

Michigan Department of Transportation

Tow Plow Training Guide



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Goal

The goals of the Tow Plow operator's course are to promote safe and proper operation, outline preventive maintenance practices and provide operational guidelines for the Tow Plow.

Introduction



The Tow Plow is a trailer-mounted snow plow designed to be towed behind a winter maintenance truck (04). With this configuration it can provide a cleared path as wide as 24 feet. The outcome of this effort is to improve our level of service by providing faster results while reducing the snow removal cost for equipment, fuel, and labor. The Tow Plow is a large piece of equipment and requires a skilled operator. Proper training, knowledge and experience are essential for an operator to maximize the Tow Plow's benefits in snow removal operations.

Course Description

This training is designed to give the participants an overview of the guidelines and instructions needed for safe, proper and efficient operation of the Tow Plow. It provides new, as well as experienced operators with the fundamental concepts and practices for operation of MDOT's Tow Plows with:

- Improved efficiency
- Greater safety
- Reduced maintenance and repair cost through preventive maintenance
- Fewer breakdowns
- Greater job satisfaction

The total training hours (8) required for this course include:

- 4 hours of Tow Plow Operator training – this includes classroom training, hands-on pre-trip inspection
- 4 hours of Tow Plow Operator Assessment – this includes training on a closed driving course and of a ride-along prior to the winter season during good weather in the area that the operator will perform snow removal operations with the Tow Plow
- Training during a winter storm event is optional. This would include a ride-along during active snow and ice removal operations, where the new employee will ride-along with an experienced Tow Plow operator who has completed the required training and is selected by the supervisor as competent to perform the ride-along. There will be no time restrictions on this evaluation. It may be completed when the experienced Tow Plow operator feels that the new operator is capable of operating the Tow Plow on various

roads within the assigned area. The purpose of this ride along is to evaluate the employee's safety and performance while operating the Tow Plow. Storm event ride-alongs are at the discretion of the supervisor and shall include:

- ✓ An experienced operator driving a trainee along a designated snow route pointing out potential issues along the route
- ✓ The trainee driving with the experienced operator observing the trainees ability to operate the Tow Plow
- ✓ All routes should be considered for this ride along and may be completed in various stages due to time, operator and equipment availability

Prerequisites

- Class "A" CDL
- Winter Operations School
- TMW Work Elements 3142 and 3143

Course Objectives

Upon completion of this course the new operator should be able to:

- Identify the key components of the Tow Plow
- Identify all safety hazards, terms and labels
- Perform a pre-trip and post-trip inspection of the Tow Plow
- Describe the preventative maintenance practices
- Identify and become familiar with all in-cab controls
- Demonstrate on a closed course, the safe and proper operating procedures



Types of roads that the Tow Plow is used to clear:

- Urban, multi-lane expressways and interstates
- Congested urban areas with left turn lanes, islands and commercial entrances
- Rural divided highways
- Passing lanes as the truck plows the first pass through the area
- Alternating passing lane routes, eliminating the need for a second truck
- Two-lane roadways with paved shoulders

The Tow Plow is a large piece of equipment that requires operator knowledge, skill and attention. It is important to become familiar with all operating characteristics prior to operation during a winter event. The Tow Plow standard configuration allows the plow to steer to the right; this allows the winter maintenance truck to cover a larger area in addition to the underbody blade.

MDOT's current configuration for the Tow Plow consists of the following features:

- In-cab controls operate the blade up and down, steering of the rear axles, and control the salting operations
- Operates the plow at any angle from 2 to 30 degrees on two 16,000 lb. steering axles
- Has a clearing path of up to 24 feet
- Requires a 40 ton or greater pintle hook
- 7 wire trailer plug
- 6 wire trailer plug for the plow and warning lights
- ABS air brakes
- 10 cubic yard hopper
- 1,000 gallon liquid tank (optional)



Due to custom configurations, all new operators need to become familiar with configurations appropriate to the tow vehicle and the Tow Plow that they are expected to operate.

Section 1 – Safety

It is required, in addition to this training, that all Tow Plow operators become familiar with the manufacturer's owner's manual, which provides additional information regarding safety, operations and maintenance of the Tow Plow.

Any plowing operation can be hazardous since the operator will be operating in adverse weather conditions that include, but are not limited to, snow and ice with limited visibility.



It is important to use safe operating practice and good judgment while operating this equipment. It is also important for the operator to be aware of their surroundings at all times. Clean all windows and mirrors to provide visibility of traffic, and hazards outside of the cab. In addition, mirrors must be

adjustable from within the cab. This allows the operator to see the Tow Plow in any position. The truck should be equipped with lighting for night operations.



Safety is up to YOU!

**Only you can protect yourself
and others around you!**

Become familiar with safety terms and symbols. Any manufacturer's safety label that is found damaged or not legible must be replaced.

The safety symbol alert means: Attention, Become Alert, Your Safety is involved. Obey all safety instructions listed in this training manual and the Tow Plow owner's manual. Failure to comply with all safety instructions and policies could result in serious injury or **DEATH**.

Key safety summary:

- Complete the required training
- Read and understand the owner's manual
- Read and understand all safety labels on the Tow Plow and tow vehicle
- Understand all operator controls for the Tow Plow
- Understand how to stop safely in the event of an emergency
- Follow safe work practices while operating, storing, or working on the Tow Plow
- Never allow anyone near the Tow Plow while in operation or while the tow vehicle is running where activation of the Tow Plow in any manner is possible
- Do not start the tow vehicle unless the work area is clear
- Replace damaged safety symbols

Lockout procedures during maintenance

All employees must follow MDOT's lockout / tag out procedures prior to performing any work on the Tow Plow. In addition, follow the manufacturer's recommendation for lockout procedures and control of the hazardous (stored) energy.

Section 2 – Inspection and Installation

Inspection

Prior to operating the Tow Plow, an inspection must be completed to ensure there are no safety defects and that the plow is operational. Daily inspections along with proper preventive maintenance will reduce the chance of a breakdown and down time of the equipment. All defects found throughout the inspection process shall be noted and repaired prior to use. Lockout / tag out procedures shall be in place once it is determined that repairs are needed to ensure that the plow is not put into service.

Prior to operating the Tow Plow, the following items are to be inspected, but are not limited to the additional features or configurations:

- Hydraulic fluid level on the tow vehicle
- Tires for damage, proper inflation and all of the lugs are in place and tight
- All safety and warning labels are in place and legible
- Ensure all required components have been greased including:
 - ✓ All of the plow harness sheave nipples

- ✓ All hydraulic pump drive shaft grease zerk fittings
- ✓ Front and rear tower sheaves and swivel blocks
- ✓ Wing extension arm grease zerk fittings
- ✓ Front and rear tower guide tracks
- ✓ All front harness pivot points
- Check for loose or missing fasteners (nuts, bolts, cotter pins, lock rings, etc.)
- Visually inspect all hydraulic hoses and connectors for wear, damage, and leaks
- Check all cables, chains, and sheaves for excessive wear and damage
- Visually inspect all plow and wing units
 - ✓ Inspect cutting edge and shoes for excessive wear
 - ✓ Do not allow cutting edge to wear down into the mold board
- Inspect mounting arms for excessive rust, damage, cracks in welds or bent and broken sections
- Inspect mounting holes on the arms and lugs for excessive wear
 - ✓ Holes greater than 3/16" clearance are to be repaired
- Inspect brake lines and glad hands
- Bleed moisture from the brake storage tanks on the tow vehicle to remove moisture and to insure that the system air pressure returns and does not leak

In preparation for the snow plowing season, a visual equipment inspection must be performed prior to operating the Tow Plow. Look for any damaged components, bends, cracked welds, hydraulic leaks, etc. Inspect all fasteners; tighten any that have loosened and replace any that are damaged. Check all hydraulic hoses for cuts, cracks, and/or leaks. Visually check plow lift chains and cables for loose clamps and frays.

Installation



Always have help when attaching the Tow Plow to the tow vehicle.

Installation may vary between units due to the custom configurations that are available. The operator must become familiar with the unit at their facility.

On new Tow Plows, prior to the winter season, it is important to set-up the Tow Plow for proper operation and to inspect for operational issues. The operating hydraulic pressure must be set to 2300 psi in order to ensure proper lift of the mold board. The hydraulic pressures must be checked and set, if needed prior to each winter season (A&E function).

Depending on the vehicle's hydraulic system, some adjustments may be needed. Ensure the steering circuit is plumbed with a minimum of ½" hydraulic hoses and that the flow setting is correct. Restricted or low hydraulic oil flow could cause the Tow Plow steering to become slow or unresponsive in extremely cold weather.

Steering circuits on Tow Plows with serial numbers lower than #55 can become unresponsive in extremely cold weather. Therefore, extreme caution should be used when deployed in extremely cold weather. Retraction for obstacles may become difficult or may not respond to steering input. In this case, it may be necessary to fully deploy the Tow Plow and hold, allowing the oil to circulate through the system and then retract to the tow position. This will allow the hydraulic oil to warm up enough for the proper response needed for the steering circuit. Tow Plows # 56 and higher utilize a shuttle valve allowing the operator to work the steering circuit to full deploy and back to tow position. This will allow oil to circulate back to the tank and will help to warm the oil and allow for better steering in extremely cold weather.

- Adjust the steering and mold board circuits of the Tow Plow so that deployment and retraction is smooth and steady
- If the steering adjustment is too fast, it can cause the Top Plow to become unstable or jerky, causing handling issues, and/or may damage the plow
- Steering adjustment that is too slow may not allow the operator to avoid obstacles during retraction

Always include the operator when making these adjustments so that the operator can determine a safe and comfortable speed for deployment and retraction.

Ensure that every operator is familiar with your specific configuration. Below is a general installation procedure for attaching the Tow Plow to the tow vehicle.

- Attach the Tow Plow to the tow vehicle pintle hitch
- Make sure the pintle receiver is locked
- Raise landing gear into full up position and ensure that the handle is stored in the tow position
- Attach the air brake lines/glad hands and check for leaks
- Connect the Tow Plow safety chains
- Connect all the hydraulic lines, including the lift and steering circuits
- Connect the 7-wire trailer plug; check to make sure the Tow Plow Lights are working
- Connect the 6-wire trailer plug; check to make sure all of the warning lights are working
- Connect the 4-wire trailer plug and make sure the proximity sensors and hopper circuits are working



The brakes may be locked due to frozen moisture in the air brake system in extremely cold weather or from long term storage. Release the brakes and when ready to move pull gently against the Tow Plow to ensure that the brakes have released. Failure to do so could result in damage to the Tow Plow tires.

Tow Plow locking pins for the lifting arms

For safety purposes, the Tow Plow lifting arms shall be pinned into the up position for transport during long durations or if you do not intend to redeploy for an extended period of time. When installing or removing the locking pins, always stand behind the plow to avoid injury or **DEATH** due to the Tow Plow falling. Always start with the two center pins of the lifting arm and work your way out so that you are positioned away from the plow when you remove the last pin. When you are reinstalling the locking pins, do it in the reverse order that you removed the pins starting with the outer pins and finishing with the center pins.

Removing the locking pins



ALWAYS remove the two center pins first!



ALWAYS stand behind the mold board when removing the two outside pins!

When you remove the safety pins make sure you place them into the designated holder to prevent them from impeding the lift arms when raising and lowering the mold board.



With the tow vehicle running, test all functions before you leave the maintenance garage to ensure proper operation:

- Determine that the mold board moves freely from the full upright position to the full down position
- Make sure the steering wheels move freely through the full stroke of the activating cylinder while moving forward

Section 3 – Operation

Deployment/Retraction



The operator shall visually check that the Tow Plow is clear of traffic when deploying!

Prior to activation of the Tow Plow, the operator must have the lock pins removed and insure that the plow area is clear of all people and obstacles when lowering the mold board. Always adjust the mirrors and keep them clean so that the Tow Plow is in the operator's view at all times.

A light on the dash of the tow vehicle will light up when the Tow Plow is deployed. Another light will light up when the mold board is lowered.



DO NOT deploy or retract the Tow Plow while stopped or with the brakes set. This will prevent damage to the tires.

Activation of the mold board and the steering may be performed at the same time as you are deploying or retracting the Tow Plow.

Using the left/right joy stick in the cab of the tow vehicle you can deploy the Tow Plow to any distance/angle desired. **Full deployment is not required for operation.**

The Tow Plow should be deployed in the following sequence:

1. Remove the lock pins from the mold board arms, starting with the center pins
2. While moving forward, activate the steer wheels to the deployed position
3. Lower the mold board to ground level (this can be done at the same time as step 2)
4. Move the unit ahead until the plow is set at the operator's desired position



WARNING: Adequate power adjustable mirrors must be installed on the tow vehicle to allow the driver to fully see the unit in the deployed position.

Always adjust the tow plow deployment based on the desired clear lane width; **full deployment is not required for operation.** Always be aware of the operating position and do not over deploy the Tow Plow. Only deploy just enough to cover the area that is required to plow. When the Tow Plow is fully deployed (at a 30° angle), it is covering a path half its length.

Always be aware of obstacles ahead of you and always be prepared to make adjustments for obstacles such as guardrails, stalled vehicles, sign posts, etc. When unsure about the clearance of the Tow Plow to obstacles, simply retract (pull in) the Tow Plow. This is extremely important in low visibility conditions.

Retract the Tow Plow when you encounter low visibility conditions to avoid striking parked or stalled cars, or any other obstacles that may be in the path of the Tow Plow. Low visibility conditions may not allow the operator enough time to retract in order to avoid an impact. Re-deploy the Tow Plow and resume normal clearing procedures once conditions improve. In the event you see an obstacle, retract the Tow Plow far enough ahead of the obstacle to clear it without having to make any sudden moves or lane changes. Visually confirm that you have cleared the obstacles and re-deploy. If you are working in a tandem operation and are the lead truck, always communicate obstacles to all other operators. This is especially important when a plow is running behind the Tow Plow and clearing the shoulders. Visibility for the remaining trucks may be diminished due to the blowing snow from the trucks in front.



When in doubt, PULL THE PLOW IN!

To return the Tow Plow to the transport position:

1. Raise the mold board and steer wheels to 0° (this may be performed simultaneously)
2. Continue moving forward until the Tow Plow is directly behind the tow vehicle
3. Ensure the mold board is in the full up position

If in transport for a long duration or you do not intend to redeploy for an extended period of time, find a safe place to stop and install the lock pins.

Mold Board

When the Tow Plow is in the tow position it is recommended that the mold board not be down due to possible scarring of the pavement or damage to raised obstacles such as manhole covers, bridge joints, raised pavement markers, etc. To reduce the chance of pavement damage or damage to the Tow Plow, use of a shoe is recommended on the leading edge of the Tow Plow. If a shoe is not available or if it is worn or damaged and needs to be removed, it is recommended that the cutting edge be mitered approximately 1" to eliminate the vertical forward edge of the blade to making contact with the pavement in the event that the mold board is down in the tow position.

The mold board shall be in the full up position (stowed) when the plow is in the tow position for transport. To return to the transport position, raise the mold board from the ground level and steer the wheels to a 0° position. Continue moving forward until the Tow Plow is directly behind the tow vehicle. If in the transport position and you do not intend to redeploy for an extended period of time, find a safe place to stop and install the lock pins.

Steering

To negotiate turns, the mold board should always be raised to the transport position; however, it may not be necessary in all cases. Operators have found that in large multilane intersections, retracting the Tow Plow enough to clear traffic and other obstacles allows for a large area of the intersection to be cleared in one pass. Good judgment and communication with other operators may be necessary to provide efficient clearing of large multilane intersections.



Tighter turns and intersections should be avoided if the Tow Plow cannot physically make the turn without stopping and backing up. However, the Tow Plow turning radius can be adjusted using the steering circuit, allowing operators to negotiate tighter turns at a smaller single lane intersection. Retract the Tow Plow and mold board into the tow position for right-hand turns. **If backing up is required, retract the Tow Plow into the tow position prior to backing up.** If left deployed, the Tow Plow will swing behind the truck to the left while backing up.

Become familiar with turnaround areas that are to be used during operation. It is recommended operators practice turns utilizing the Tow Plow steering on a closed lot at their maintenance facility and also become familiar with intersections and turning areas that they may encounter along their plow routes. It is also important to identify areas where turnaround procedures are not allowed.

Section 4 – General Operations

Prior to Operation

Before each use:

- Make sure that all nuts and bolts are in place and properly tightened
- Make sure that all other fasteners are in place and performing their specified function
- Make sure all safety signs are in place, clean and legible
- Replace any damaged parts or excessively worn parts
- Inspect for damage to any part of the plow mold board or push frame, such as broken or worn bolts or pins, cracked welds, worn or broken bolts
- Check the cutting edge for excessive wear, replace if necessary
- Check all hoses for cuts, cracks and leaks

Plowing Operations

While plowing multiple lanes, make sure you are familiar with the crown of the roadway in relation to the Tow Plow's position. Experience has shown that the Tow Plow should be positioned, if possible, with the crown between the tow vehicle and the Tow Plow in order to prevent damage to the road surface. If this is not possible try to keep the center of the Tow Plow mold boards at the crown of the road.

Tandem or team plowing operations is possibly the safest and most effective method for clearing priority one (**ORANGE**) routes. Operational speeds should be within the following:

- Safe for road conditions present
- Safe for the traffic volumes and conditions
- Reduced spacing appropriately for limited visibility
- Never exceed 35 miles per hour when salting

Team plow operations can consist of almost any number of trucks needed to clear the roadway from shoulder to shoulder in a single pass. Trucks may be positioned in any manner that operators feel safe and comfortable with and is most effective. Positions may also need to be set based on truck configuration and style of plows and wings to be used. Operators must allow a safe distance between trucks to allow traffic to pass safely if conditions warrant.

In the event snow is windrowed when plowing in a team operation, either a clean-up truck or the last truck in the operation should drop off to open up the ramps and provide access to traffic on and off the main highway. In some cases, a protective or "blocker" vehicle may be used to help control traffic during group operations.

Use caution when plowing heavy snow loads. Correction of plow position, either by the tow vehicle or the Tow Plow, may be needed to maintain the width of the area to be cleared. As the snow load increases, skewing or side shifting of the Tow Plow may occur. If correction is needed and the operator decides to close in on obstacles, such as guardrails or curbs, be aware that the snow load could suddenly reduce and the Tow Plow will skew back to its original position and could strike the roadside obstacle. This situation is even more prevalent when plowing on and under overpasses as the snow load decreases in these situations. The Tow Plow is designed to plow hard surface shoulders such as concrete or asphalt, **DO NOT operate the Tow Plow on gravel shoulders.** Be aware of obstacles while deployed and use the steering circuit to plow around any obstacles on the shoulder. **DO NOT steer the tow vehicle into an adjacent lane to avoid an obstacle as there may be traffic present in that lane.**

Periodically during plowing, stop to inspect the plow cutting edges and mold board shoes for wear. At the first sign of excessive wear, discard and replace with new parts.

Emergency Stopping

Always maintain a safe distance from traffic in front of you. Incidents that may cause traffic to suddenly stop will require more time and distance for you to react and stop. Unlike stopping a typical winter maintenance truck, the Tow Plow is a trailer with a salt hopper and air brakes and braking when the road surfaces are potentially slick from snow and ice can cause the trailer to

skid around and jackknife. Therefore, it is important to give yourself plenty of room to stop. The Tow Plow is equipped with an anti-lock breaking system (ABS). With the ABS system the trailer is less likely to swing out, but if you lose steering control or start to jackknife, let up on the brakes (if you can safely do so) until you gain control. When driving a combination truck and trailer with ABS, brake as you normally would use the following guidelines:

- Use only the force necessary to stop safely and stay in control
- Brake the same way, regardless of whether you have ABS on the trailer, truck , or both
- As you slow down, monitor your truck and trailer and back off the brakes (when safe to do so) to stay in control

Remember, if your ABS malfunctions, you still have regular brakes. Drive normally for the conditions, but get the ABS serviced soon.



ABS won't allow you to drive faster, follow closely, or drive less carefully!

The procedure for stopping a trailer skid is:

- Recognize the trailer skid by seeing it in your mirrors
- Check mirrors anytime you brake hard to make sure the trailer is staying where it should
- Once the trailer swings out of your lane it is hard to prevent a jackknife
- Stop using the brakes to get traction back
- Do not use the hand brake (this will cause the trailer to continue to skid).
- Once the wheels start to grip the road again, the trailer will start to straighten out and follow the tow vehicle
- If the Tow Plow is deployed during a skid, leave it in the deployed position

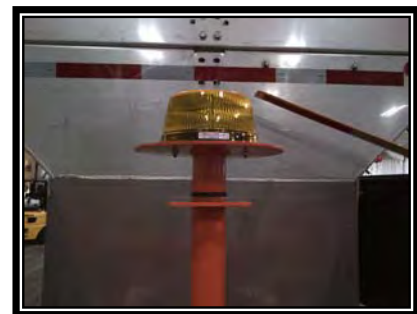
Lighting

There are two groups of lighting on the Tow Plow:

- Work/Warning
- Operational (DOT)

The Tow Plow lighting is connected to the truck via two separate trailer plugs:

- 7-wire large plug for the DOT vehicle lights
- 6-wire plug for the work and warning lights



All DOT lighting shall be in good working order and operation. You must inspect all lighting for proper operation. This includes:

- Tail lights
- Brake lights
- Turn signals
- Side marker lights



Warning lights on the Tow Plow shall be activated during plowing operations.

It can be difficult to determine how far the Tow Plow is deployed. Therefore, it is important to enhance driver visibility and deployment width using proper mirrors and lights.

Due to limited visibility from the cab of the tow vehicle, it is important to be able to see the Tow Plow when it is deployed. As stated previously, use of adjustable power mirrors, spot mirrors and lighting for night operations is imperative. When incorporating work lights to the Tow Plow, do not aim work lighting toward traffic. If possible, aim work lighting downward to reduce glare for the operator and motorists.

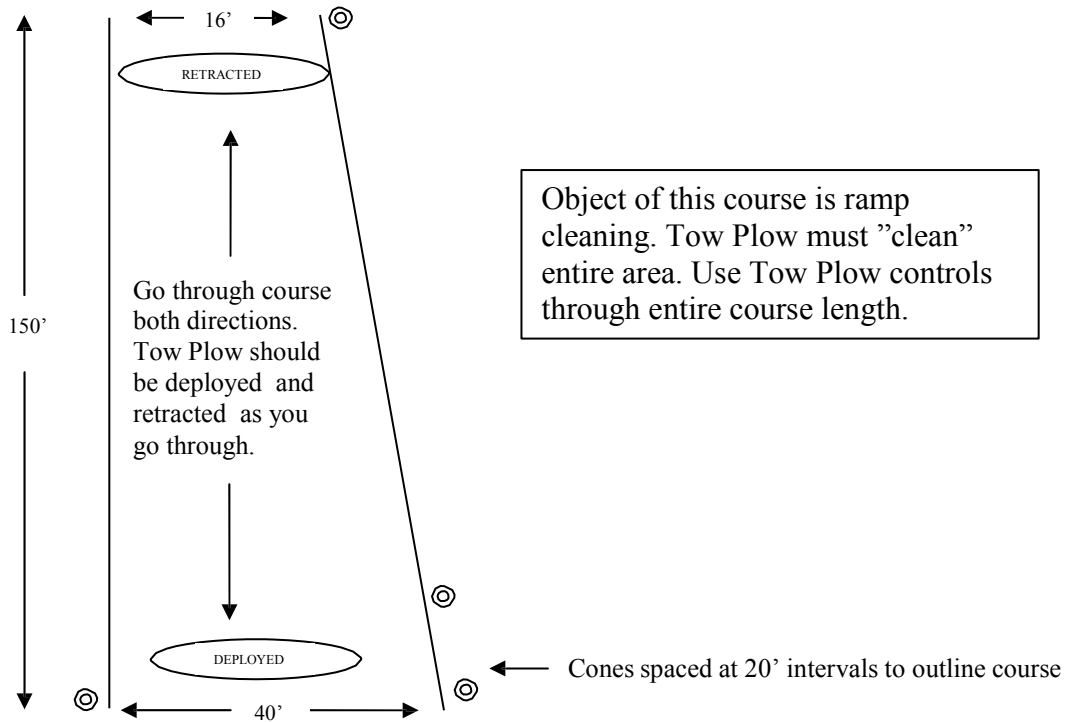
Blade Maintenance

Replacement of cutting edge:

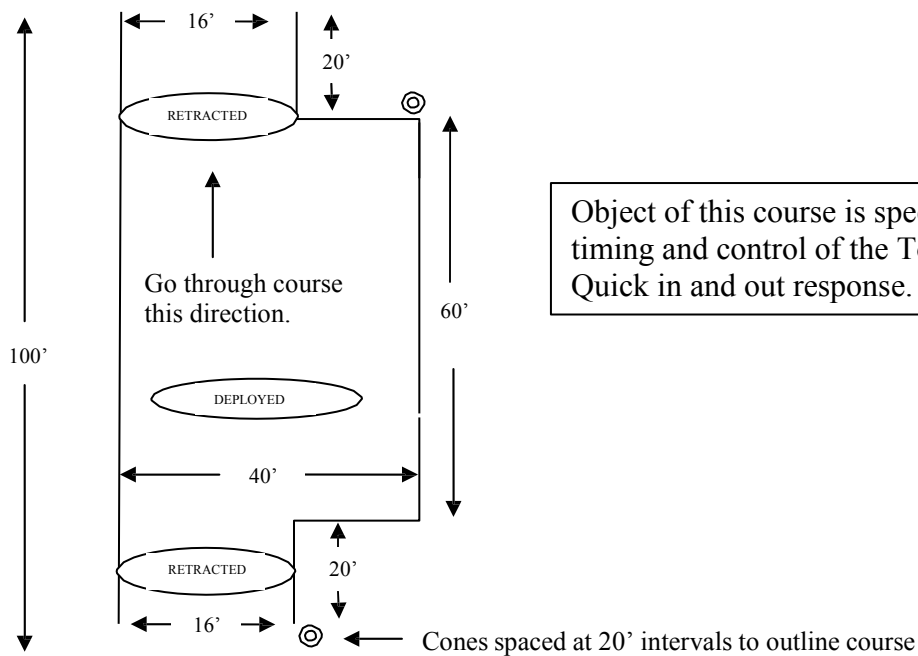
1. Park the tow vehicle on a level surface (such as a concrete garage floor or paved area) that is large enough to safely accommodate the unit with the Tow Plow attached. Place the vehicle's transmission in "park," and set the parking brake
2. Lower the Tow Plow mold board onto a suitable blocking positioned immediately behind the mold board. This blocking must be of sufficient height to hold the cutting edge approximately 6 to 8 inches above the level surface
3. Shut off the tow vehicles engine, remove the starter key, wait for all moving parts to come to a stop, and relieve all pressure in the hydraulic lines
4. Loosen the nuts on all the cutting edge bolts; remove all nuts and bolts except the bolts on each end of the cutting edge
5. While holding up the end of the cutting edge, remove the nut and bolt from that end and allow the cutting edge to pivot down to the level surface
6. Repeat step 5 for the other end of the cutting edge
7. Reinstall new cutting edges by reversing the procedures in steps 5 thru 7; tightening all nuts to recommended torque values

Michigan Department of Transportation Tow Plow Obstacle Course Training

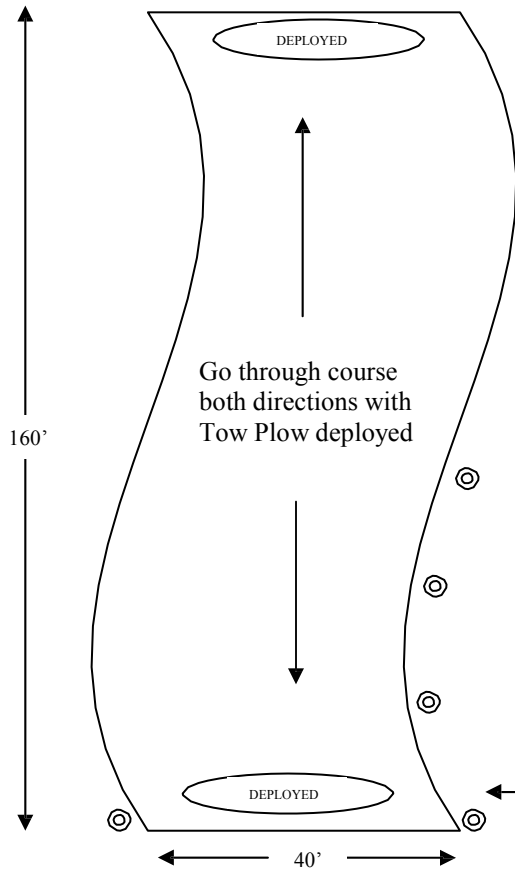
The "Ramp"



The "Quick Change"



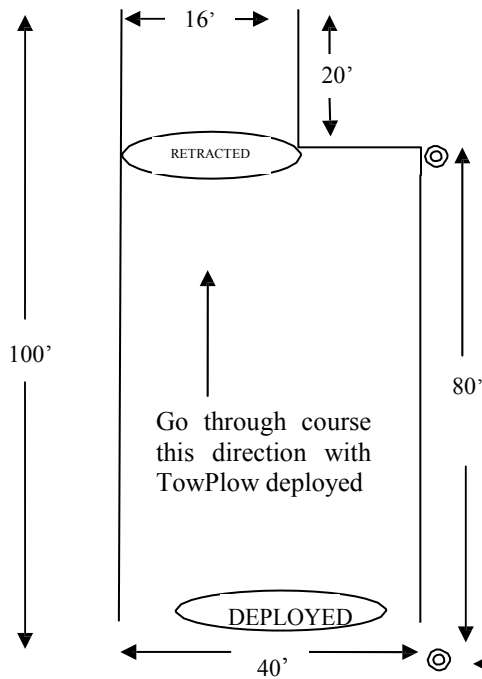
The "S" curve



Object of this course is steering control and perception of distance. Mirror usage is critical.

Cones spaced at 20' intervals to outline course. Move cones over 5' at the 20' spacing to construct the "S".

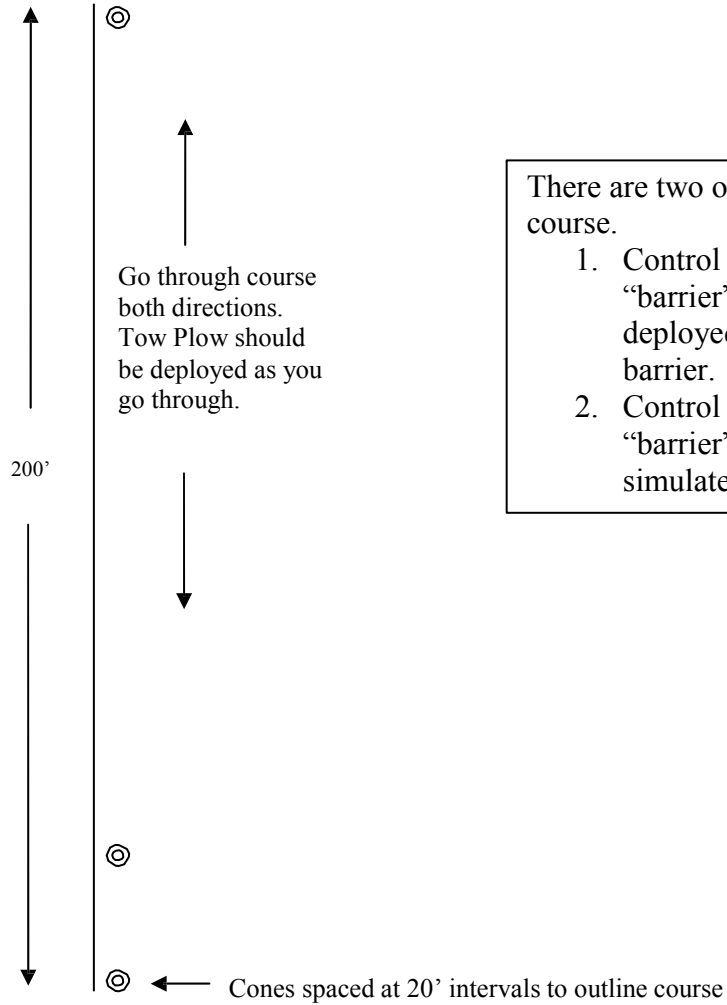
The "Parked Car"



Object of this course is speed control, recognizing obstacle in the way, timing and control of the Tow Plow.

Cones spaced at 20' intervals to outline course

The "Barrier"



There are two objectives for this course.

1. Control front plow close to "barrier" with Tow Plow deployed to simulate median barrier.
2. Control Tow Plow close to "barrier" deployed to simulate guardrail.

Tow Plow Pre and Post Trip Inspection

Note: Employees are required to perform an inspection of the Tow Plow Prior to each shift.

- Hydraulic fluid level (tow vehicle)
- Check for excess moisture in the brake storage tanks (tow vehicle)
- Receiver hitch closed and locked
- Chains connected to the tow vehicle
- Brake lines and glad hands locked with no leaks
- Brake, turn and marker lights operational
- Warning lights operational
- Lug nuts in place and tight
- Tires for damage and proper inflation
- Loose or missing fasteners (nuts, bolts, cotter pins, locking rings, etc.)
- Inspect all hydraulic hoses and connectors for wear, damage, and leaks
- Cables, chains, and sheaves for excessive wear and damage
- Plow frame and mold board
- Cutting edge and shoes for excessive wear
- Lift arms, mounting holes, and lugs for excessive wear
- Safety and warning labels in place and legible
- All components have been greased
- Hopper box gate opening set
-
-