Guide to Colorado State University Cooperative Extension District Agricultural Safety Display

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The Colorado State University Cooperative Extension District Agricultural Safety Display, designed to be used at county fairs, crop clinics, etc., was built by the Department of Agricultural and Chemical Engineering and funded by NIOSH. The display has two segments, a tractor rollover display and a display backboard, title, safety script, pictures and examples of handouts. The display can be used unattended or with a knowledgeable person to answer questions. If it is unattended, only the display board should be used.

The first segment is the tractor rollover display. It has a rollover box, a metal cast tractor with removable rollover protective structure (ROPS) and a radio-controlled tractor with a controller. A string and hook is included to demonstrate proper hitching. The purpose of the rollover display is to teach young people and remind adults of the correct method of driving tractors up, down and across hills. Following are the general tractor driving rules and how they can be demonstrated (Practice the following demonstrations prior to performing in front of an audience.):

1. Always back up and drive down hills with a conventional style tractor (rear wheels larger than the front wheels). Remember that the front is always pointing down hill whether the operator is backing up or driving down the hill. When backing up or driving down a hill, keep the tractor in low gear. Never turn sharply on hills.

   Demonstration:

   1. **Drive tractor straight up the hill (tractor will overturn)**
   2. **Back tractor straight up the hill**
   3. **Drive the tractor straight down the hill**
   4. **Back the tractor straight down the hill (the tractor will overturn)**

   NOTE: To include the audience, ask them the correct way to go up or down the hill. From this response, do one of the above. All choices should be selected before this segment of the demonstration is completed.

2. On a conventional-style tractor with proper ballast 35 percent of the weight is in the front and 65 percent in the rear. If the front end is too heavy, the tractor will be difficult to turn as the tires dig into the soil. If the front end is too light, the tractor will not turn as quickly as expected, and there is an increased chance of a rear rollover.

   Demonstration:
   Place the tractor on the slope pointing straight downward and have one or more of the audience lift up the rear of the tractor. Turn the tractor around and have the participants lift up the front end. Ask them which end was heavier to lift. This may be performed on a flat surface, but is not nearly as dramatic.

3. When crossing hills. if the operator is leaning significantly toward the Uphill rear tire. the tractor is on too steep a slope. All that is required to over turn a tractor is a hole on the downhill side. a bumP on the uphill side or both. More deaths occur from side rollovers than rear rollovers. If this situation occurs, the operator should stop the tractor and look around to determine the safest means of getting off the hill. The operator can either turn and back up or turn and drive down the hill. There may be a fence or ditch at the bottom so the operator must back up the hill. Or there may be an obstruction of some type at the top of the hill, thus turning and driving down the hill is safer. If backing up or driving down is not possible due to obstructions, back up slowly in the same wheel tracks from the direction the operator came until it becomes possible to either back up or drive down the hill. The operator knows the surface he/she drove over, but the operator may not know if the terrain is passable if he/she continues forward. Even slopes that have been traversed often may not be safe; a rock or hole struck at the wrong angle or speed could result in a side rollover.

   Demonstration:
   Place the tractor across the slope and ask the audience if they know how to tell when the slope is too steep to traverse. Tell them the rule about leaning toward the uphill tire. Ask the audience how would they get off the hill safely. Tell them about turning and driving down hill or turning and backing up the hill.

4. If the operator's tractor has a ROPS cab or rollbar then the seatbelt must be worn. There has been only one death in the United States where a ROPS was properly installed and the seatbelt was worn. The operator went off a 14 foot bridge and landed upside down. There have been many deaths when ROPS were present, but the seatbelt was not worn. It is more dangerous to have a ROPS and not wear the seatbelt than it is not to have a ROPS.

   Discussion Topic:
   Explain to the audience what a ROPS is and its purpose. Ask the audience what other safety equipment should be used with ROPS (seatbelts). This

segment cannot be demonstrated with the model tractor, but it should be discussed.

5. The only time seatbelts should not be worn is when a ROPS is not present on the tractor allowing the operator a chance to escape. Tractors without a ROPS tend to roll over 180 degrees or more (there is no room for an operator when the tractor is upside down). A tractor with a ROPS roll over approximately 90 degrees. The safest protection is to have a ROPS and a seatbelt installed on the tractor and wear the seatbelt.

Demonstration:
Use the metal cast tractor for this demonstration. Show the audience how far the tractor will roll over with the ROPS on the tractor; then show how far the tractor will roll over with the ROPS removed. The ROPS can be removed by pushing in the piston near the lower cross member of the ROPS with a coin or key. Place the tractor upside down, and ask the audience how much room remains for the operator. This will show them that there is not enough room for the operator if the tractor does not have a ROPS and rolls over.

6. If the tractor is equipped with a front end loader. Operate the tractor with the front end loader in a down position. When the loader bucket is up, the tractor's center of gravity moves to a higher position. This makes the tractor unstable and subject to side rollover. If the bucket must be up to complete a task, operate the tractor in a lower gear, do not turn sharply and return the bucket to the down position when possible.

Demonstration:
The display does not contain a tractor with a front end loader, but this topic can be demonstrated. Ask for a volunteer from the audience, and have the volunteer to squat down with their feet apart. Gently try to push him/her over to the side. Next, have the volunteer stand and push him/her to the side. It will be easier to push the volunteer off balance when he/she is standing up. This will demonstrate how the center of gravity raises with increased height. The same principle applies to tractors that have the buckets in the up position.

7. It only takes three-quarters of a second for a tractor starting to roll over backwards to reach the Point of no- return: another three-quarters of a second, and the tractor is completely over. Reaction time is a 1/2 second or longer. Therefore, there is not enough time to react to a rear rollover. Operate equipment correctly to eliminate accidents.

Demonstration:
Using the radio-controlled tractor, back the tractor part way down hill. Reverse the direction suddenly and the tractor will turn over quickly. This demonstrates how fast a tractor will turn over when under a load.

8. Only hitch equipment to the tractor at the draw bar unless the equipment has been specifically designed to attach to the three-point hitch. Draw bars can be attached to the lower arms of the three-point hitch. Inadvertently, the three point may be raised, increasing the potential for a rear rollover. Attaching equipment higher than the draw bar can produce enough torque on the

Demonstration:
Using the radio-controlled tractor and the string with attached hook, show the audience what happens when a tractor is hitched correctly and incorrectly. Hitch the string to the draw bar, and have a volunteer hang onto the string end at the same level as the draw bar. Drive the tractor forward. Next, hitch the string to the eye bolt and repeat the process. The tractor will roll over to the rear.

9. If the tractor is stuck. never attach a log or other object to the tires to provide more traction. If the tire should suddenly stop rotating. the potential for a rear rollover increases significantly. Attach towing equipment to the draw bar only.

Demonstration:
Because of the low power of the motor, the tractor may or may not roll over in this demonstration, but the front end should raise slightly. Hold one of the rear tires and try to drive the tractor forward. The front end should raise slightly. Explain to the audience that a real tractor will have enough power to roll over.

10. Keep equipment in good working order with proper maintenance. Ninety-five percent of all accidents occur because of human failure; keeping equipment in good working condition eliminates the remaining 5 percent that occur from equipment failure. Furthermore, keeping equipment in good working condition and using proper maintenance practices reduces the potential number of major repairs. The equipment also will be more dependable in accomplishing tasks.

Discussion Topic:
Discuss the benefits of keeping

machinery in good working condition.

11. Read the owner's manual to become familiar with the tractor or equipment.

    Discussion Topic:
    Discuss with the audience the benefits of knowing exactly which tasks the piece of machinery is designed to accomplish. Becoming familiar with equipment also identifies potential hazards inherent to the machine.

12. Always shut off the tractor and engage the parking brake or put the transmission in park before getting off. Doing this eliminates the chance of being run over or entangled in running machinery (i.e., PTO shafts and towed powered machinery). If there are other people around, keep them at a safe distance and in sight. Remove the key.

    Discussion Topic:
    Discuss the hazards of leaving equipment running. Many people are killed every year by being run over or entangled in the PTO shaft and other equipment.

13. Never allow an extra rider on equipment. If there is only one seat on the tractor. then the only person that should be on the tractor is the operator. Many children and adults are killed by being run over by tractors or equipment. The extra rider can be knocked off, forced off or fall off.

    Discussion Topic:
    Discuss this item with the audience.

14. Tractors and other equipment that are not designed to travel at more than 25 miles per hour must display a Slow Moving Vehicle (SMV) sign. This sign must be placed not less than 2 feet nor more than 6 feet above the ground with the point directed upward and placed at the rear of the tractor or equipment. If the SMV is faded, replace it. Many accidents occur every year when motorists run into the rear of slow moving equipment. An additional method to protect the operator and motorists is to turn on flashing four-way amber lights. This gives motorists an indication that the equipment is travelling 25 MPH or less.

    Discussion Topic:
    Discuss the above with the audience and show the SMV sign at the rear of the radio-controlled tractor.

The second segment of the District Agricultural Safety Display is a display backboard, title, safety script, pictures and examples of handouts. The handouts and other supplies are either available free or can be purchased from the suppliers listed in the resource directory. The title, script and pictures can be stored in the rollover box; the lid can be opened at either corner of the elevated portion. The script and pictures aid in covering three areas of agricultural safety: tractor and equipment safety, chemical safety and animal safety. The tractor and equipment safety information can be used with the above operating rules. The display board can be used for other types of displays as the pictures and titles are removable.

Proper handling and application of agricultural chemicals reduces hazards inherent with use. Potential hazards are contamination of the handler, others in the area and groundwater. The long-term effects of some chemicals are not entirely known, and it is best to use the chemicals with safety practices in mind. Read the pesticide label for correct application and use personal protective equipment (PPE).

Handling livestock with the idea that they are to be kept safe reduces the injury potential to the handler. Animals are not always predictable in their actions, so accidents may happen. If the livestock are kept calm, there is less chance they will react to outside influences. Intact males always possess a greater potential for harming their handler than do other sexes. In general, horses injure and kill more people than do other species of livestock.

Also included with the display is a log and it is located in the last section of the binder. The first ten log sheets are provided for you, as well as a master sheet. This sheet has been produced on thicker paper, DO NOT USE IT, EXCEPT FOR MAKING ADDITIONAL COPIES OF THE LOG. Filling out the log will aid in the evaluation of the effectiveness of the display. After each log sheet has been completed, please return the sheet to either Mac Legault or Paul Ayers. Your assistance will allow us to provide more handouts and other supplies to you free of charge.

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