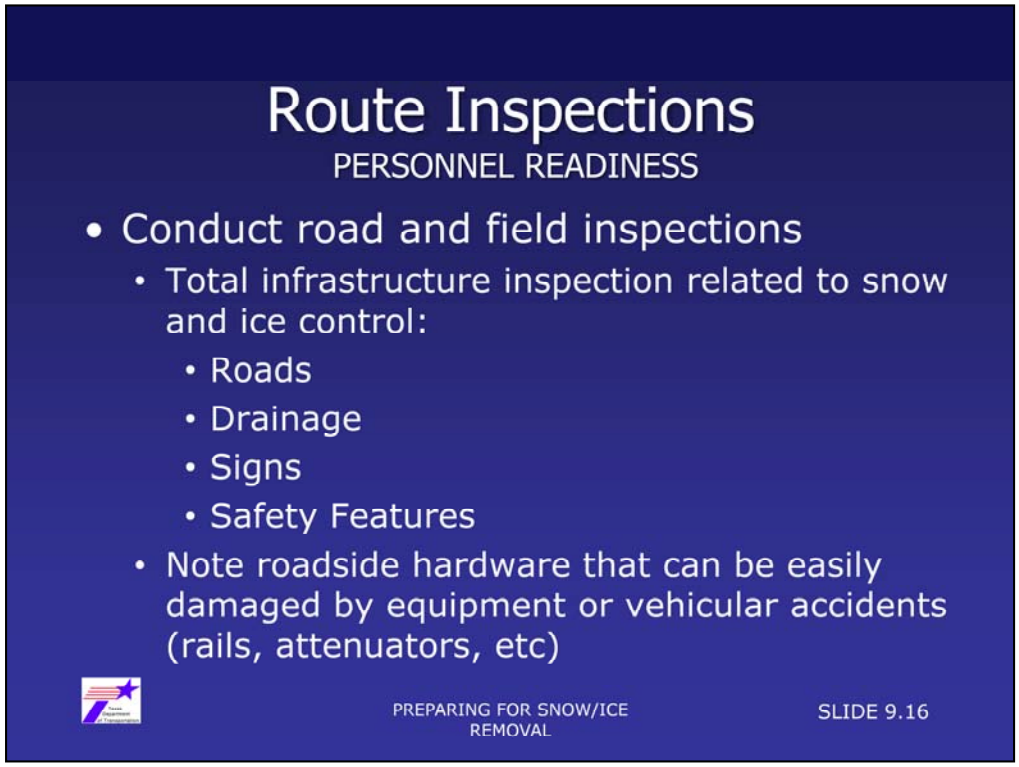
You will review, and update as necessary, your District Snow and Ice Control Plan.



Instructor Notes: Present the following key points.

One of the things this plan includes will be maps which designate the plow routes. Depending on your level of seniority, you will probably be assigned one of these routes.

You need to <u>know your route</u>. Where it starts and stops, where your material stockpile is. Where to turn around, etc.



Instructor Notes: Present the following key points.

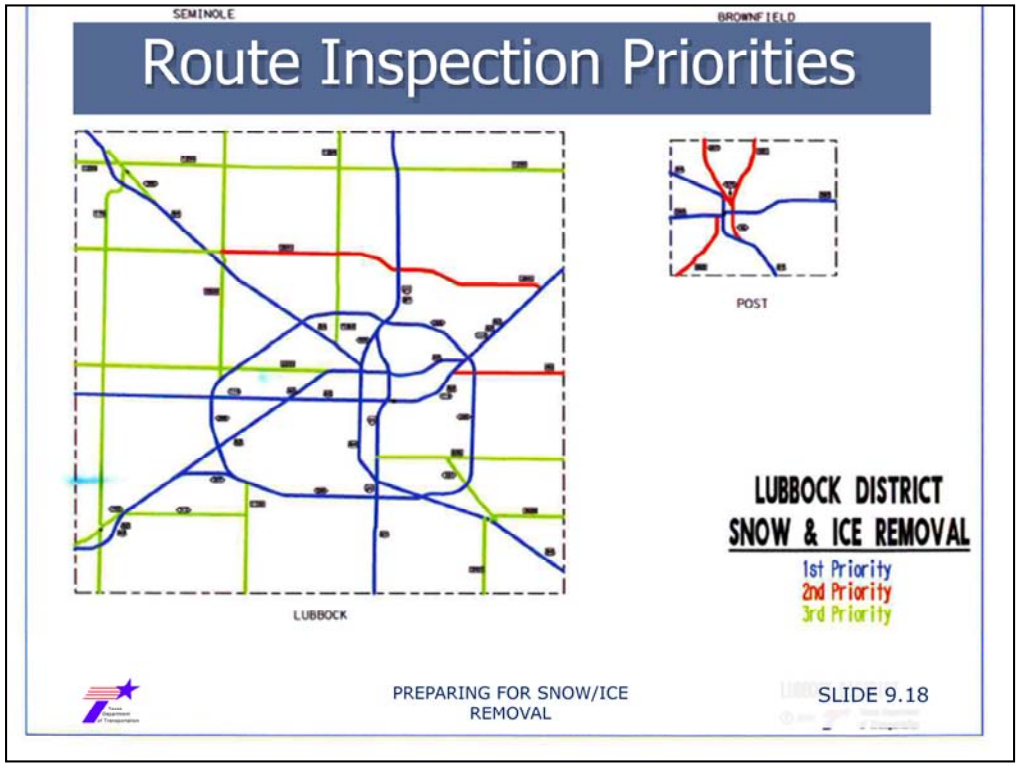
A good way to know your route is to inspect your route, prior to the winter season. The pre-season route inspection will provide you with a lot of helpful information.

Some of the things to look for are identified.



Instructor Notes: Present the following key points.

This video discusses the route inspection.

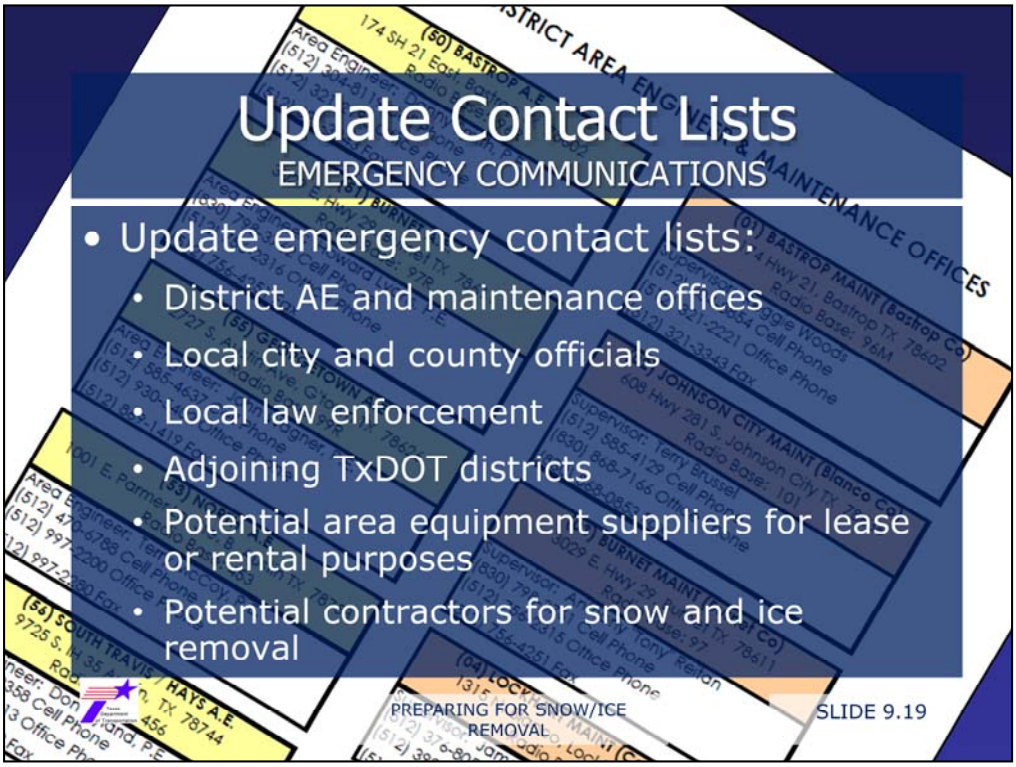


Instructor Notes: Present the following key points.

One thing you will notice about plow routes is that they do not all have the same priority.

Your District Snow and Ice Control Plan will identify the priorities.

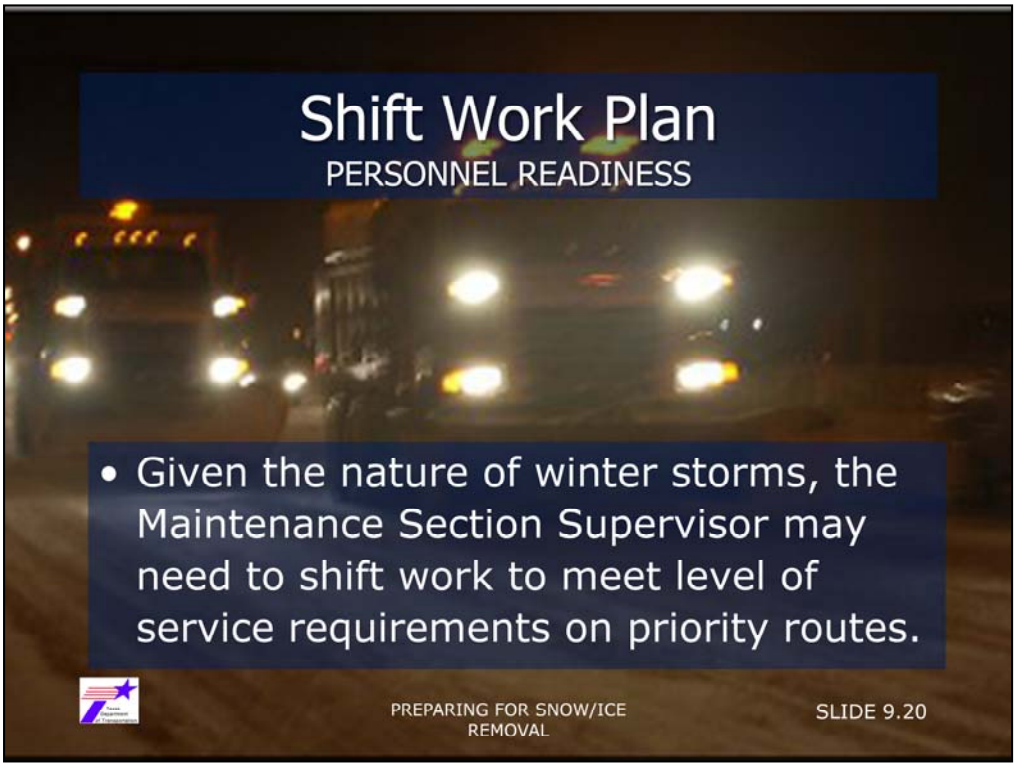
Your Supervisor will direct you on which routes to do first.



Instructor Notes: Present the following key points.

One key part of the District Snow and Ice Control Plan is the contact lists.

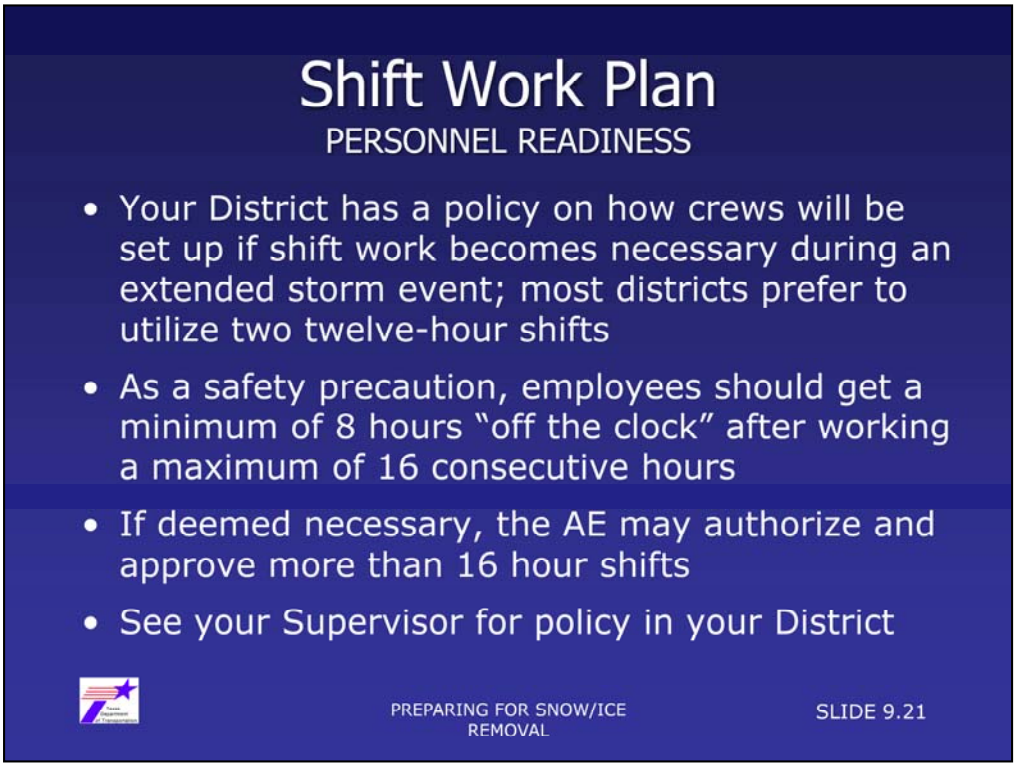
Be sure to review this. Make sure your information is correct.



Instructor Notes: Present the following key points.

Sometimes winter weather will dictate that your Supervisor go to shift work to adequately respond to the storm.

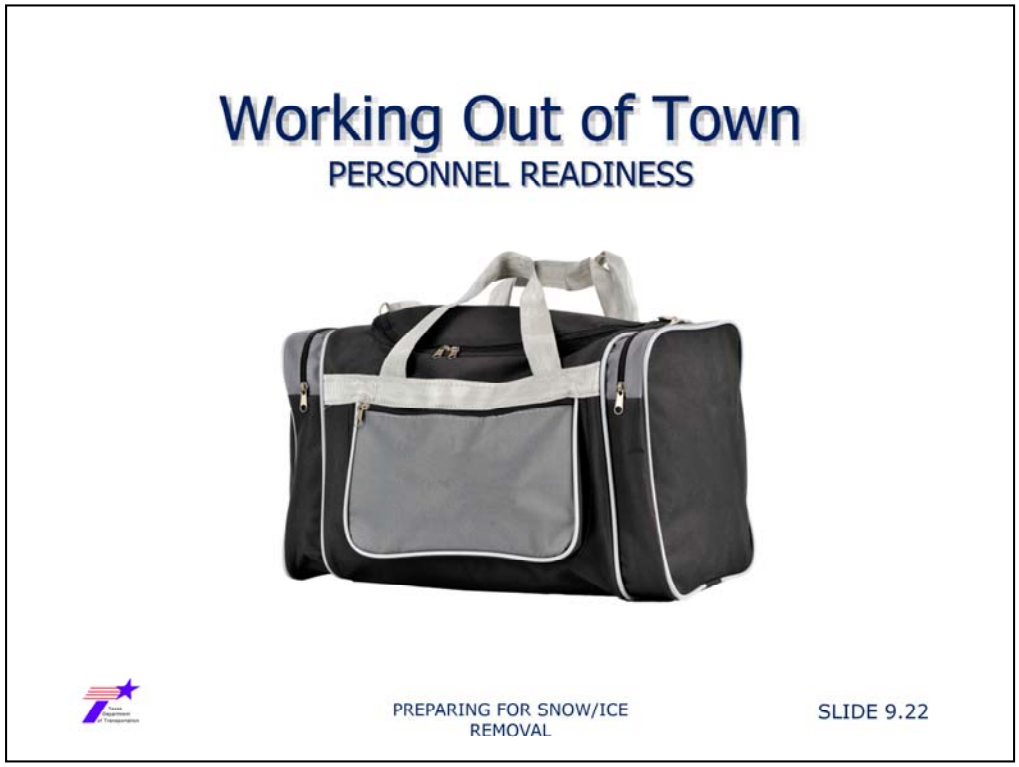
Your job is to be ready for this.



Instructor Notes: Present the following key points.

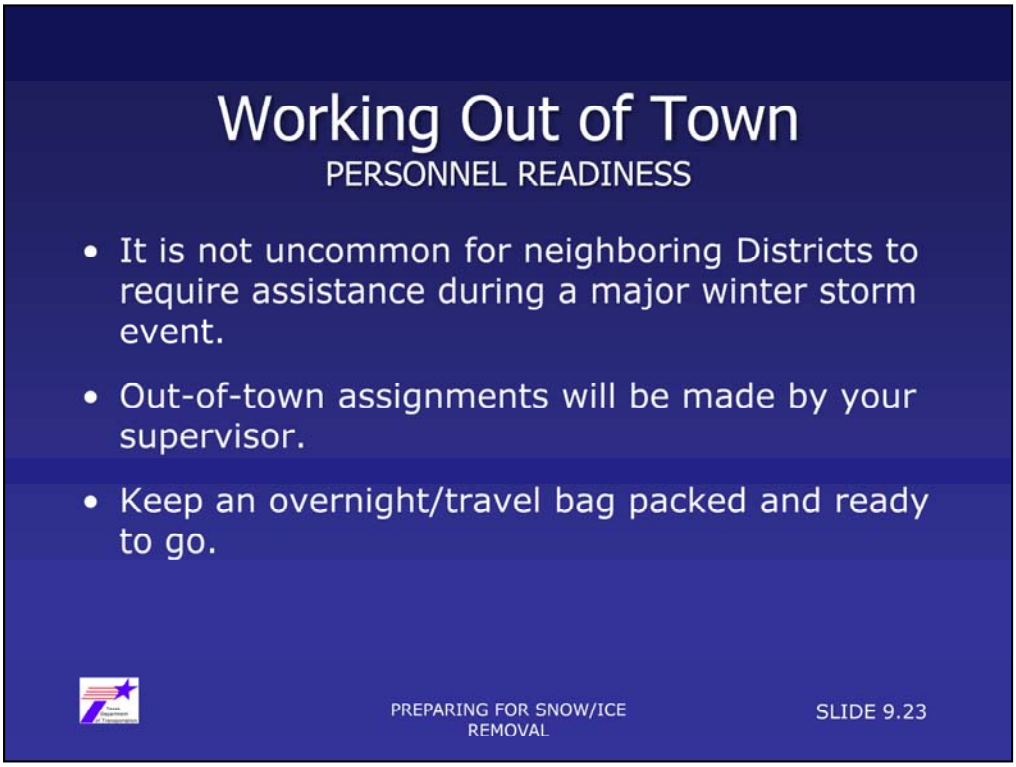
Some of the details for shift work are shown here.

Your Supervisor will direct you relative to shift work.



Instructor Notes: Present the following key points.

For large storms, you may be required to work out of town, in other Districts.



Instructor Notes: Present the following key points.

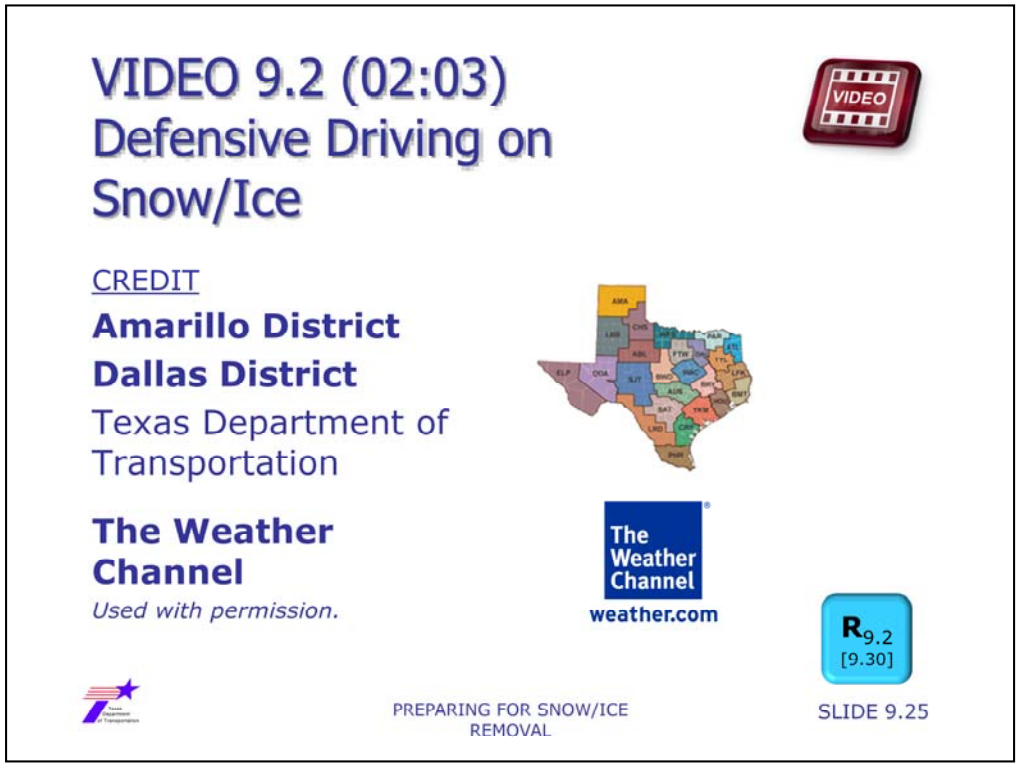
As shown here, keep an overnight/traveling bag packed and ready to go.

You might want to keep a stash of snacks, too… jerky, granola bars, etc. Finding an open establishment/place to eat during a winter storm, especially when working in rural areas, may be difficult.



Instructor Notes: Present the following key points.

Winter weather makes for notoriously hazardous driving conditions.



Instructor Notes: Present the following key points.

This video discusses defensive driving practices on snow and ice.



Instructor Notes: Present the following key points.

Normally we think of personal protective equipment in terms of safety glasses, hard hats, etc.

But for winter weather, warm, dry clothing is a key factor.



Instructor Notes: Present the following key points.

This video provides some instruction on proper clothing for winter maintenance operations.



Instructor Notes: Present the following key points.

Winter roadway maintenance is fundamentally about responding to winter weather.

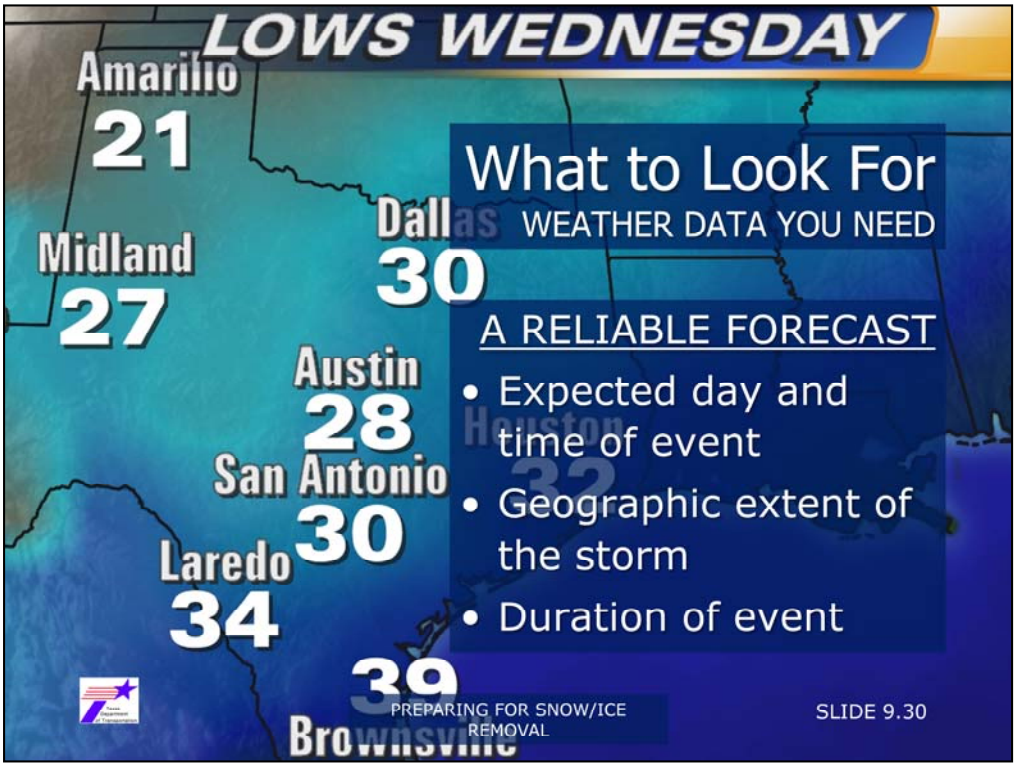


Instructor Notes: Present the following key points.

You will want to get in the habit of keeping an eye on the weather.

Your supervisor needs your assistance both in terms of monitoring weather as it develops, and providing your own detailed observations about road conditions and weather as you see it on your assigned route.

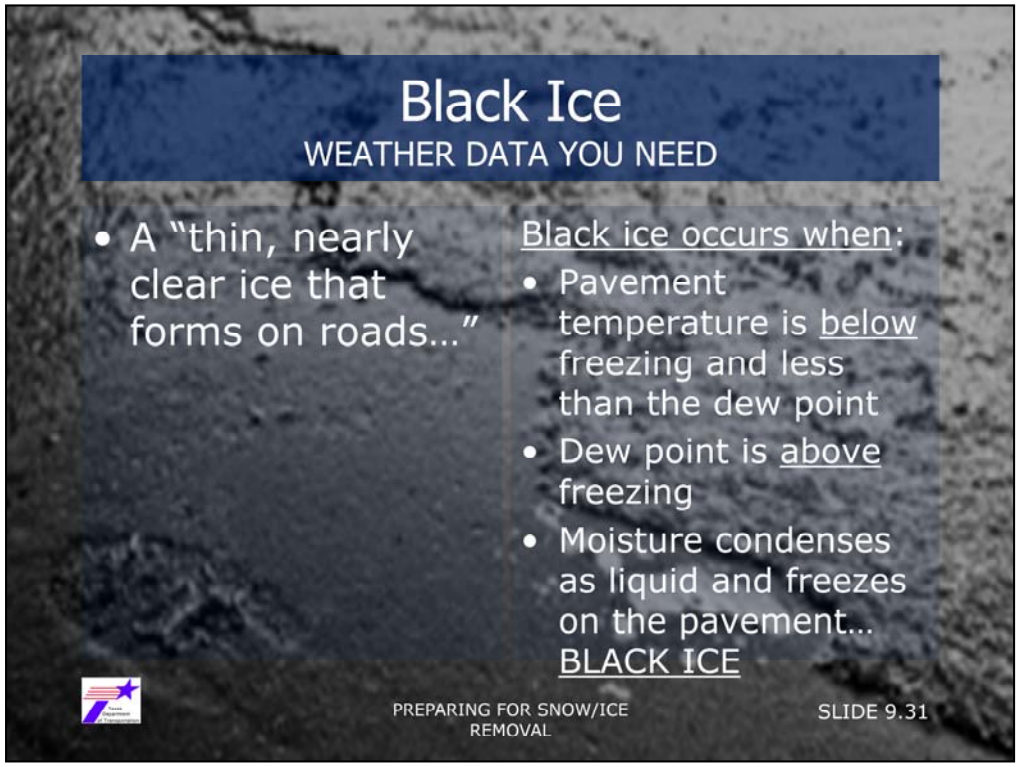
You probably have your own favorite source for local weather, the forecaster you feel gets it right more times than not.



Instructor Notes: Present the following key points.

Here are some things to look for.

Again, your Supervisor will benefit from your careful, detailed awareness and knowledge of weather and road conditions where you are.

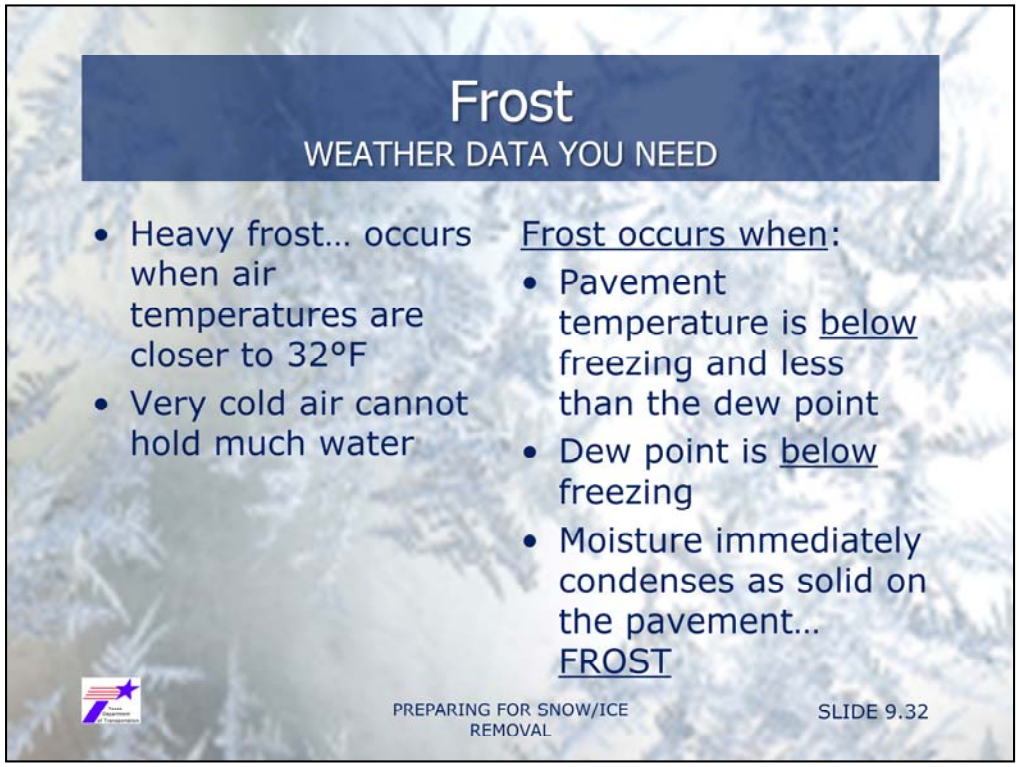


Instructor Notes: Present the following key points.

Black ice is a problem in many Districts. This slide identifies the weather conditions that are conducive to the formation of black ice.

Notice that a key factor is the PAVEMENT temperature. You can get this using your pavement temperature sensor.

The pavement temperature, combined with information about the dew point temperature, will tell you whether conditions are right for formation of black ice.



Instructor Notes: Present the following key points.

Similarly, frost is a problem in many Districts. This slide identifies the weather conditions that are conducive to the formation of frost.

Again, notice that a key factor is the PAVEMENT temperature.

The pavement temperature, combined with information about the dew point temperature, will tell you whether conditions are right for formation of frost.



Instructor Notes: Present the following key points.

We now turn our attention to the winter weather maintenance level of service.

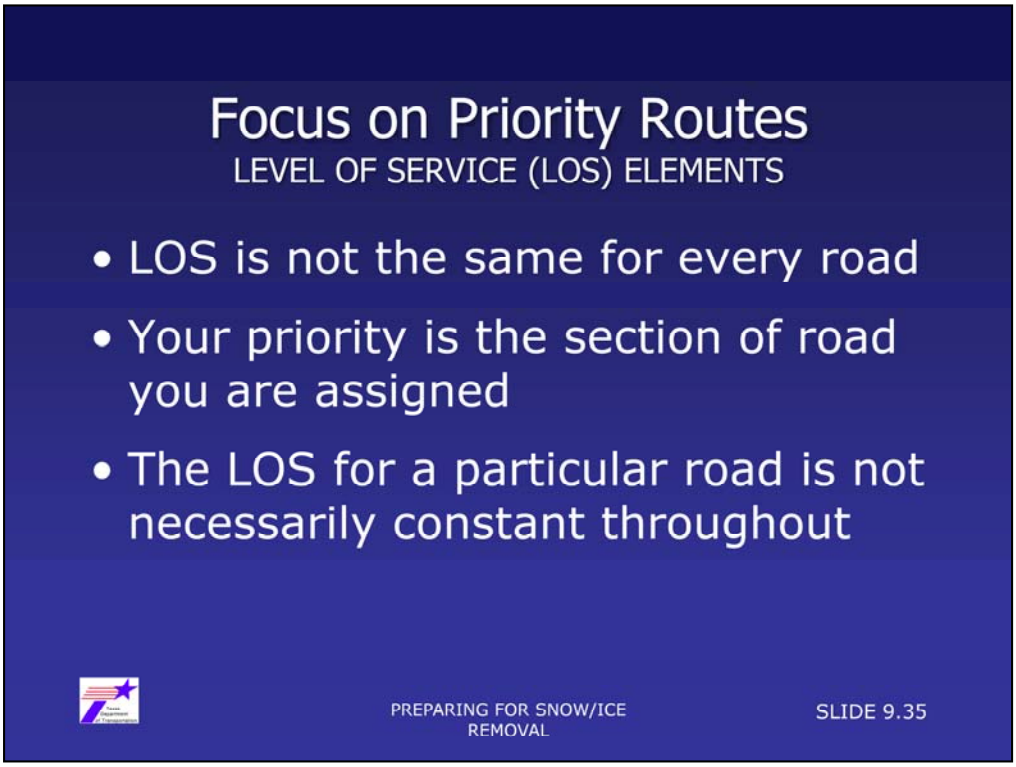
By level of service, we mean, the outcome (results) your supervisor expects you to achieve for your snow and ice control efforts.



Instructor Notes: Present the following key points.

This slide provides an outcomes-based definition of level of service for snow and ice control.

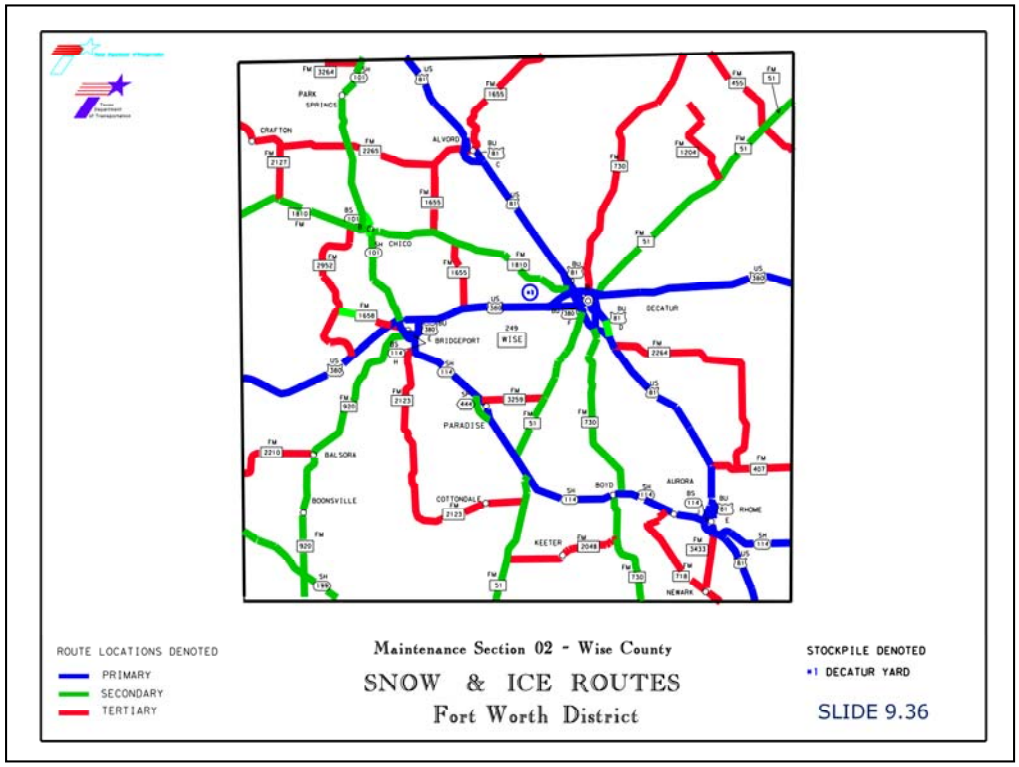
This type of definition is viewed as a best practice for winter maintenance operations.



Instructor Notes: Present the following key points.

WHAT DO YOU NEED TO KNOW?

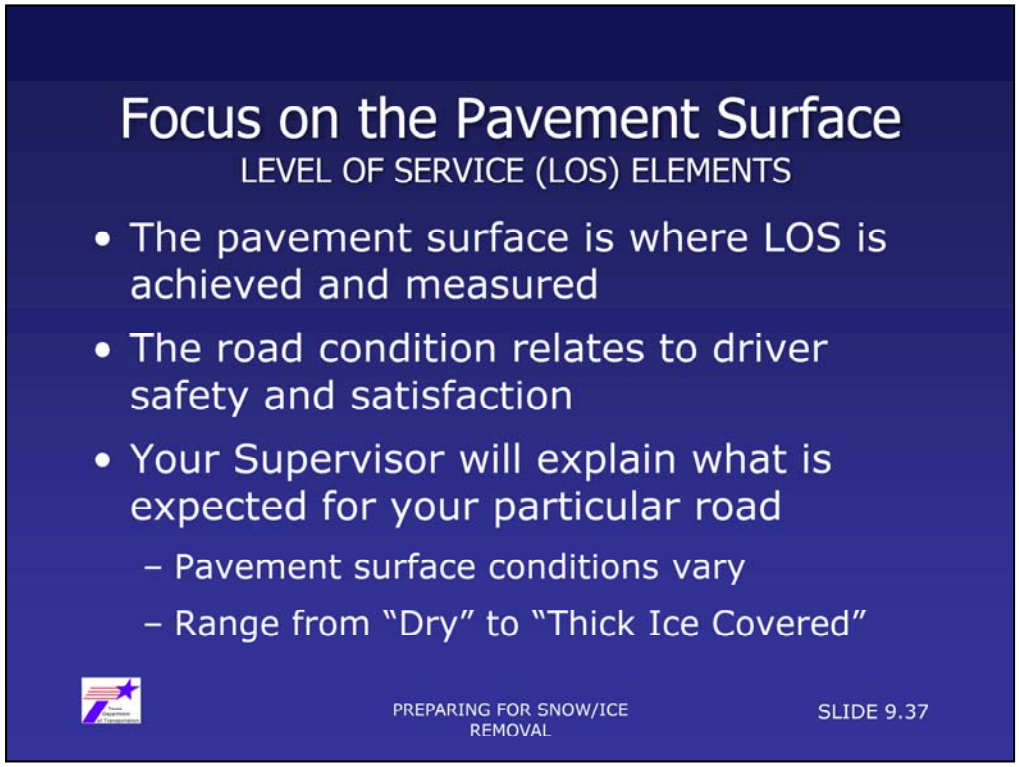
Your Supervisor will expect you to focus on particular routes that are a priority in your maintenance section.



Instructor Notes: Present the following key points.

The plow routes in your maintenance section should be identified in the District Snow and Ice Control Plan.

You need to know your route(s).



Instructor Notes: Present the following key points.

The traveling public cares about the condition of the road surface, not necessarily how many plows are on the road in your maintenance section.

Therefore, your Maintenance Supervisor may ask you to achieve a certain objective relative to the pavement surface.

This might be stated as "centerline bare" or "wheel-path bare." OR he might say to keep the road open and passable for passenger vehicles.

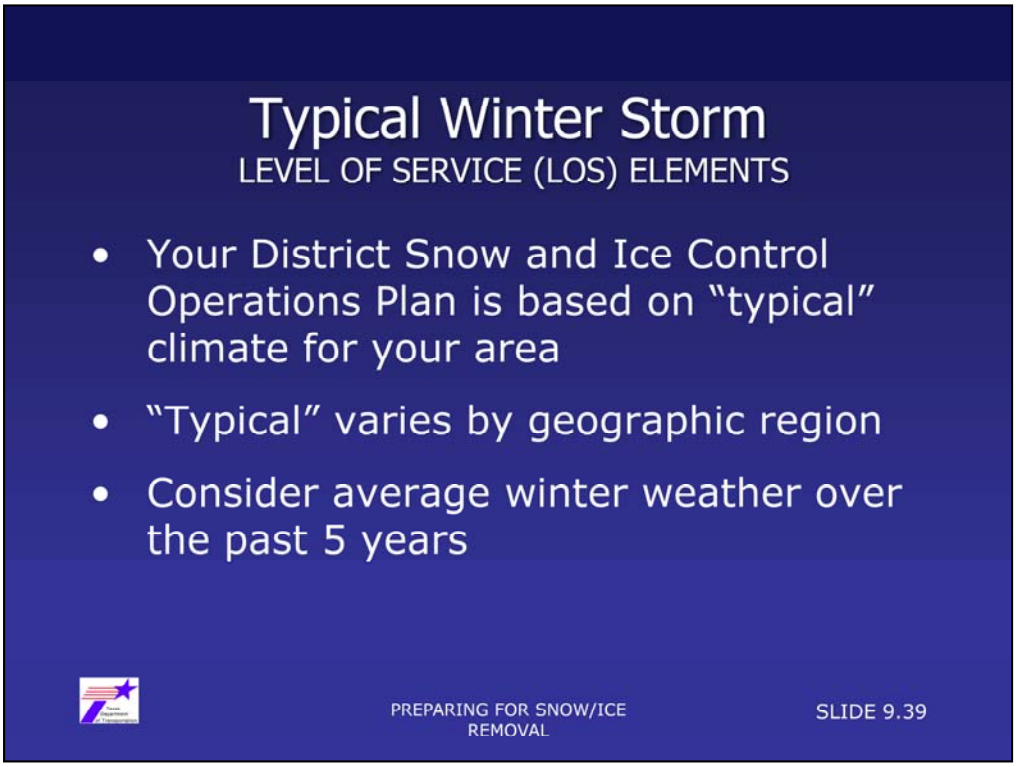
Either way, your Supervisor will explain the goal; that is, what he expects you to achieve.



Instructor Notes: Present the following key points.

This image provides an example of what is meant by "wheel-path bare."

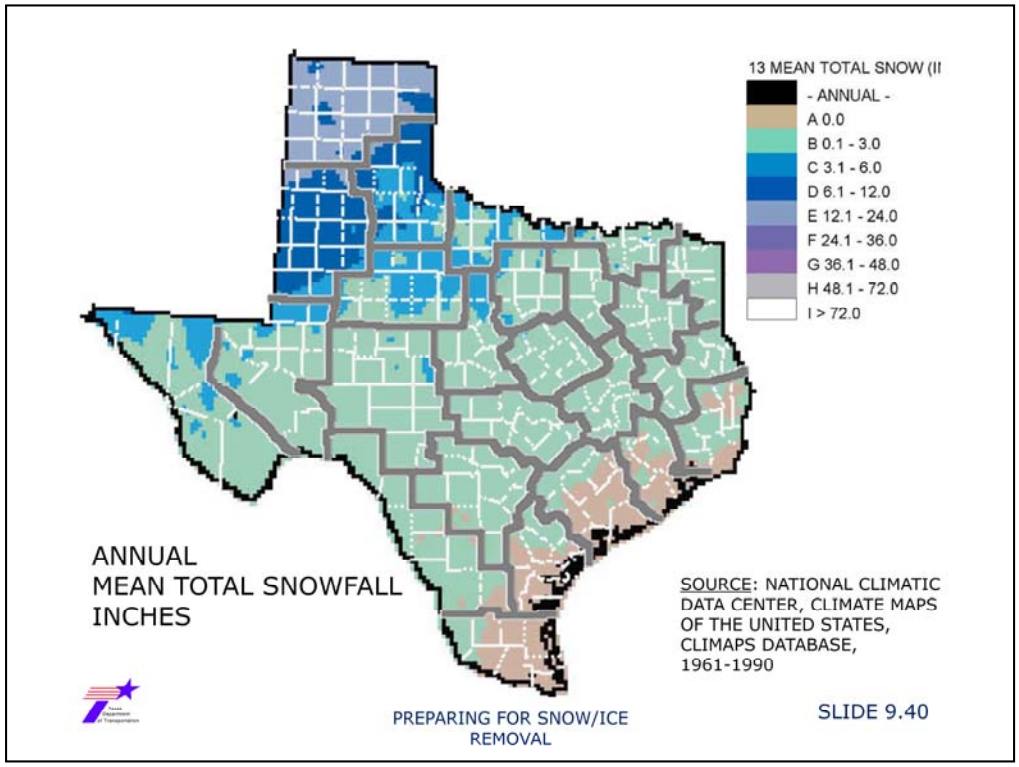
You can see how this type of description of the pavement surface would be helpful, both to your Supervisor who is responsible to keep the roads passable, and to the traveling public who wants to know the road conditions.



Instructor Notes: Present the following key points.

You should know that winter maintenance planning at TxDOT is done in terms of typical climate; that is, the average winter conditions that have existed in your area for the past five years or so.

These are not the major, headline-making snow and ice storms.



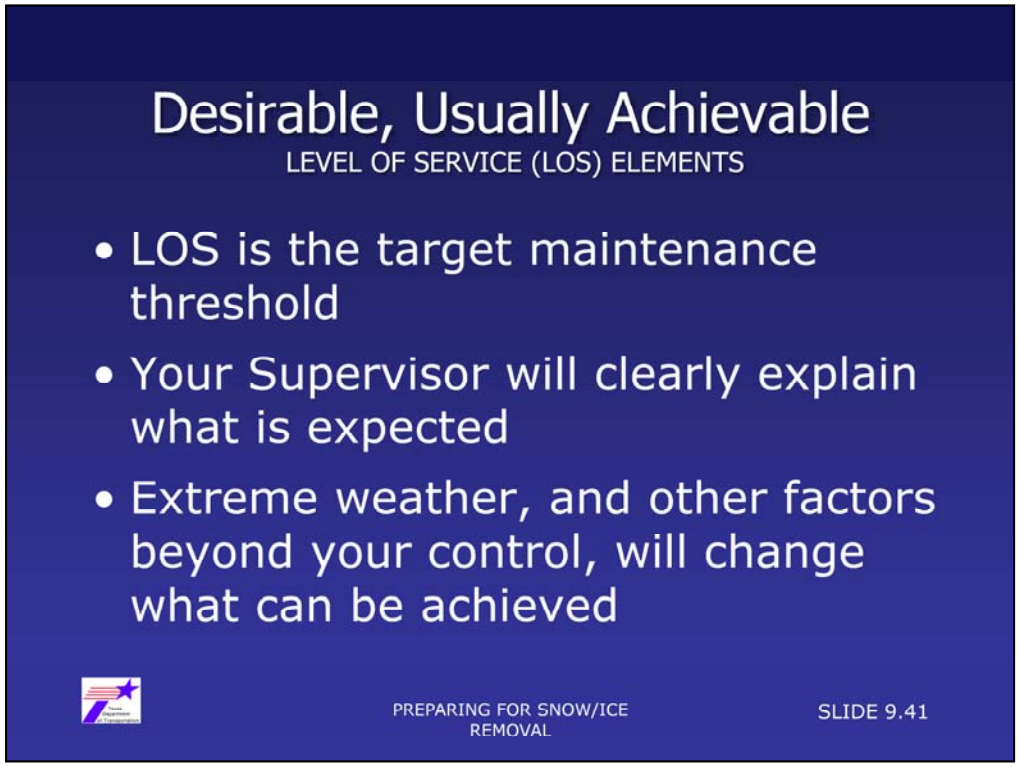
Instructor Notes: Present the following key points.

Weather varies throughout Texas, as we know.

This color-coded climate map shows that the Texas Panhandle typically receives 12 to 24 inches of snow each winter.

In contrast, the Dallas/Fort Worth Metroplex will typically receive 0 to 3 inches of snow (or ice) each year.

These are all averages, however. Each winter storm will be different, and the storm is what you have to respond to.



Instructor Notes: Present the following key points.

This discussion about climate is to say that because planning is done based on typical conditions, the level of service your Supervisor (and the traveling public) expects you to achieve is also based on typical conditions.

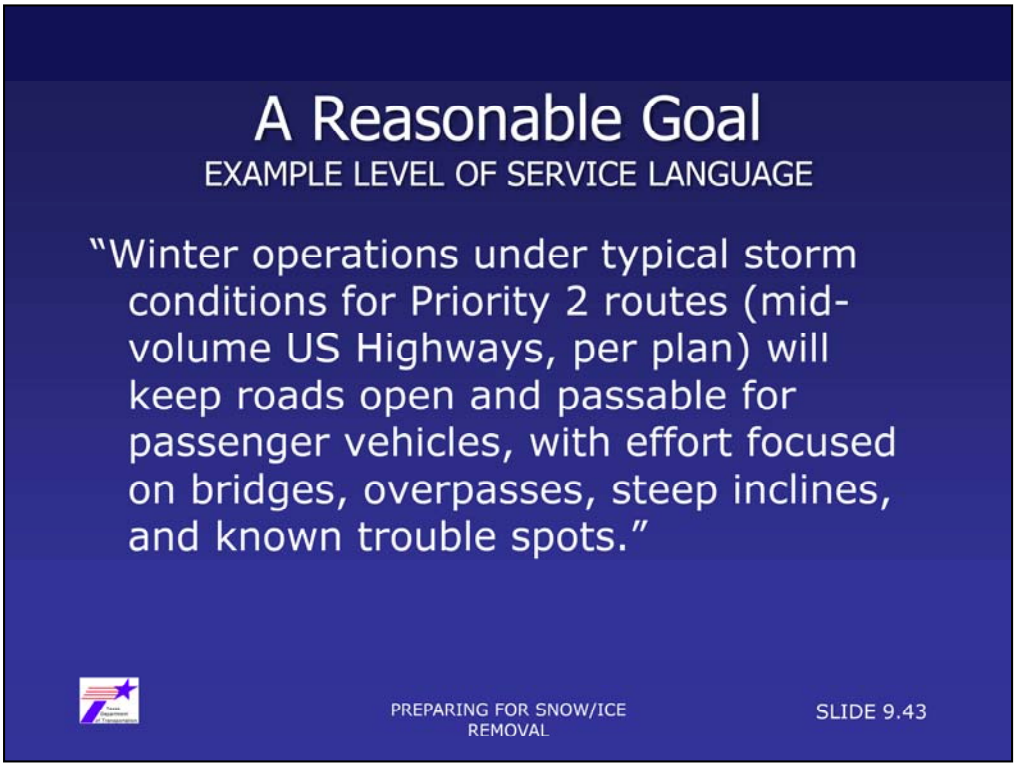
In the case of extreme weather, the standards will be relaxed.



Instructor Notes: Present the following key points.

Briefly put, "Sometimes, Mother Nature wins."

Roadway maintenance in winter weather is like this.



Instructor Notes: Present the following key points.

WHAT DO YOU NEED TO KNOW?

Your Supervisor will explain to you what he wants you to achieve.

It might sound something like what is shown here.

As always, your Supervisor will expect you to do your best.



Instructor Notes: Present the following key points.

Much of what we have discussed up to this point has been about snow operations.

We will now briefly discuss winter maintenance operations with respect to ICE.



Instructor Notes: Present the following key points.

TO BEGIN, we can say that snow plows are NOT very effective on ice.

Snow plows ride on top of the ice, with only their weight as ballast.

Snow plows do not include a mechanism to hydraulically create down-pressure on the moldboard so that the blade will dig into, and remove, ice that is bonded to the roadway.



Instructor Notes: Present the following key points.

Motor graders, however, have the downward pressure capability.

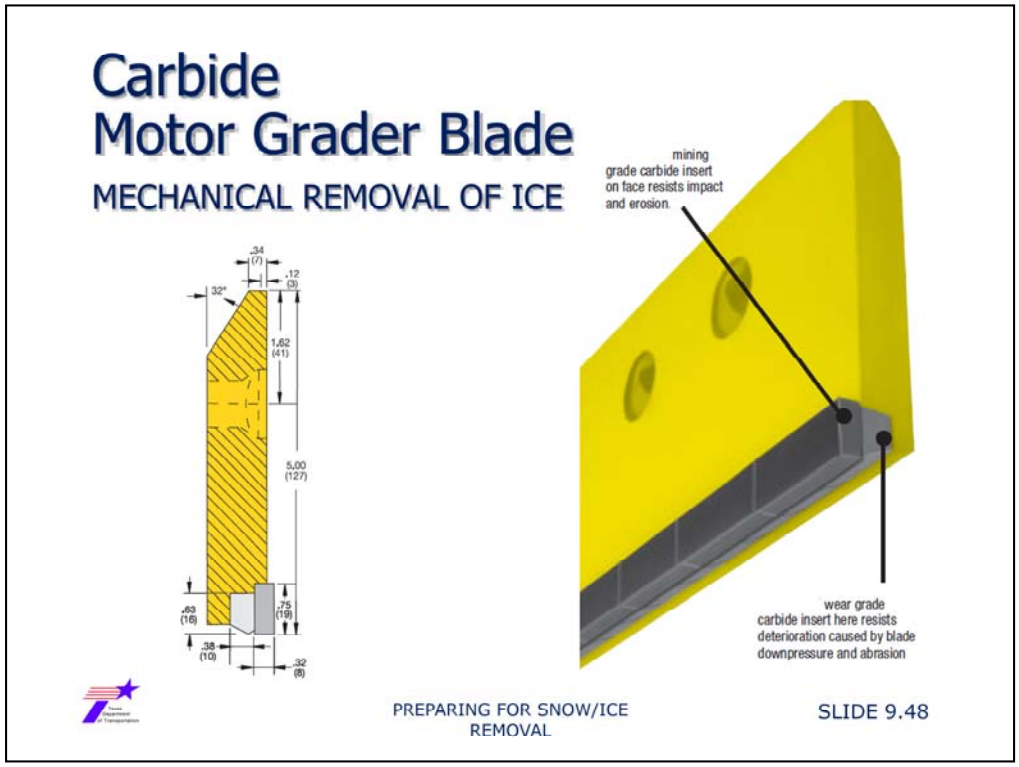
Thus, motor graders can be used to plow both snow and ice; whereas, snow plows can only be used (effectively) for snow.



Instructor Notes: Present the following key points.

We have discussed how mild steel snow plow blades do not last very long.

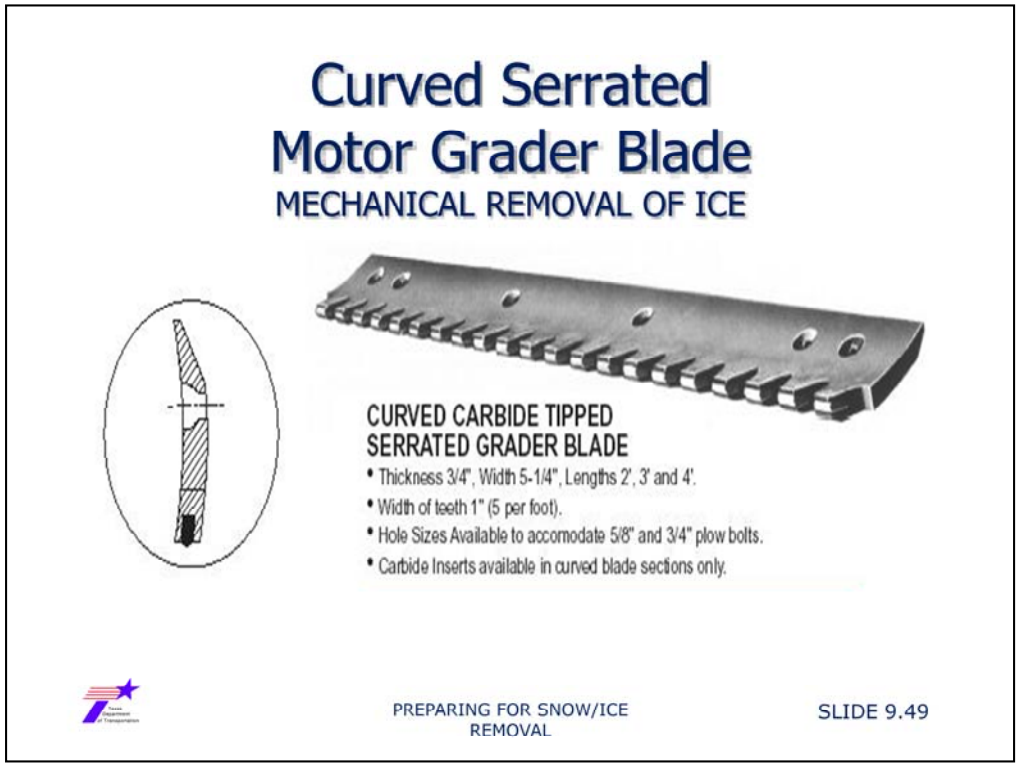
The same is true for motor grader blades. While standard duty (mild steel) blades may work well for moving earth or paving materials, the mild steel blades do not last long when scraping on concrete or asphalt pavement.



Instructor Notes: Present the following key points.

Carbide blades exist for motor graders just like they do for snow plows.

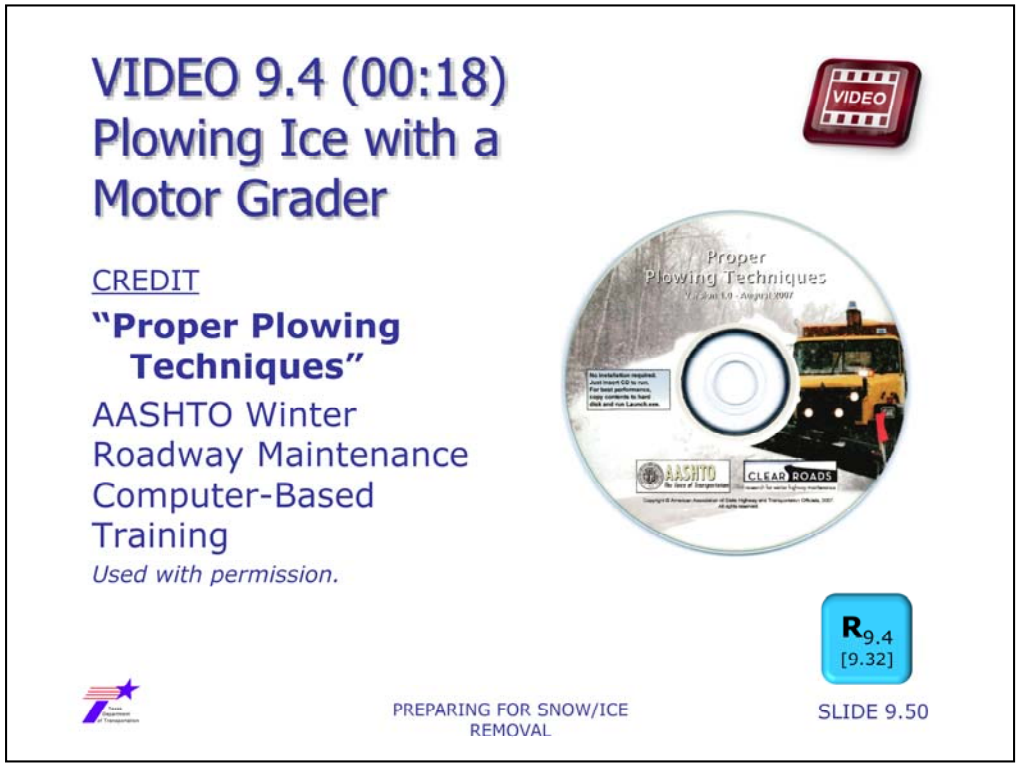
If your maintenance section is regularly using motor graders to plow ice or snow, you may have these in the inventory.



Instructor Notes: Present the following key points.

Some of the motor grader blades are serrated to facilitate more aggressive ice removal.

Again, if you have these kinds of blades, your Supervisor may ask you to help install these blades on motor graders during the winter season.



Instructor Notes: Present the following key points.

This brief film discusses plowing ice with a motor grader.

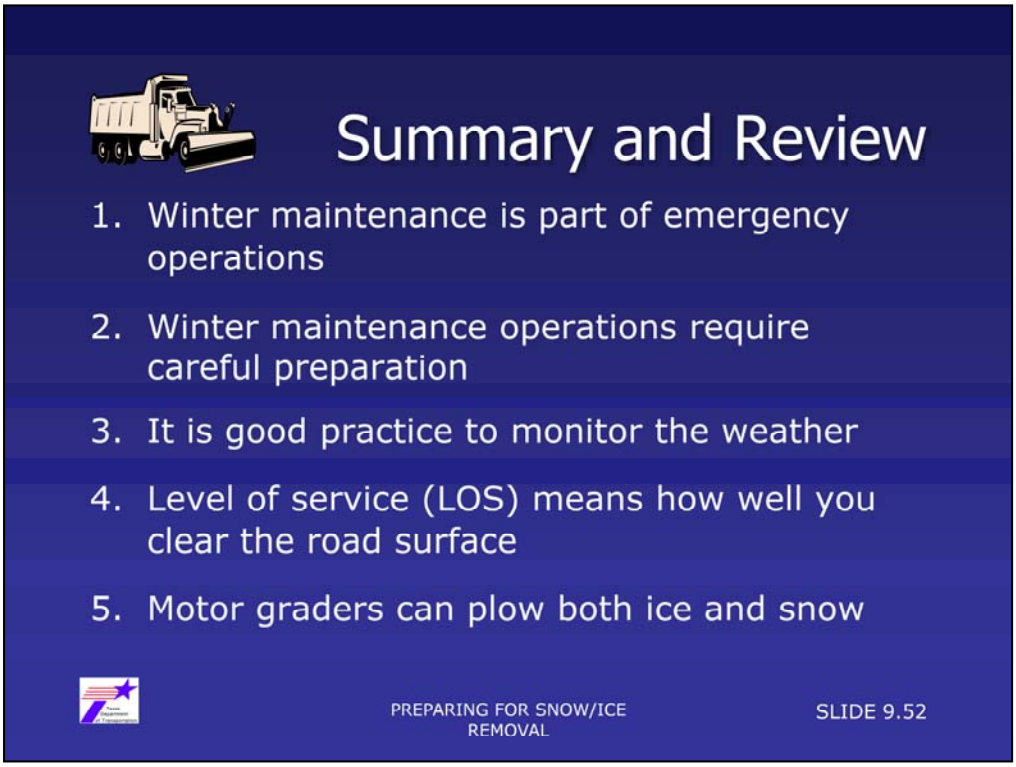


Instructor Notes: Present the following key points.

It is agreed by maintenance professionals everywhere that ice is more difficult to deal with than snow.

This is especially true if the ice is bonded to the roadway surface.

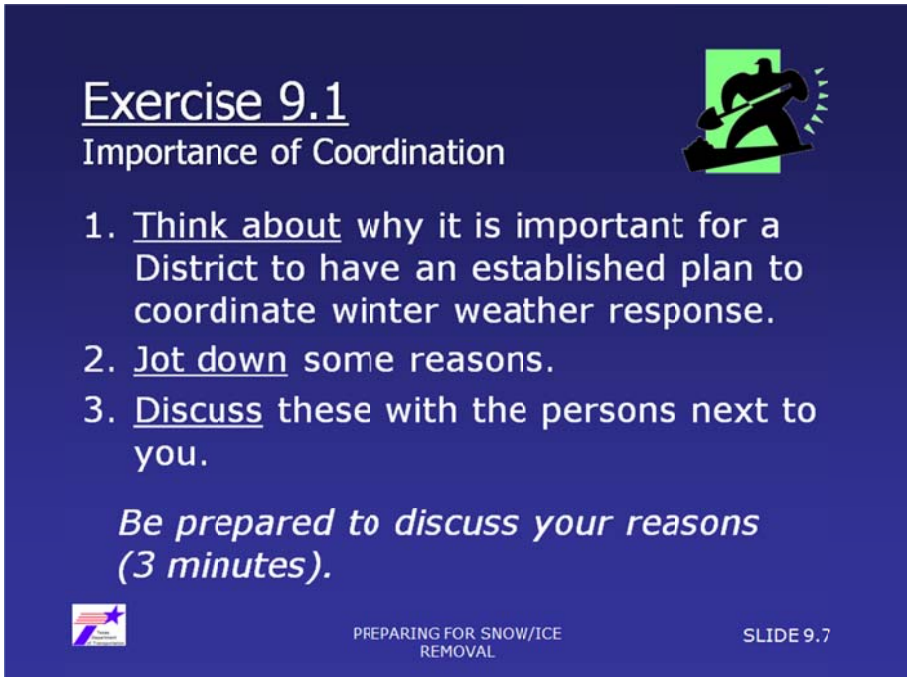
So, anti-ice when you can. And be sure to anti-ice responsibly.



Instructor Notes: Present the following key points.

PINK SHEETS.

Answer each question.


Exercise 9.1
Importance of Coordination
1. Think about why it is important for a District to have an established plan to coordinate winter weather response.
2. Jot down some reasons.
3. Discuss these with the persons next to you.
Be prepared to discuss your reasons (3 minutes).
PREPARING FOR SNOW/ICE REMOVAL
SLIDE 9.7

VIDEO 9.1. ROUTE INSPECTION (00:58)

SCRIPT

Each driver should travel his snow route in advance of the winter season to familiarize himself with the route and learn if hazards or obstructions are present which will affect plowing.

Become very familiar with the route you are responsible for. The way to do this effectively is to drive the route one or more times *prior to* any snowfall on the ground.

This video identifies several natural features to watch for, such as hills and curves, bumps, shaded areas, fences, and the like.

Also pay special attention to obstacles such as bridge expansion joints, low-hanging wires, concrete curbs, and any other kind of obstruction or hazard along your plow route.

It may be difficult or dangerous to jot these locations down while driving, so bring someone along with you during your dry run to take notes. For safe operation you will want to memorize these locations.

VIDEO 9.2. DEFENSIVE DRIVING ON SNOW/ICE (02:03)

SCRIPT

There's no doubt about it, winter weather makes for hazardous driving conditions! This video from the TxDOT Amarillo district shows snow plows operating in heavy traffic on Interstate 40.

We all know that when the weather outside is bad, the best place to be is inside! But despite warnings and encouragement to stay home, some of the travelling public will be out on the road.

When you have to drive on snow and ice, keep safety first, and drive defensively both to protect others and yourself. Practice these winter weather driving tips:

1. Make sure your vehicle is winter weather ready. Carefully performing your pre-trip inspection will go a long way toward ensuring your safety.

2. Experienced snow and ice drivers tell us to decrease speed and to allow extra room for turning and stopping. Brake gently, and accelerate gently, so as not to lose control.

3. Retain visibility. Make sure others can see you, and keep your visibility as good as possible.

4. Always know your own location, monitor road conditions, and communicate updates to your co-workers and your supervisor.

Even when you have done all you know to do, things can happen. The following film clip first aired on the Weather Channel. The video speaks for itself.

Be safe!

VIDEO 9.3. WINTER WEATHER CLOTHING (01:48)

SCRIPT

Selecting your snow plowing wardrobe may seem like a trivial issue, and it may be until you get caught out that first time in a howling snow storm with equipment problems. It is then, the clothing you are wearing becomes a vital issue.

It has been said that when selecting clothing to wear, plan for the normal but be prepared for the unusual. Experienced operators will tell you that you will usually face the unusual when plowing snow.

Start every shift with clean, dry skin and carefully chosen clean clothing. Cotton t-shirts and underwear are your best choice next to your skin. Over that wear 2 piece style long underwear, either thermal material or wool.

On your feet, wear cotton or polypropylene socks as the first layer. Polypropylene is the best choice because it wicks moisture away from your skin; cotton tends to hold moisture. A good choice for a second layer is wool socks. Do not wear stretch socks because they tend to cut off blood circulation, and it is good circulation that keeps your feet warm. As for trousers, jeans are a good choice. Suspenders are better than a belt because they allow for more air circulation.

When you pick out shirts, think in terms of layers because loose fitting layers of clothing trap air to keep you warm. Over your undershirt, a heavy flannel shirt is a good choice. Pick out shirts with long tails so they do not worked up and leave bare skin exposed when you get in and out of the truck. A heavy sweatshirt with or without hood, makes a great third layer.

VIDEO 9.4. PLOWING ICE WITH A MOTOR GRADER (00:18)

SCRIPT

Motor graders can be equipped with an ice blade or V-Plow.

These powerful machines are operated at speeds much lower than regular truck mounted plows, generally just 5 to 10 miles per hour.

Class Exercise – Review Questions
Module 9 – PREPARING FOR SNOW/ICE REMOVAL

MNT812 Winter Weather Operations Training

1. Responding to a winter storm is part of emergency operations at TxDOT because:
   A. Winter storms constitute a state of emergency
   B. Operating equipment in winter weather can be very hazardous
   C. Winter storm response often occurs outside of normal business hours
   D. All of the above

   The correct answer is C.

   Recall that winter weather operations are classified as "routine maintenance" but this falls under the heading of "emergency operations" because of how winter storms do not typically follow normal business hours.

2. [True/False] No matter the size of the storm, for your maintenance section, the Maintenance Supervisor holds the key operational role in the Incident Command System.
   A. True
   B. False

   This statement is TRUE.

   From the standpoint of operations personnel, the Maintenance Supervisor is always in charge. For typical storms, he is solely in charge. For major storms, he may be subordinate to others, such as the Director of Maintenance. But at the Maintenance Section level, the Supervisor is lead.

3. Some of the preparations needed for winter maintenance operations include:
   A. Be ready for shift work and working out of town
   B. Inspect and become familiar with your plow route
   C. Make sure you have adequate winter weather clothing
   D. All of the above

   The correct answer is D.

4. [True/False] TxDOT policy on defensive driving during major winter storms is that it is better and safer for operations personnel to stay at home, safe and warm, and to keep roadway maintenance equipment off the road and in the garage, protected from damage.

   A. True

   B. False

   This statement is FALSE.

   While this is the advice TxDOT broadcasts to the travelling public, TxDOT personnel have a responsibility to be out on the road, even during major storms, to make sure the roads are open and safe.

5. [True/False] During the winter storm season, it is the job of your Supervisor to keep an eye on the weather. That is one thing you do not have to worry about.

   A. True

   B. False

   This statement is FALSE.

   Your Supervisor can't see everything. He needs your help.

6. [True/False] The important thing about level of service is, your Supervisor will explain the outcome he expects you to achieve for your assigned section of road.

   A. True

   B. False

   This statement is TRUE.

7. [True/False] Snow plows and motor graders are equally effective at plowing both snow and ice.

   A. True

   B. False

   This statement is FALSE.

   A motor grader can effectively plow both snow and ice. A snow plow can effectively plow only snow.



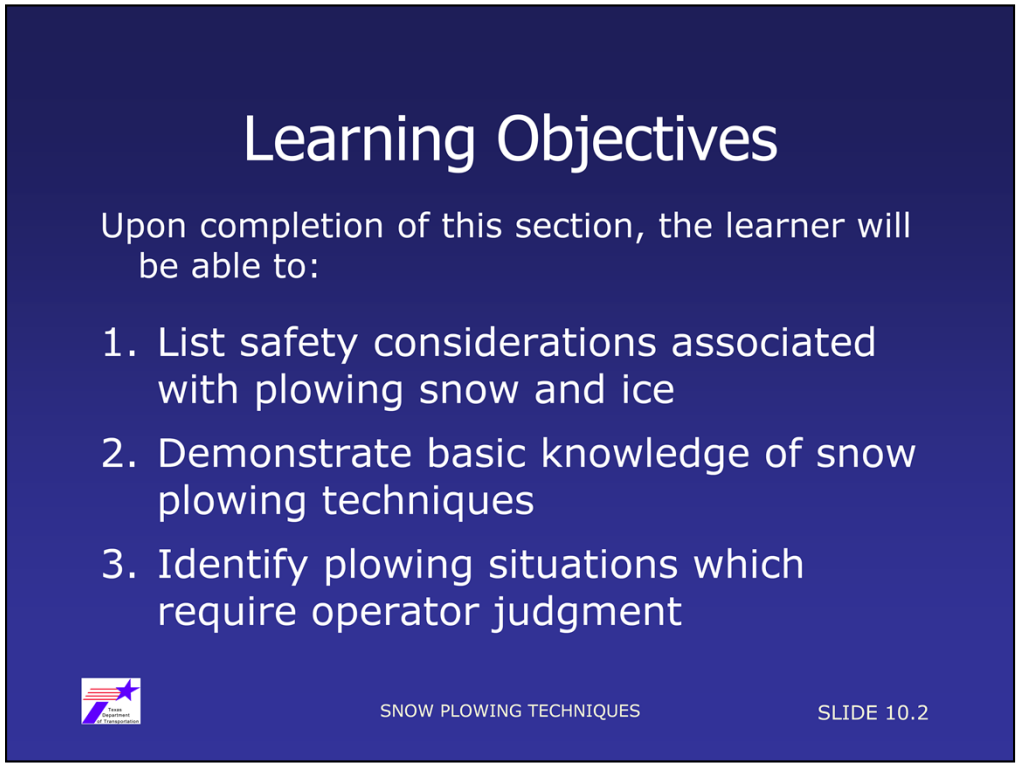
Instructor Notes: Present the following key points.

In this module, we will discuss actual snow plowing techniques.

It is interesting that, when this curriculum was being developed, it was felt that most of the curriculum would be about plowing snow.

But we have had to do more than a day of instruction just to get to this point.

Clearly, there is much more to winter weather operations than plowing snow. But plowing snow is part of it.



Instructor Notes: Present the following key points.

Note the learning objectives.



Instructor Notes: Present the following key points.

When we talk about plowing snow, we are of course referring to plowing snow with a reversible snow plow such as is shown in this image.



Instructor Notes: Present the following key points.

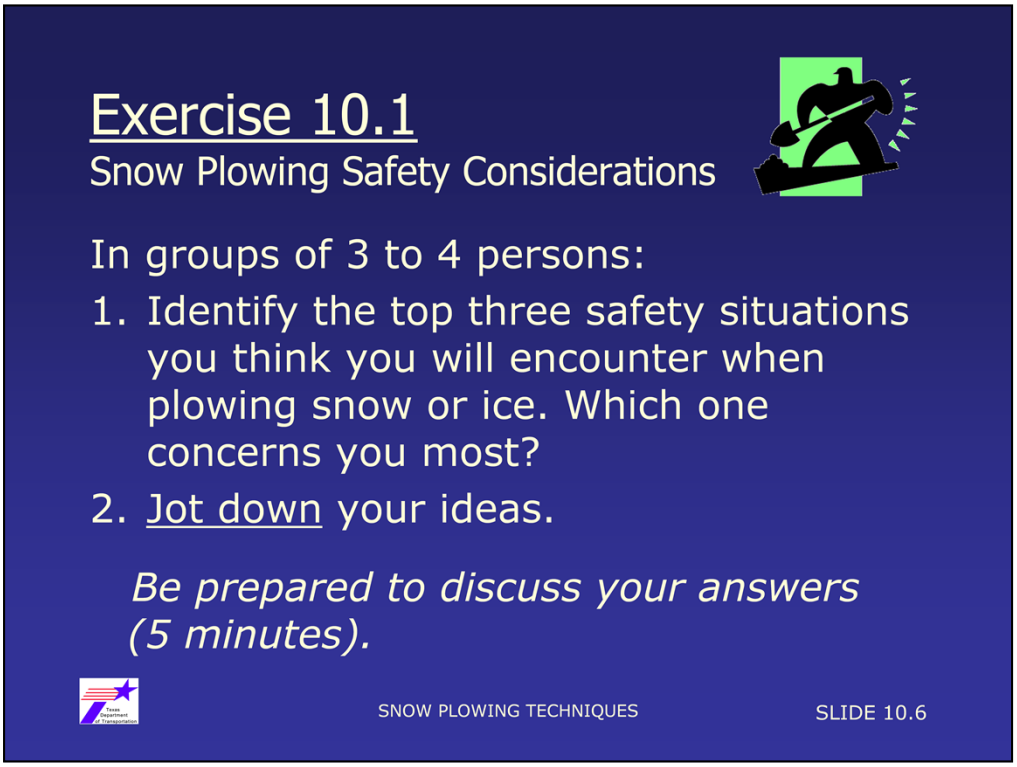
HOWEVER, everything we say about plowing snow with a snow plow is equally applicable to plowing snow with a motor grader.

So if your District has no snow plows, only motor graders, not to worry. This is for you, too.



Instructor Notes: Present the following key points.

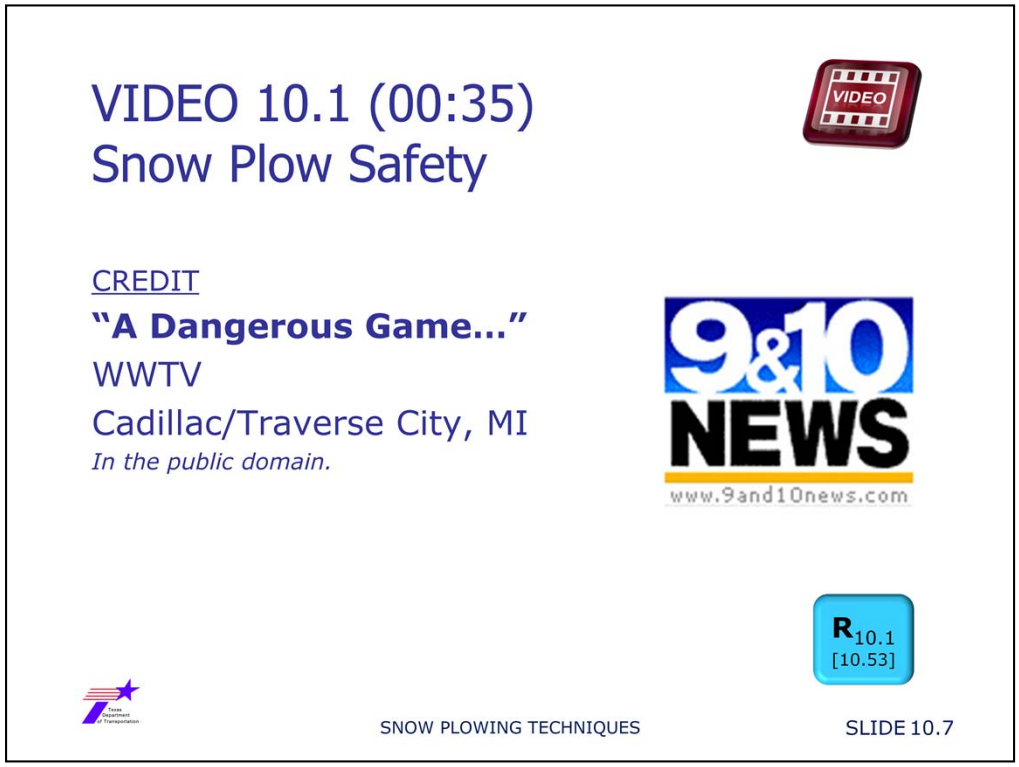
SNOW PLOW OPERATIONS ARE ABOUT SAFETY, FIRST TO LAST.



Instructor Notes: Present the following key points.

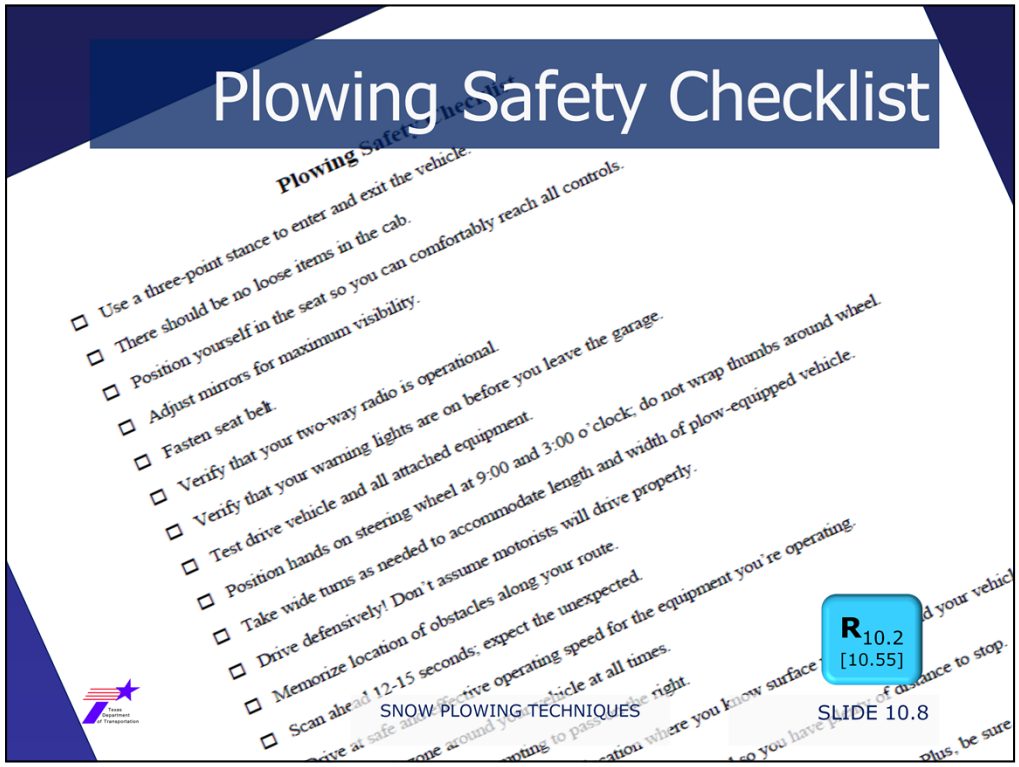
GREEN SHEET.

DO THIS EXERCISE.



Instructor Notes: Present the following key points.

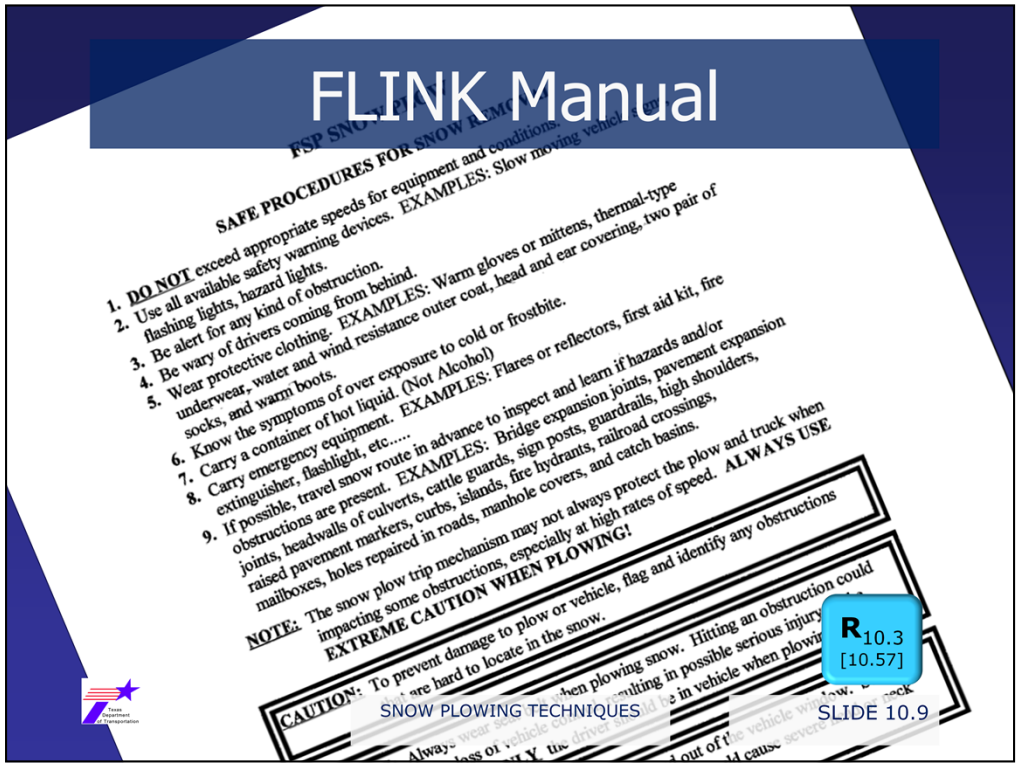
This video provides a unique perspective on plowing safety.



Instructor Notes: Present the following key points.

A "Plowing Safety Checklist" exists. Reference 10.2.

Remove this from your binder. Review the items.



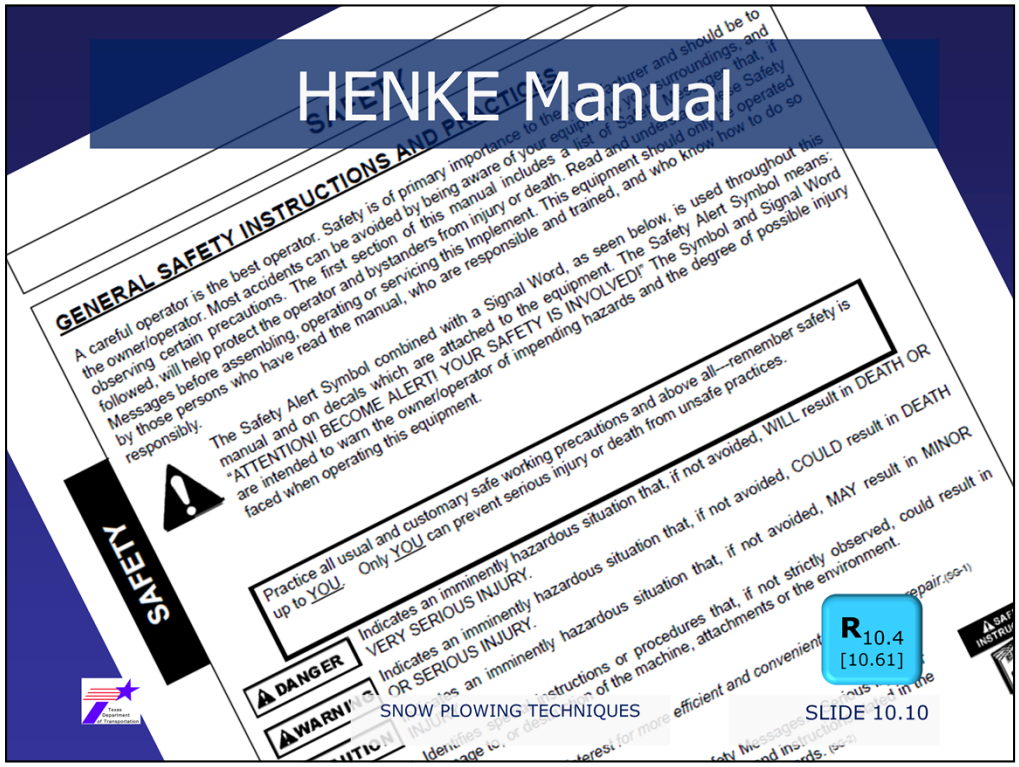
Instructor Notes: Present the following key points.

We have included the safety information from the latest snow plow manufacturers' manuals.

These include Flink, Henke, and Monroe.

SAFETY FIRST.

TxDOT expects you to read this.



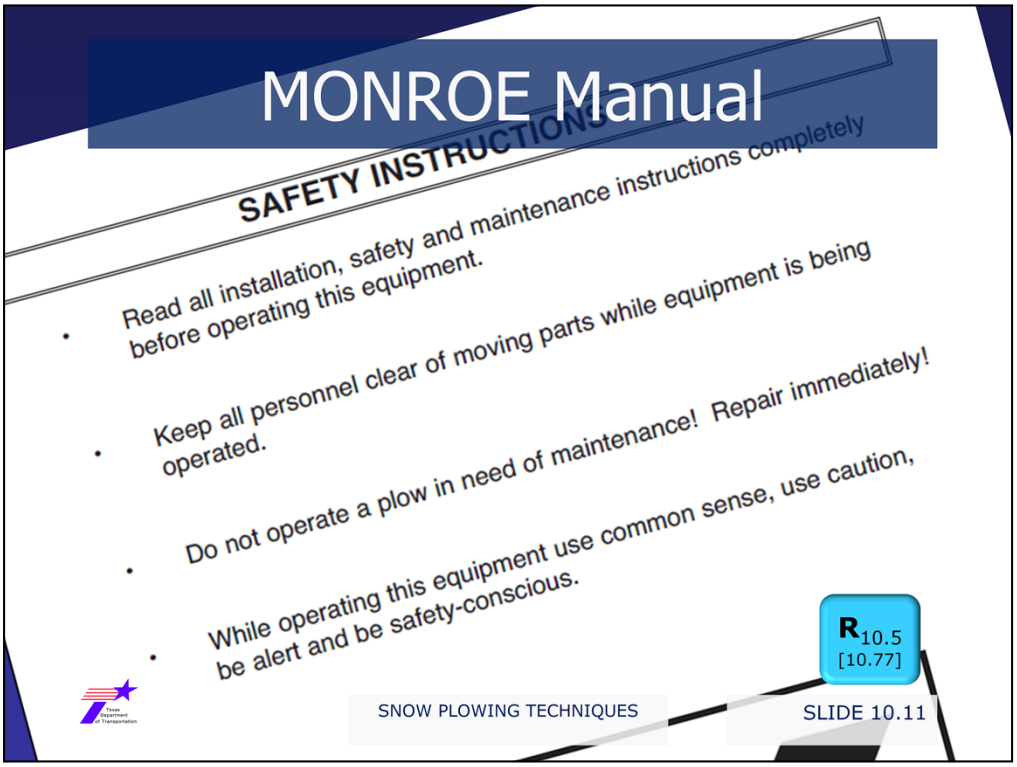
Instructor Notes: Present the following key points.

We have included the safety information from the latest snow plow manufacturers' manuals.

These include Flink, Henke, and Monroe.

SAFETY FIRST.

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Instructor Notes: Present the following key points.

We have included the safety information from the latest snow plow manufacturers' manuals.

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SAFETY FIRST.

TxDOT expects you to read this.



Instructor Notes: Present the following key points.

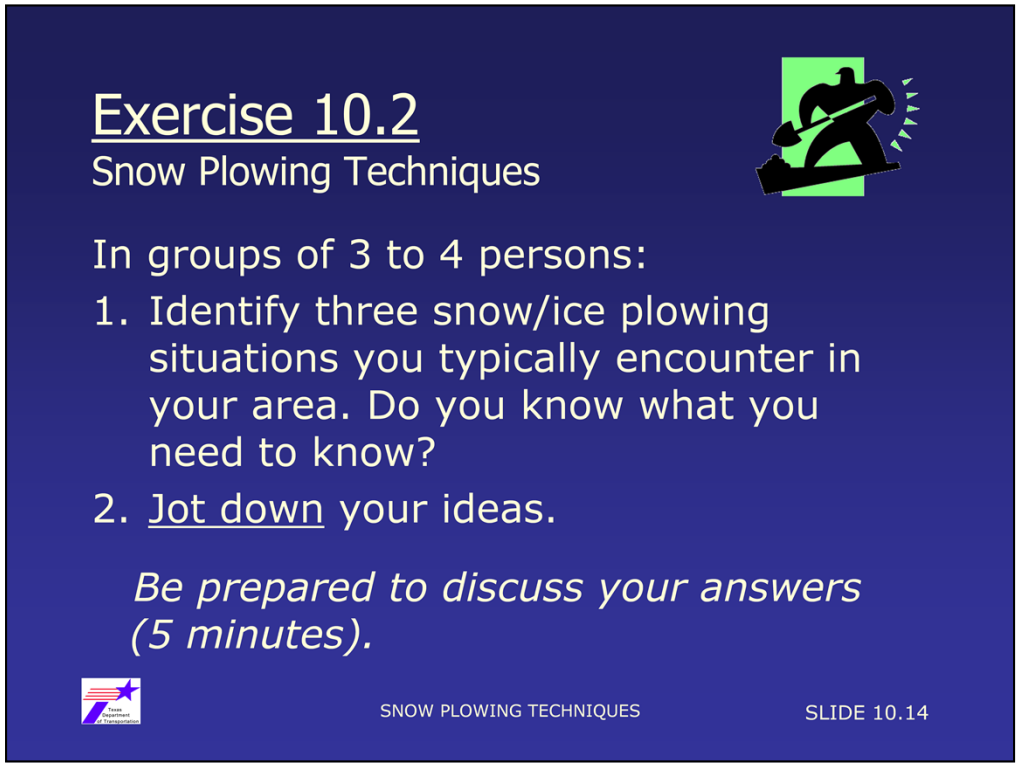
SNOW PLOW OPERATIONS ARE ABOUT SAFETY, FIRST TO LAST.

There is no substitute for safety.



Instructor Notes: Present the following key points.

We shall now discuss snow plowing techniques.



Instructor Notes: Present the following key points.

GREEN SHEET.

Do if the schedule will allow.



Instructor Notes: Present the following key points.

This video asks the question, “Are you ready?”



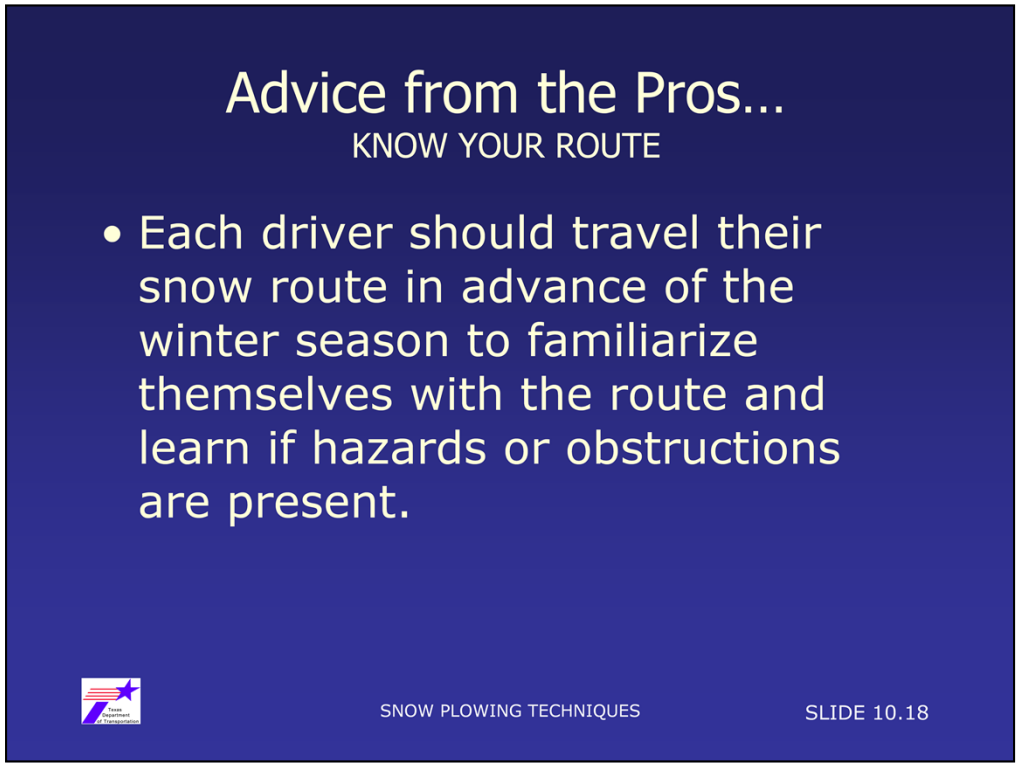
Instructor Notes: Present the following key points.

Advice from the pros…



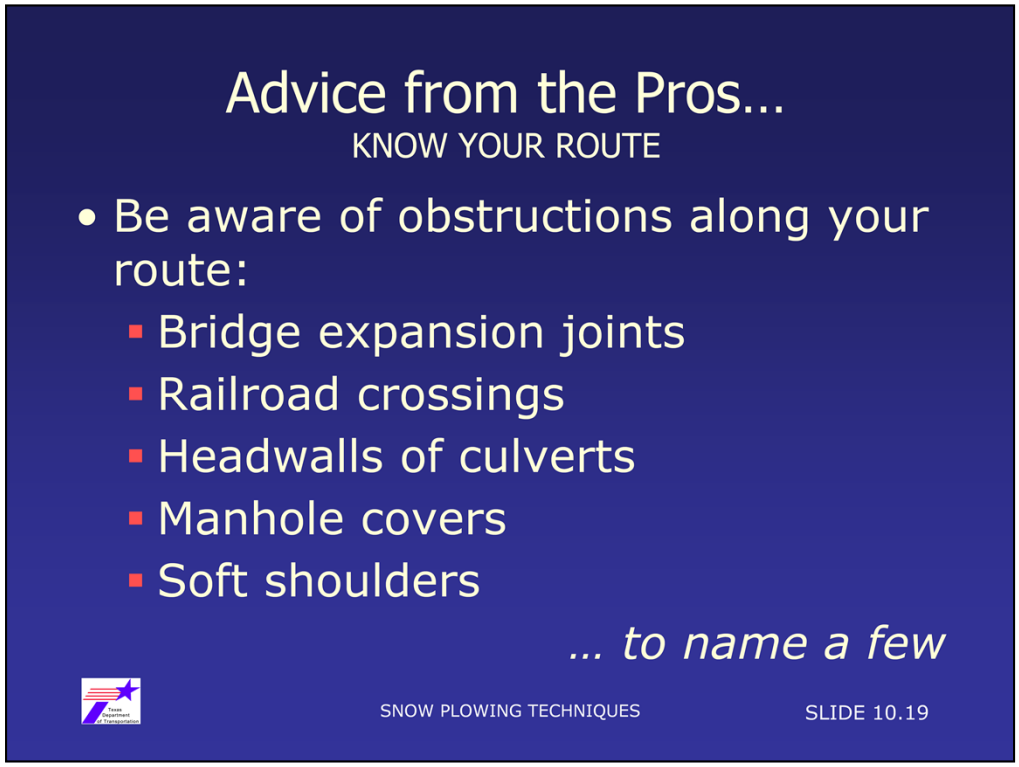
Instructor Notes: Present the following key points.

We have talked before about the importance of knowing your plow route. This video emphasizes how different the route can appear from summer to winter.



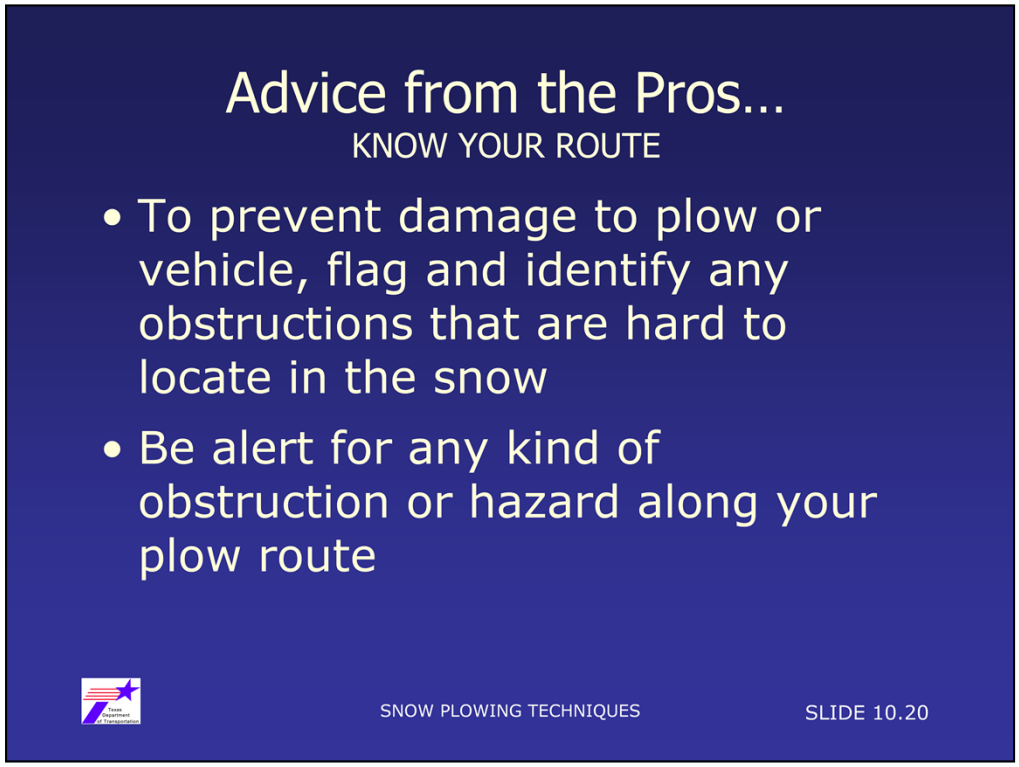
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



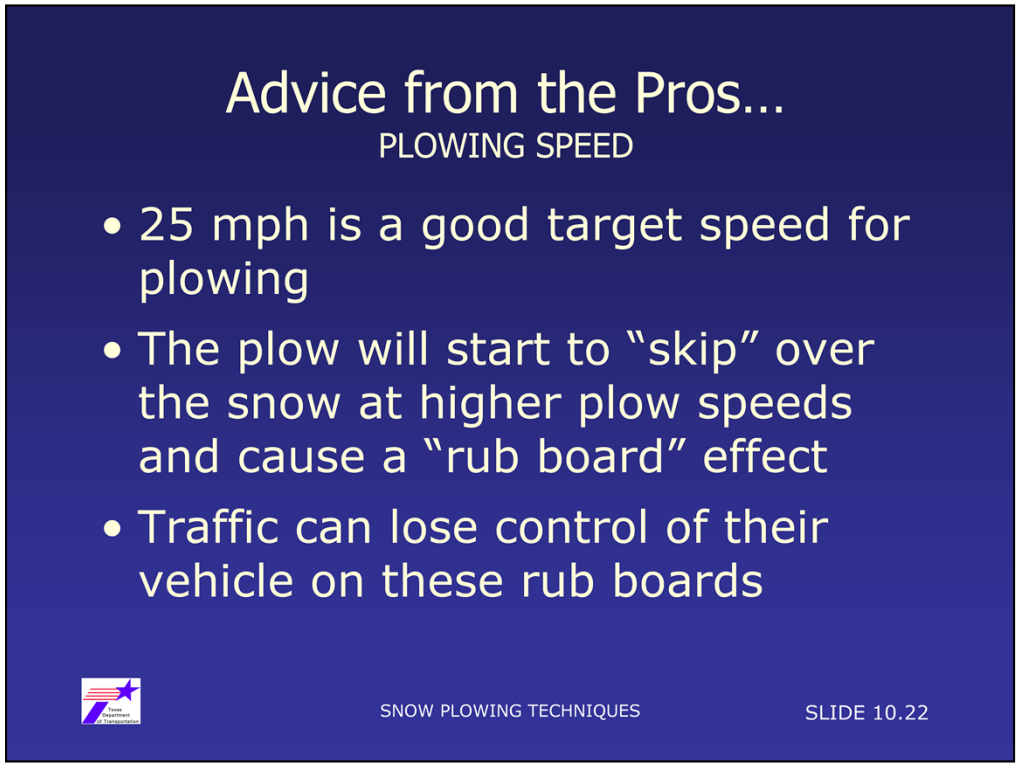
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

This video discusses plowing speed.



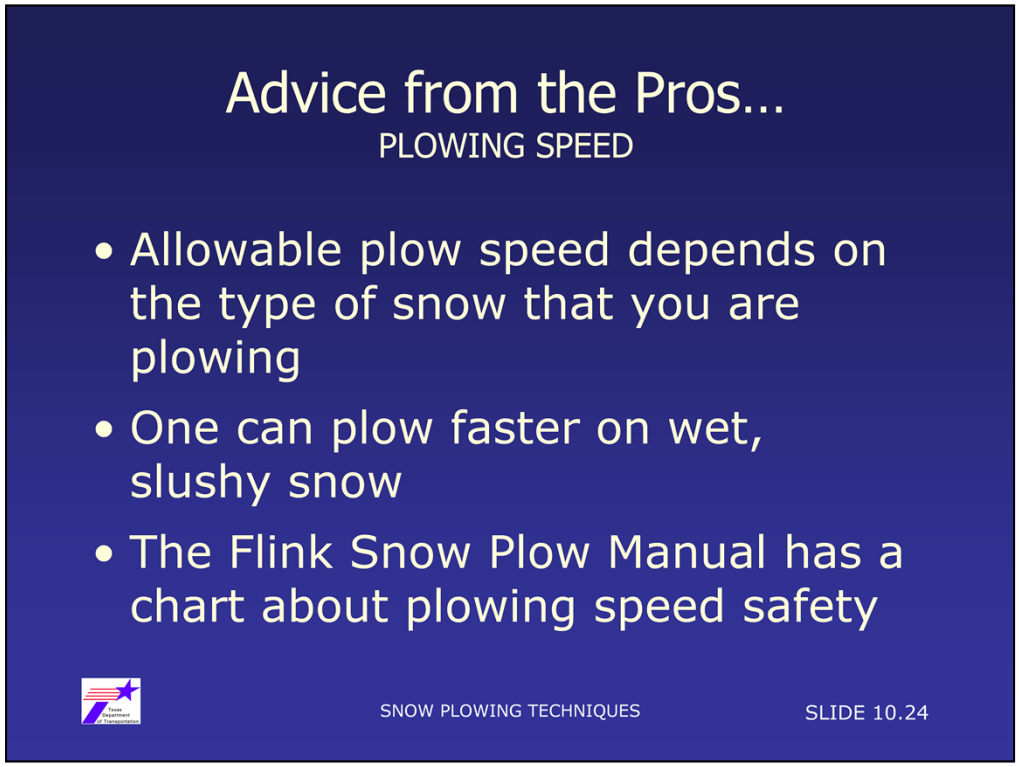
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

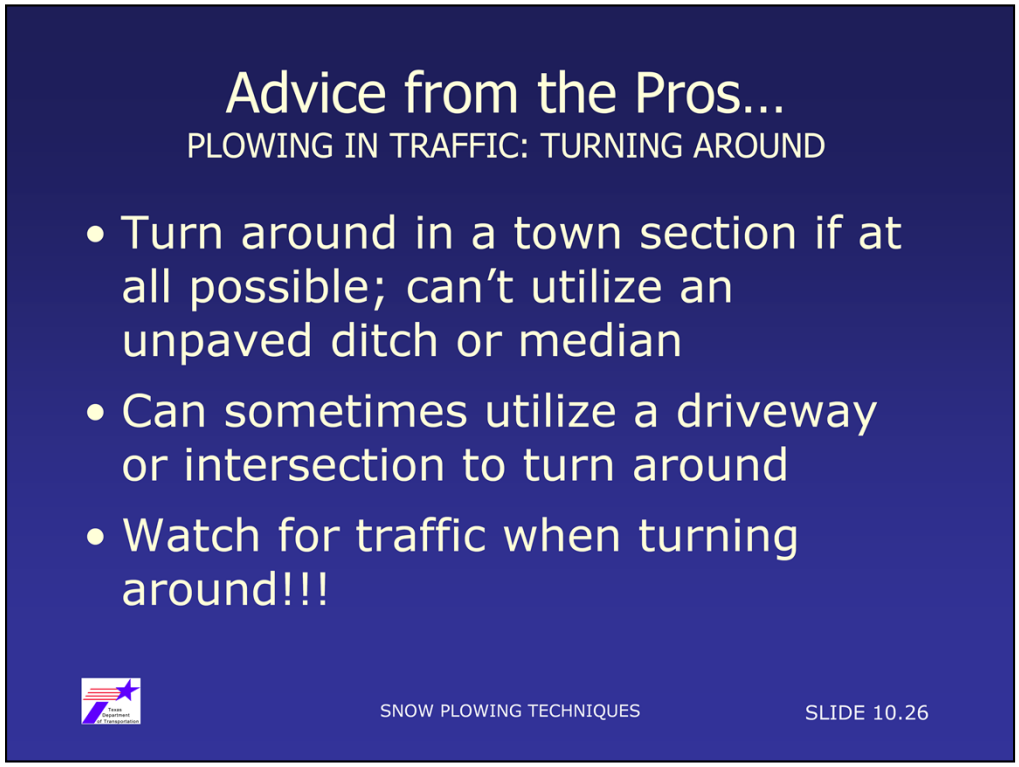
Advice from the pros…

NOTE THE CHART IN THE FLINK MANUAL...



Instructor Notes: Present the following key points.

Snow plowing does not happen behind barricades, or within the limits of traffic control. Snow plowing is done in traffic! For this reason, safety awareness is of paramount importance.



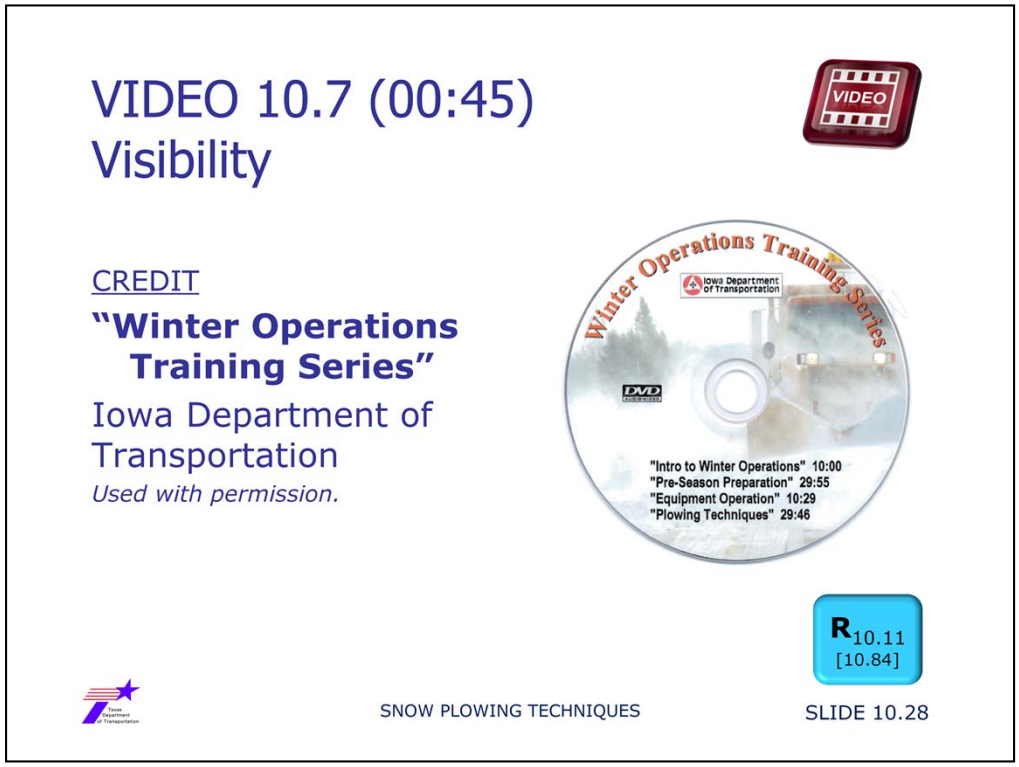
Instructor Notes: Present the following key points.

Advice from the pros…



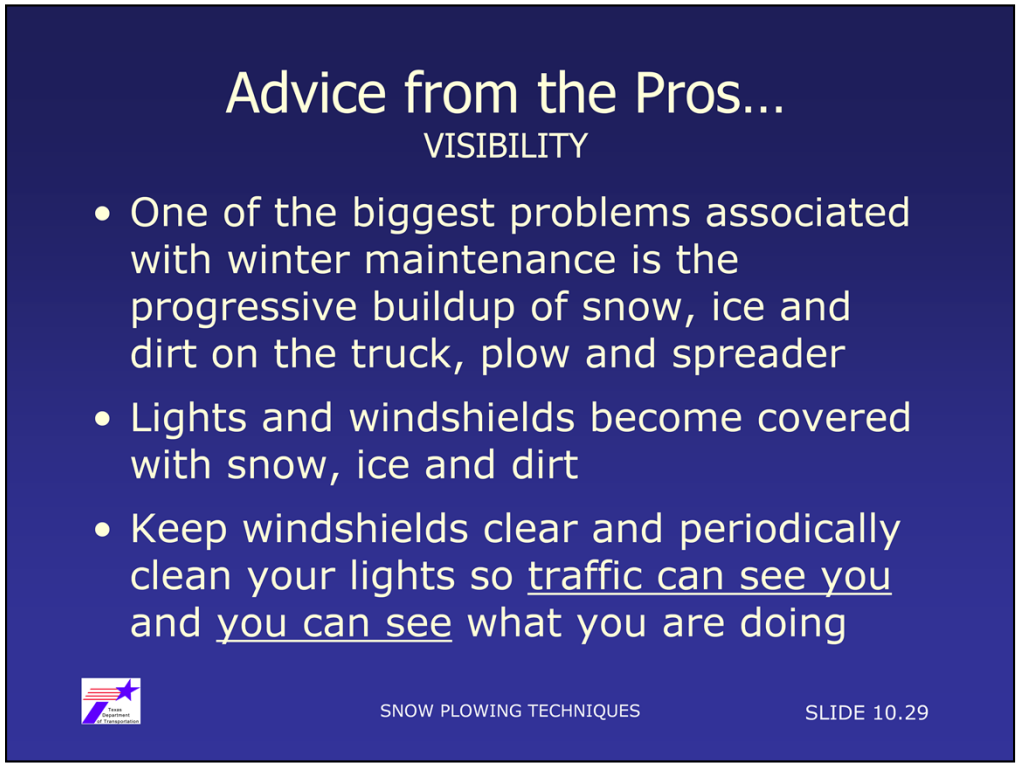
Instructor Notes: Present the following key points.

If you have operated a plow truck, you know that plow trucks handle differently than you may think.



Instructor Notes: Present the following key points.

Visibility means being able to see others, and making sure that others can see you.



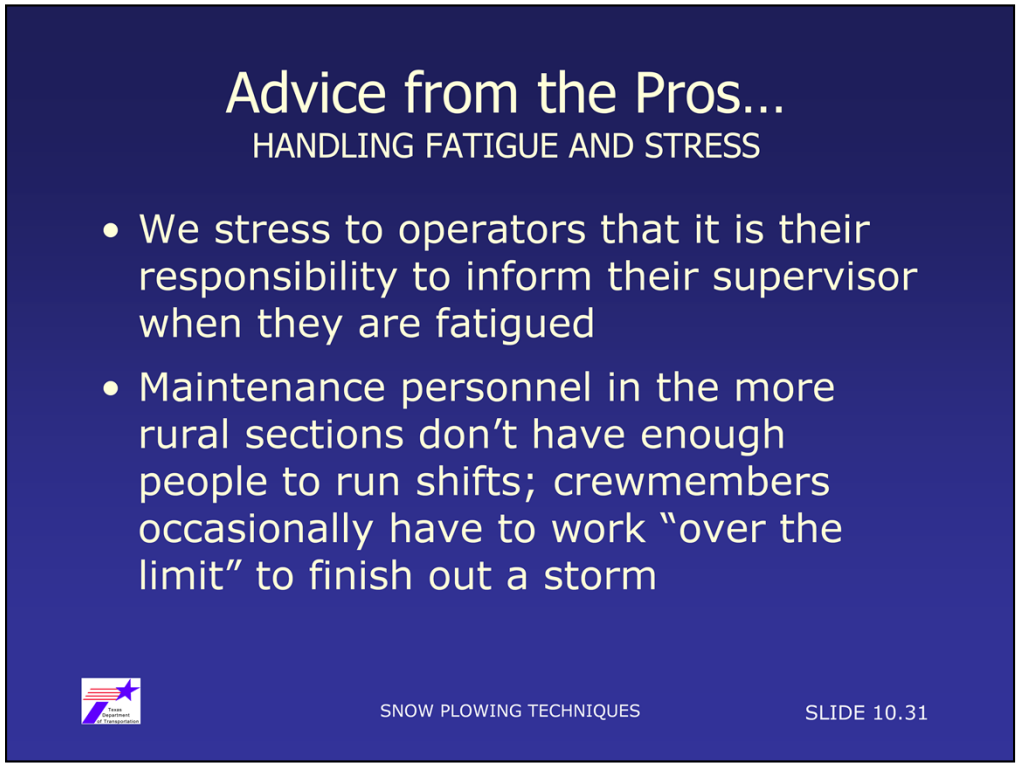
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Fatigue and stress are part of winter maintenance operations. This video highlights some of the things you can do to address these factors.



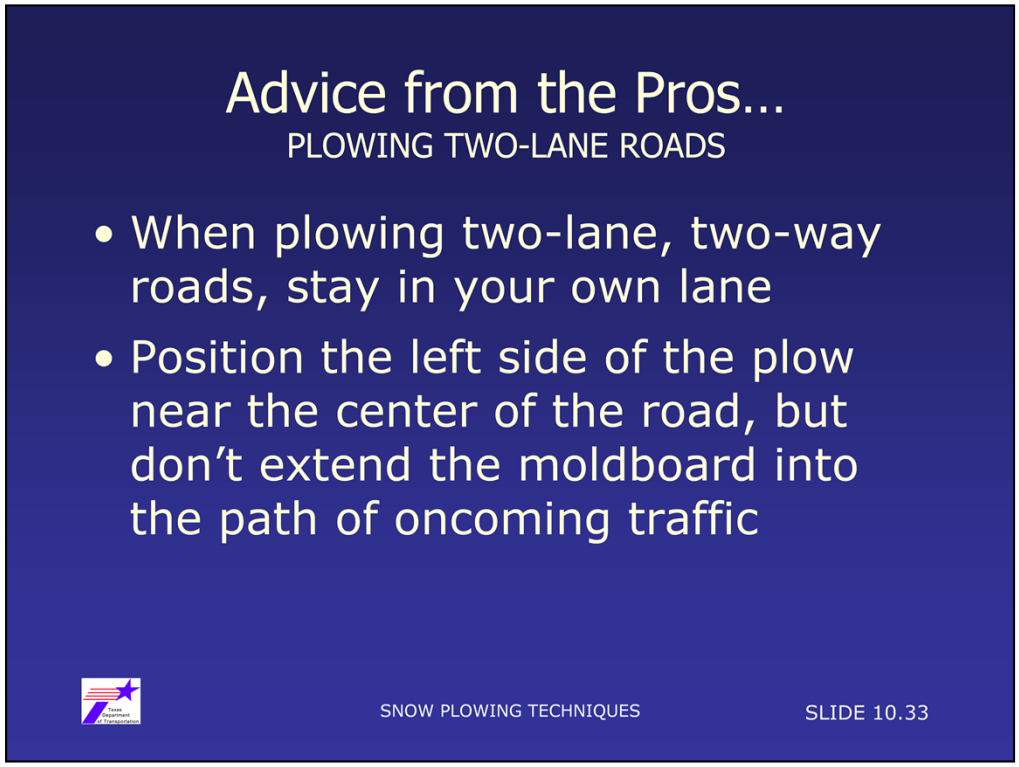
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Plowing two-lane roads is typically where novice plow operators make their first solo run. This video describes how to properly plow a two-lane road.



Instructor Notes: Present the following key points.

Advice from the pros…

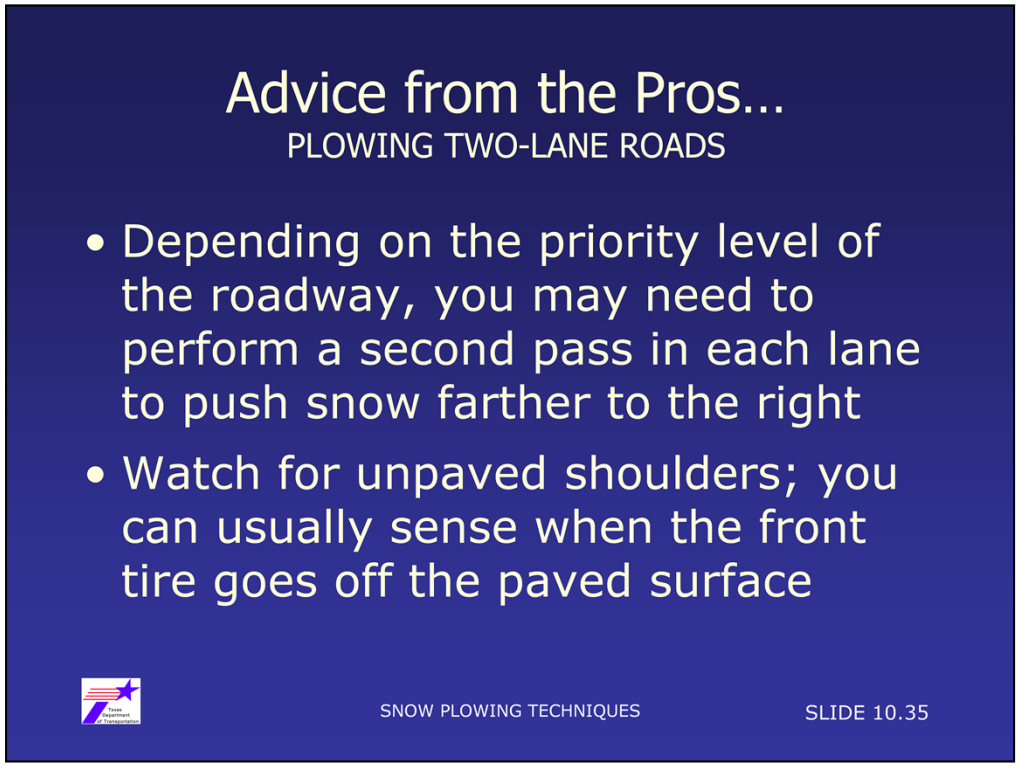


Instructor Notes: Present the following key points.

Advice from the pros…

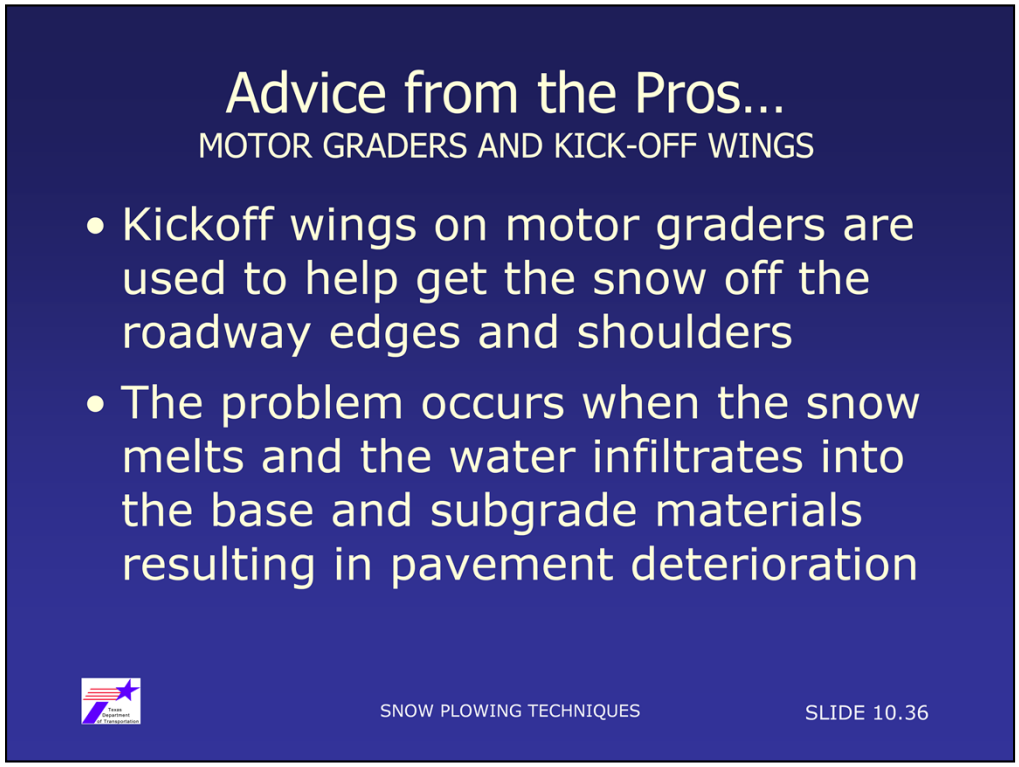
NOTE: RPMs can be a safety concern. There have been incidents in the past where snow plows scraped off RPMs while plowing at high speed. In one case, the RPM became a projectile which penetrated through a passenger car windshield and hit the driver.

Your Supervisor will provide guidance to you on your District's policy for RPMs.



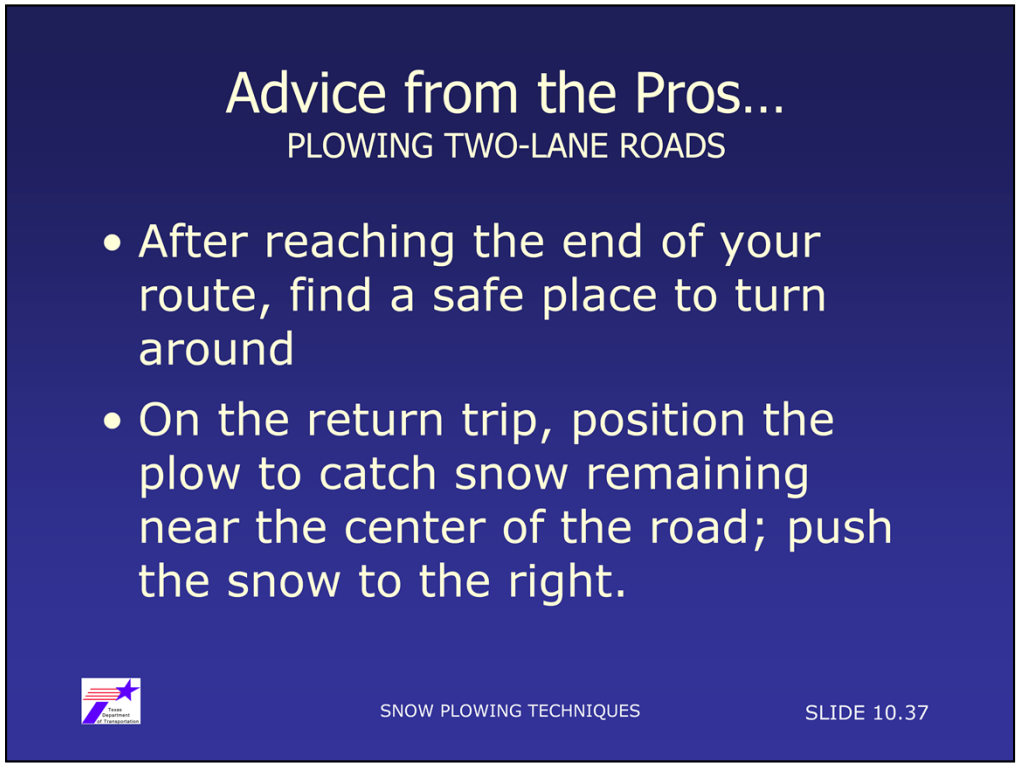
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



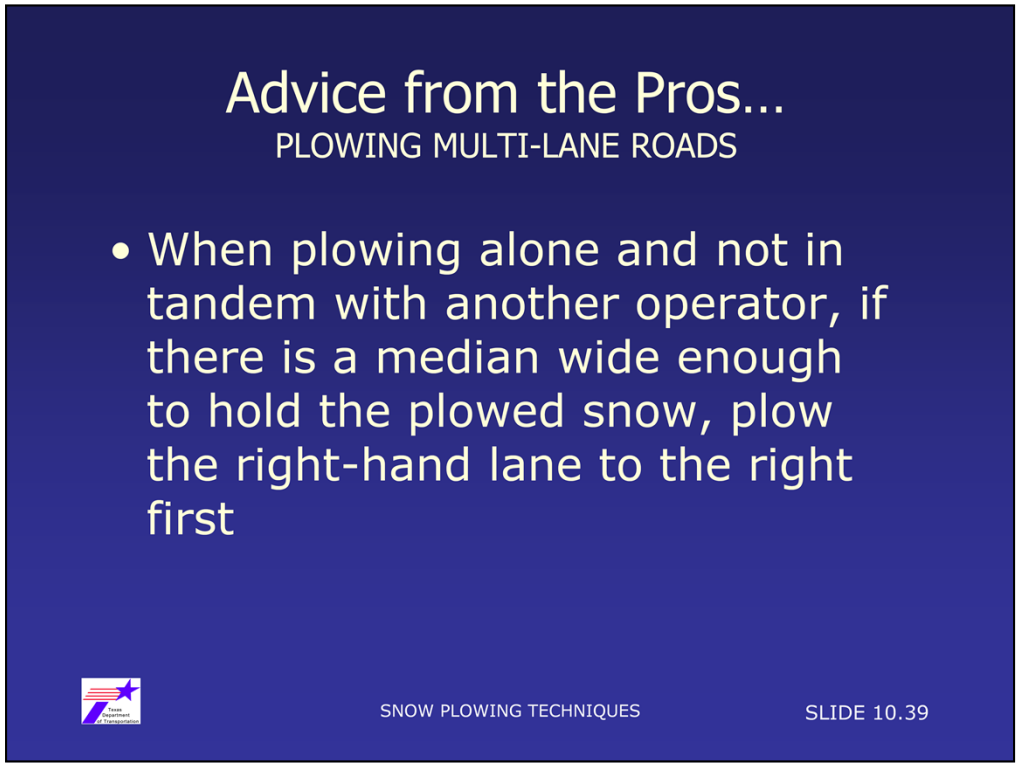
Instructor Notes: Present the following key points.

Advice from the pros…



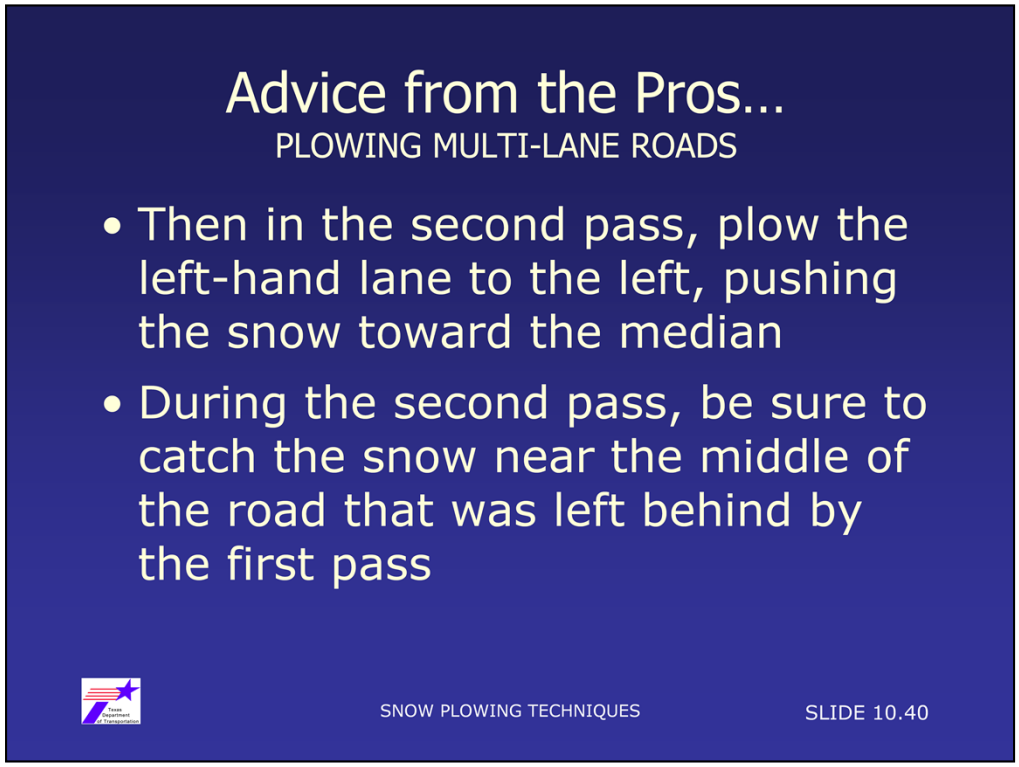
Instructor Notes: Present the following key points.

This video discusses plowing multiple lane roads.



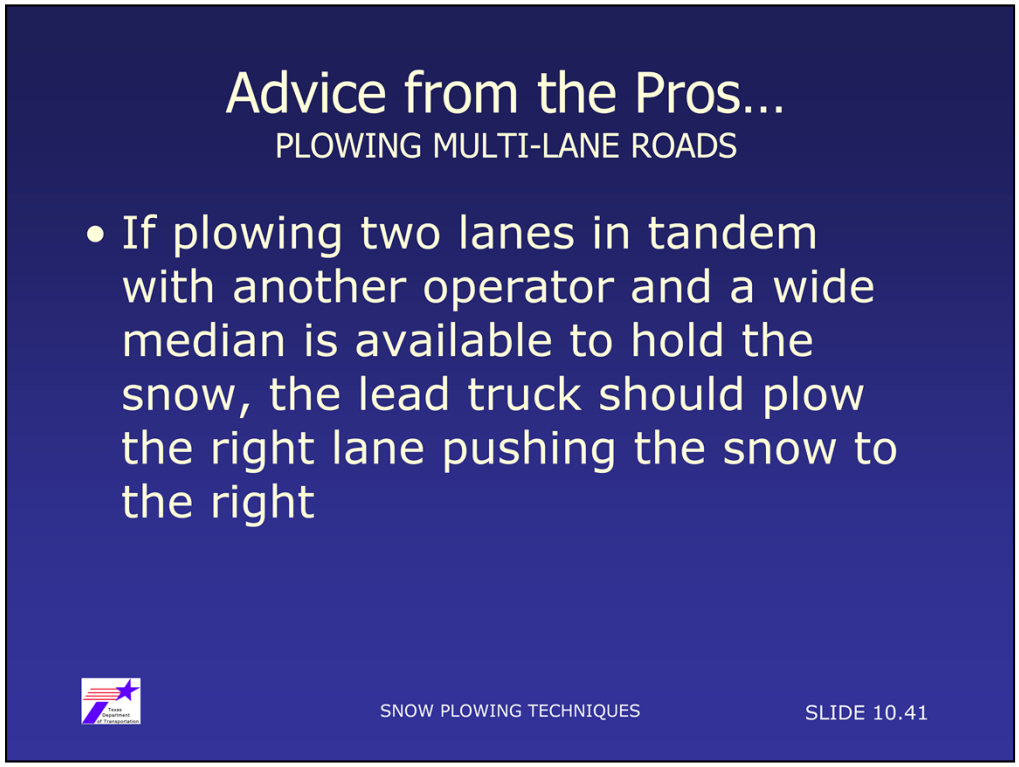
Instructor Notes: Present the following key points.

Advice from the pros…



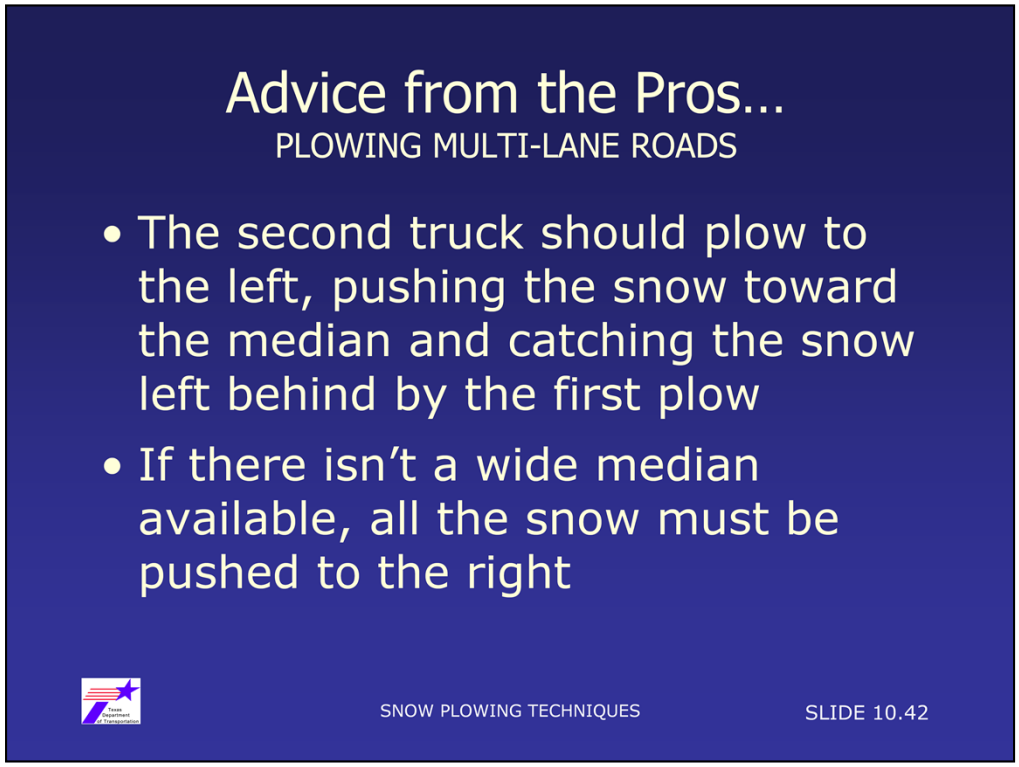
Instructor Notes: Present the following key points.

Advice from the pros…



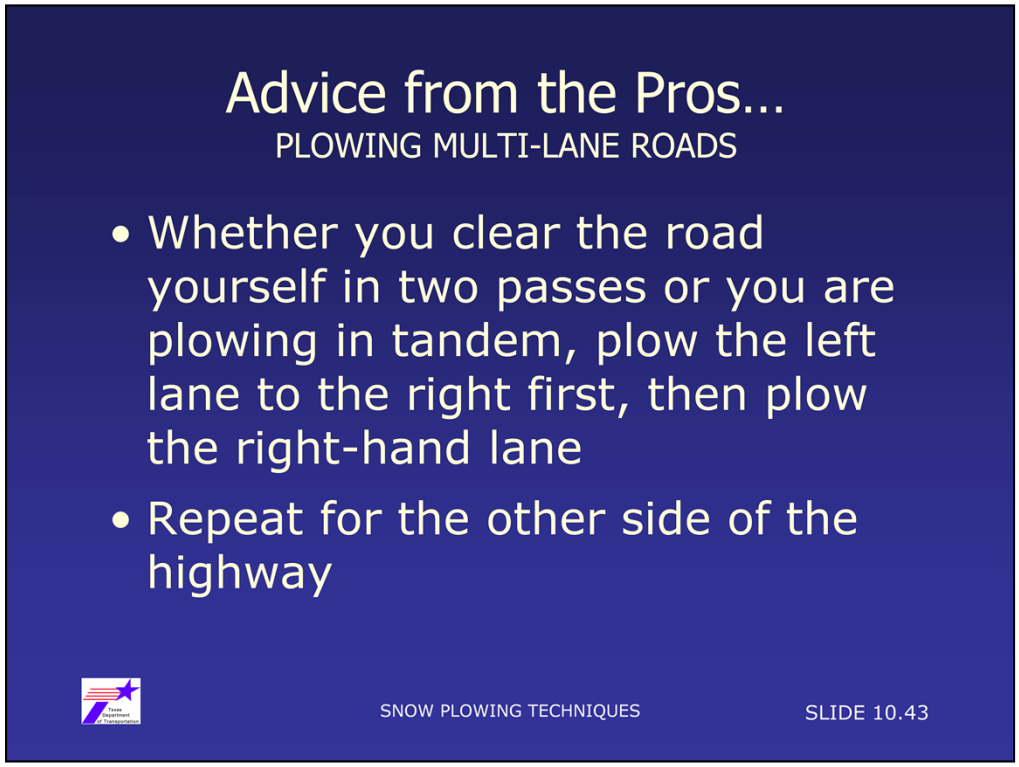
Instructor Notes: Present the following key points.

Advice from the pros…



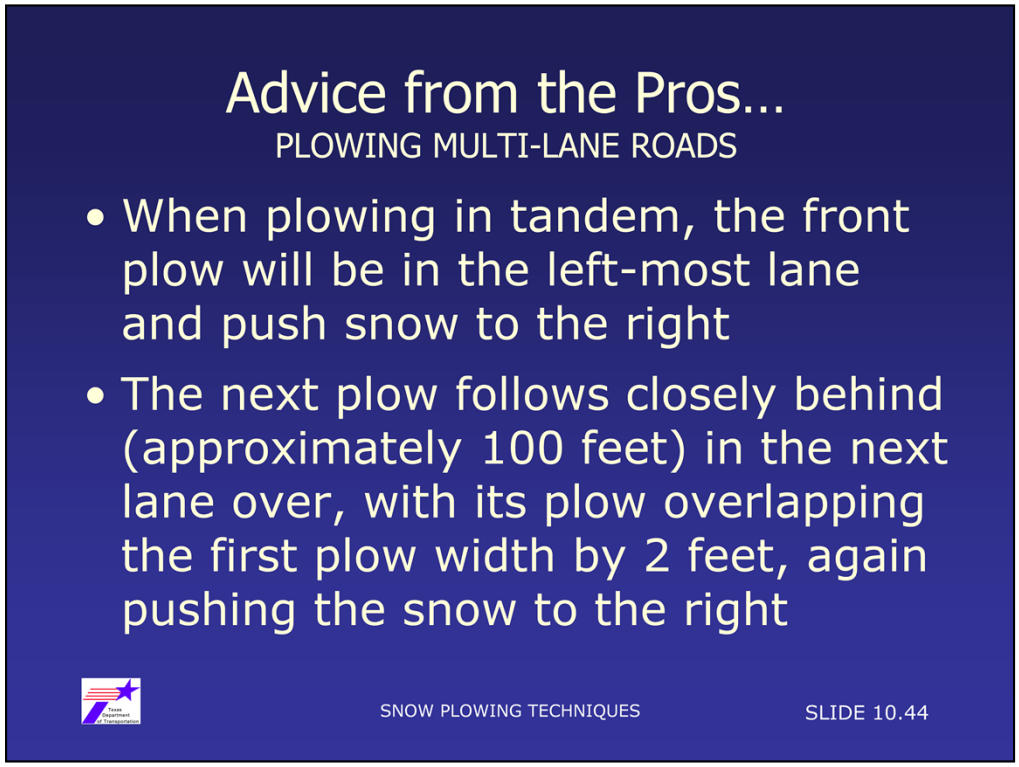
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



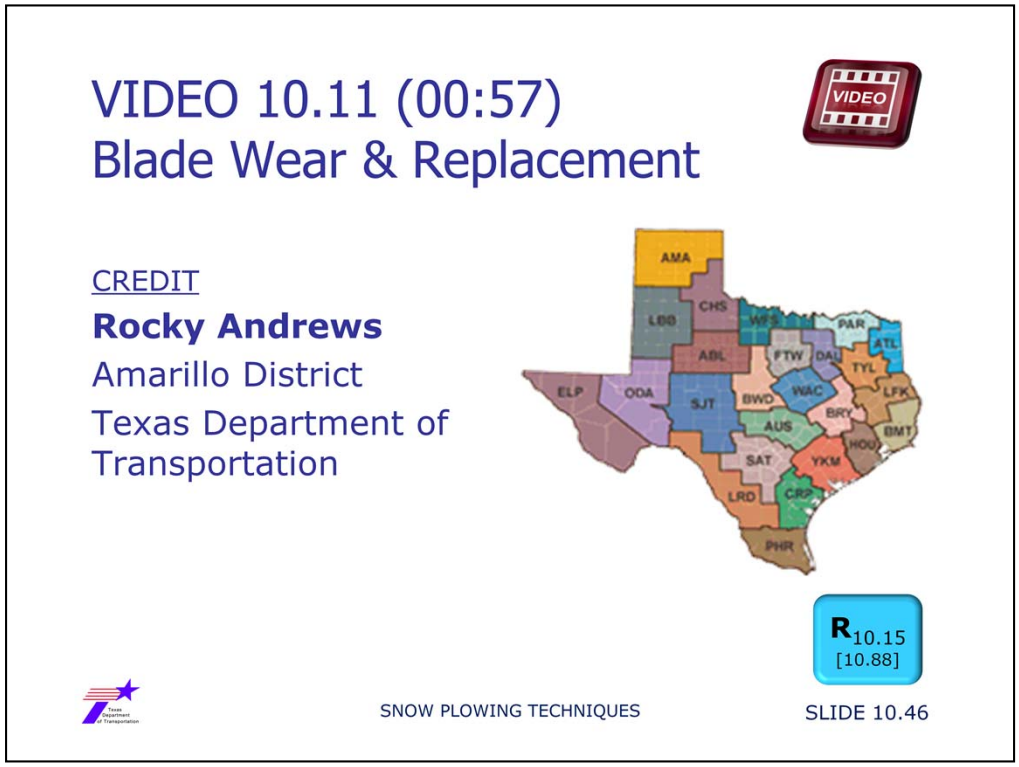
Instructor Notes: Present the following key points.

Advice from the pros…



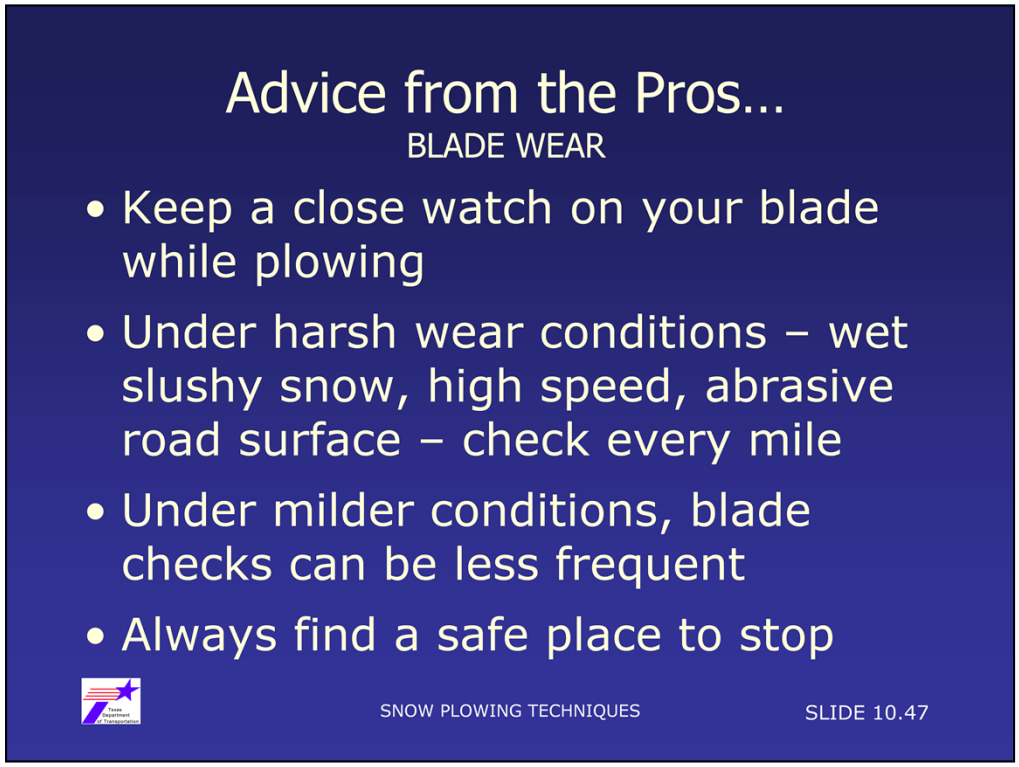
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

This video, featuring Mr. Rocky Andrews from the AMARILLO District, discusses blade wear and replacement.



Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

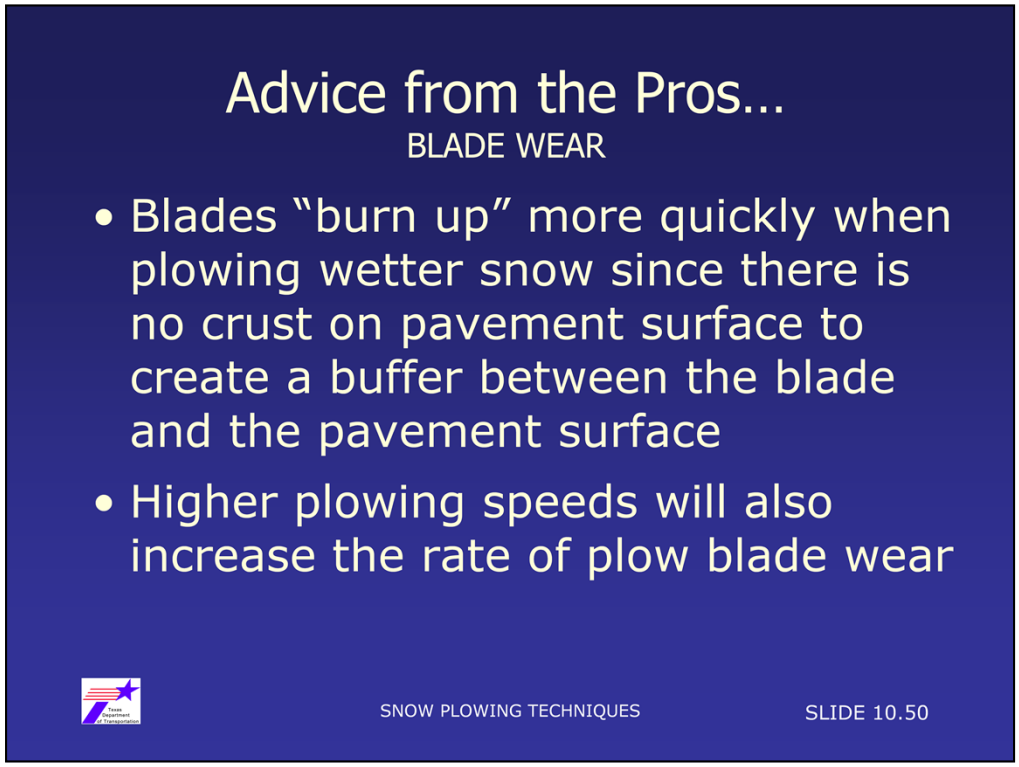
Advice from the pros…



Instructor Notes: Present the following key points.

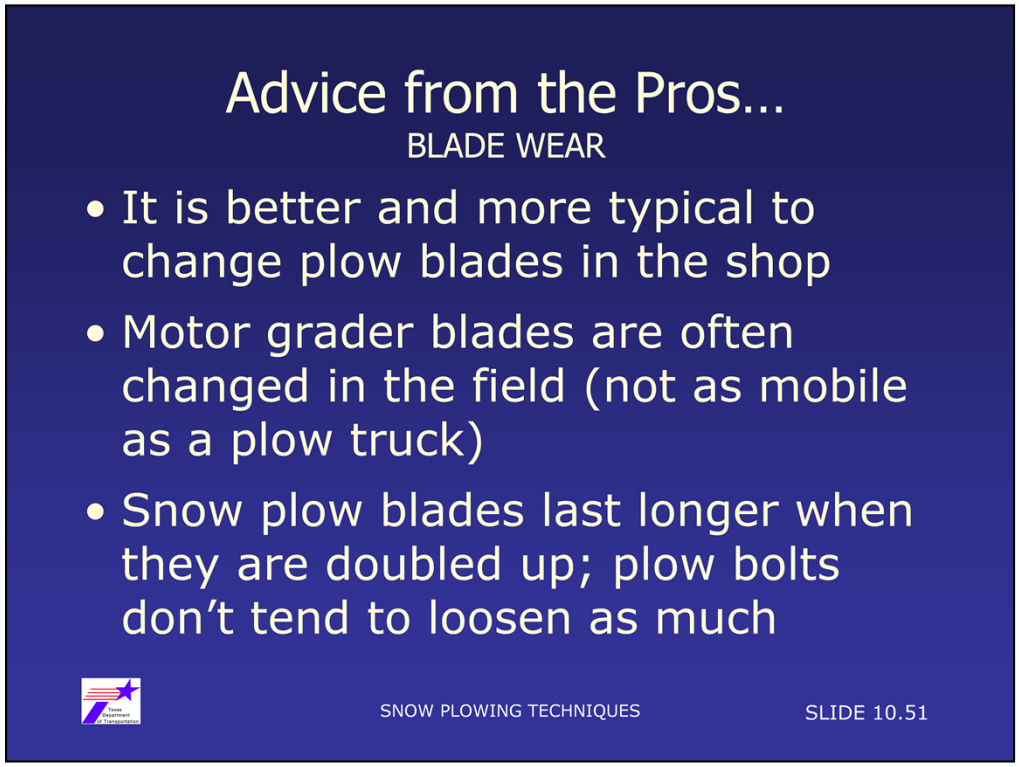
2 inches… 2 fingers… 1 ½ inches…

BOTTOM LINE… NOT INTO THE MOLDBOARD!!!



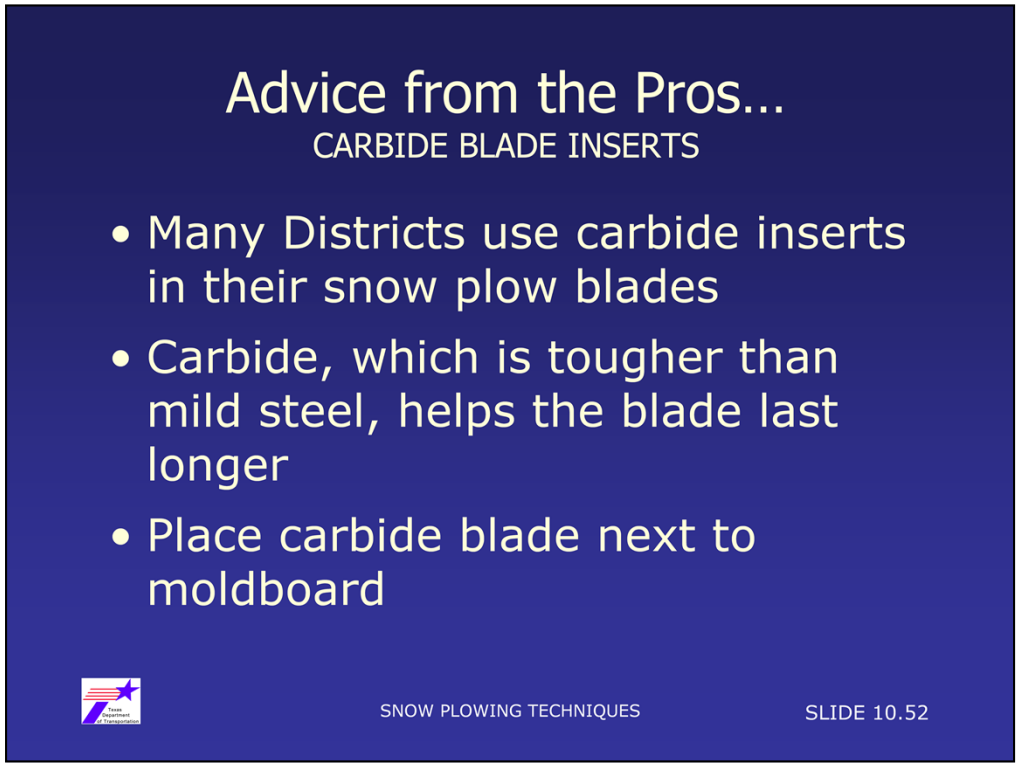
Instructor Notes: Present the following key points.

Advice from the pros…



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Advice from the pros…



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Advice from the pros…



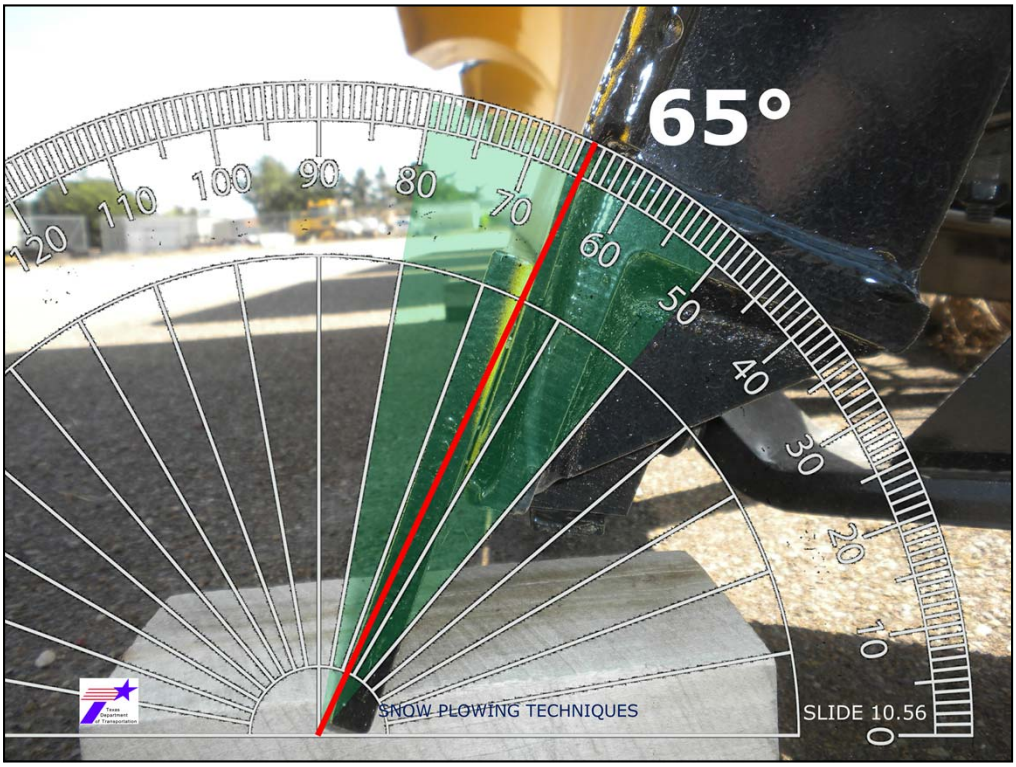
Instructor Notes: Present the following key points.

Advice from the pros…



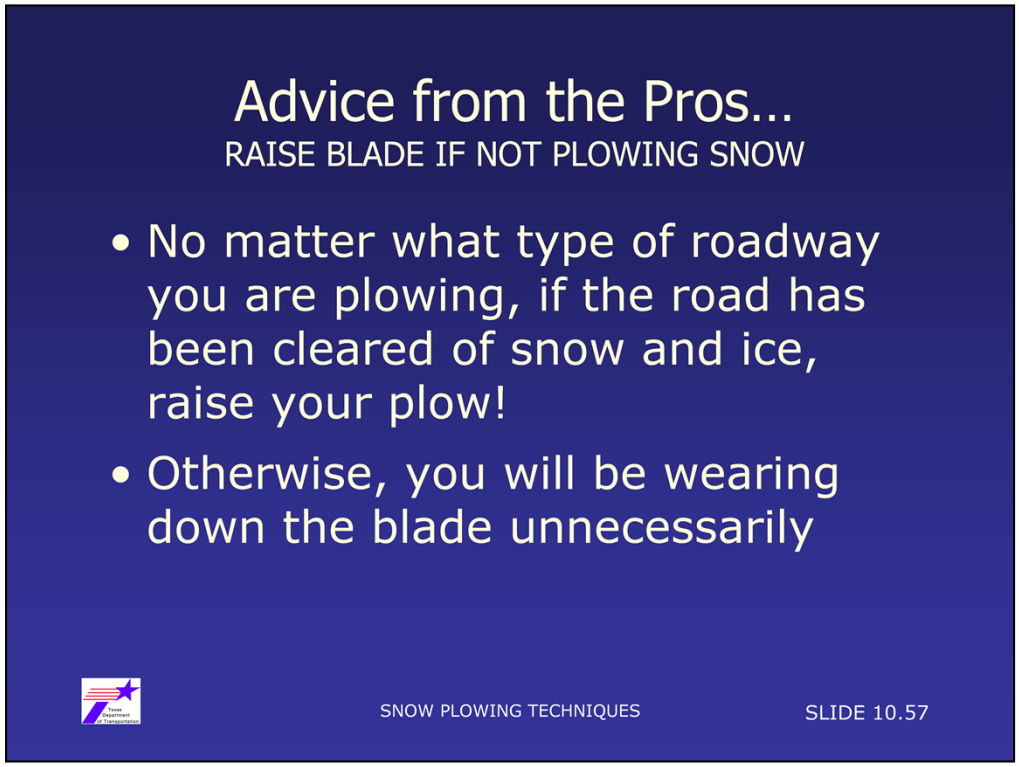
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

This image shows the recommended plowing angle, plus or minus.



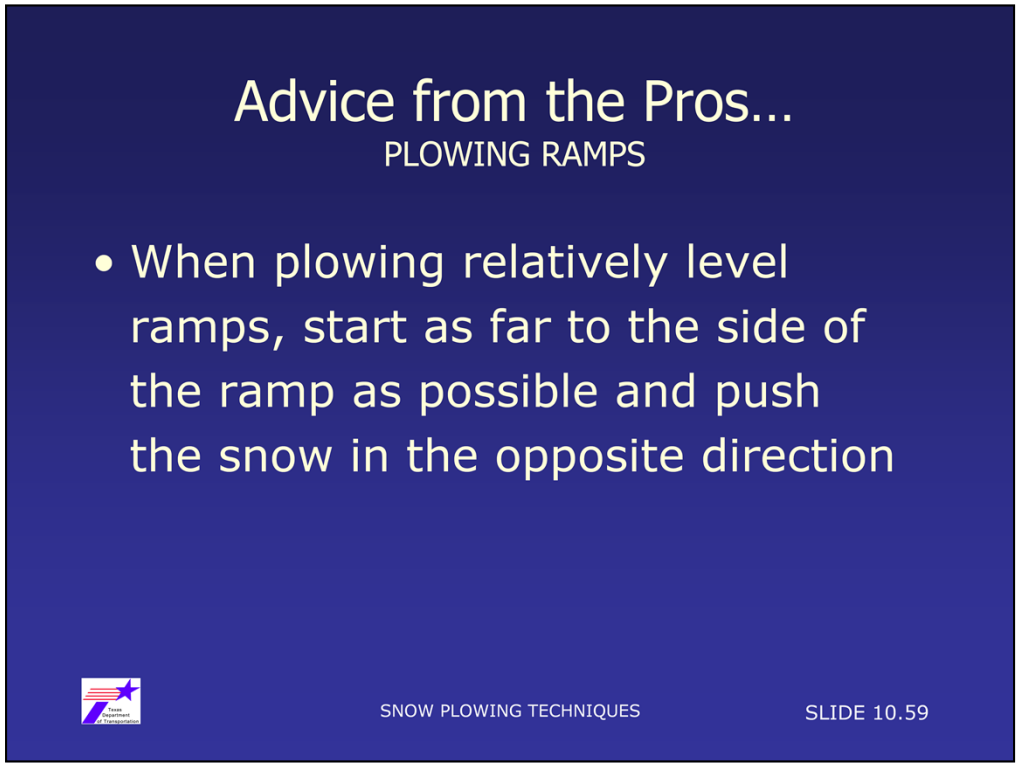
Instructor Notes: Present the following key points.

Advice from the pros…



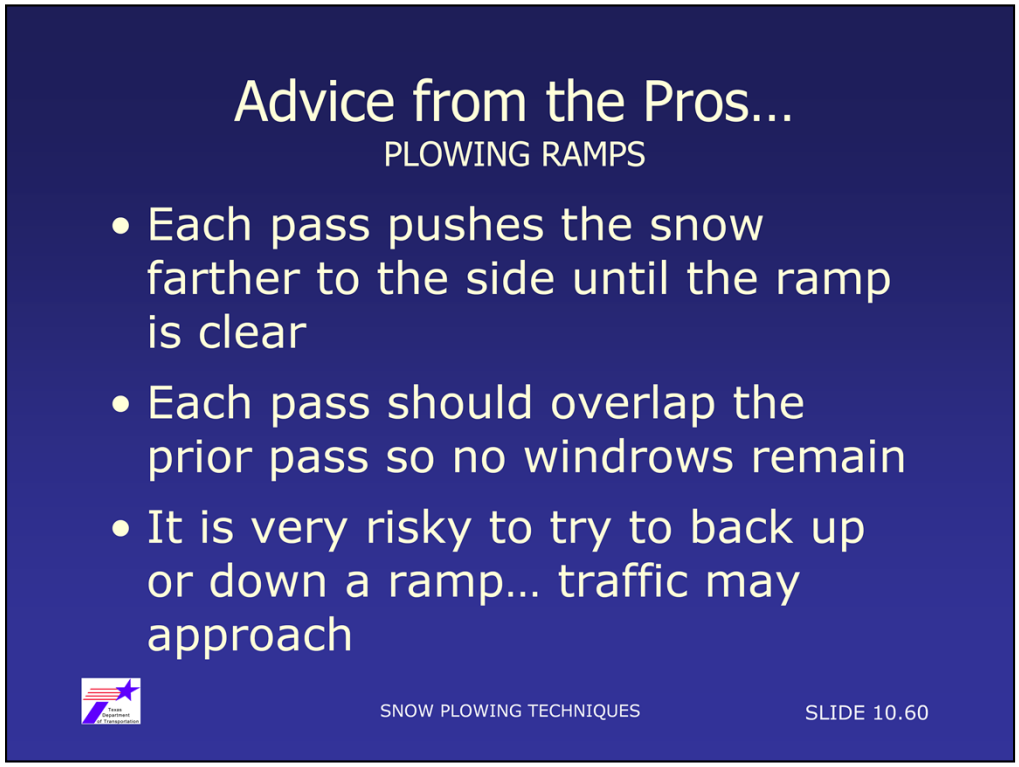
Instructor Notes: Present the following key points.

Ramps need plowing, too, as shown in this video.



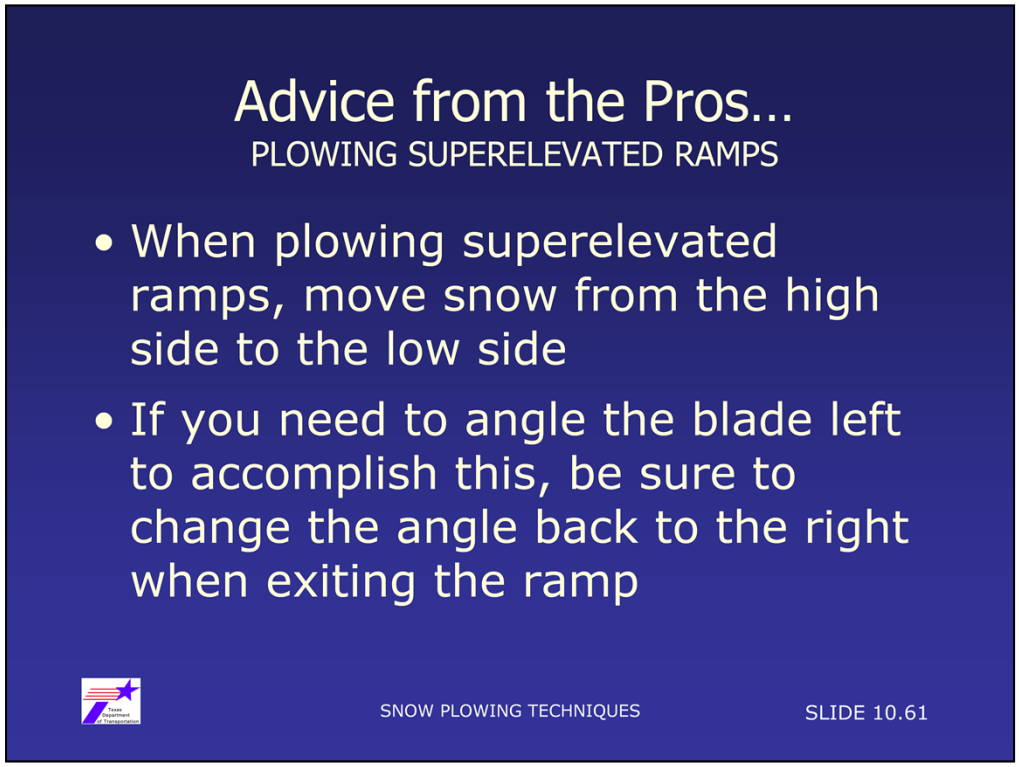
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



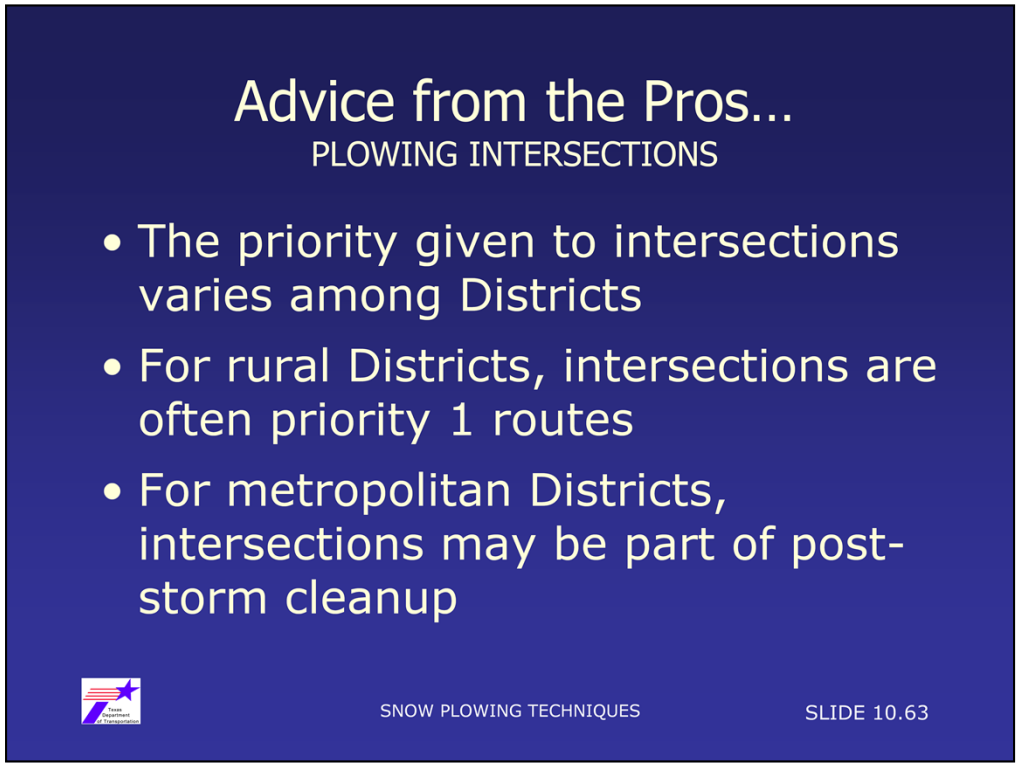
Instructor Notes: Present the following key points.

Advice from the pros…



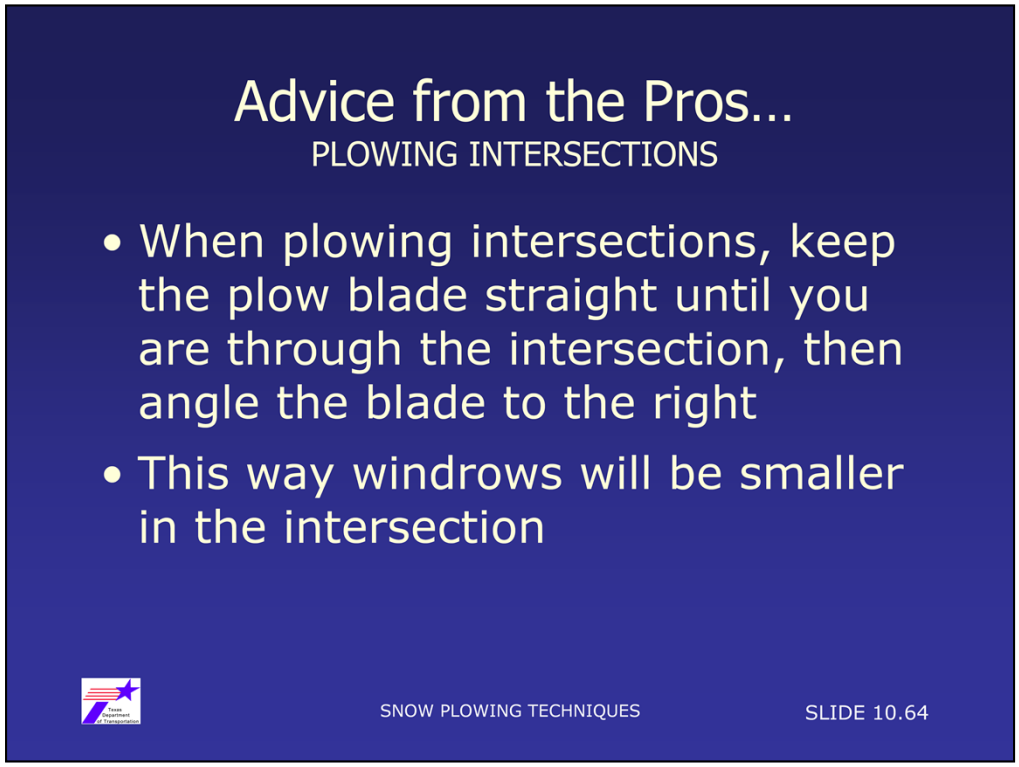
Instructor Notes: Present the following key points.

Intersections require special attention when plowing snow.



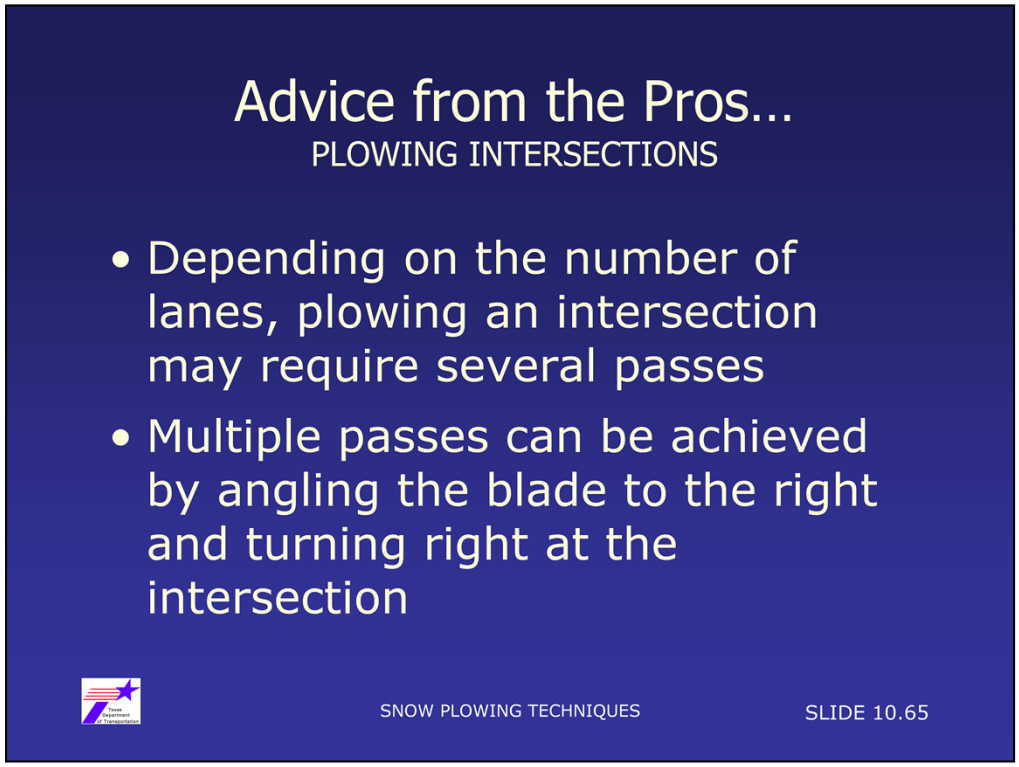
Instructor Notes: Present the following key points.

Advice from the pros…



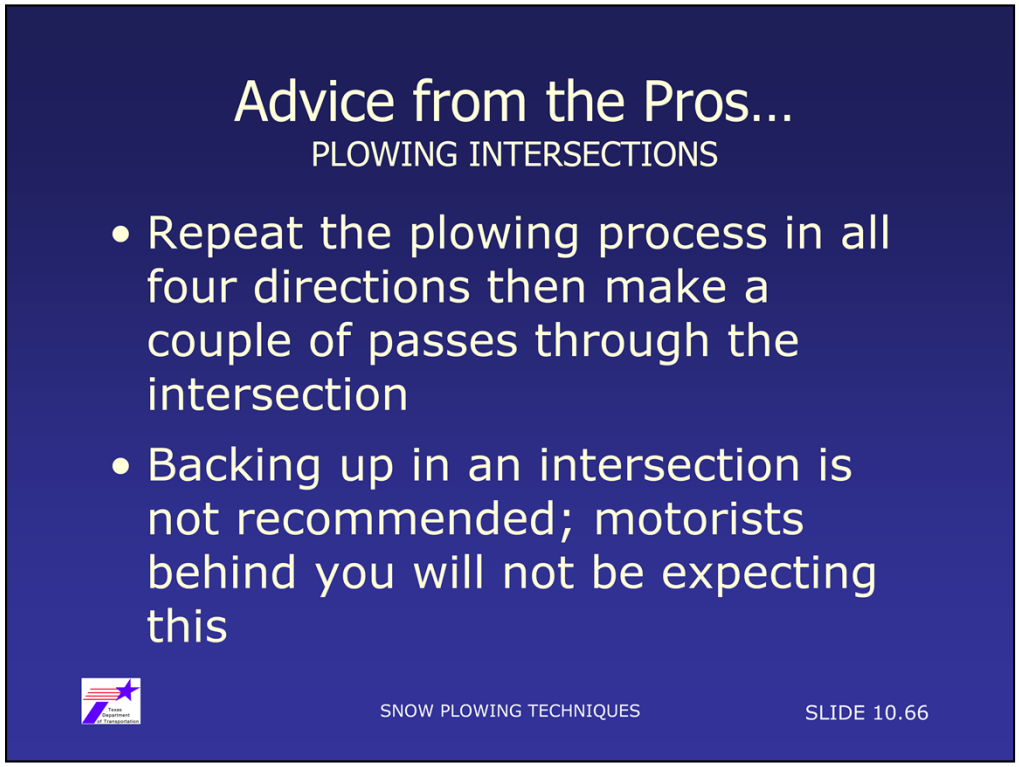
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



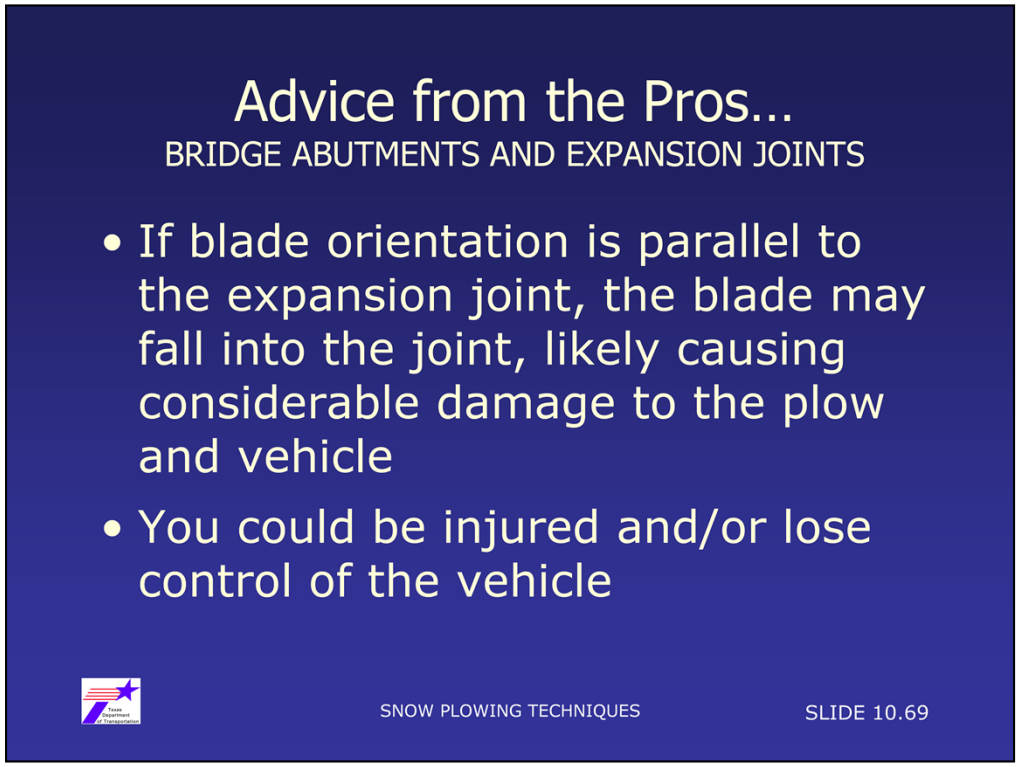
Instructor Notes: Present the following key points.

Plowing snow from bridges can involve several issues which require special attention.



Instructor Notes: Present the following key points.

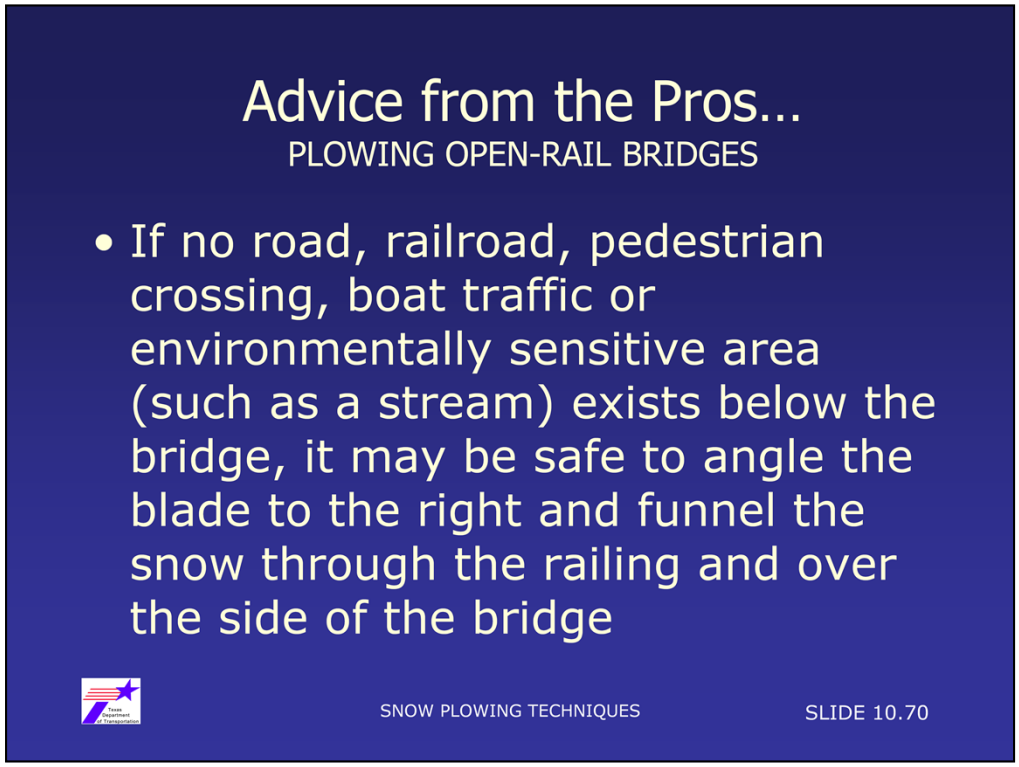
Advice from the pros…



Instructor Notes: Present the following key points.

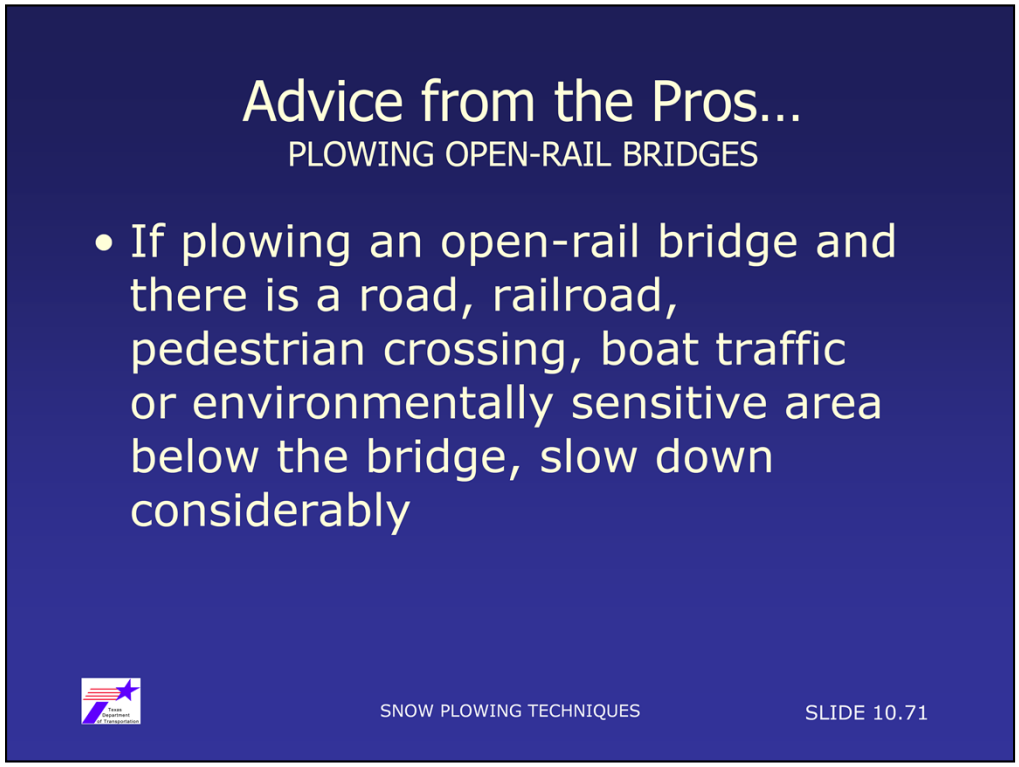
Advice from the pros…

NOTE: Some TxDOT bridges have expansion joints oriented on a skew. In this case, the operator must exercise special care to avoid dropping the plow blade into the expansion joint.



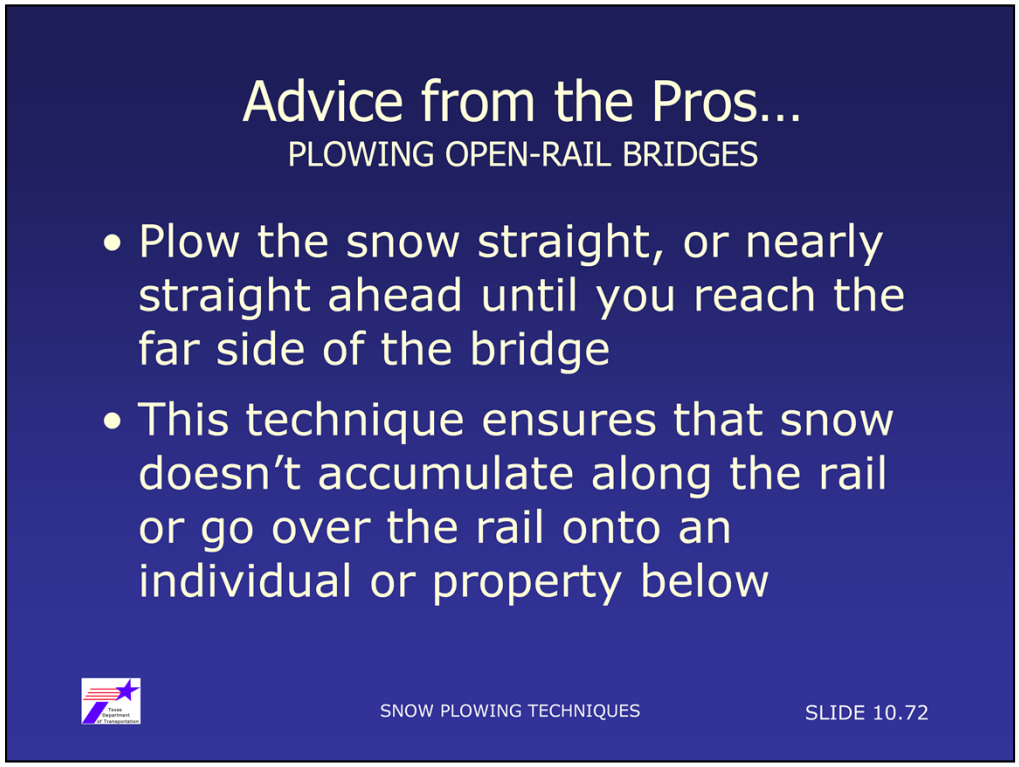
Instructor Notes: Present the following key points.

Advice from the pros…



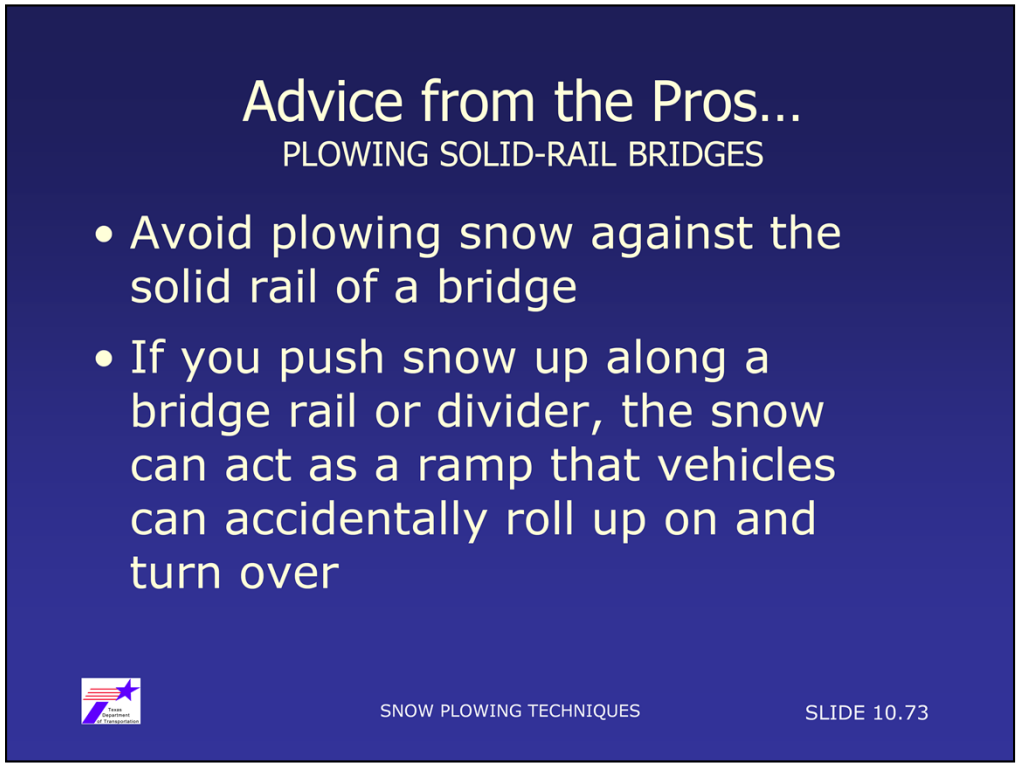
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



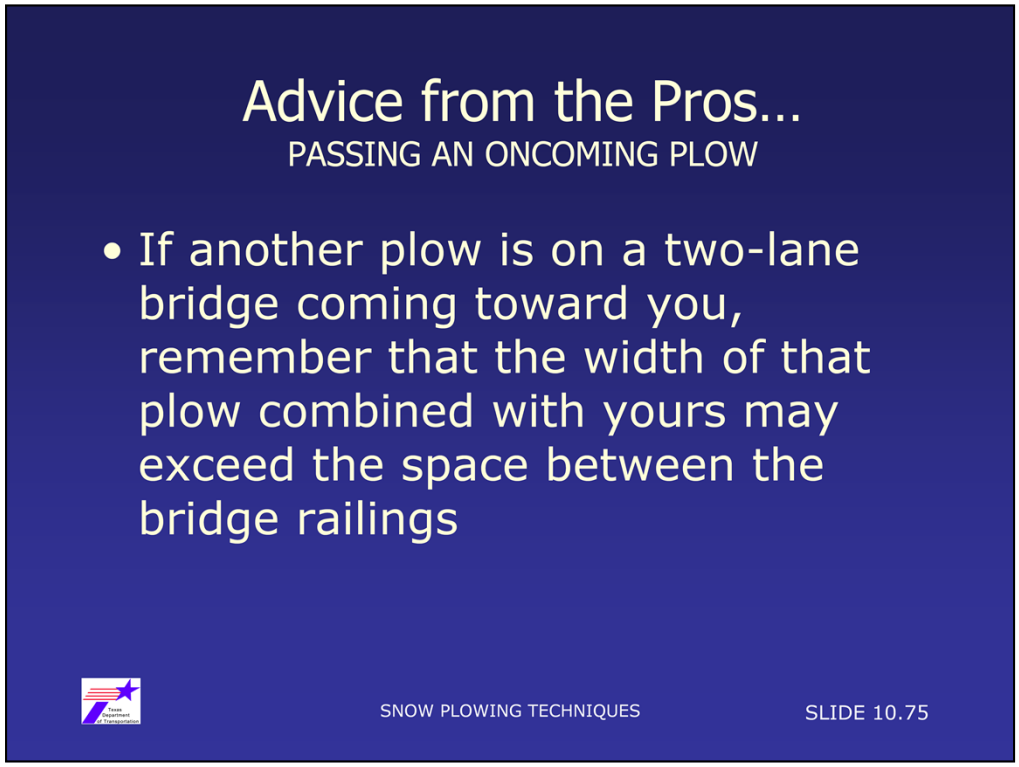
Instructor Notes: Present the following key points.

Advice from the pros…



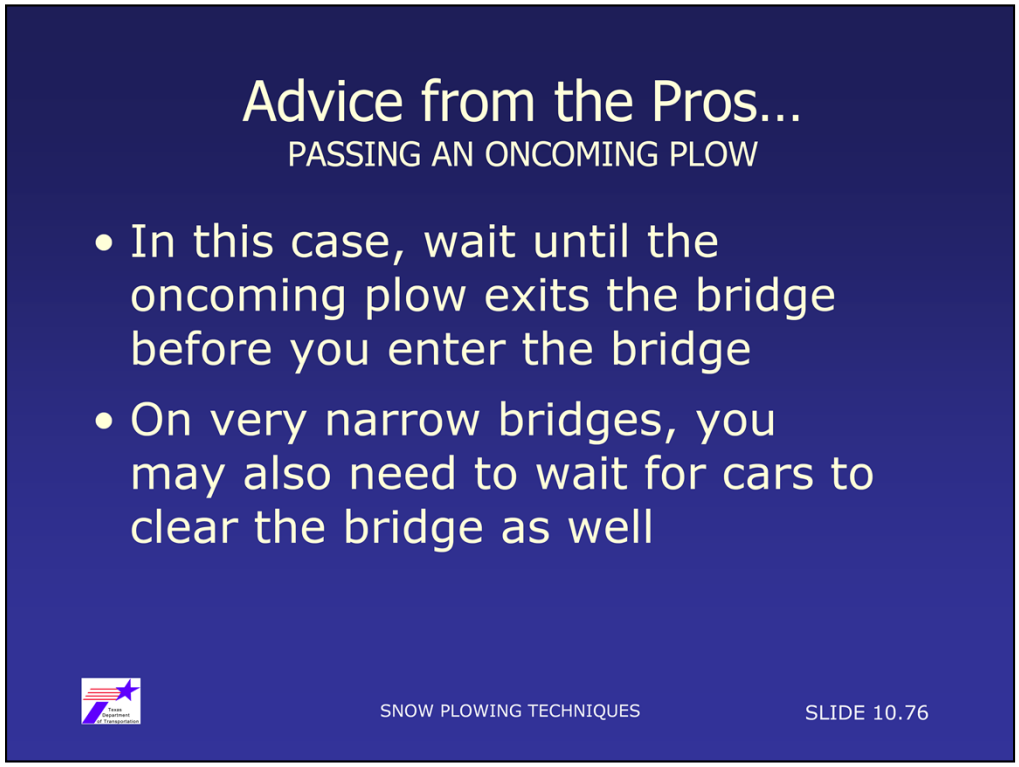
Instructor Notes: Present the following key points.

Advice from the pros…



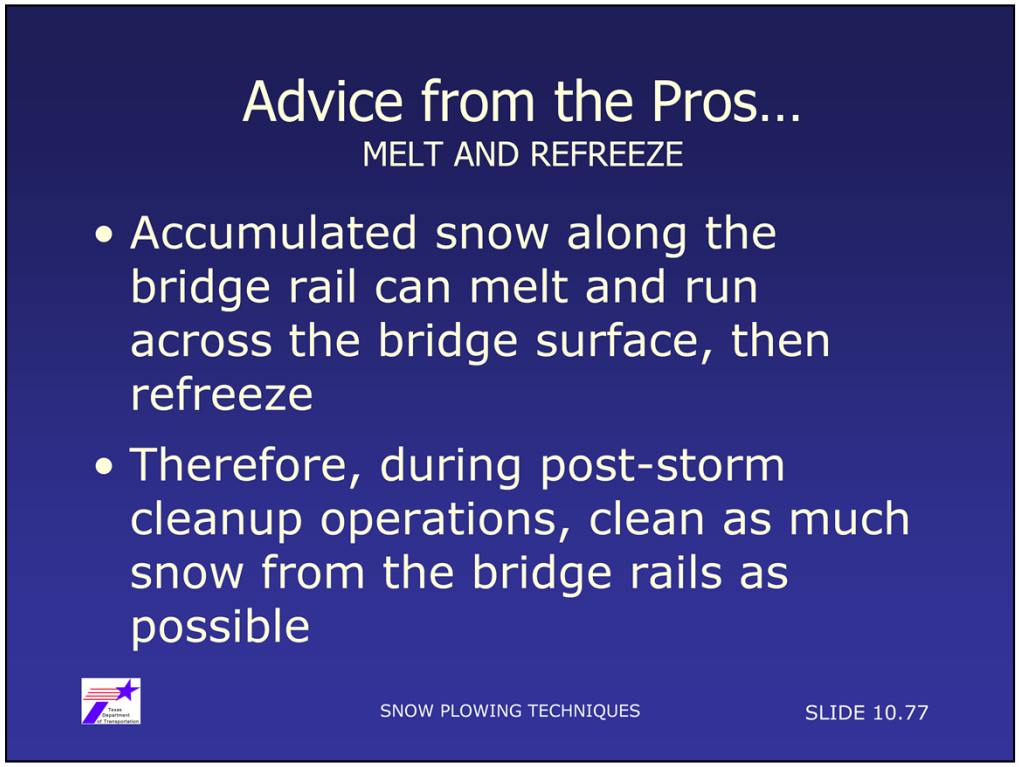
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



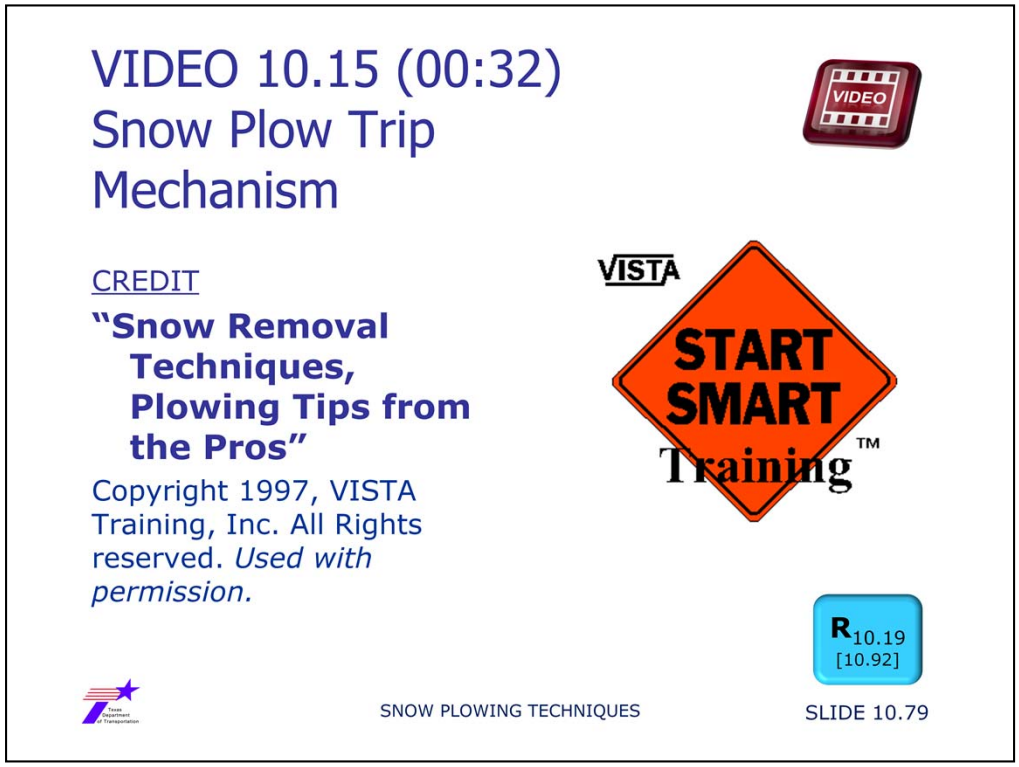
Instructor Notes: Present the following key points.

Advice from the pros…



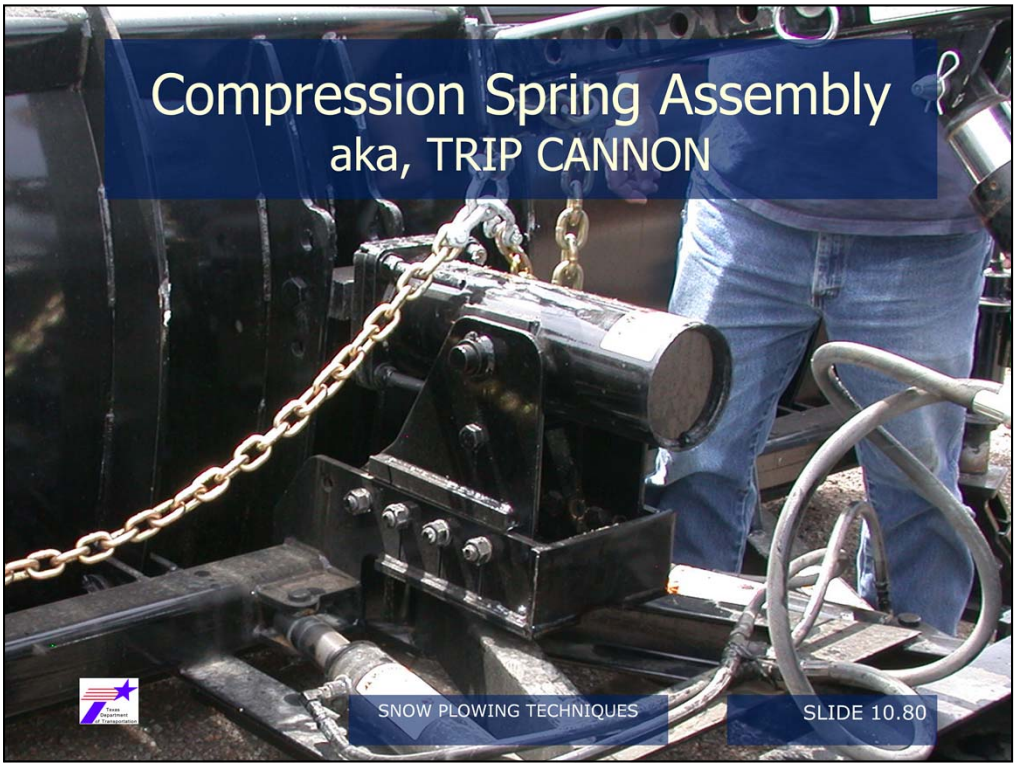
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

As noted, if you accidentally hit the bridge expansion joint with your snow plow blade, it will activate your plow trip mechanism. This brief video shows how violent such an experience can be.



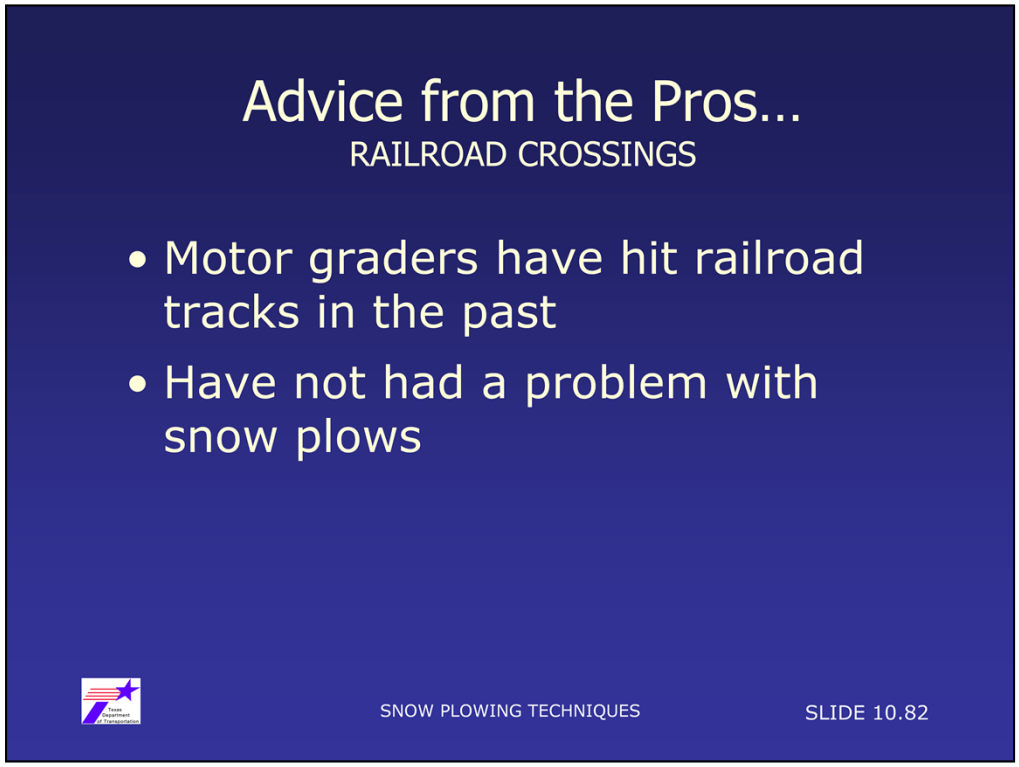
Instructor Notes: Present the following key points.

The spring trip mechanism, or trip cannon, or compression spring assembly… is a key safety feature of your snow plow. Make sure you understand its function and use.



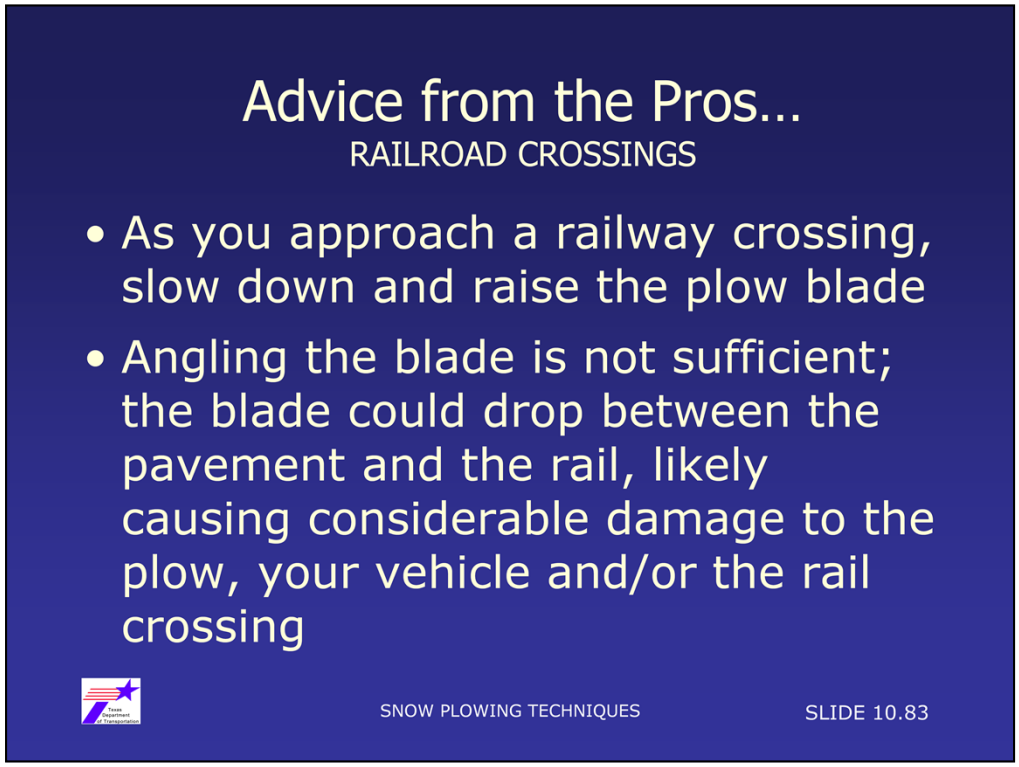
Instructor Notes: Present the following key points.

This video identifies standard practice for plowing railroad crossings?



Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



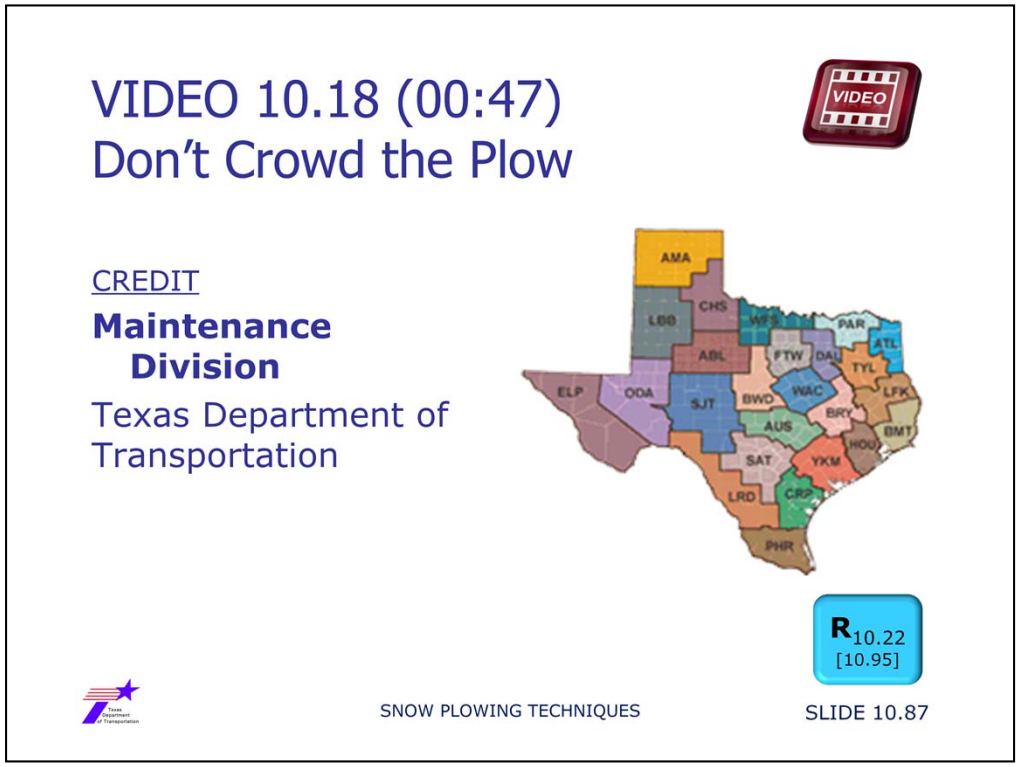
Instructor Notes: Present the following key points.

Recall that the desired outcome of this winter weather operations training is that you are a safe, confident, and efficient operator.



Instructor Notes: Present the following key points.

We hope you are “ready to hit the road.”



Instructor Notes: Present the following key points.

SAFETY FIRST!

This public service announcement emphasizes that the traveling public has a responsibility to give you room to do your job.



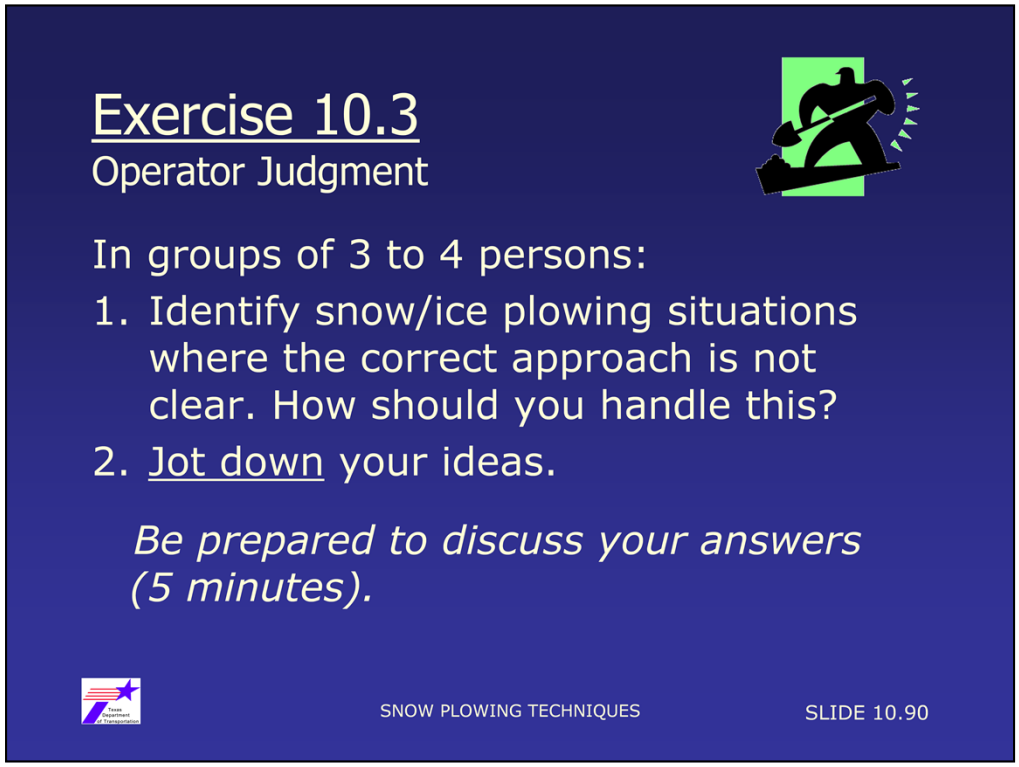
Instructor Notes: Present the following key points.

We will now discuss some non-standard situations where the best way to plow snow is not clear.



Instructor Notes: Present the following key points.

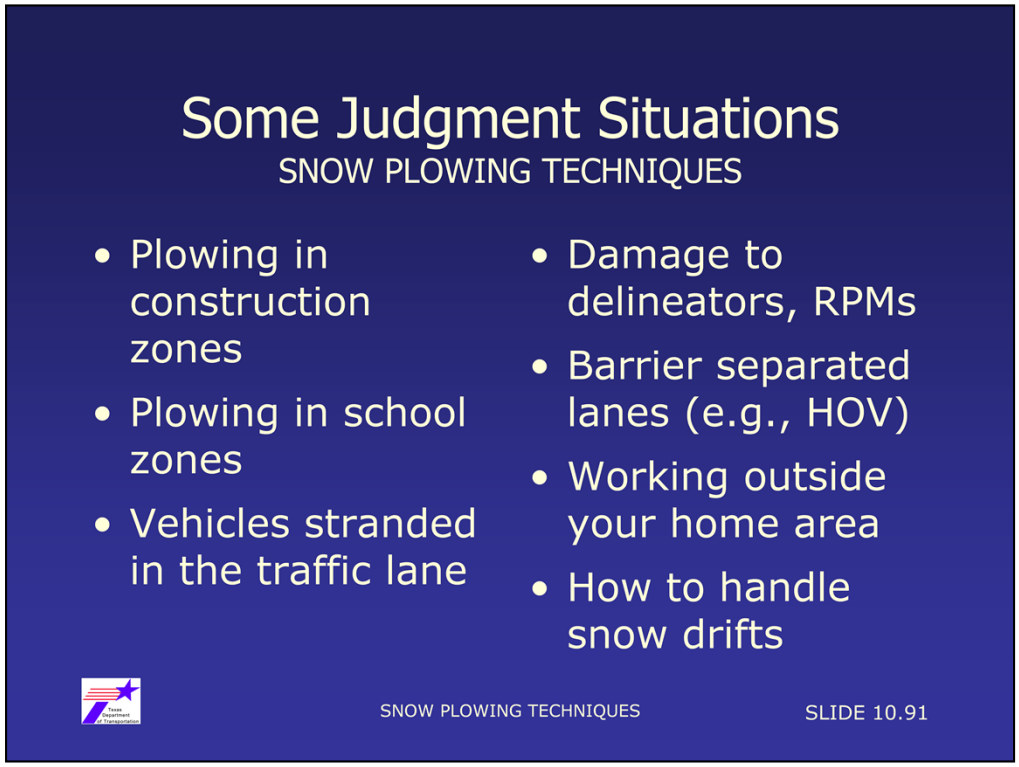
Unique snow plowing situations call for operator judgment.



Instructor Notes: Present the following key points.

GREEN SHEET.

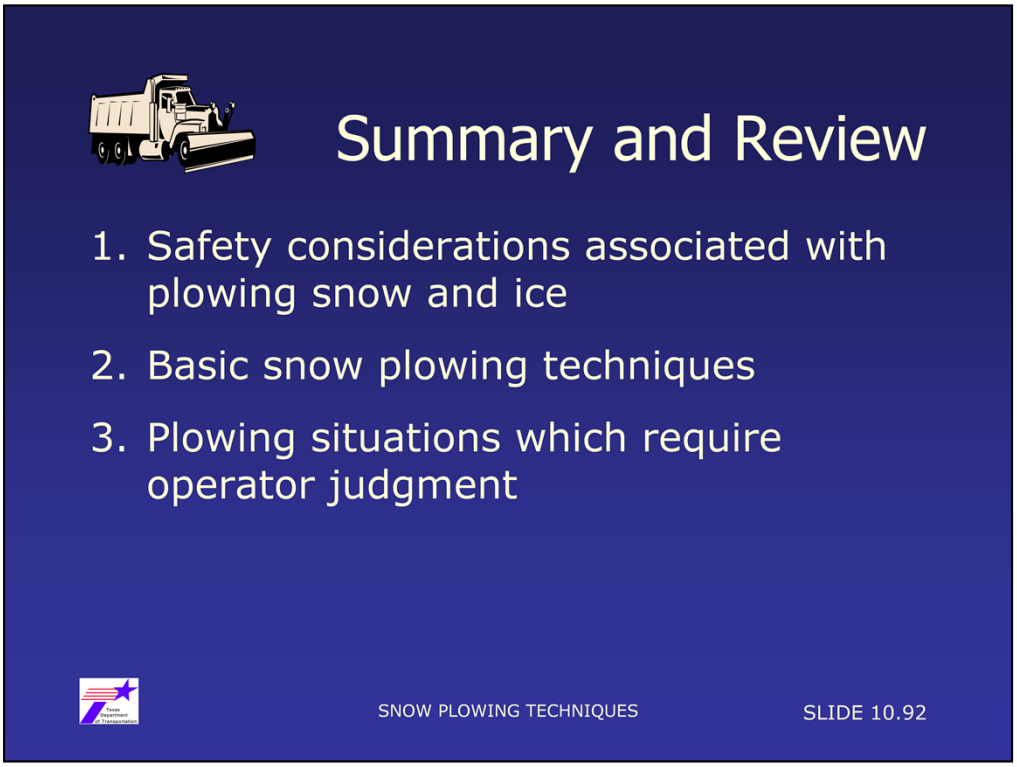
Do this exercise if the schedule allows.



Instructor Notes: Present the following key points.

These are some snow plowing judgment situations that were identified by other TxDOT maintenance personnel.

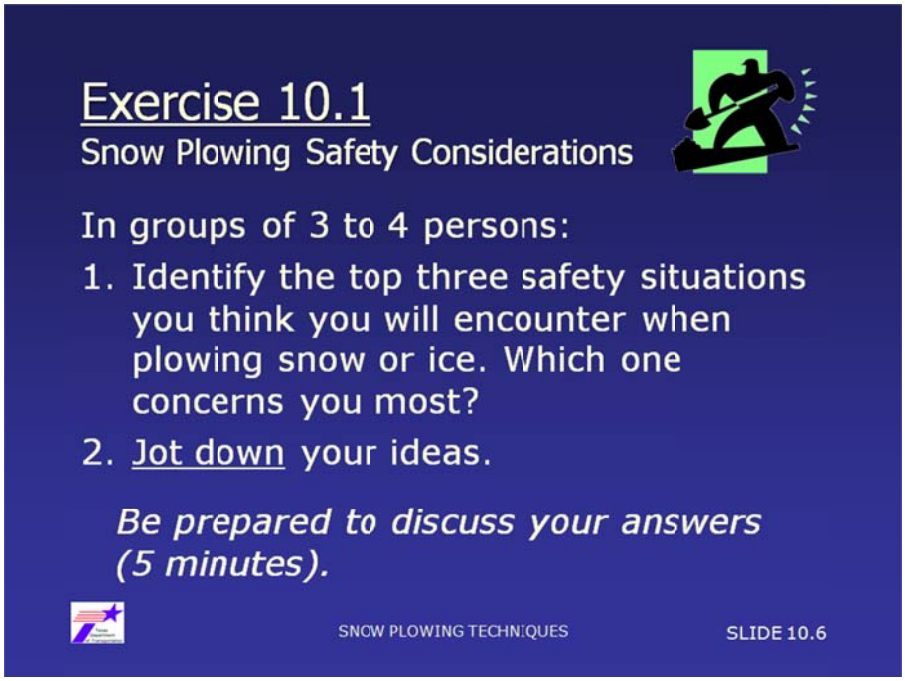
Many such situations exist.

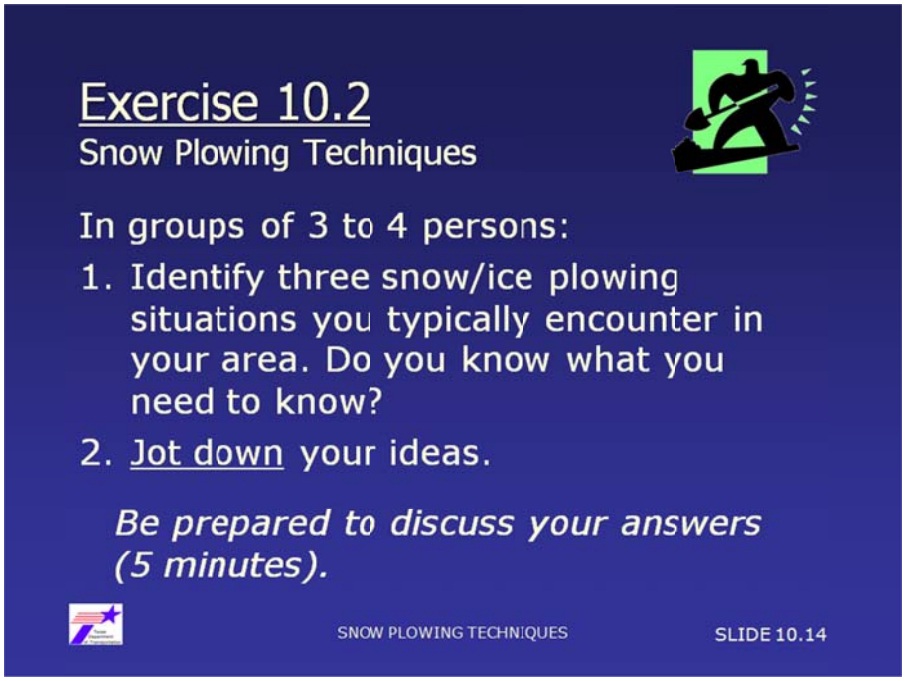


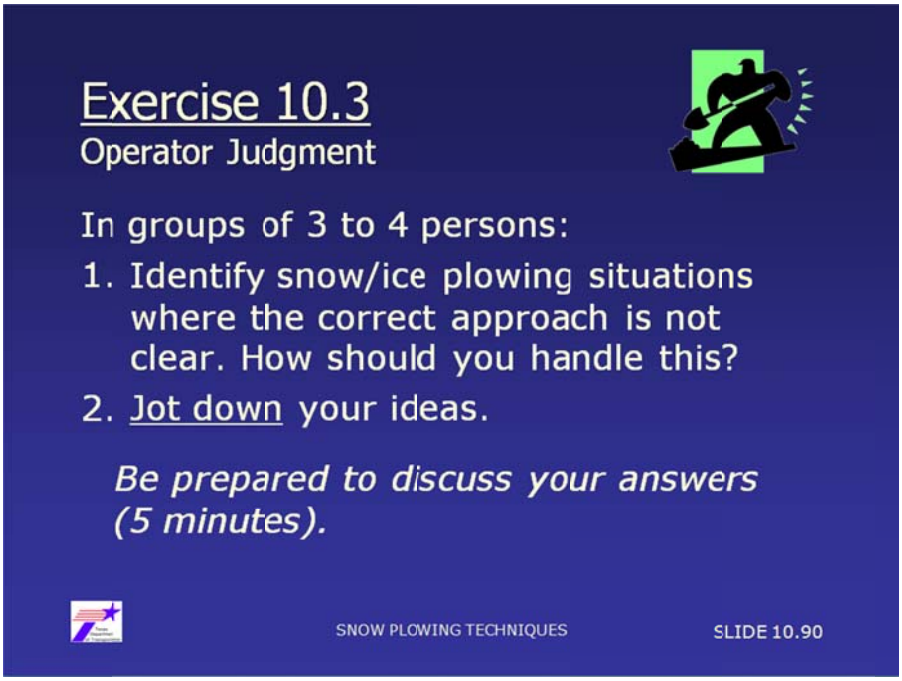
Instructor Notes: Present the following key points.

PINK SHEETS!

Answer each question.


Exercise 10.1
Snow Plowing Safety Considerations
In groups of 3 to 4 persons:
1. Identify the top three safety situations you think you will encounter when plowing snow or ice. Which one concerns you most?
2. Jot down your ideas.
Be prepared to discuss your answers (5 minutes).
SNOW PLOWING TECHNIQUES
SLIDE 10.6


Exercise 10.2
Snow Plowing Techniques
In groups of 3 to 4 persons:
1. Identify three snow/ice plowing situations you typically encounter in your area. Do you know what you need to know?
2. Jot down your ideas.
Be prepared to discuss your answers (5 minutes).
SNOW PLOWING TECHNIQUES
SLIDE 10.14


Exercise 10.3
Operator Judgment
In groups of 3 to 4 persons:
1. Identify snow/ice plowing situations where the correct approach is not clear. How should you handle this?
2. Jot down your ideas.
Be prepared to discuss your answers (5 minutes).
SNOW PLOWING TECHNIQUES
SLIDE 10.90

VIDEO 10.1. SNOW PLOW SAFETY (00:35)

SCRIPT

Another dangerous game kids play is to tunnel in snow banks near the road.

A few years ago one boy… (snow plow spray)

Page intentionally left blank.

PLOWING SAFETY CHECKLIST

Plowing Safety Checklist

- ☐ Use a three-point stance to enter and exit the vehicle.
- ☐ There should be no loose items in the cab.
- ☐ Position yourself in the seat so you can comfortably reach all controls.
- ☐ Adjust mirrors for maximum visibility.
- ☐ Fasten seat belt.
- ☐ Verify that your two-way radio is operational.
- ☐ Verify that your warning lights are on before you leave the garage.
- ☐ Test drive vehicle and all attached equipment.
- ☐ Position hands on steering wheel at 9:00 and 3:00 o'clock; do not wrap thumbs around wheel.
- ☐ Take wide turns as needed to accommodate length and width of plow-equipped vehicle.
- ☐ Drive defensively! Don't assume motorists will drive properly.
- ☐ Memorize location of obstacles along your route.
- ☐ Scan ahead 12-15 seconds; expect the unexpected.
- ☐ Drive at safe and effective operating speed for the equipment you're operating.
- ☐ Keep a safe zone around your vehicle at all times.
- ☐ Watch for vehicles attempting to pass on the right.
- ☐ When pulling over, do so in safe location where you know surface will be firm and your vehicle will not present a hazard to motorists.
- ☐ Keep plenty of distance between you and car ahead so you have plenty of distance to stop.
- ☐ Check mirrors every 3-5 seconds.
- ☐ Use extreme caution when shifting to the left. Look for oncoming traffic. Plus, be sure no one is trying to pass on the left.
- ☐ When approaching a wide oncoming vehicle, such as another plow, cover brake; stop if necessary.
- ☐ Become familiar with opposing force of snow so you know how much to over-steer.
- ☐ Don't run plow along the curb.

Proper Plowing Techniques CBT Copyright © AASHTO 2007

- ☐ At night, be wary of tired or impaired motorists or pedestrians.
- ☐ Do not plow snow off an overpass if there is a road, structure, traveled waterway, pedestrian walkway, etc. below.
- ☐ Watch for pedestrians in crosswalks, on sidewalks, in driveways, etc.
- ☐ Watch for children at play.
- ☐ Investigate tall accumulations and drifts before plowing through them.
- ☐ Always travel in same direction as traffic.
- ☐ Never make a U-turn in the middle of a median. Use safe turn-around locations.
- ☐ When backing, you must know what is behind you. Get out and check if necessary.
- ☐ Don't assume motorists will heed your backup alarm and flashers.
- ☐ Always be alert for emergency vehicles; slow and pull over as they approach.
- ☐ Take breaks as needed. Eat nutritious snacks and drink plenty of fluids.
- ☐ Perform a check of your equipment and clean lights and reflectors when you pull over.
- ☐ Keep warning lights on when pulled over.
- ☐ You are responsible for the safe operation of your equipment at all times. No excuses!
- ☐ If you come upon an accident with injuries, radio for help; render aid only per your supervisor's instructions.
- ☐ If you come upon a stranded vehicle, assist only as necessary to clear roadway.

Proper Plowing Techniques CBT Copyright © AASHTO 2007

Source: "Plowing Safety Checklist," Documents, **Equipment Maintenance CD**, Version 1, AASHTO Clear Roads Computer Based Training, July 2007.

FLINK SNOW PLOW MANUAL (JUNE 2001)

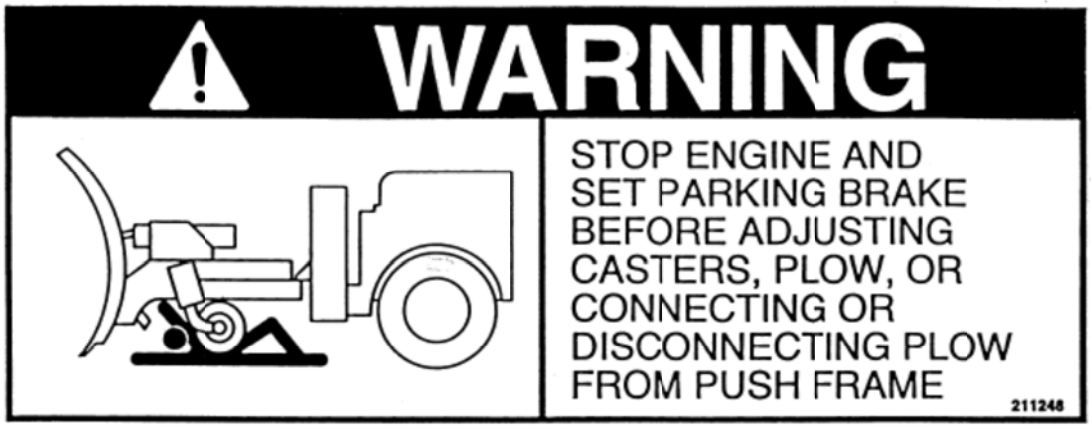
READ THE FOLLOWING
IT MAY PERTAIN TO YOU!!!!



EXCESSIVE SPEED COULD MAKE YOUR SNOW PLOW INTO A TIME !!!!BOMB!!!!

SENSIBLE SPEEDS MAKE PLOWING SAFER!!!!

Alterations to this snowplow or using it for purposes other than which it was designed, could create serious safety hazards and possible injury to personnel, or could cause damage to the truck or plow.





FSP SNOW PLOW

SAFE PROCEDURES FOR SNOW REMOVAL

1. **DO NOT** exceed appropriate speeds for equipment and conditions.
2. Use all available safety warning devices. EXAMPLES: Slow moving vehicle signs, flashing lights, hazard lights.
3. Be alert for any kind of obstruction.
4. Be wary of drivers coming from behind.
5. Wear protective clothing. EXAMPLES: Warm gloves or mittens, thermal-type underwear, water and wind resistance outer coat, head and ear covering, two pair of socks, and warm boots.
6. Know the symptoms of over exposure to cold or frostbite.
7. Carry a container of hot liquid. (Not Alcohol)
8. Carry emergency equipment. EXAMPLES: Flares or reflectors, first aid kit, fire extinguisher, flashlight, etc.....
9. If possible, travel snow route in advance to inspect and learn if hazards and/or obstructions are present. EXAMPLES: Bridge expansion joints, pavement expansion joints, headwalls of culverts, cattle guards, sign posts, guardrails, high shoulders, raised pavement markers, curbs, islands, fire hydrants, railroad crossings, mailboxes, holes repaired in roads, manhole covers, and catch basins.

NOTE: The snow plow trip mechanism may not always protect the plow and truck when impacting some obstructions, especially at high rates of speed. **ALWAYS USE EXTREME CAUTION WHEN PLOWING!**

CAUTION: To prevent damage to plow or vehicle, flag and identify any obstructions that are hard to locate in the snow.

WARNING: Always wear seat belt when plowing snow. Hitting an obstruction could cause loss of vehicle control, resulting in possible serious injury to the operator. **ONLY** the driver should be in vehicle when plowing.

WARNING: Driver should never plow with head out of the vehicle window. Sudden stops or object protruding from snow could cause severe head or neck injury.

GENERAL INSTRUCTION

1. The first step in organizing a snow removal policy, is to prepare a map or blueprint of the area and implement a snow fighting program.
2. Before a snow fall every area to be plowed should be inspected for hazards and obstructions.
3. Note all "Trapped Areas" in which snow would have to be carried away. This is necessary where piled snow will limit vision or access.
4. Indicate priorities on map for clearing procedures.

FSP SNOW PLOW

PLOWING DIFFERENT SNOW CONDITIONS

1. Suggested procedure: **PLOW WITH THE STORM.**
2. Suggested procedure: Plow snowfall with entire blade, a full cut of snow will enable driver to control vehicle. This will allow equal distribution across moldboard face, and vehicle will track without pulling.
3. Suggested procedure: Wet deep snow may be plowed with full blade width, if snow becomes to heavy for moldboard to discharge a 3/4 to 1/2 blade width might help to discharge snow effectively. **Experience and knowledge** are the best guides to snow removal.
4. Suggested procedure: When plowing deep snow, be sure to keep vehicle plowing and in a lower gear. As moldboard clears path of snow, the weight of the snow can quickly accumulate.
5. Suggested procedure: Hard-packed or icy snow; Raise running gear so cutting edge comes in contact with road surface. In this situation, use lowest gear to obtain maximum power to the cutting edge. Angling blade is more effective in this procedure. Also this procedure prevents plow from riding over snow.

NOTE: This Winter condition can cause a plow truck to slide across roadway.

6. Suggested **MAXIMUM snow plowing speed of 20 m.p.h.** under ideal plowing conditions, assuming driver is familiar with area and roadway being plowed. We recommend reduced speed and extreme caution when conditions become hazardous, poor visibility, and (or) unfamiliar areas to driver.

SEASON MAINTENANCE

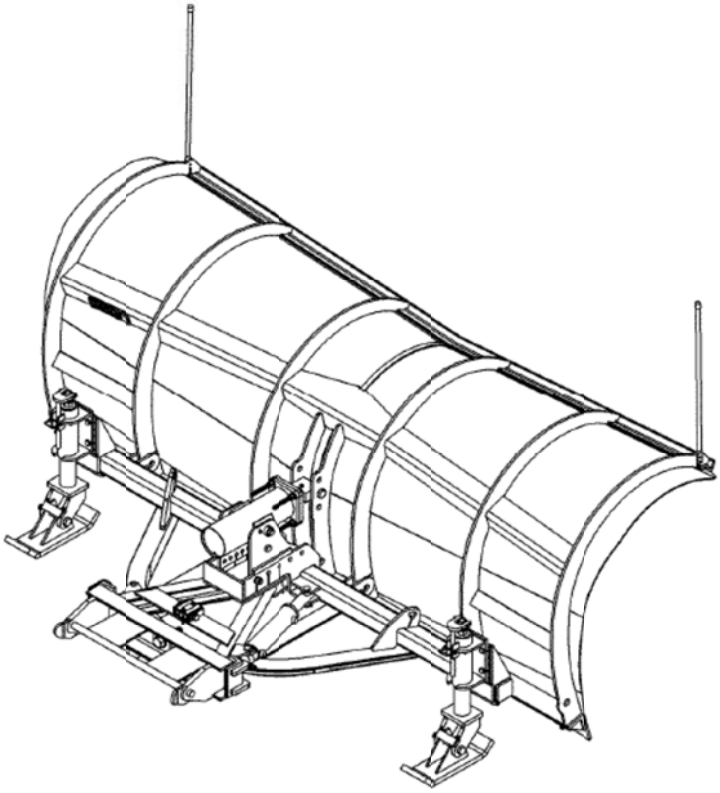
1. Inspect snow plow and push frame before starting shift, during shift (between each run), and after shift. If parts are worn or damaged replace as soon as possible, waiting could cause further damage. Weld any damaged areas to prevent total breakage.
2. Grease all fittings before shift, making sure fitting is taking lubrication. Then during shift check and lubricate. Give special attention to caster wheel assemblies, making sure wheel bearings are well lubricated, but not breaking seals.
3. Periodically grease cannon spring arm weld assembly between snowfalls. This will depend on usage of unit. (See page-5- on greasing illustration).
4. Periodically check swivel bar for excessive slack in between "A" frame and swivel bar. Tighten swivel bar bolt and nut, until slack is drawn up between swivel bar and "A" frame.
5. All plow and salt trucks should receive a preliminary wash/rinse after each use and a thorough cleaning as soon as storm will allow.
6. Make sure vehicles and equipment have been inspected, and fueled ready to go.

HENKE SNOW PLOW MANUAL (OCT 2011)

HENKE REVERSIBLE I-PLOW INVERTED CIRCLE

HENKE MODEL: Reversible EXP10 & EXP11, EST-IC, TX DOT11

For TEXAS DOT Medium to Heavy Duty Trucks

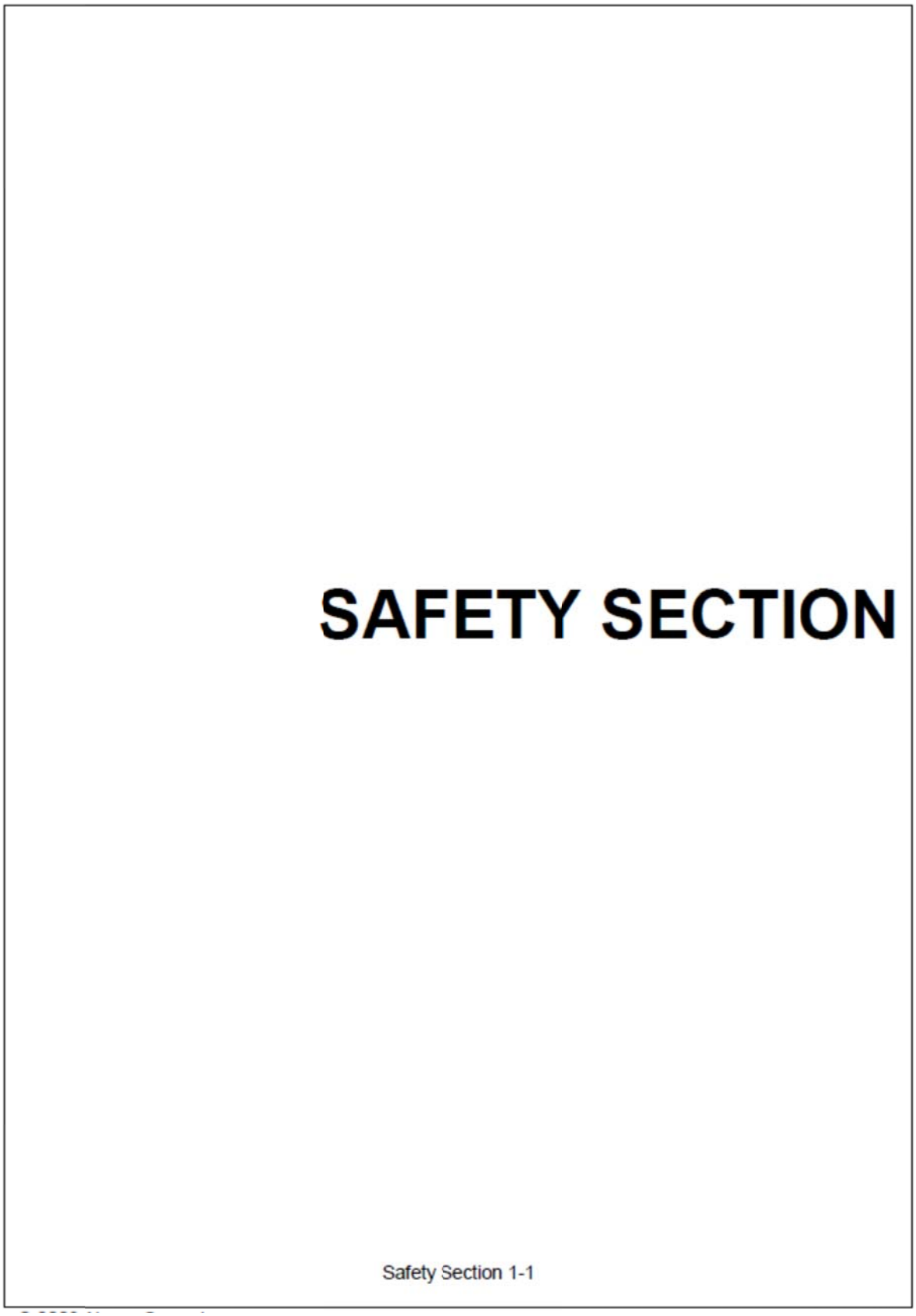


SERIAL NUMBER: _____

PARTS BOOK AND INSTALLATION MANUAL
VERSION 2.0, OCTOBER 2011

HENKE MANUFACTURING CORPORATION
MANUFACTURERS OF SNOW REMOVAL EQUIPMENT FOR 80 YEARS
3070 WILSON AVE. LEAVENWORTH, KS 66048 PHONE(913)682-9000 FAX(913)682-0300
WEBSITE ADDRESS : WWW.HENKEMFG.COM EMAIL: PARTS@HENKEMFG.COM

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SAFETY SECTION
Safety Section 1-1

SAFETY

GENERAL SAFETY INSTRUCTIONS AND PRACTICES

A careful operator is the best operator. Safety is of primary importance to the manufacturer and should be to the owner/operator. Most accidents can be avoided by being aware of your equipment, your surroundings, and observing certain precautions. The first section of this manual includes a list of Safety Messages that, if followed, will help protect the operator and bystanders from injury or death. Read and understand these Safety Messages before assembling, operating or servicing this Implement. This equipment should only be operated by those persons who have read the manual, who are responsible and trained, and who know how to do so responsibly.



The Safety Alert Symbol combined with a Signal Word, as seen below, is used throughout this manual and on decals which are attached to the equipment. The Safety Alert Symbol means: "ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!" The Symbol and Signal Word are intended to warn the owner/operator of impending hazards and the degree of possible injury faced when operating this equipment.

Practice all usual and customary safe working precautions and above all---remember safety is up to YOU. Only YOU can prevent serious injury or death from unsafe practices.

⚠ DANGER Indicates an imminently hazardous situation that, if not avoided, WILL result in DEATH OR VERY SERIOUS INJURY.

⚠ WARNING Indicates an imminently hazardous situation that, if not avoided, COULD result in DEATH OR SERIOUS INJURY.

⚠ CAUTION Indicates an imminently hazardous situation that, if not avoided, MAY result in MINOR INJURY.

Important Identifies special instructions or procedures that, if not strictly observed, could result in damage to, or destruction of the machine, attachments or the environment.

NOTE: *Identifies points of particular interest for more efficient and convenient operation or repair.* (SG-1)

READ, UNDERSTAND, and FOLLOW the following Safety Messages. Serious injury or death may occur unless care is taken to follow the warnings and instructions stated in the Safety Messages. Always use good common sense to avoid hazards. (SG-2)



NF Front Plows, Dozer Blades, and MAT Safety Section 1-2

SAFETY

⚠WARNING Repeated or substantial breathing of hazardous dusts, including crystalline silica, could cause fatal or serious respiratory disease including silicosis. Concrete, masonry, many types of rock, and various other materials contain silica sand. California lists respirable crystalline silica as a substance known to cause cancer. Operation of this equipment under certain conditions may generate airborne dust particles that could contain crystalline silica. In those conditions, personal protective equipment including an appropriate respirator must be used. If excessive dust is generated, a dust collection or suppression system should also be used during operation. (SG-41)



⚠PELIGRO Si no lee ingles, pida ayuda a alguien que si lo lea para que le traduzca las medidas de seguridad. (SG-3)



⚠DANGER Never operate the Snow Plow until you have read and completely understand this Manual, the Truck or Power units Operator's Manual, and each of the Safety Messages found in these Manuals and those affixed to the Snow Plow, Truck, or Power units and its components. Learn how to stop the power unit engine suddenly in an emergency. Never allow inexperienced or untrained personnel to operate the Truck or Power unit and Snow Plow without supervision. Make sure the operator has fully read and understood the manuals prior to operation. (SPNG-4)



In addition to the design and configuration of this Snow Plow, including Safety Signs and Safety Equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence, and proper training of personnel involved in the operation, transport, maintenance, and storage of the machine. Refer also to Safety Messages and operation instruction in each of the appropriate sections of the Truck or Power unit Manuals. Pay close attention to the Safety Signs affixed to the Snow Plow. (SNPG-5)

PARTS INFORMATION

HENKE Snow Plows use balanced and matched system components for plows, carriers, and other components. These parts are made and tested to HENKE specifications. Non-genuine or "will fit" parts do not consistently meet these specifications. The use of non-genuine or "will fit" parts may reduce Snow Plow performance, void HENKE warranties, and present a safety hazard. Use genuine HENKE parts for economy and safety. (SNPG-6)

SEE YOUR HENKE DEALER

⚠WARNING Always maintain the safety signs in good readable condition. If the safety signs are missing, damaged, or unreadable, obtain and install replacement safety signs immediately. (SG-5)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-3

SAFETY

⚠DANGER All Safety Shields, Guards and other Protective Safety devices should be used and maintained in good working condition. All safety devices should be inspected carefully at least daily for missing or broken components. **NEVER REMOVE PROTECTIVE SHIELDS AND GUARDS! NEVER MODIFY OR CUT PROTECTIVE SHIELDS OR GUARDS!** When shields or guards are removed to access areas for maintenance, they must be replaced and be in good condition before operating. Missing, broken, or worn shields, guards, and other protective devices must be replaced at once and prior to operation to reduce the possibility of injury. (SNPS-02)

⚠WARNING The Snow Plow power unit should be equipped with a fire extinguisher, rated for all fires, in an accessible and visible area. The fire extinguisher should be inspected routinely by a certified inspector for operational use and replaced as needed. Never obstruct access to the fire extinguisher. (SNPS-6)

OPERATOR SAFETY INSTRUCTIONS AND PRACTICES

⚠DANGER **NEVER use drugs or alcohol** immediately before or while driving or operating the Snow Plow. Drugs and alcohol will affect an operator's alertness and coordination and therefore affect the operator's ability to operate the Equipment safely. Before operating the Equipment, an operator on prescription or over-the-counter medication must consult a medical professional regarding any side effects of the medication that would hinder their ability to operate the Equipment safely. **NEVER** knowingly allow anyone to operate this Equipment when their alertness or coordination is impaired. Serious injury or death to the operator or others could result if the operator is under the influence of drugs or alcohol. (SNPD-3)

⚠WARNING Always wear OSHA approved Personal Protective Equipment (PPE) while operating, servicing, repairing, and/or cleaning the Equipment. PPE is designed to provide bodily protection during such activities.

Personal Protective Equipment includes:
-Protective Eye Wear
-Steel Toed Safety Footwear
-Gloves
-Hearing Protection
-Close Fitted Clothing
-Hard Hat-When working around a raised hopper.
-Respirator-Depending on conditions and material being swept or cleaned.

Specialized protective equipment may be required if dangerous or hazardous material is being moved by the plow. (SNPD-4)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-4

SAFETY

⚠ CAUTION Prolonged operation of the Snow Plow may cause operator boredom and/or fatigue affecting the safe operation of the Snow Plow and Truck or Power unit. It is recommended that the operator take scheduled work breaks to help prevent these potentially impaired operating conditions. If possible, completely shut down the Equipment, exit the cab and move around stretching your arms and legs. Never operate the Equipment in a fatigued or bored mental state that impairs proper and safe Equipment operation. (SNPD-5)

⚠ CAUTION **PROLONGED EXPOSURE TO LOUD NOISE MAY CAUSE PERMANENT HEARING LOSS!** Equipment operation can often be noisy enough to cause permanent hearing loss. We recommend that you always wear hearing protection if the noise in the Operator's position exceeds 80db. Noise over 85db over an extended period of time will cause severe hearing loss. Noise over 90db adjacent to the Operator over an extended period of time will cause permanent or total hearing loss. ***Note:*** *Hearing loss from loud noise [from sweepers, chain saws, radios, and other such sources close to the ear] is cumulative over a lifetime without hope of natural recovery.* (SNPD-6)



⚠ CAUTION Prolonged operation of the Equipment in cold weather may cause operator hypothermia affecting the safe operation of the Snow Plow and Truck or Power unit. It is recommended that the operator wear appropriate clothing take scheduled work breaks to help prevent these potentially impaired operating conditions. If possible, completely shut down the Equipment, exit the cab and warm the body in a properly heated area. Never operate the Equipment in a fatigued or impaired mental state that effects the proper and safe Equipment operation. (SNPD-8)

⚠ WARNING Use both hands for support when getting on and off the truck or power unit. Use handles and steps on the equipment for support when boarding. Never use the Truck or Snow Plow control levers for support when boarding the equipment. (SNPO-01)

⚠ WARNING Use available truck or power unit handles and steps to exit the operator's station. Make sure you have solid footing before stepping down. Be careful of your step and use extra caution when mud, ice, snow, or other matter has accumulated on the steps or handrails. Never rush to exit or jump off the truck or power unit. (SNPO-02)

⚠ DANGER Do not attempt to mount the Truck or Power Unit while the machine is moving. Never attempt to mount a runaway Snow Plow. Serious injury or death may occur from being run over by a moving Truck, Power Unit, or Snow Plow. (SNPO-03)

⚠ DANGER BEFORE leaving the operator's seat, always engage the parking brake and/or set the Truck's or Power Unit's transmission in the park position, stop the engine, remove the key, and wait for all moving parts to stop. Never dismount a Truck or Power Unit that is moving or while the engines are running. Operate the equipment controls from the Operator's seat only. (SNPO-04)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-5

SAFETY

⚠WARNING Always wear a seat belt while driving the equipment during operation and transport. Serious injury or even death could result from falling from the operator's station or from being involved in a collision. (SNPO-05)

⚠ DANGER Start the engines only when seated and belted in the operator's seat. Operate the equipment controls only while properly seated with the seat belt secured around you. Inadvertent movement of the power unit or attachment components may cause serious injury or death to the operator and passersby. Read the truck or Power Unit operator's manuals for proper starting instructions. (SNPO-06)

⚠ DANGER Do not operate, or perform maintenance to, the Equipment while wearing loose fitting clothing. Entanglement of loose clothing with the rotating elements can result in serious injury or death. Stay clear of all rotating elements at all times. (SNPD-7)

⚠ DANGER Operate only in conditions where you have clear visibility of the area in daylight or with adequate artificial lighting. Never operate in darkness of foggy conditions where you cannot clearly see at least 50 feet in front and to the sides of the equipment. Make sure that you can clearly see and identify passersby, steep slopes, ditches, drop-offs, overhead obstructions, power lines, oversized debris and foreign objects. If you are unable to see these types of items, discontinue operation until visibility improves. (SNPO-8)

⚠WARNING When transporting the Snow Plow between locations, follow all local traffic laws and regulations. (SNPO-10)

⚠WARNING Operate at a speed that allows you to safely operate and control the Truck and Snow Plow. Safe plowing speed depends on street condition and the type and amount of debris being moved. Slow down for corners, curbs, parked cars, protruding signs and other obstacles. Use slow traveling speeds when operating on or near steep slopes, ditches, drop-offs, overhead obstructions, power lines, or when debris and foreign objects are to be avoided. (SNPO-13)

⚠WARNING Do not operate the Equipment if excessive vibration or noise exists. Shut down the equipment and the Truck or Power Unit engine. Inspect the Equipment to determine the source of the vibration or noise. If parts are loose, damaged, or missing, replace them immediately. Do not operate the Equipment until all necessary repairs have been performed. To reduce the possibility of property damage, serious injury, or even death, never operate the Equipment with missing or damaged components. (SNPO-16)

⚠WARNING Never attempt to plow debris that is too large for the Snow Plow (oversized objects such as broken limbs and discarded tires). Such objects may damage the snow plow components and cause serious mechanical damage to the equipment. If possible, carefully place such objects out of the Snow Plow and traffic path until properly removed by another means. (SNPO-17)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-6

SAFETY

⚠WARNING Unplowed snow, plied ice and debris, and snow drifts left behind the equipment might pose a driving hazard to vehicle traffic colliding with the debris or losing traction on the material. It is recommended to post warning signs alerting driver's of the equipment operation presence and the need to reduce vehicle speed. If such hazards are left behind following the Snow Plows passage, the area should be plowed a second time and any remaining hazards removed by an alternative method. (SNPO-19)

⚠ DANGER Do not allow the Snow Plow to come in contact with potentially dangerous and/or hazardous material. Such hazards may include, but are not exclusively limited to, the following:

- Fire Hazards- Fuel spills, burning material,
- Chemical Hazards- Chemical spills, discarded chemical containers, batteries,
- Biological Hazards- Decaying Carcasses, BioMedical Waste,
- Radioactive Hazards-Radioactive Waste, Radioactive Material,
- Carcinogenic Materials-Asbestos,
- Corrosive Materials-Batteries, Acids and Bases.

In most areas, these types of material require special handling requirements for safe and proper disposal and should not be plowed by the Snow Plow, nor can they be disposed of in a general landfill site like most swept waste. Contact the appropriate authority for the collection and disposal requirements of such dangerous and/ or hazardous material. (SNPO-25)

⚠ DANGER Always wear required OSHA approved Personal Protective Equipment (PPE) when coming in contact with and removing potentially dangerous and hazardous material that has collected on the Snow Plow equipment or which is obstructing one or more components. Pay close attention to dangerous and hazardous material including, but not exclusively limited to, chemicals, decaying carcasses and sharp objects. (SNPO-26)

⚠WARNING Verbal communication near a Truck or Power Unit and Snow Plow is difficult and dangerous. Operating instructions and directions should be made prior to starting the equipment. Unclear and misunderstood communication may lead to operator and bystander injury or death and equipment damage. If communication by the operator is necessary, completely shutdown and exit the equipment. Never allow anyone to approach the equipment while in operation. (SNPO-28)

⚠ DANGER Never allow children to play on, under, or around the Truck or Power Unit nor allow children to operate equipment controls. Children can slip or fall off the equipment and be injured or killed. Children can cause the equipment components to shift or fall crushing themselves or others. (SNPO-29)

⚠WARNING Allow passengers only in situations where their presence is involved in the operation (operator training, supervision, maintenance inspection). Never carry passengers whose presence distracts from the safe operation or transport of the equipment. Passengers must be seated securely and belted in the cab's passenger seat. Never allow any person to ride on any other location of the Truck, Power Unit or Snow Plow during operation or transport. (SNPO-30)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-7

SAFETY

⚠WARNING Extreme caution should be used by the operator when operating near passersby. Stop snow plowing if a passerby comes within 25 feet of the plow to prevent possible passerby injury or death from being struck by the equipment or from a thrown object. (SNPO-31)

⚠ CAUTION Under certain conditions, the Snow Plow is capable of propelling objects up to 75 feet. Be extremely careful when plowing at higher speeds and hitting large dense objects, such as rocks, chucks of frozen ice, metal objects, broken glass, or other solid objects that might become propelled and cause bodily injury to passersby or damage to property such as windows and vehicles. (SNPO-32)

⚠WARNING Make sure that no bystander, animal or obstruction such as a vehicle, building, or street sign are within the width of the Snow Plow. The design of the Snow Plow may impair the operator vision when operating. Use extreme caution to ensure that the Snow Plow is not driven into the path of pedestrian or vehicle traffic. Serious injury or death and property damage could result from running into, being crushed by, or run over by a Snow Plow. (SNPO-33)

⚠ DANGER Make sure no bystanders or animals are within 25 feet of the equipment basket when dumping contents from or cleaning the Snow Basket. Bucket contents, which may exceed several thousand pounds, could fall and crush a bystander or an animal resulting in possible injury or death. (SNPO-34)

⚠ DANGER Use extreme caution when operating the Equipment in traffic. To alert motorist of the Equipment's presence, use all equipped warning signals to alert motorist and pedestrians of the equipment's presence and relatively slow speed. Serious injury or death and property damage may occur if a vehicle collides with this Equipment. (SNPS-3)

⚠WARNING Before starting a snow plowing operation, make sure all the warning signal lights are connected, visible and working. Routinely inspect the equipment's headlights, brake lights, backup lights, and turn signal lights for operational condition. Immediately repair non-functioning lighting. Always follow all local traffic regulations while operating the Snow Plow. (SNPS-4)

⚠WARNING Always turn on all safety lights and flashers when you operate the Snow Plow. (SNPS-5)

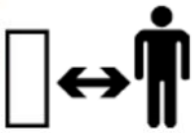
⚠ DANGER Be particularly careful in transport. The Implement has raised and moved the center of gravity to the front of the Power Unit increasing the possibility of overturn and tipping forward. Turn curves or go up slopes only at low speed and using a gradual turning angle. Go up slopes with the Implement located uphill. Slow down on rough or uneven surfaces. (SPU-2)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-8

SAFETY

CONNECTING OR DISCONNECTING IMPLEMENT SAFETY INSTRUCTIONS AND PRACTICES

⚠WARNING Do not stand or allow bystander or coworkers between the attachment and the truck or power unit while installing or disconnecting the attachment. Keep hands and body clear of the attachment and the attachment mounts. Serious injury or death can result from a person being crushed between the attachment and truck or power unit. (SNPC-01)



⚠WARNING Reset the tripped snow plow edge by raising the snow plow off the ground. DO NOT attempt to reset the trip edge by hand. The trip edge is spring loaded and sudden and unexpected movement can occur resulting in serious injuries. Keep and hands and feet away from the trip edge. If the trip edge does not reset, stop plowing and have the snow plow repaired before resuming snow plowing. (SNPO-12)

⚠WARNING Make sure the implement is properly attached to the Power Unit and the retaining pins securely lock the Implement into position. Improper mounting of the Implement onto the Power Unit can result in the Implement falling causing serious injury. (SNPC-02)

⚠WARNING The operator of the equipment must be trained in the operation and safe use of this machine. The operator must read and completely understand the operator's manuals of the Snow Plow, Truck or Power unit manufacturers. New operators should be trained in an open area clear of obstructions before operating on public roadways. If operation of the entire Snow Plow unit (Truck or Power unit) is not completely understood, consult your authorized sales representative for a detailed explanation. Never allow an untrained or unqualified driver to operate the Snow Plow. (SNPD-1)

⚠CAUTION The Snow Plow driver must meet the requirements and possess a Motor Vehicle License as determined by the state in which the Snow Plow is operated if used on public roadways. Contact your local State Department of Public Safety office for special licensing requirements to operate the Snow Plow in your area. (SNPD-2)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-9

SAFETY

MAINTENANCE AND SERVICE SAFETY INSTRUCTIONS AND PRACTICES

⚠WARNING Perform service, repairs and lubrication according to the maintenance section. Ensure the unit is properly lubricated as specified in the lubrication schedule and all bolts and nuts are properly torqued. Failure to properly service, repair and maintain this Implement in good operating condition could cause component failure and possible serious injury or even death. (SG-35)

⚠WARNING Periodically inspect all moving parts for wear and replace when necessary with authorized service parts. Look for loose fasteners, worn or broken parts, and leaky or loose fittings. Make sure all pins are properly secured. Serious injury may occur from not maintaining this equipment in good working order. (SNPM-01)



⚠WARNING Inspect the entire Snow Plow before each use. Accidents may occur or damage to the equipment may result if the Snow Plow is not maintained in good mechanical working order.

- Check for loose bolts, worn or broken parts, pinched hydraulic hoses, and leaky or loose fittings.
- Make sure all pins are secure and safety pin equipped.
- Make sure replacement parts are the correct size and properly installed.
- Make sure all fluid levels are full and replenish as necessary.
- Make sure fuel, oil, and coolant caps are replaced and tightened.
- Check tire condition for tread wear and tire pressure at the rated PSI.
- Make sure that all safety shields and guards are attached and in good condition.
- Make sure all scheduled maintenance is up to date. (SNPM-02)

⚠WARNING Do not modify or alter this Snow Plow. Do not permit anyone to modify or alter this equipment, any of its components or any Snow Plow function. Modification can result in equipment failure and cause serious injuries to the operator, coworkers, or bystanders. (SNPM-03)

⚠WARNING Use extreme care when climbing onto the equipment to perform repairs, maintenance, and cleaning. Use proper stands and ladders to access areas that cannot be reached from ground level. Slipping and falling off the equipment can cause serious injury or death. (SNPM-04)

⚠WARNING Never attempt to repair, lubricate, adjust, clean, remove obstructions or perform any other type of service to any component while the Snow Plow is in motion or while the engine is running. Completely shut down the engine and wait for all motion to come to a complete stop before servicing the Snow Plow. (SNPM-05)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-10

SAFETY

⚠ DANGER Never leave the Snow Plow unattended while the plow is in the raised position. Accidental operation of the lifting lever or a hydraulic failure may cause a sudden drop of the unit which could result in injury or death by crushing. If the plow must be raised for inspection or service securely block up and support the Plow to prevent it falling. (SNPM-05)

⚠ DANGER Never crawl under the Snow Plow or any raised component unless it is properly blocked up and support to prevent it from falling. Accidental operation of a lifting lever or hydraulic failure may cause a sudden drop of the unit with injury or death by crushing. (SNPM-07)

⚠ WARNING Use proper protective equipment including gloves, safety eye wear, arm protection when handling plow blades and components during replacement, adjustment, and maintenance. Plow edges and components can become sharp and have burrs that could inflict puncture and cuts to the hands, arms, and/or eyes if proper protective equipment is not worn. (SNPM-08)

⚠ WARNING Replace bent, cracked, or broken plow blade with a new blade. Never attempt to straighten or weld on plow blades because this will likely crack or otherwise damage the blade with subsequent failure and possible serious injury from broken blade being ejected from plow. (SNPM-10)

⚠ DANGER Escaping pressurized hydraulic oil generated by hydraulic pumps has the potential to inflict serious injury and possible death. Never attempt to repair a pump or hose or tighten a connection while the system is pressurized. Always shut down the engine and relieve hydraulic oil pressure before performing any repairs to the hydraulic system. (SNPM-11)

⚠ WARNING Hydraulic pressure must be relieved from the hydraulic circuit prior to doing any maintenance or repair work and when the Snow Plow is parked at the end of the day. Place the Snow Plow(s) on the ground or securely blocked up. Turn off the Truck engine then engage the hydraulic remote cylinders several times to relieve hydraulic pressure prior to performing any maintenance or repair work. (SNPM-12)

⚠ WARNING Never remove debris from or unclog jams in the plow or lifting components until the engine have been completely shutdown and all components have come to a complete stop and are lowered to ground level and hydraulic pressure relieved. Always wear PPE when removing collected material and debris from the equipment. Serious injury or death may occur if any of these precautions are not followed when removing plugged or entangled debris. (SNPM-15)

⚠ WARNING Engine Exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. (SNPM-20)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-11

SAFETY

⚠ DANGER Do not operate this equipment with hydraulic oil or fuel leaking. Oil and fuel are expensive and their presence could present a hazard. Do not check for leaks with your hand! High-pressure oil streams from breaks in the line could penetrate the skin and cause tissue damage including gangrene. To check for a hose leak, SHUT the ENGINE OFF and remove all hydraulic pressure. Wear oil impenetrable gloves, safety glasses and use Cardboard to check for evidence of oil leaks. If you suspect a leak, REMOVE the HOSE and have it tested at a Dealer. If oil does penetrate the skin, have the injury treated immediately by a physician knowledgeable and skilled in this procedure. (SNPM-21)



⚠ WARNING Always read carefully and fully comply with the manufacturers instructions when handling fuels, oils, solvents, cleansers, and any other chemical agent. (SNPM-22)

⚠ WARNING Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. Wash Hands after handling. (SNPM-23)

⚠ WARNING Avoid contact with hot surfaces on the bottom of the skid shoes or plow cutting edges. Use gloves and eye protection when servicing hot components. Contact with a hot surface can cause serious injury from burns or scalding. (SNPM-24)

⚠ WARNING Remove the negative battery cable from the battery before performing any maintenance on the electrical system to prevent an accidental circuit shorting and sparks. Sparks can result in wiring damaged, fire or personal injury. (SNPM-25)

⚠ WARNING Before conducting maintenance on the Snow Plow stop the truck or Power Unit, place the transmission in the park position and set the parking brake. Turn the engine off and remove the key to prevent inadvertent or accidental starting of the engine. Unexpected engine start up or vehicle movement can result in serious bodily injuries or death. (SNPM-27)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-12

SAFETY

Transporting Safety Instructions and Practices

⚠WARNING Transport the Truck, Power Unit, and Snow Plow only at safe speeds. Serious accidents and injuries can result from driving this equipment at unsafe speeds. Become familiar with the driving characteristics of the equipment and how it handles before operating or transporting on streets and highways. Make sure the Truck's or Power Unit's steering, brakes, and wheels are in good condition and operate properly)

Before transporting the Equipment determine the safe transport speeds for you and the machine.
Make sure you abide by the following rules:

- Test the Truck or power unit and Snow Plow at a slow speed and increase the speed slowly. Apply the brakes smoothly to determine the stopping characteristics of the Truck equipped with the Snow Plow. As you increase the speed of the Truck, the stopping distance increases. Determine the maximum safe transport speed for you and the equipment. When driving down a hill or on wet or icy roads, the braking distance increases: use extreme care and reduce your speed. Do not operate the equipment with weak or faulty brakes.
- Obey all traffic laws and regulations. Never exceed the posted speed limit.
- The Snow Plow has moved the center of gravity of the equipment forward. Use extreme caution when transporting at highway speeds. Slow down for sharp corners or on slopes to avoid loss of steering control.
- Only transport the equipment at the speeds determined as safe and which allow for proper control of the machine while driving and stopping during an emergency.
- When operating in traffic, use the Truck's or Power Units directional indicator or signal lights to indicate your movement. Always use the flashing warning lights and other equipped warning features to alert motorist of your presence and slow moving speed when operating in traffic. **Be Aware of Traffic Around You and Watch Out for the Other Guy.** (SNPO-09)

NF Front Plows, Dozer Blades, and MAT Safety Section 1-13

SAFETY

Federal Laws and Regulations

This section is intended to explain in broad terms the concept and effect of federal laws and regulations concerning employer and employee equipment operators. This section is not intended as a legal interpretation of the law and should not be considered as such.

Employer-Employee Operator Regulations

U.S. Public Law 91-596 (The Williams-Steiger Occupational and Health Act of 1970) OSHA

This Act Seeks:

"...to assure so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources..."

DUTIES

Sec. 5 (a) Each employer-

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations and orders issued pursuant to this Act which are applicable to his own actions and conduct.

OSHA Regulations

OSHA regulations state in part: "At the time of initial assignment and at least annually thereafter, the employer shall instruct every employee in the safe operation and servicing of all equipment with which the employee is, or will be involved."

Employer Responsibilities:

To ensure employee safety during plow and truck or other power unit operation, it is the employer's responsibility to:

1. Train the employee in the proper and safe operation of the plow and truck or other power unit.
2. Require that the employee read and fully understand the plow and truck or other power unit Operator's manual.
3. Permit only qualified and properly trained employees to operate the plow and truck or other power unit.
4. Maintain the plow and truck or other power unit in a safe operational condition and maintain all shields and guards on the equipment.
5. Ensure the truck or other power unit is equipped with a functional ROPS and seat belt and require that the employee operator securely fasten the safety belt and operate with the ROPS in the raised position at all times.
6. Forbid the employee operator to carry additional riders on the Tractor or Implement.
7. Provide the required tools to maintain the plow and truck or other power unit in a good safe working condition and provide the necessary support devices to secure the equipment safely while performing repairs and service.
8. Require that the employee operator stop operating equipment if bystanders or passersby come within 25 feet.

Child Labor Under 16 Years of Age

Some regulations specify that no one under the age of 16 may operate power machinery. It is your responsibility to know what these regulations are in your own area or situation. (Refer to U.S. Dept. of Labor, Employment Standard Administration, Wage & Home Division, Child Labor Bulletin #102.)

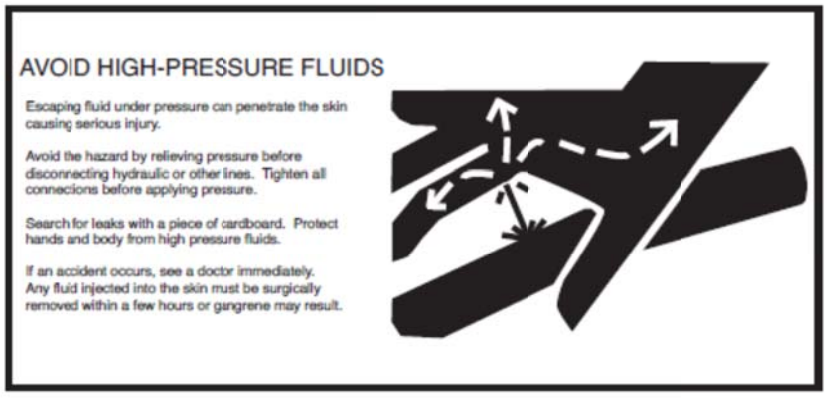
NF Front Plows, Dozer Blades, and MAT Safety Section 1-14

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MONROE 2006 TEXAS D.O.T. PLOW SERVICE AND PARTS MANUAL

SAFETY INSTRUCTIONS

- Read all installation, safety and maintenance instructions completely before operating this equipment.
- Keep all personnel clear of moving parts while equipment is being operated.
- Do not operate a plow in need of maintenance! Repair immediately!
- While operating this equipment use common sense, use caution, be alert and be safety-conscious.



2

MAINTENANCE INSTRUCTIONS

In Season:

- Check for loose bolts and nuts daily, and re-torque before use. (Failure to inspect equipment on a daily basis may seriously affect safety and/or efficiency.)
- Lubricate all grease fittings every ten hours of normal use and more frequently under heavy use.
- A cross over relief valve (1800 PSI) MUST be plumbed into the reversing circuit.
- Check all hydraulic fittings for tightness on a regular basis.
- System pressure should NOT exceed 2000 PSI.
- Check cutting edge for wear. Do not let cutting edge wear closer than ½" to ⅜" from the bottom angle of the moldboard.
- Due to the nature of use and environment this equipment is operating in, damage and wear may occur at anytime. Therefore, **Monroe Truck Equipment** recommends the end user establish and follow a daily inspection routine before using this equipment.

Off Season:

- Use care when disconnecting hydraulic lines to assure that no dirt or foreign objects enter the hydraulic system. Use caps to cover hydraulic hose fittings and insert plugs in hydraulic ports.
- Hydraulic cylinders should be fully retracted when stored during the off season to prevent damage or corrosion. The remaining exposed shaft surface should be coated with a thick grease to prevent corrosion, which must be removed before returning to regular service.
- Check mounting bolts for wear and/or damaged threads and replace before next season.

TORQUE CHART

SIZE	GRADE 2	GRADE 5	GRADE 8
1/4-20	50 IN-LBS	75 IN-LBS	9 FT-LBS
3/8-16	15 FT-LBS	23 FT-LBS	35 FT-LBS
1/2-13	35 FT-LBS	55 FT-LBS	80 FT-LBS
5/8-11	75 FT-LBS	110 FT-LBS	170 FT-LBS
3/4-10	130 FT-LBS	200 FT-LBS	280 FT-LBS
1-8	190 FT-LBS	480 FT-LBS	680 FT-LBS
1 1/4-7	380 FT-LBS	840 FT-LBS	1360 FT-LBS

3

VIDEO 10.2. ARE YOU READY? (01:08)

SCRIPT

(Television playing in the background)

Guy: How does it look out there?

Girl: It is really starting to accumulate. The wind is picking up too.

Guy: Well they just said on tv that the wind is whipping up to almost 25 mph out in the northwest.

Girl: Did they say how cold it is going to get?

Guy: Last report 10 above zero with a wind chill 29 below. I'm sure I'm going to get a call from the shop if it keeps snowing like this.

Girl: Are you ready?

With the second shift ready to begin soon, all the knowledge you gain both in your training sessions and during your first ride is going to be tested because today is the real thing.

Out on that highway it is going to be just you with all that you have learned and that truck with all its equipment fighting Mother Nature. Are you ready for the challenge?

VIDEO 10.3. KNOW YOUR ROUTE (01:57)

SCRIPT

Curbs, raised islands, guardrails, and many other obstacles can present real problems when the snow is deep. Many of these obstacles can be totally hidden, and the only way to avoid hitting them is to know where they are, exactly where they are. You need to memorize the location of these obstacles along your route so you don't hit them when you are plowing. Now that may sound so obvious that is doesn't even need to be mentioned but stop and think for a second, is there a guardrail that is within two miles of your home? Do you know exactly where it starts and stops? Most people don't.

If it is at all possible, drive your route before it snows so you can learn as much as you can about potential problems.

Guardrails, curbs, and islands are fairly obvious problems to watch for but there are a number of other obstacles that you've probably never even noticed.

For example, utility companies used steel plates to cover temporary excavations, new sewer lines, water lines, and so on. You can imagine what would happen if you push the plate away from the excavation, an open hole.

Manholes can present a problem in the same way as steel plates. Usually they are flushed with the pavement surface, which is no problem but some stand above the surface and they can stag your plow.

Other obstacles that you need to be on the watch for include mailboxes, fire hydrants, delineators, light poles, guide wires, and signs. In a bad storm, any of these can be hard to see and easy to hit. Stalled or stuck vehicles can't be checked on ahead of a snow fall but can appear quickly so be on a constant watch for them too.

VIDEO 10.4. PLOWING SPEED (00:30)

SCRIPT

About 25 miles per hour has proven to be the most efficient plowing speed.

When speed exceeds 25, the plow tends to skip over the snow and it will require an extra trip to clear the snow that was left.

As an operator you need to know that excessive speed can damage snow plow equipment very easily.

VIDEO 10.5. PLOWING IN TRAFFIC (01:24)

SCRIPT

Others rely on you to make their trip safer so always think prevention and drive defensively at all times. Don't assume that others see or hear you approach. Be on constant watch so that you can compensate for others mistakes. Scan well ahead for oncoming traffic and potential hazards. In snowy conditions with decent visibility that's about a quarter of a mile or 12 to 15 seconds ahead.

Also, scan the rearview mirror every 3 to 5 seconds to check for drivers that are ready to pass you. If a long line of vehicles forms behind you, use your judgment about moving over to allow traffic to pass by. If you make a decision to pull over, always signal your intentions and pick your spot carefully.

Shoulders and driveways can be icy and slick or soft and muddy at various times during the winter months so be cautious. Also, always be on the alert for emergency vehicles. It is not always possible for you to pull your plow entirely off the road but when an emergency vehicle needs to pass, slow down and pull over to the right as far as possible.

VIDEO 10.6. PLOW TRUCK HANDLING (01:10)

SCRIPT

When roads are snow and ice covered, it of course takes longer to stop. Try to anticipate when you need to slow down or stop and leave yourself plenty of room.

Turning takes more room too. When you add a plow to the front of the truck, the truck becomes longer and wider. You won't be able to make a lot of turns that you could make without the plow attached so think ahead. Be selective in finding a spot to turn around. Make sure there is plenty of space to turn and that you have a clear view in all directions.

Even driving on straight sections of road is like nothing you have ever experienced. The snow really has an effect on how the truck handles.

As you push the snow it is pushing your truck in the opposite direction you are pushing the snow. If you are plowing to the right the snow will push the truck to the left. When there is a lot of snow on the road you will have to oversteer to counter act that force.

VIDEO 10.7. VISIBLITY (00:45)

SCRIPT

Visibility is generally an issue when you are plowing snow. If the wind isn't blowing the snow, your plow or other vehicles are kicking it up.

Keep your windows as clean as possible so you can see in all directions.

If your truck is equipped with heated mirrors make sure they are turned on.

Always keep your windshield wipers clean and always have your lights on so others can see you.

There will be times when you must slow down because of visibility problems or even have to pull off the road in case of a complete white out.

VIDEO 10.8. HANDLING FATIGUE AND STRESS (01:13)

SCRIPT

Operating a snow plow, especially in severe weather conditions, can be highly stressful.

If at all possible, prepare yourself and get plenty of sleep before you arrive for your shift. Once you are on the job, drink liquids and eat enough foods to stay alert and keep your energy level up. Also, whenever you feel the need, stop your truck; get out for some fresh air and stretch. Wear comfortable clothing appropriate for the conditions so that you stay warm and dry even when you have to be outside the truck cab.

Your safety and the safety of other drivers on the road is of upmost importance at all times.

There may be times where the conditions may be so severe that you can't keep your route clear. If this should happen, remain calm and know that sometimes conditions are beyond your control. If at any time you have an important question or a serious problem, use your radio to call your supervisor or another experience operator.

VIDEO 10.9. PLOWING TWO-LANE ROADS (01:58)

SCRIPT

On your first time out alone, you will probably be assigned to plow two-lane, two-way roads.

To begin, stay in your own lane. Position the left side of the plow near the center of the road and angle your plow to the right to push the snow off of the right hand side of the road.

Always try to uncover the center line on your first pass. Normally you will also use your light –duty wing as a plow extension to increase your plowing width. If the wind is blowing hard or if it is especially still then the snow is falling straight down, you may have difficulty from time to time seeing the center line. When you can't see the center line you may have to revert to using the edge of the road as your guide. Veteran snow plow operators often watch the shoulder for sign or rock or grass if there is not a hard surfaced shoulder. You can also look for delineators, guardrails, road signs, mailboxes, and other objects that can help give you some idea where the center line is.

You can usually feel when the front wheel goes off the road on the shoulder. If this happens, compensate by carefully steering back towards the center line. When you get to the end of your run, find a safe place to turn around. Once you have made your turn and are ready to head back, position the plow to catch the snow that was left near the center of the road. If you are lucky, you'll be able to see the center line but many times the center line is already covered up by the time you head back.

Continue making passes until both of the deriving lanes are opened and have been returned to near normal winter driving conditions or you are reassigned to a different route.

VIDEO 10.10. PLOWING MULTIPLE-LANE ROADS (01:57)

SCRIPT

Everything you will learn about plowing a two-lane highway applies to plowing a multiple-lane freeway or interstate with the exception of where you make your first pass. As with any road, the first concern on a multiple-lane divided highway, is provide a pathway for vehicles to get through. Where you plow that first lane depends on whether there is a median wide enough to hold the snow.

If there is a wide median, then logical thing to do is to make your first path in the right hand lane with your plow angled to the right. Move the snow on that first pass to the right hand shoulder. With your second pass, angle your plow to the left and move your snow to the left, towards the median. If two trucks can work together of course, you can get a lot more done with one plow moving the snow to the right and second moving the snow to the left. Here the lead truck is in the right lane with a plow angled to the right pushing snow toward the shoulder. The second truck follows with the plow angled to the left. This truck has to be lined up so that is catches the snow left by the first truck. If there isn't a wide median, you do not have a choice; you'll have to push all of the snow to the right. Here the lead truck can't push snow to the left; there is no place for it to go so it pushes snow to the right. The second truck lines up so that it catches snow that was left by the first truck and continues pushing the snow to the right.

When you are working alone and you are in a situation where you can't move snow to the left, then you will have to make your fist pass in the left lane, and then follow up by catching the snow that was left by your first pass and continue pushing snow to the right.

VIDEO 10.11. BLADE WEAR & REPLACEMENT (00:57)

SCRIPT

Question: What is your call on when a blade needs to be replaced? Is it two fingers or an inch and a half (1 1/2”)?

Answer: Before it gets to that moldboard.

Alright so right here is the moldboard. Here are the bolts that bolt the cutting edges on; and see, this one is worn right here on the edge so they run these down close enough that it’s worn, it’s okay, it’s fine, it’s not hurt; but when these cutting edges get to that moldboard right there, you got to change them. So these have got a fingers width, three-quarters of an inch (3/4”) or so, and an inch maybe, of wear left before these have got to be changed.

VIDEO 10.12. PLOWING RAMPS (00:50)

SCRIPT

Cleaning ramps is much the same as plowing any other type of road. There are a couple of points to keep in mind though.

First, whenever possible, move the snow from the high side of the ramp to the low side, the same as on super elevated bridges. You do not want a buildup of snow on the high size of the ramp because when it melts it will run across the road and possibly refreeze if the temperature drops.

And second, be sure that your plow is angled in the proper direction when coming off a ramp and before entering a roadway. There are cases where you will be pushing snow one way and then after leaving the ramp, have to push snow the other way.

VIDEO 10.13. PLOWING INTERSECTIONS (00:43)

SCRIPT

With the main roadway clear, it's time to start cleaning intersections. Here are a couple of ways it can be done.

One is to straighten your plow as you enter the intersection. Go on across moving slightly to the right as you go through the intersection to catch as much snow as possible.

Another method is to go through the intersection from every direction, always moving the snow to the right.

This method may also require a couple of final passes with the plow straight to cleanup any snow that is left in the center of the intersection.

VIDEO 10.14. PLOWING BRIDGES (02:03)

SCRIPT

If you are plowing an open or low side rail bridge, one that is open or low enough to allow the snow to go through or over, and if there is not another railway or road below, then you will plow it much the same as a road, moving the snow to the right, over or through the bridge barrier.

However, if there is a railroad or road below, or if the road has high closed barriers on each side, then you are going to have to plow it differently than a road. You have to go slower to avoid throwing the snow over the bridge and on to any traffic or tracks below.

And instead of moving the snow to the right, set the plow straight or nearly straight and move the snow to the end of the bridge, that way you don't end up with snow piled along the barrier. That's important, because if the snow builds up along the barrier it can form a ramp, and a vehicle could go up over the barrier and off the bridge. So, for bridges with high closed barriers, plow straight and slow.

On super elevated bridges, always move as much snow as possible to the low side of the bridge. That prevents snow on the high side from melting and then refreezing into ice as it flows across the bridge to the low side.

Whenever you go on and off a bridge, you must make certain that the angle your blade is not parallel with the expansion joint. If it is, the blade can fall into the expansion joint and cause considerable damage.

Also, be as especially careful when plowing truss or pony truss bridges. Hitting a truss with a plow can also cause damage. As you already know or will quickly become aware of, bridge decks tend to ice up before the roadway so use caution whenever plowing a bridge.

VIDEO 10.15. SNOW PLOW TRIP MECHANISM (00:32)

SCRIPT

Regardless of the type of plowing you're doing, travel speed is always important.

Sometimes when the plow trips, it can pitch straight up and down turning the blade into a big ice skate. If the blade is loaded with snow or if you hit a patch of ice, it can pull your truck in the direction where the blade is aimed, into a ditch, or worse yet into oncoming traffic.

VIDEO 10.16.RAILROAD CROSSINGS (00:38)

SCRIPT

When approaching railroad tracks, raise your plow high enough to clear the tracks. Then lower it when you are completely across. Otherwise you could catch the plow in the tracks and damage the mold board, the blade, or the tracks.

Also, turn off the spreader when crossing tracks. There is a very good reason for this. A buildup of snow, ice, salt, or abrasives on the tracks could actually derail a train so at all railroad crossing raise your plow and turn off your spreader.

VIDEO 10.17. READY TO HIT THE ROAD (00:47)

SCRIPT

Well, are you ready to hit the road? If there were ideas or techniques presented in this video that you did not completely understand or don't fully agree with discuss them soon with your supervisor.

Every newly trained snow plow operator heads out on that first run with some trepidation. There is much to remember. However, if you apply what you have learned during your training and use good common sense out on the road you are certain to soon be a respected DOT snow plow operator.

Good luck, and good plowing!

VIDEO 10.18. DON'T CROWD THE PLOW (00:47)

SCRIPT

When winter weather hits, Texas Department of Transportation snow plows work around the clock to make sure roads are safe and passable for you.

However, these large vehicles can present a hazard to drivers who get too close. Return the favor and give them room to work. DON'T TAKE A CHANCE… DON'T CROWD THE PLOW!

A winter safety reminder from TxDOT. For road conditions call 800-452-9292 or log on to dot.state.tx.us

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Class Exercise – Review Questions
Module 10 – SNOW PLOWING TECHNIQUES

MNT812 Winter Weather Operations Training

1. [True/False] I have read and understand the manufacturer's safety information and operating instructions for the snow plow I am using.
   A. True
   B. False

   If your answer to this statement is not TRUE, well, it should be.

   This is one manual that TxDOT expects you to read.

2. A good target speed for plowing snow is 25 miles per hour. Plowing at higher speeds can cause the following:
   A. The plow will start to "skip" over the snow and create a "rub board" effect which can cause traffic to lose control
   B. A more violent trip and possible loss of control can occur if the snow plow hits an obstruction in or adjacent to the road
   C. The likelihood of a plow truck driver losing control of his vehicle is increased if the plow truck encounters an unexpected or unforeseen section of ice on the road
   D. All of the above

   The correct answer is D.

3. [True/False] All reversible plows are equipped with a trip mechanism which allows the plow to tip forward to reduce damage to the plow and truck if an immovable object is hit.
   A. True
   B. False

   This statement is TRUE.

   SAFETY FIRST!!!

4. Which of the following does not represent accepted practice when plowing active two-lane roads:

   A. Plow one lane at a time
   B. Plow in the same direction as traffic
   C. Try to uncover the centerline on the first pass, pushing snow to the right
   D. Position approximately two feet of the moldboard into the path of oncoming traffic to ensure that you uncover the centerline on the first pass

   The correct answer is D.

   Do not drive, even partially, into oncoming traffic when plowing. SAFETY FIRST!!!

5. [True/False] On superelevated ramps or bridges, remove as much snow away from the high side as possible to prevent meltback and refreeze.

   A. True
   B. False

   This statement is TRUE.

6. Assume you are plowing a divided, two-lane road that slopes from the inside lane to the outside lane (left to right). A median exists that is wide enough to hold plowed snow. Accepted procedure is to:

   A. Plow the right (outside) lane first, pushing snow to the right
   B. Plow the left (inside) lane to the left, pushing snow toward the median
   C. If two plow trucks are available, both lanes of the road may be plowed in tandem using the same approach described above
   D. All of the above

   The correct answer is D.

7. [True/False] When plowing snow or ice in the area of a bridge expansion joint, the snow plow or grader moldboard should always be aligned parallel to the expansion joint.

   A. True

   B. False

   This statement is FALSE.

   Plowing so that your blade can fall into a bridge joint will cause the trip cannon to trip. Avoid this.

8. [True/False] It is acceptable to leave small windrows of snow (less than 2 feet wide and 2 feet high) along the centerline of a road, between lanes, or along bridge rails.

   A. True

   B. False

   This statement is FALSE.

   Such windrows are a hazard to the travelling public. SAFETY FIRST!!!

9. [True/False] When plowing railroad crossings, in order to prevent dense snowpack or ice build-up that could cause a train to derail, accepted practice is to remove snow and ice from the railroad crossing by plowing in the same direction as the rails, but being careful not to plow past the road right-of-way.

   A. True

   B. False

   This statement is FALSE.

   TxDOT does not plow railroad crossings. TxDOT leaves them alone.

10. [True/False] When plowing snow or ice in a situation where the correct approach is not clear, the operator should use his best judgment.

    A. True

    B. False

    This statement is TRUE.

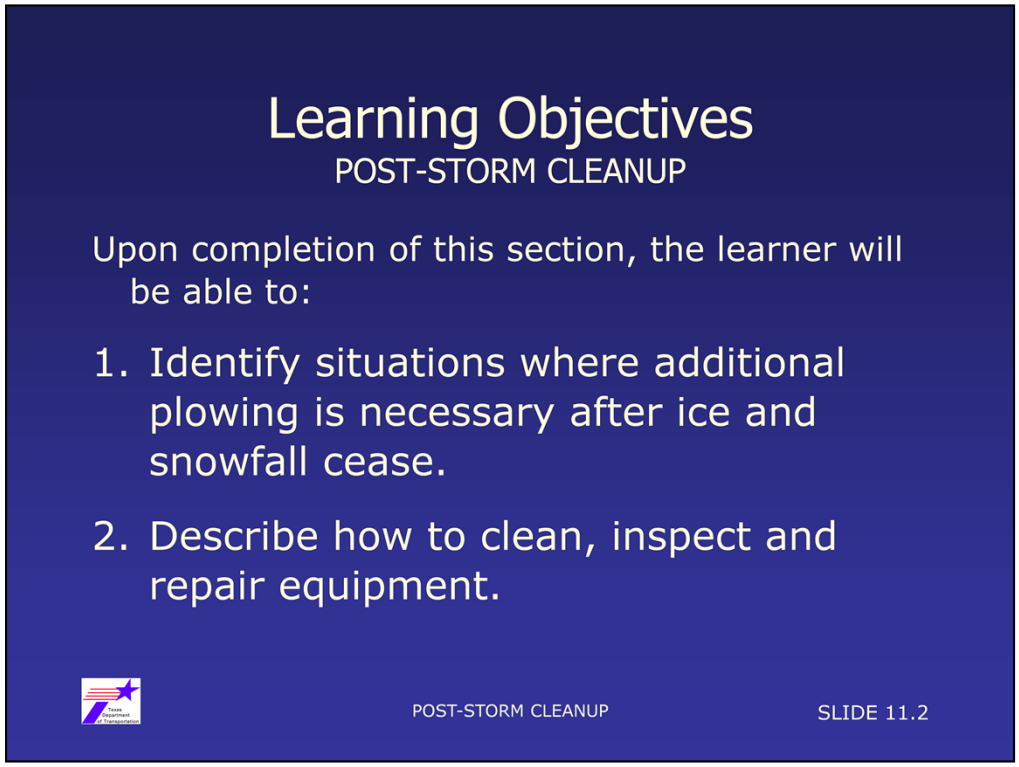
    Many such situations exist.



Instructor Notes: Present the following key points.

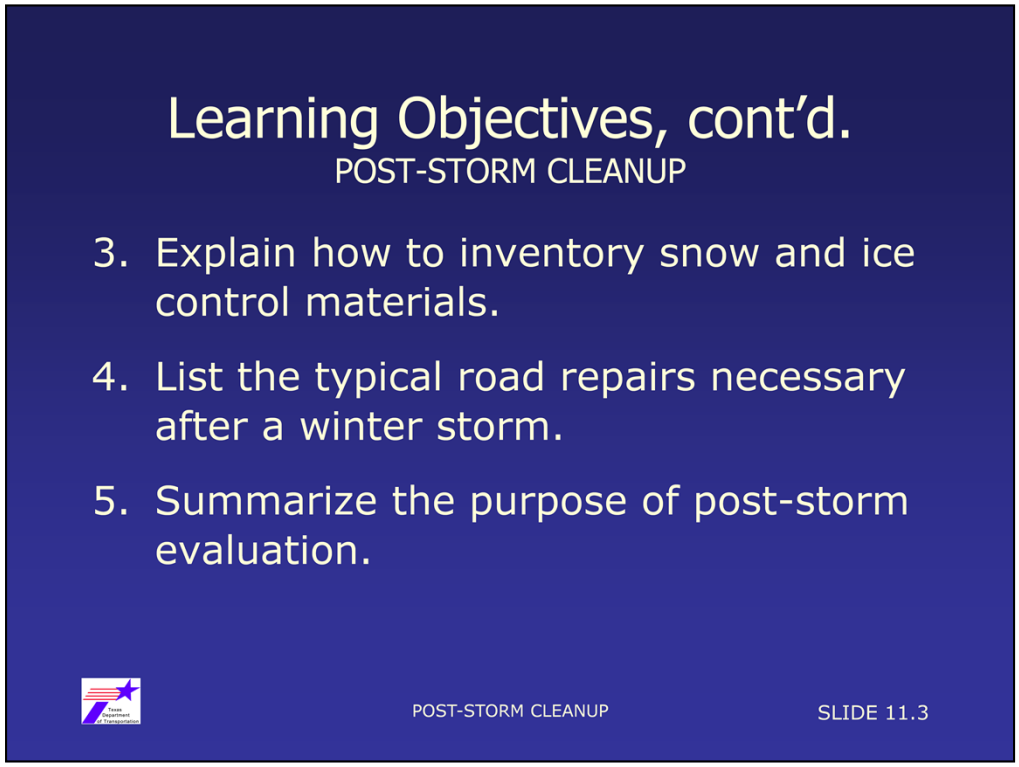
It is a fact that much work remains to be done after the storm is over… more than you might think.

Post-storm cleanup is the topic of this module.



Instructor Notes: Present the following key points.

Note the learning objectives…



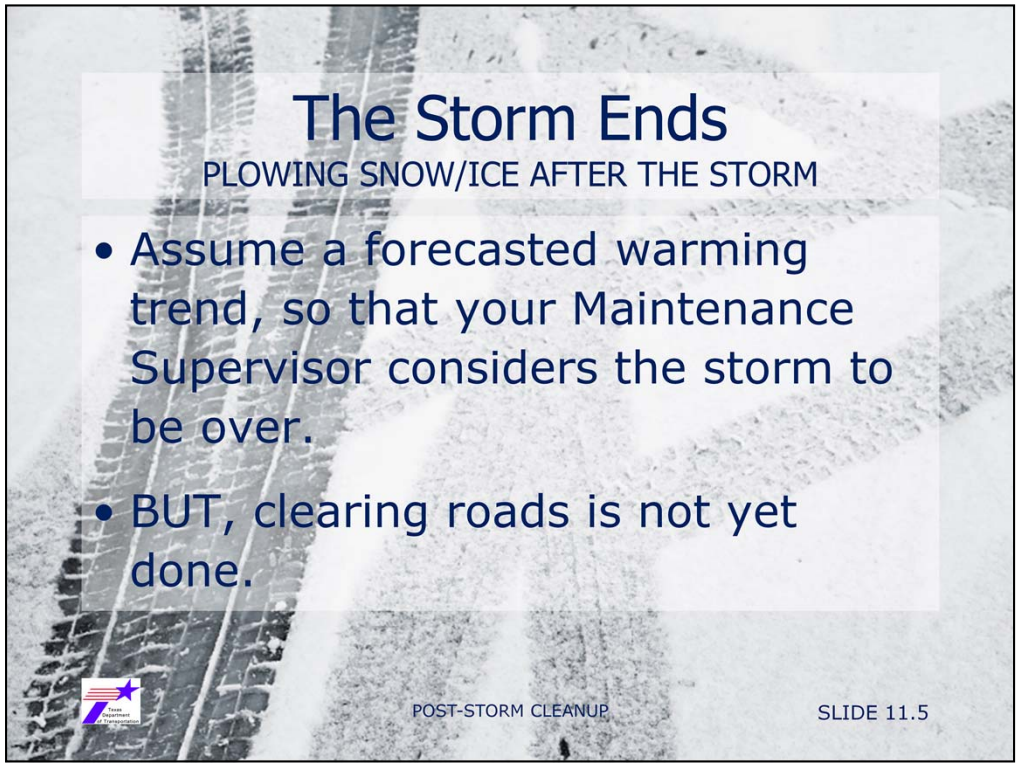
Instructor Notes: Present the following key points.

Note the learning objectives…



Instructor Notes: Present the following key points.

One of the roadway maintenance tasks that exists after the storm ends is MORE SNOW PLOWING!



Instructor Notes: Present the following key points.

Assume the storm is technically (practically) over.



Instructor Notes: Present the following key points.

Many roads will still have snow and ice bonded to the roadway.

De-icing will continue.



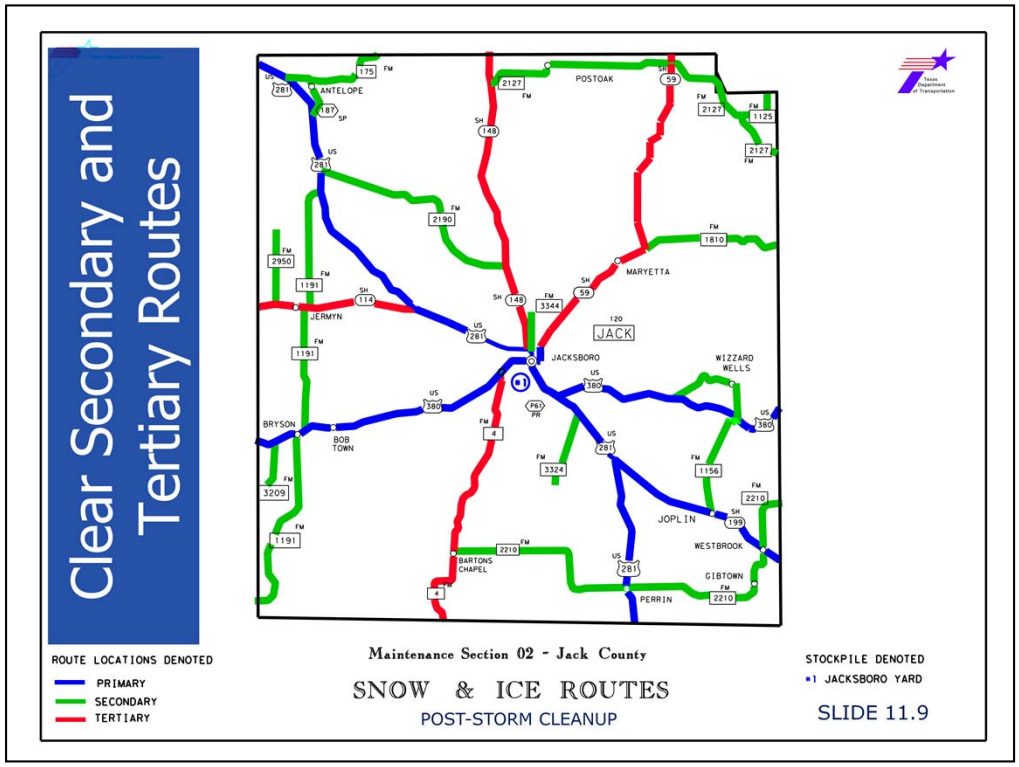
Instructor Notes: Present the following key points.

Plowing snow from these roads will continue.



Instructor Notes: Present the following key points.

SAFETY FIRST! Snow plowing is about safety, first to last.



Instructor Notes: Present the following key points.

During the storm, you may have had to focus your efforts on priority routes.

If those are now open, you will need to turn your attention to clearing secondary, or tertiary routes.



Instructor Notes: Present the following key points.

Some routes may have been temporarily suspended… such as due to school closings. But now those will start to open up.



Instructor Notes: Present the following key points.

It is necessary to remove snow completely away from the shoulders. This may require you to revisit roads that are otherwise open.

VIDEO 11.1 (00:19) Plowing Snow/Ice After the Storm

CREDIT

"Proper Plowing Techniques"

AASHTO Winter Roadway Maintenance Computer-Based Training

Used with permission.



R11.1 [11.39]

POST-STORM CLEANUP

SLIDE 11.12

Instructor Notes: Present the following key points.

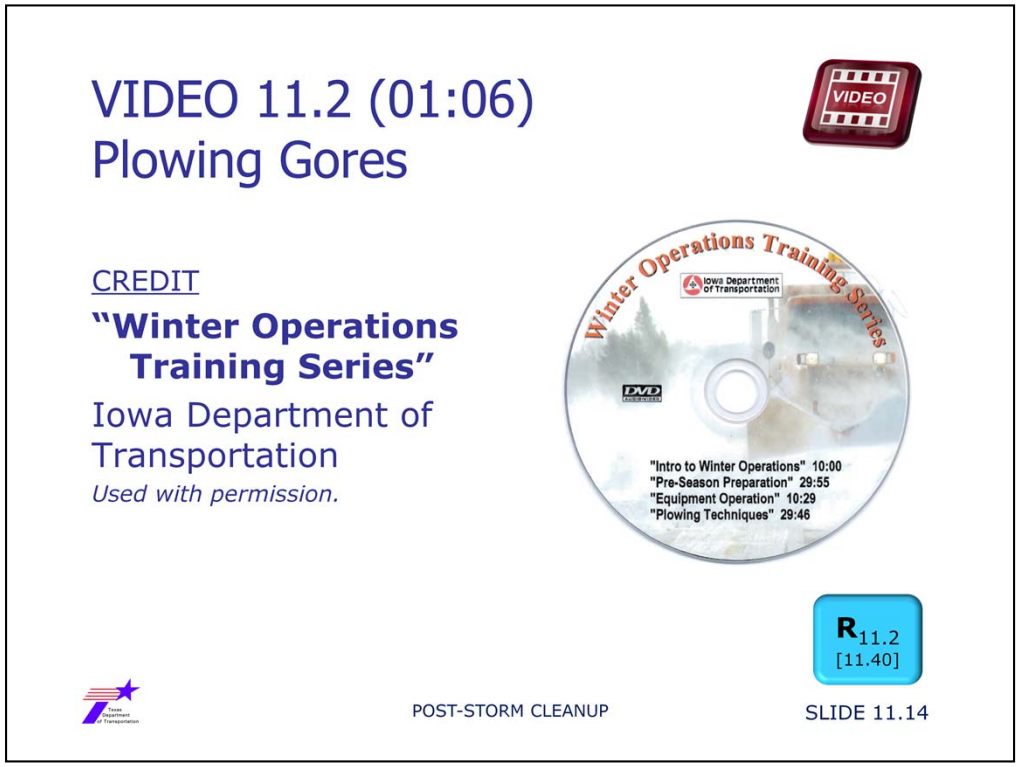
This brief video discusses plowing snow and ice after the storm.



Instructor Notes: Present the following key points.

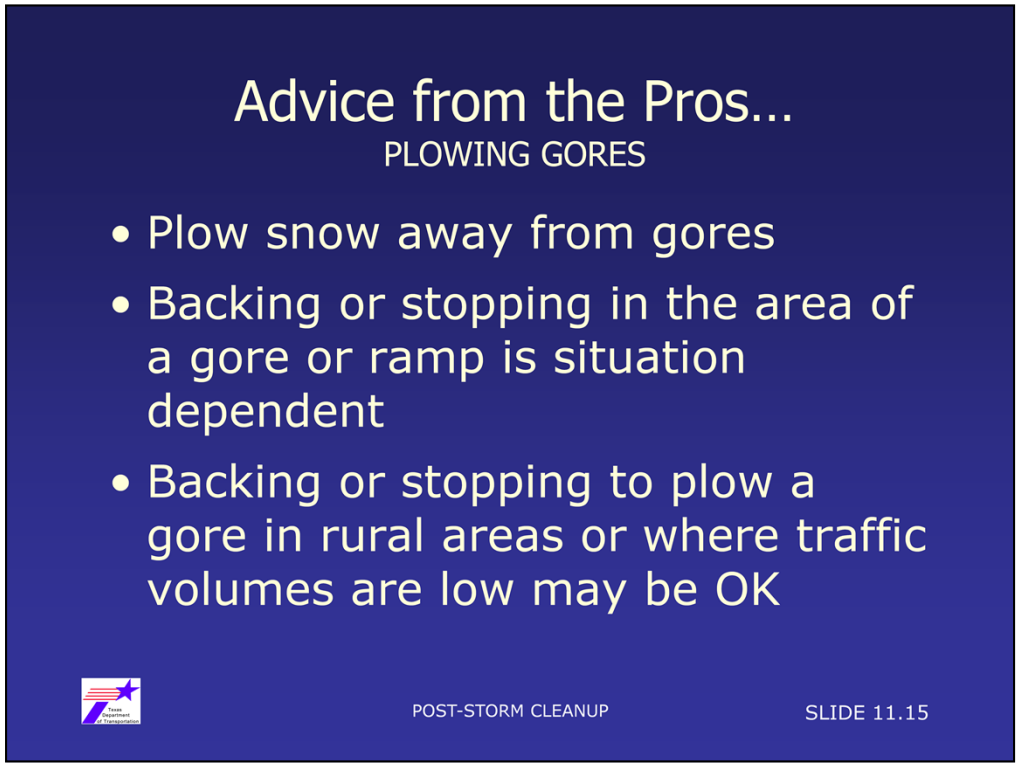
Certain portions of roadways, such as gores, would not be priorities.

A GORE is the area between driving lanes, as shown in the image. After the storm is over, part of cleanup is to clear snow from these areas.



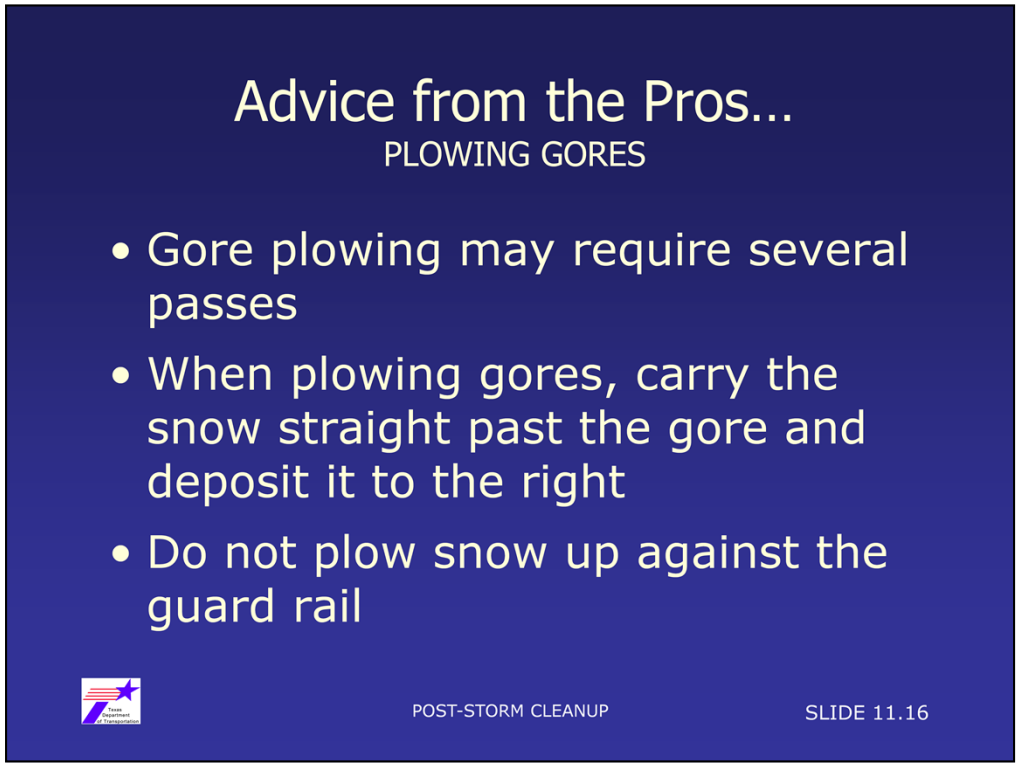
Instructor Notes: Present the following key points.

This video explains how to plow snow from a gore.



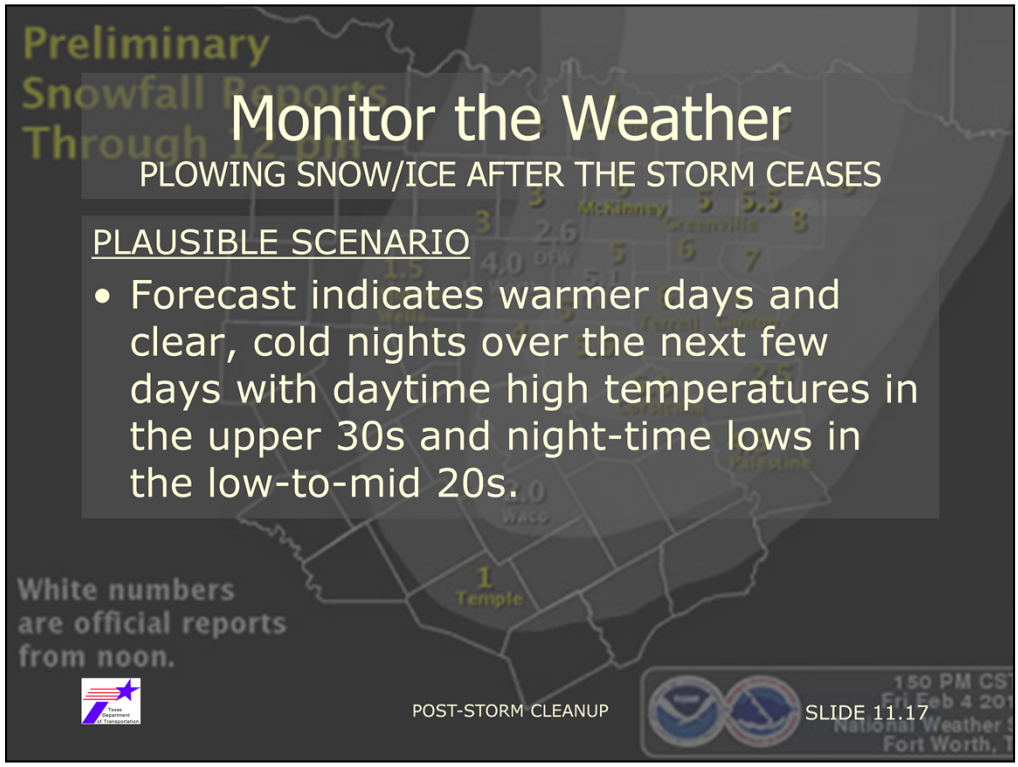
Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

Advice from the pros…



Instructor Notes: Present the following key points.

You will want to continue to monitor the weather. Remember, your Supervisor cannot do everything by himself.



Instructor Notes: Present the following key points.

Melt-back and re-freeze is a significant post-storm issue.

After the storm, snow which has drifted against median barriers, as shown here, can melt during the warmer days, and this snowmelt will re-freeze at night.

The frozen snowmelt becomes ice, which is very hazardous, and more so because motorists will not be expecting it.

Note the clear blue sky and mostly clear road surface in the photo, taken in the LUBBOCK District. Yet significant plowing remains to be done to address melt-back and re-freeze.



Instructor Notes: Present the following key points.

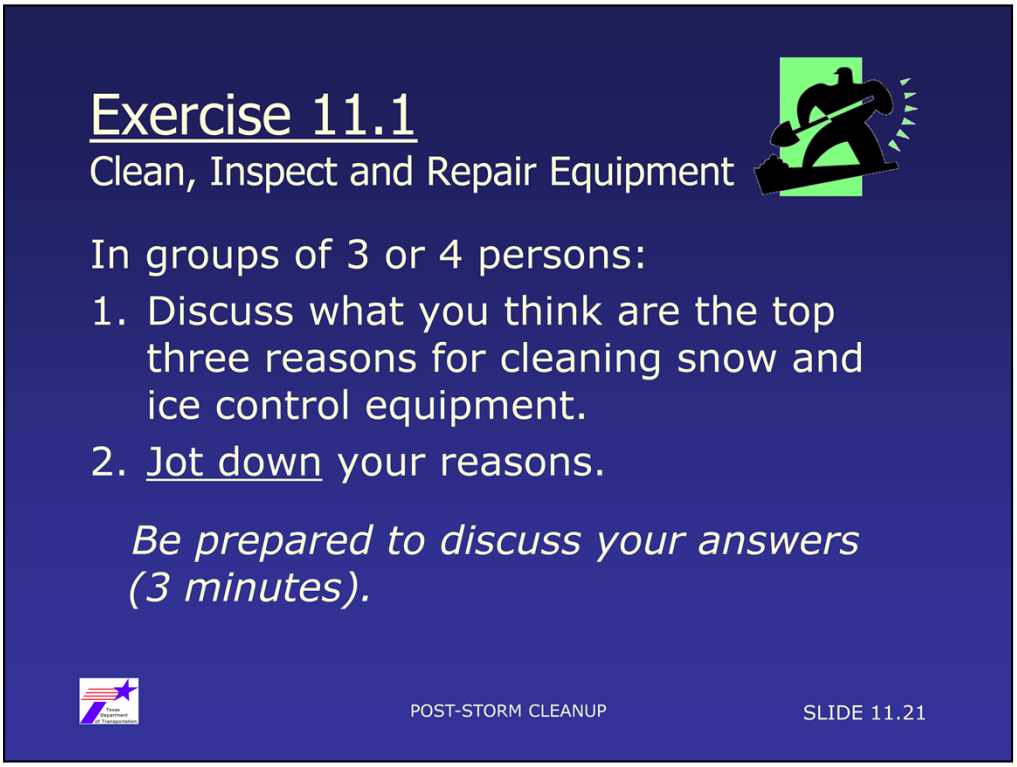
Another post-storm activity is to clean, inspect, and repair equipment.



Instructor Notes: Present the following key points.

Equipment will be needed, in working condition, for the next storm.

Therefore, it is necessary to clean, inspect and repair equipment.



Instructor Notes: Present the following key points.

GREEN SHEET.

Do if the schedule allows.



Instructor Notes: Present the following key points.

This image shows a wash stand in the ABILENE District. Such a wash stand will help facilitate cleaning your snow and ice control equipment.



Instructor Notes: Present the following key points.

A wash stand in the FORT WORTH District.



Instructor Notes: Present the following key points.

Some use a fire hose with a nozzle.



Instructor Notes: Present the following key points.

A high-end wash station located in McHenry County, ILLINOIS.

No matter what type of wash station you have, the goal is the same: to thoroughly remove the dirt, grime, and snow and ice control chemicals from your equipment.



Instructor Notes: Present the following key points.

WASH SAFELY!!



Instructor Notes: Present the following key points.

Liquid spray rigs need to be thoroughly cleaned after each storm.



Instructor Notes: Present the following key points.

Flush the tank and the entire liquid distribution system.

Do this two or three times.



Instructor Notes: Present the following key points.

Clean the truck chassis.

Snow and ice chemical will splash and spray up under the truck bed, so this area is particularly susceptible to corrosion.

The underside of the truck needs to be thoroughly washed.



Instructor Notes: Present the following key points.

Snow and ice control chemicals are corrosive!



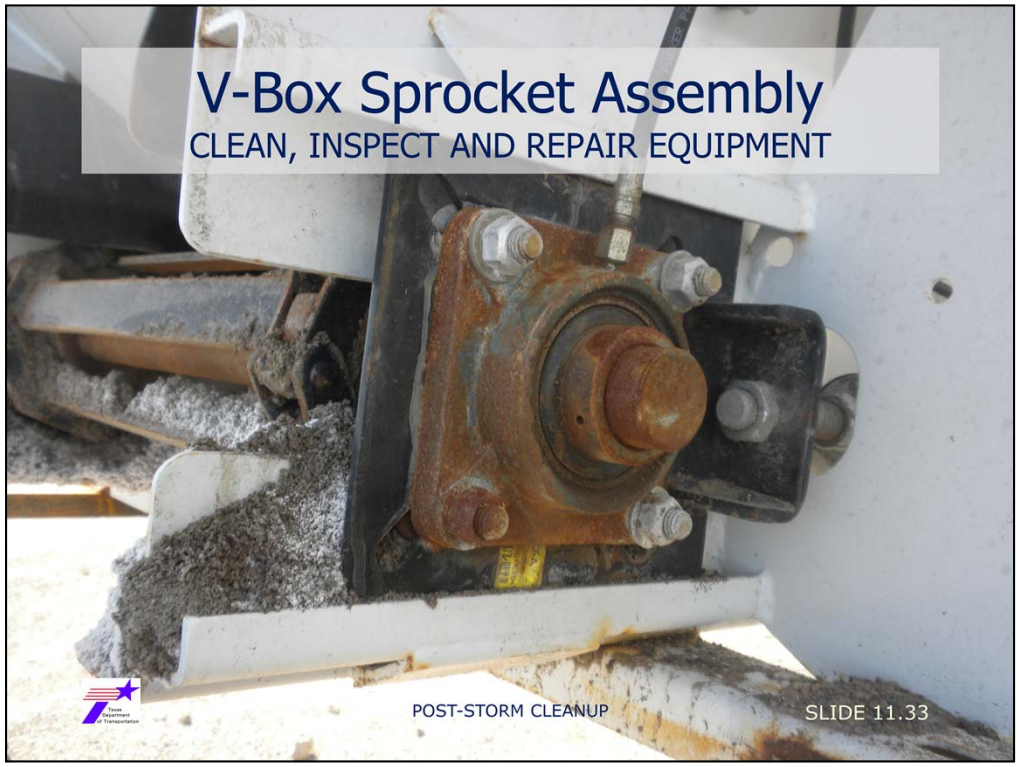
Instructor Notes: Present the following key points.

Granular material applicators (V-box spreaders) also require thorough cleaning.



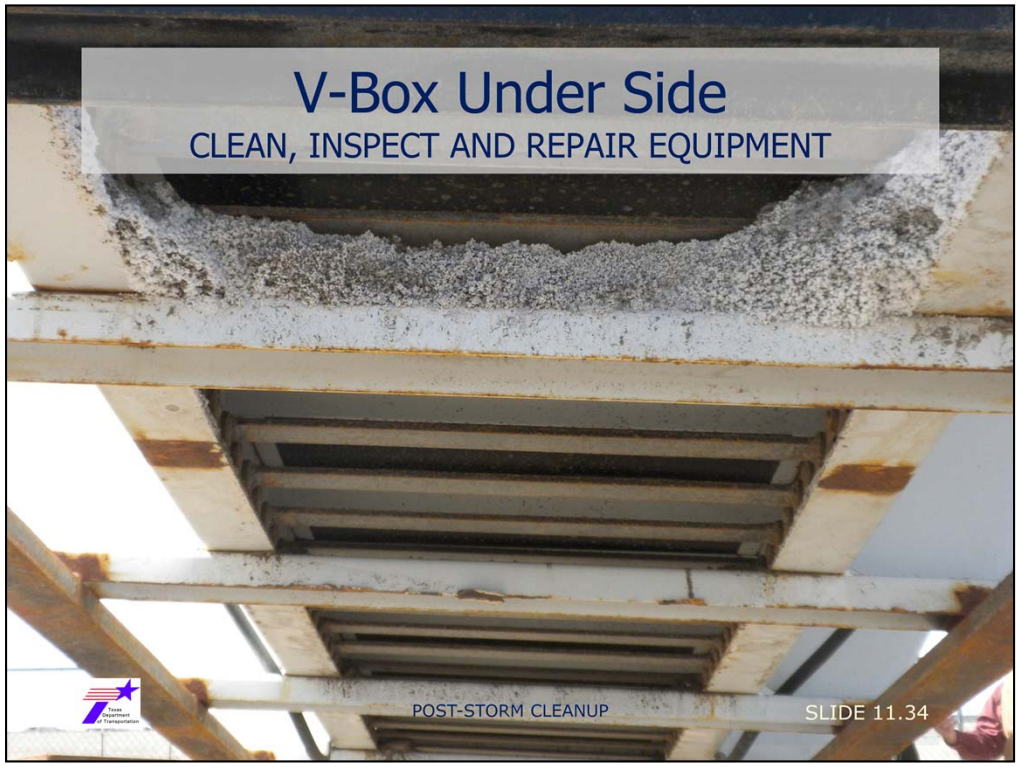
Instructor Notes: Present the following key points.

Clean the front support. Do not stow your equipment like this.



Instructor Notes: Present the following key points.

Clean the sprocket assembly. Do not stow your equipment like this.



Instructor Notes: Present the following key points.

Clean under the V-box. Do not stow your equipment like this.



Instructor Notes: Present the following key points.

Clean the conveyor system. Do not stow your equipment like this.



Instructor Notes: Present the following key points.

Snow and ice control chemicals are corrosive!



Instructor Notes: Present the following key points.

With the equipment clean, it can be inspected.



Instructor Notes: Present the following key points.

INSPECT SAFELY!



Instructor Notes: Present the following key points.

Thoroughly check your snow plow. Use the checklist discussed in Module 5.



Instructor Notes: Present the following key points.

Replace blades as necessary.



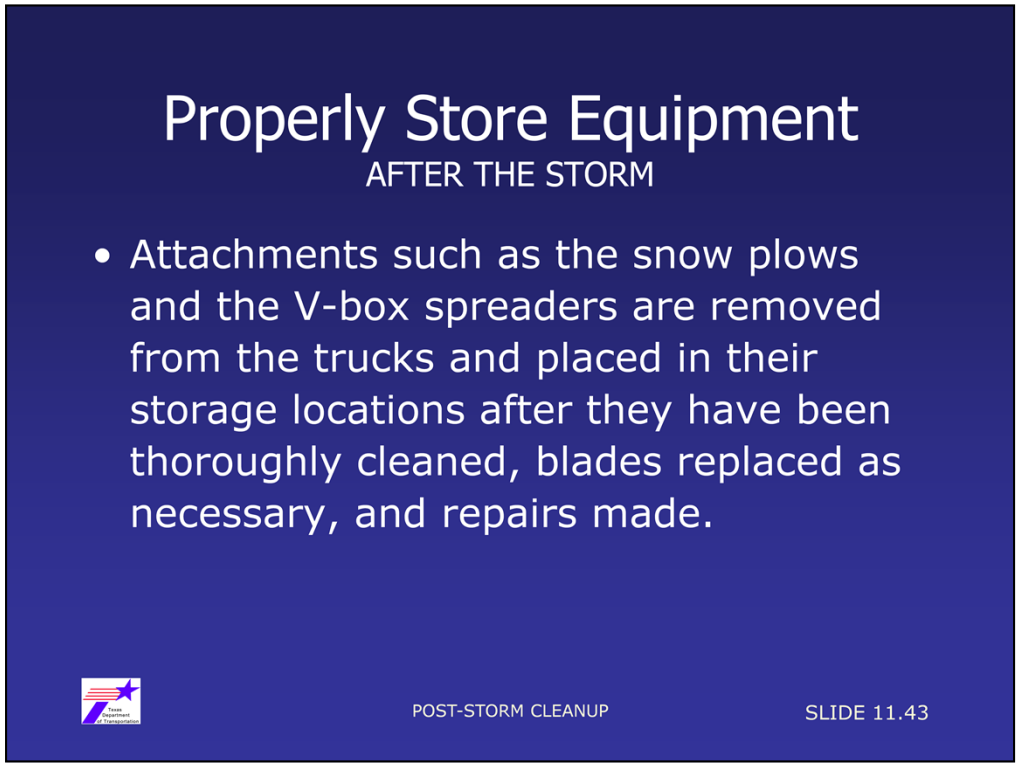
Instructor Notes: Present the following key points.

Repair the plow as necessary.



Instructor Notes: Present the following key points.

Properly store your equipment… in the Maintenance Yard, in the Garage, in designated storage areas.



Instructor Notes: Present the following key points.

Store your attachments.



Instructor Notes: Present the following key points.

V-boxes should be stored so they can be readily mounted prior to the next storm.

Return the V-boxes to the hanging storage racks.



Instructor Notes: Present the following key points.

Or, return the V-boxes to their leg stand support system.



Instructor Notes: Present the following key points.

Properly stow your plows.



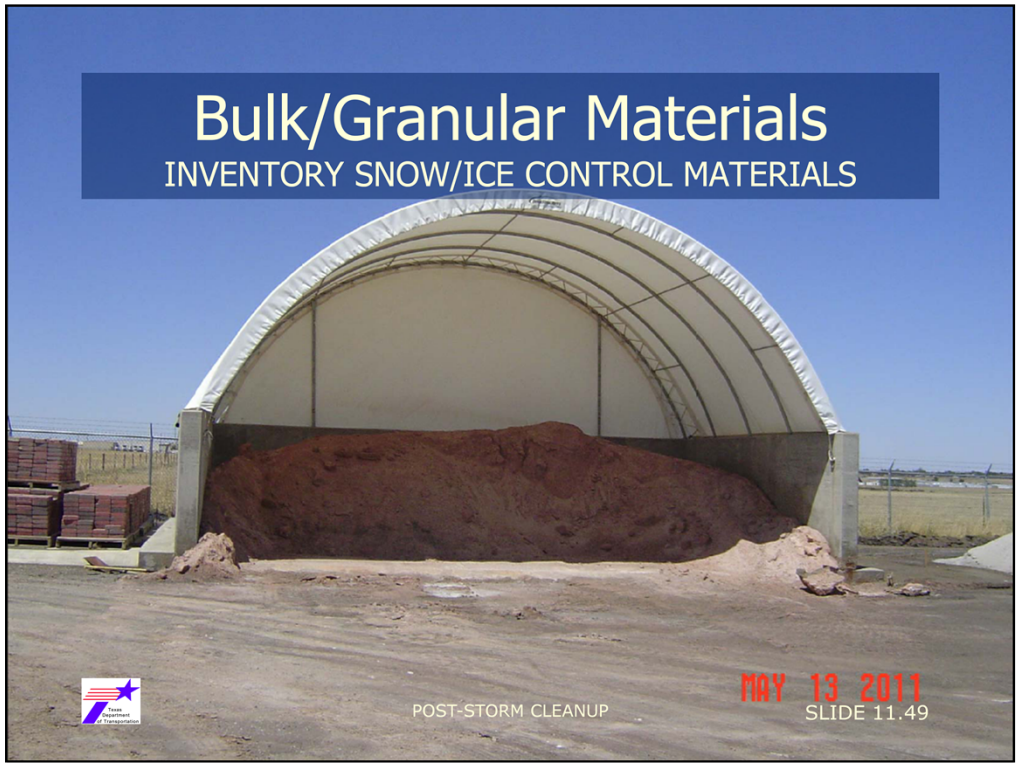
Instructor Notes: Present the following key points.

Post-storm activities include making sure you have adequate snow and ice control materials on hand for the next storm.



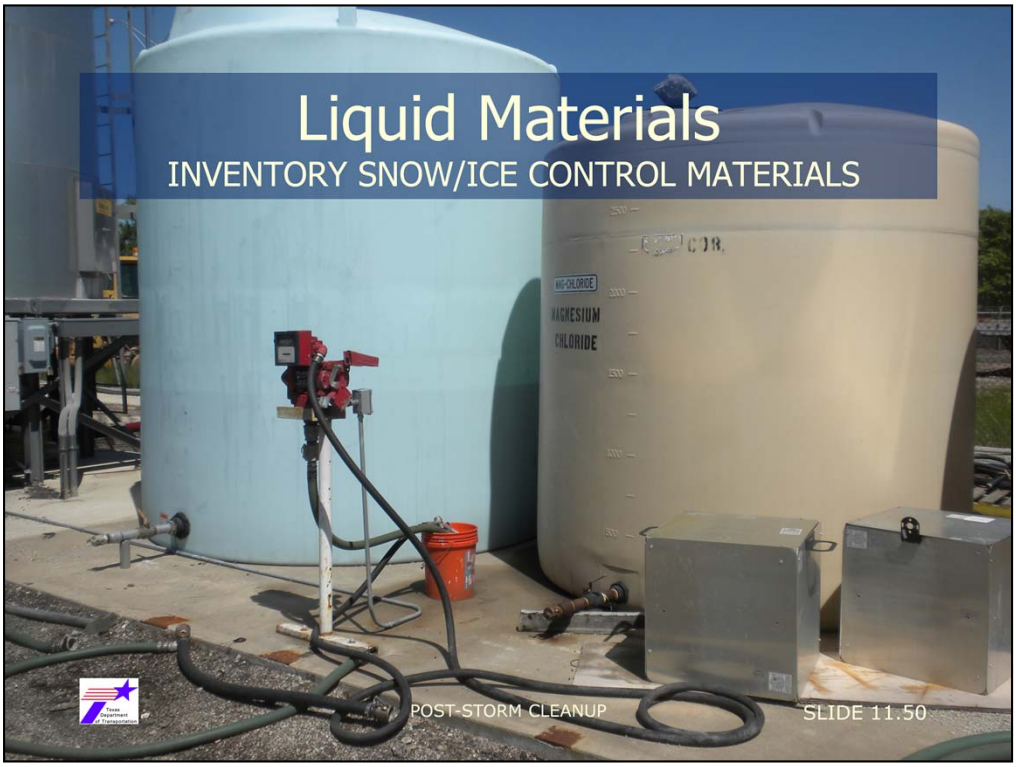
Instructor Notes: Present the following key points.

Your Supervisor will ask you to inventory the materials you have.



Instructor Notes: Present the following key points.

This includes bulk/granular materials such as road salt or Meltdown 20.



Instructor Notes: Present the following key points.

This includes liquid materials such as Meltdown Apex or salt brine.



Instructor Notes: Present the following key points.

This includes abrasives. Your Supervisor wants to make sure you have a sufficient quantity on hand.

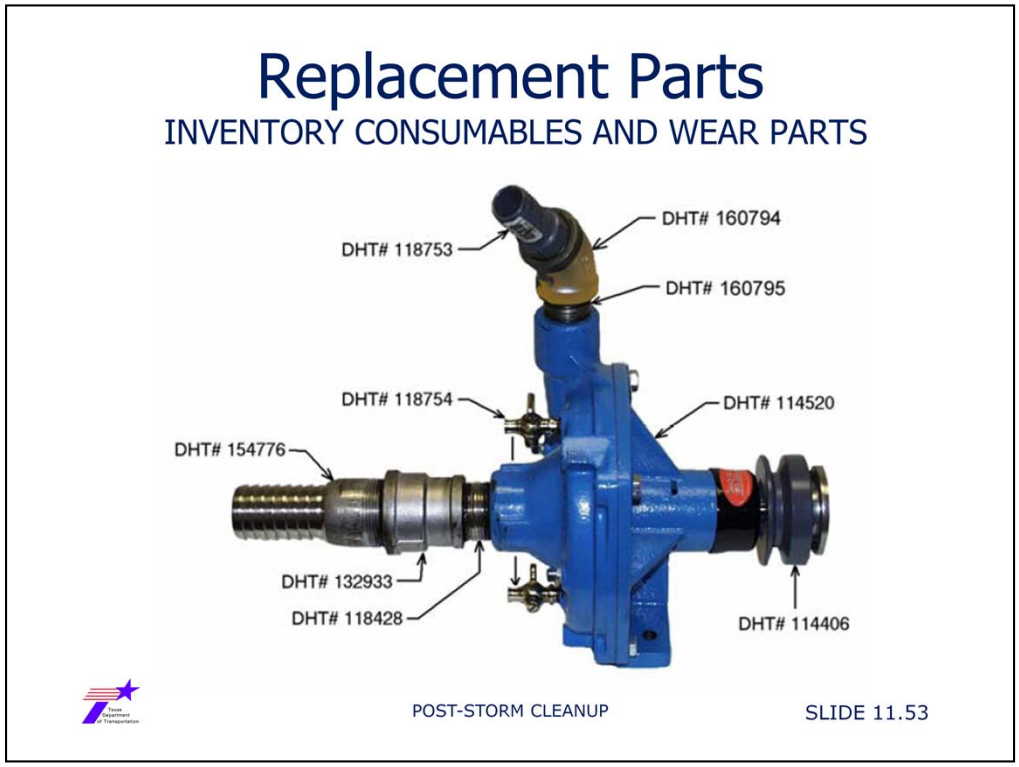
Store the materials properly.

Remember: only abrasives can be stored under bridges – no chemicals. Also, make sure to not impact the bridge structure.



Instructor Notes: Present the following key points.

You will need to inventory your consumables and wear parts. You want to have an adequate supply so that your operation does not shut down for something simple.



Instructor Notes: Present the following key points.

For example, it is best practice to have an extra pump for your liquid spray rig.

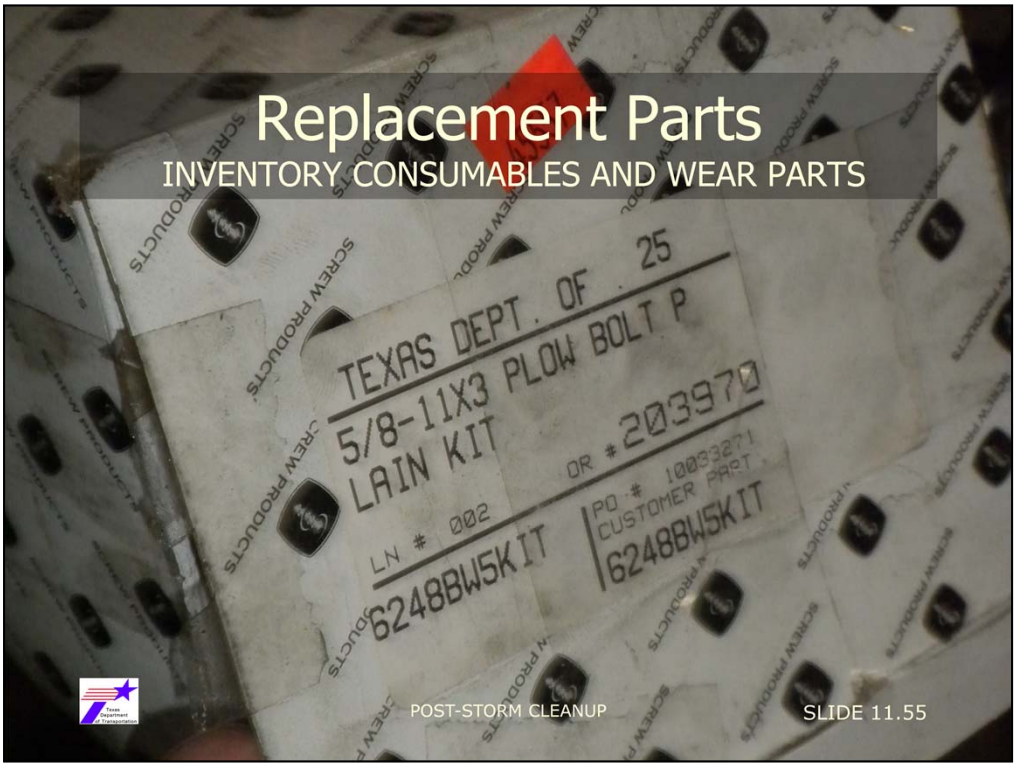
Further, during the times between use, it is best practice to remove the (functional pump) from the liquid spray rig and store the pump in a bucket of anti-freeze.

This is quick and easy to do and will help prevent the pump from corroding and seizing up during the time between applications.



Instructor Notes: Present the following key points.

Snow plow blades need to be inventoried.



Instructor Notes: Present the following key points.

As do plow bolts.



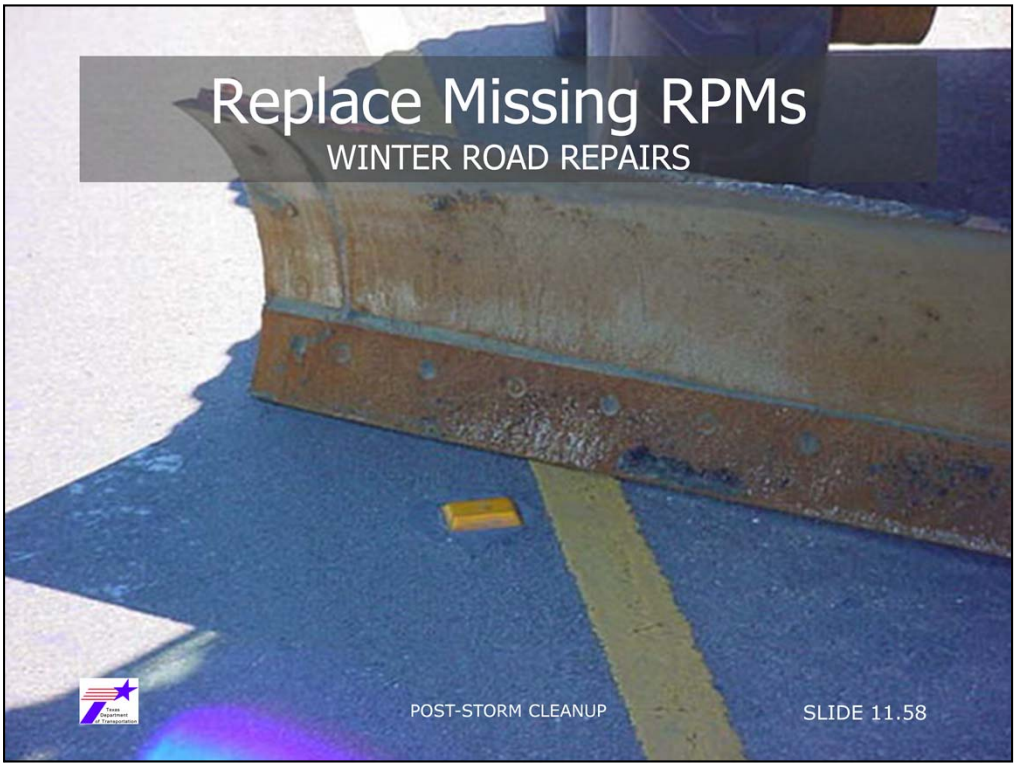
Instructor Notes: Present the following key points.

Another post-storm activity is road repair. Winter weather is hard on roads.



Instructor Notes: Present the following key points.

You will want to repair or replace damaged delineators.



Instructor Notes: Present the following key points.

In those Districts that use RPMs, snow plowing will often scrape them off. These need to be replaced.



Instructor Notes: Present the following key points.

Damage guardrail should be repaired or replaced.



Instructor Notes: Present the following key points.

Damaged cable barriers should be repaired or replaced.



Instructor Notes: Present the following key points.

Potholes will frequently appear after winter storms. These require repair.



Instructor Notes: Present the following key points.

One key element of effective winter storm management is taking time to make sure you learn what works well and what needs improvement.

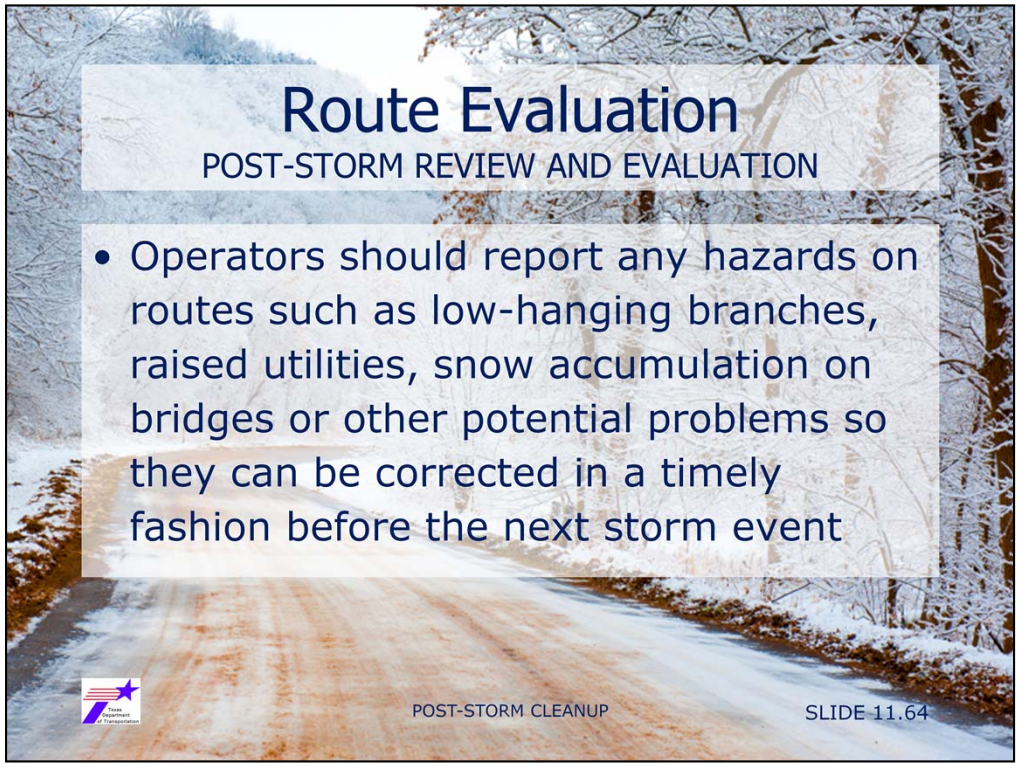
Your Supervisor will need you to provide this information.



Instructor Notes: Present the following key points.

Think about your equipment, and how it performed.

Identify problems and get these repaired.

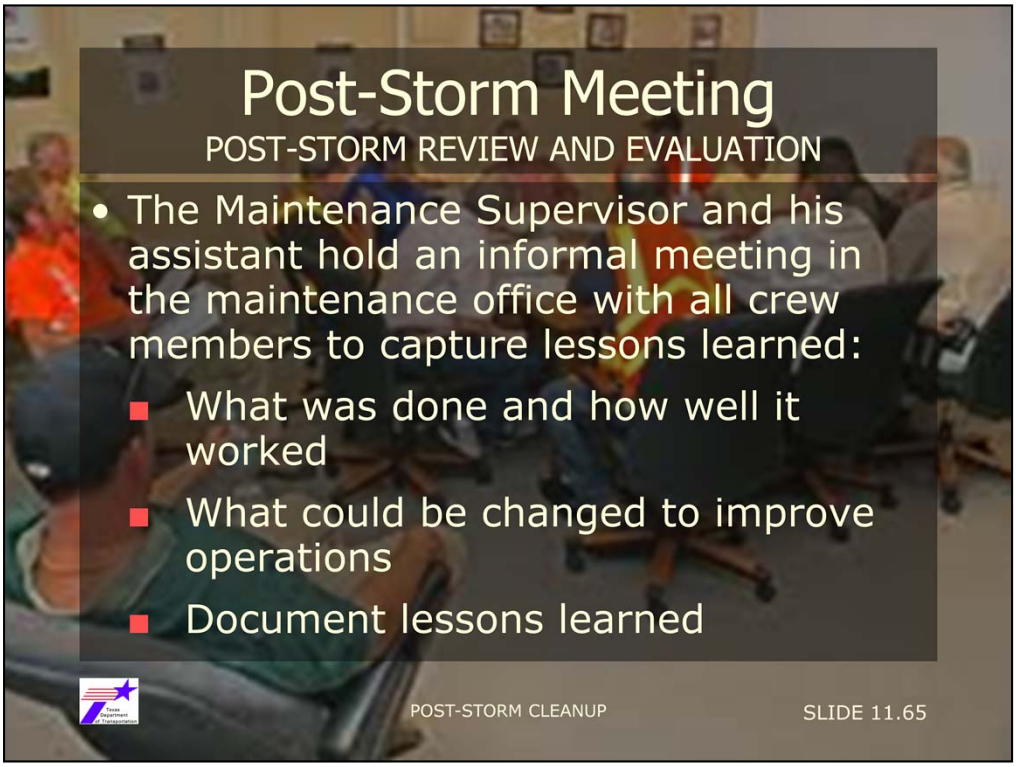


Instructor Notes: Present the following key points.

Think about your plow route.

Did you encounter unexpected things? Hazards?

Do any areas require attention?



Instructor Notes: Present the following key points.

Actively participate in your Supervisor's post -torm meeting.

If there is no formal post-storm meeting, still, take time to report your observations and experiences to your Supervisor.



Instructor Notes: Present the following key points.

We have noted how winter weather maintenance follows a cycle.

Depending on the stage of the season, post-storm cleanup may be your first efforts at pre-season preparation.



Instructor Notes: Present the following key points.

Reference R11.3 is the END-OF-SEASON CHECKLIST.

When you are at the end of the winter season, this checklist identifies several things you will need to do.



Instructor Notes: Present the following key points.

This training presents a lot of information that is intended to help you do your job well.

However, only so much can be accomplished in the classroom. MOST of what you learn will be through on-the-job, hands-on experience.

This training has been designed to complement your on-the-job experiences, and to help you advance in your knowledge and skill in winter maintenance operations.

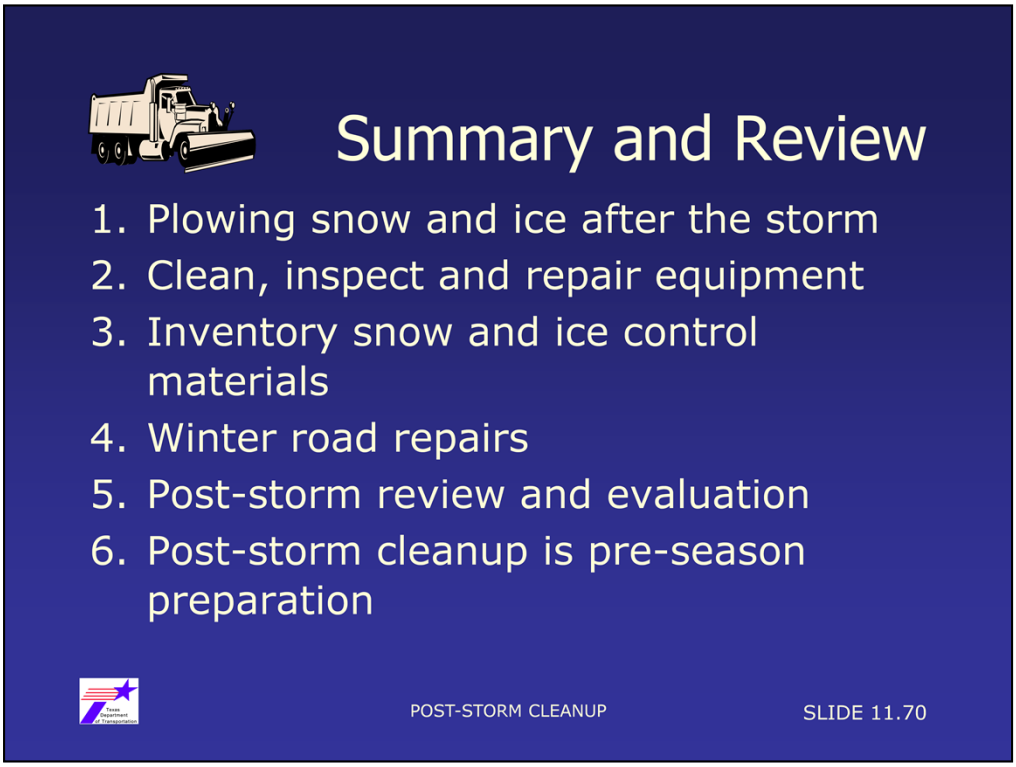


Instructor Notes: Present the following key points.

ALL OF US, however, can learn more.

If winter weather maintenance is interesting to you, and you want to learn more, TxDOT has some excellent computer-based training materials you will enjoy.

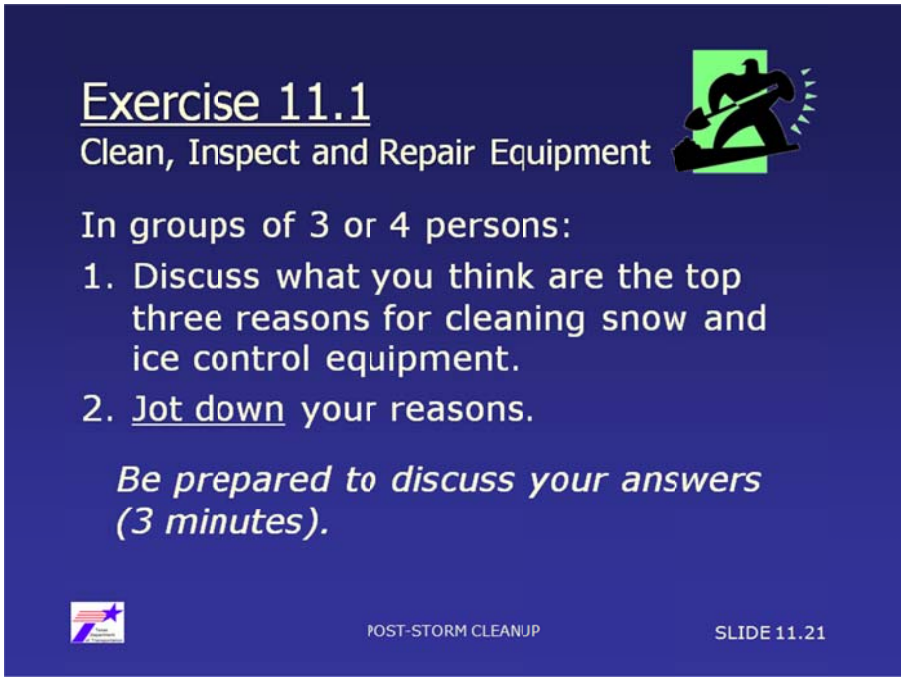
See your Supervisor about how to access the AASHTO computer-based training series.



Instructor Notes: Present the following key points.

PINK SHEETS!

Answer each question.


Exercise 11.1
Clean, Inspect and Repair Equipment
In groups of 3 or 4 persons:
1. Discuss what you think are the top three reasons for cleaning snow and ice control equipment.
2. Jot down your reasons.
Be prepared to discuss your answers (3 minutes).
POST-STORM CLEANUP
SLIDE 11.21

VIDEO 11.1. PLOWING SNOW/ICE AFTER THE STORM (00:19)

SCRIPT

During a significant snow event, you may only have time to make one pass on lower volume roads and on neighborhood streets.

During clean-up operations, widen these plowed routes.

VIDEO 11.2. PLOWING GORES (01:06)

SCRIPT

The area between the road and the ramp is called a gore.

With gores, the whole idea is to carry the snow past the gore, depositing it beyond the shoulder.

To do that, keep the plow straight as you enter the gore, then angle the plow to the right after you pass it.

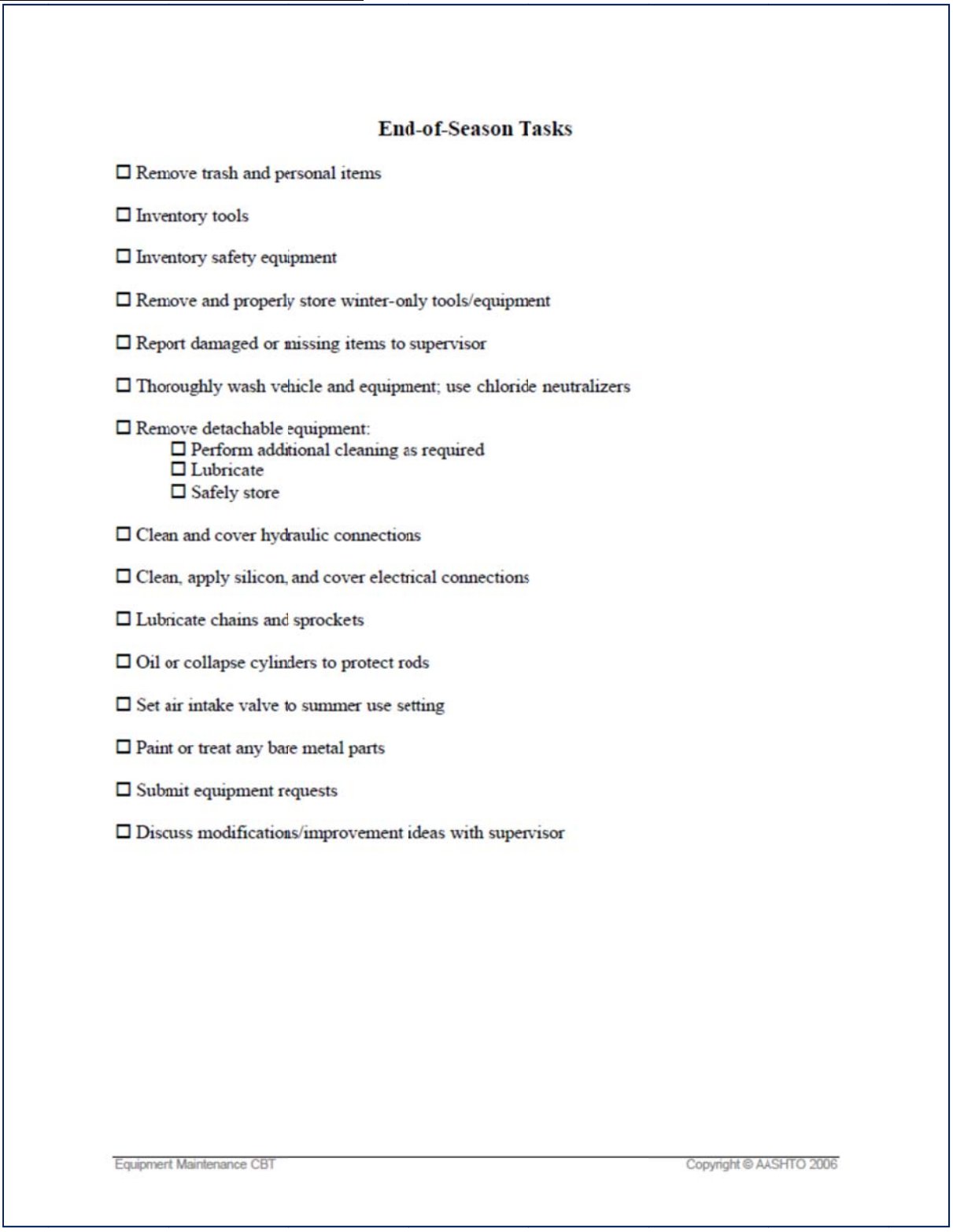
Never push the snow straight into the gore, that would be like building a concrete wall near the roadway.

Some gores have crash cushions. These come in a lot of different shapes and sizes but the procedure is always the same; keep snow away from them!

That is because a buildup of snow here can form either a wall or ramp, and both are deadly.

When cleaning some gores or point areas, it may be necessary to back up and make several passes; and that means you may have to team-up with one operator controlling traffic while the other handles the cleanup job.

END OF SEASON CHECKLIST



End-of-Season Tasks

- ☐ Remove trash and personal items
- ☐ Inventory tools
- ☐ Inventory safety equipment
- ☐ Remove and properly store winter-only tools/equipment
- ☐ Report damaged or missing items to supervisor
- ☐ Thoroughly wash vehicle and equipment; use chloride neutralizers
- ☐ Remove detachable equipment:
  - ☐ Perform additional cleaning as required
  - ☐ Lubricate
  - ☐ Safely store
- ☐ Clean and cover hydraulic connections
- ☐ Clean, apply silicon, and cover electrical connections
- ☐ Lubricate chains and sprockets
- ☐ Oil or collapse cylinders to protect rods
- ☐ Set air intake valve to summer use setting
- ☐ Paint or treat any bare metal parts
- ☐ Submit equipment requests
- ☐ Discuss modifications/improvement ideas with supervisor

Equipment Maintenance CBT

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Source: "End of Season Tasks," Documents, **Equipment Maintenance CD**, Version 1, AASHTO Clear Roads Computer Based Training, July 2007.

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Class Exercise – Review Questions
Module 11 – POST-STORM CLEANUP

MNT812 Winter Weather Operations Training

1. [True/False] When the storm is over, it is safe to say the roadway maintenance work is pretty much complete also.
   A. True
   B. False

   This statement is FALSE.

   Much work remains to be done.

2. Plowing snow after the storm may be required for which of the following situations:
   A. Conditions that relate to melt-back and re-freeze
   B. Removing snow from pavement shoulders
   C. Clearing secondary and tertiary routes
   D. All of the above

   The correct answer is D.

3. [True/False] Thorough cleaning of winter maintenance equipment requires multiple wash-rinse cycles, but that is what it takes to help protect the equipment from corrosion.
   A. True
   B. False

   This statement is TRUE.

4. For which snow and ice control materials must you conduct a post-storm inventory?
   A. Granular chemical materials
   B. Liquid chemical materials
   C. Abrasives
   D. All of the above

   The correct answer is D.

5. Post-storm road repairs may include which of the following:
   A. Repair potholes
   B. Replace pavement delineators and RPMs
   C. Repair/replace damaged guardrail and cable barriers
   D. All of the above

   The correct answer is D.

6. [True/False] One of the benefits of the post-storm evaluation is to document lessons learned.
   A. True
   B. False

   This statement is TRUE.

7. [True/False] Post-storm cleanup is pre-season preparation.
   A. True
   B. False

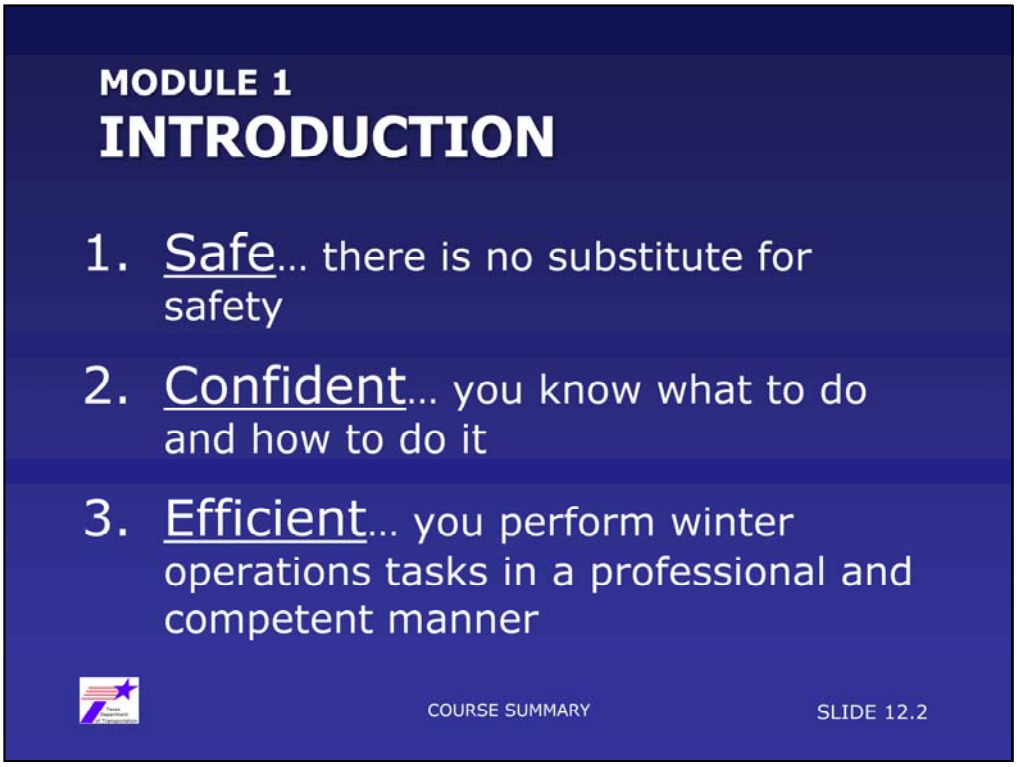
   This statement is TRUE.



Instructor Notes: Present the following key points.

Module 12 is our final module for the course.

Here we will summarize what we have learned, highlighting key themes, one slide per chapter.



Instructor Notes: Present the following key points.

In Module 1, we stated the desired outcomes for this course, for YOU as a maintenance operations employee.

When it comes to winter weather maintenance, we want YOU to be:

•SAFE

•CONFIDENT

•EFFICIENT

This is good for you, it is good for TxDOT, and it is good for the citizens of Texas. That has been what this training is all about.



Instructor Notes: Present the following key points.

In Module 2, we discussed how winter weather maintenance follows a cycle, from pre-season, to in-season, to post-season.

Each part of the cycle has its own tasks and responsibilities.

In particular, a solid program for pre-season preparation is how you will be ready for the winter storms that come your way. Your focus in the pre-season will be on getting equipment ready and making sure that you have adequate materials.



Instructor Notes: Present the following key points.

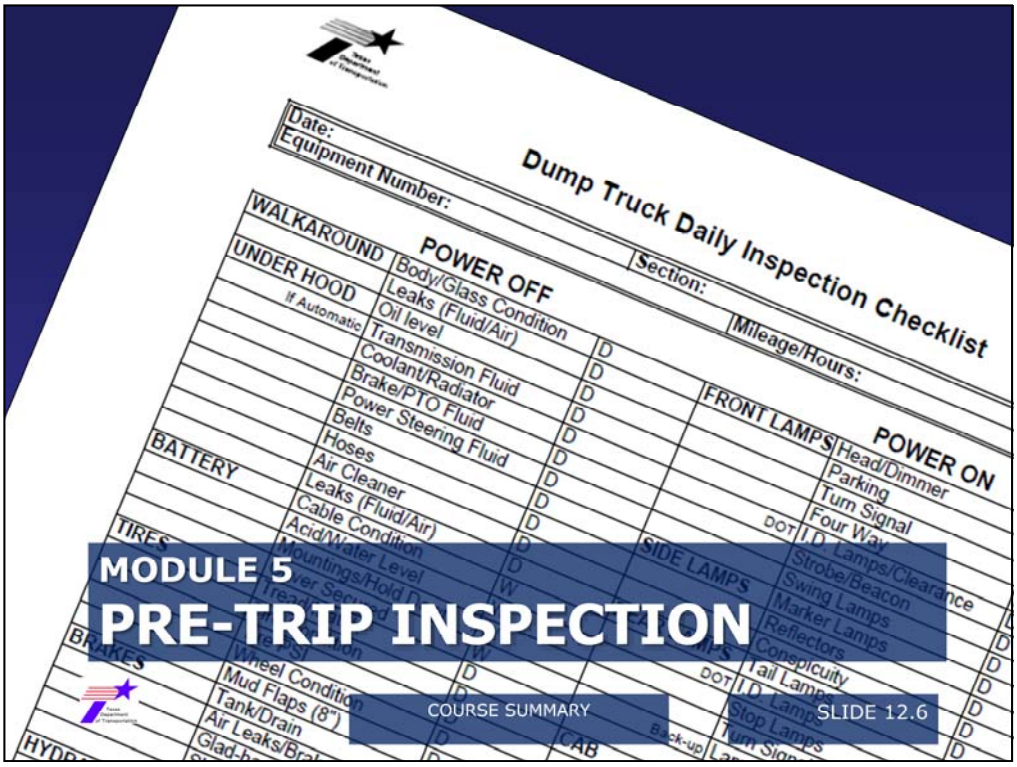
In Module 3, we showed you how to mount and dismount a V-box spreader from either a leg stand support or from a hanging storage rack.

This is a task you will do before each storm.



Instructor Notes: Present the following key points.

In Module 4, we learned how to mount, connect, and test a reversible snow plow. This is another task that will be required of you before each storm.



Instructor Notes: Present the following key points.

Module 5 focused on the pre-trip inspections, relative to winter weather, for the dump truck, the V-box, and the snow plow.

We provided you with the TxDOT checklist forms and showed you how to use them.



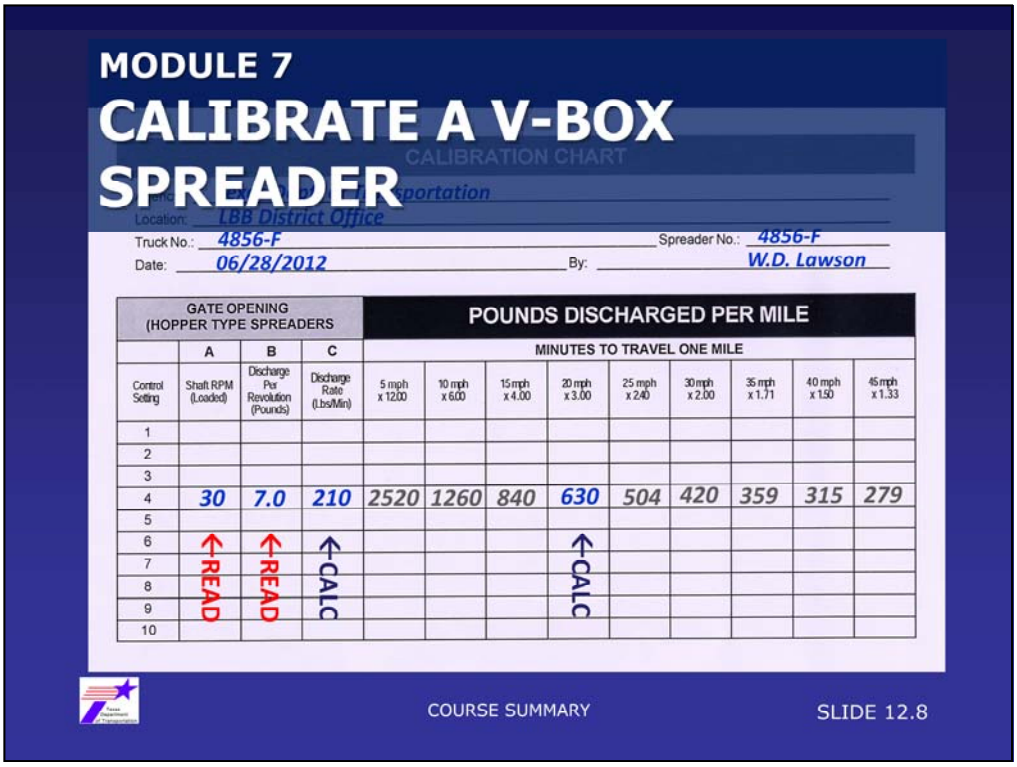
Instructor Notes: Present the following key points.

In Module 6, we discussed the snow and ice control chemicals that TxDOT uses.

Relative to granular chemicals, TxDOT uses road salt and Meltdown 20.

Relative to liquid chemicals, TxDOT uses Meltdown Apex and salt brine.

We discussed chemical safety, application rates, how these chemicals work, and why it is important to use these chemicals responsibly.



Instructor Notes: Present the following key points.

In Module 7, you learned about calibrating a V-box spreader. Calibration is important because it improves efficiency, saves money, and helps to minimize impact of chemical usage on the environment. Calibration is best practice, all around.



Instructor Notes: Present the following key points.

In Module 8, we learned that the most important part of calibrating a liquid spray rig is making sure that all components of the system exist, are correctly sized, and are functional. After that, calibration is easy.



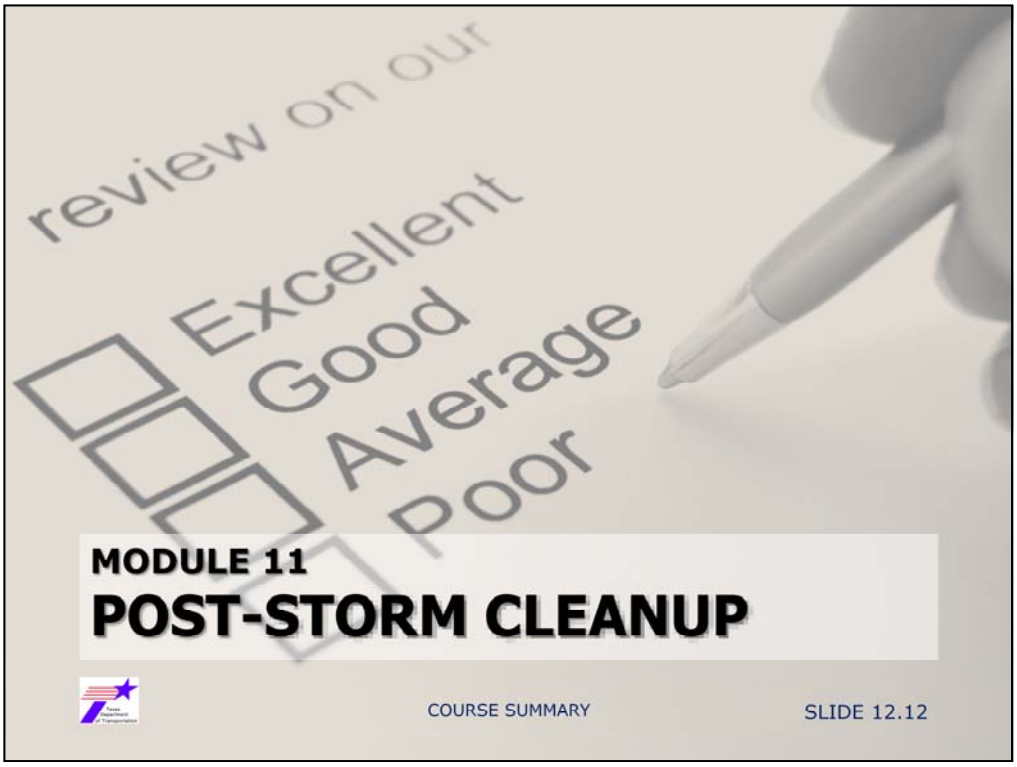
Instructor Notes: Present the following key points.

Module 9 began with an explanation of how snow and ice control is part of emergency operations. We then discussed the importance of knowing your plow route, of driving safely and defensively, of keeping an eye on the weather, and knowing the level of service your supervisor expects you to achieve. Finally, we discussed how plowing ice is not the same as plowing snow.



Instructor Notes: Present the following key points.

In Module 10, we discussed actual plowing techniques, both the standard types of conditions you will encounter as well as situations that require operator judgment. In all cases, we emphasized that winter maintenance operations are all about safety – both for you and for the traveling public.



Instructor Notes: Present the following key points.

Module 11 reminded us that much work remains to be done after the winter storm is over, not the least of which is to evaluate your response and to continuously improve your operation.



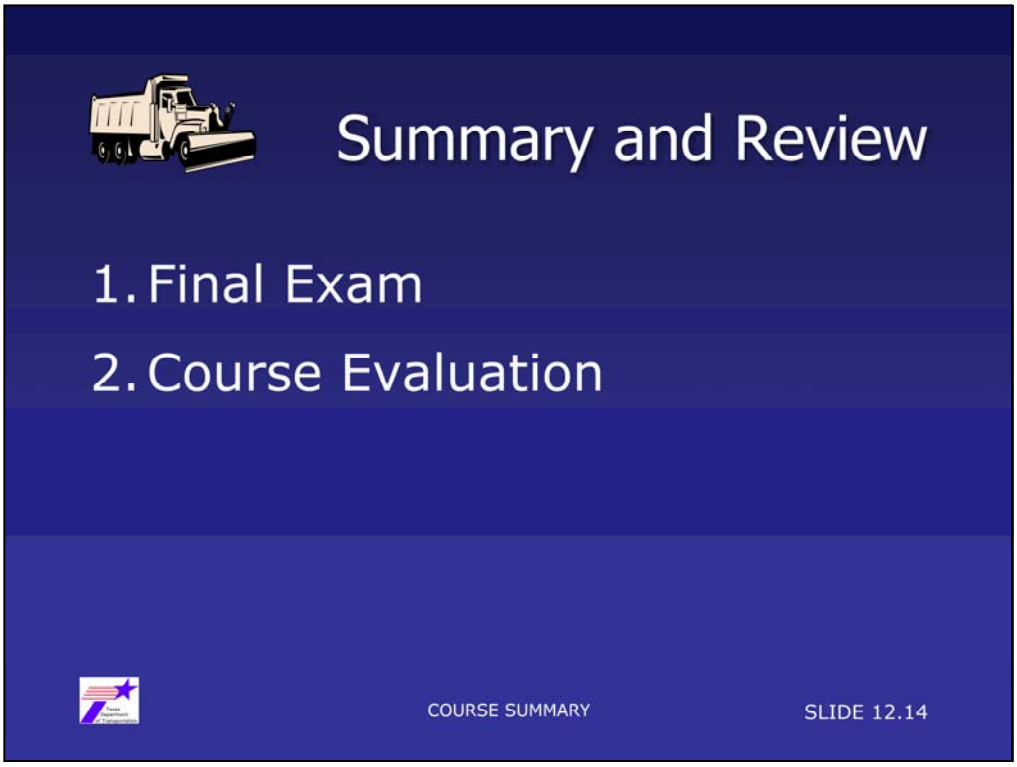
Instructor Notes: Present the following key points.

In summary, the work you do is an important service to the traveling public.

Who is the traveling public? It might be college students trying to get home during the holidays. It might be a man or woman headed to work. Or a first responder taking care of an emergency situation. Someone's wife. Someone's kid. Perhaps your wife or kid.

Service to the traveling public is why you do what you do. Thank you for your commitment to learning this material, and for diligently doing your job when it comes to winter weather operations.

Thank you.



Instructor Notes: Present the following key points.

At this point, we have two things remaining and we will be done.

1. The Final Exam.

2. The Course Evaluation.

Let's proceed with those.