

# Agricultural tractor

**Note:** It is recommended that you read the Supporting Information page before you read this factsheet.

## Preparation

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- Agricultural tractors, as the name suggests, are machines originally designed for the agricultural sector but adopted by the construction sector to support of construction-related activities such as trailer and bowser towing and using implements such as sweeper brushes. Accidents and incidents do occur and proper pre-use checks are required for safe operation. Failure to properly check the tractor or implement before work could mean that, as with all plant and machinery, injuries are caused because faults can affect both performance and safety.
- The tractor and any implement must be checked according to manufacturer's requirements before work starts by following the information contained in the operator's or user's manual. If the tractor and implement are not checked, or not checked thoroughly, a defect could exist which can cause a near miss or even an injury.
- For example, one vital check is the operation of the hand or parking brake as a tractor, unlike most plant, may need to be left with its engine running without the operator in the seat when the Power Take Off (PTO) is being used to drive implements. A defective handbrake in an unattended machine can have serious consequences.
- Another check that would be made on an agricultural tractor is the correct operation of the PTO drive. This should be checked before the machine is put to work, otherwise a defective PTO drive may only be noticed after an implement is coupled up ready for use.
- Any defects, no matter how minor, must be reported immediately as what the operator may consider to be a minor fault, such as outer damage the hydraulic hoses on for example, a front loader attachment, could be a significant but not a visible fault.
- The cab glass and mirrors should be regularly cleaned which aids effective vision. Access to clean the cab glass or mirrors should be planned so that a fall from height can be avoided or minimised. An operator climbing onto parts of the tractor, such as the wheels or rear link arms, could slip or trip and possibly fall.
- This also applies when checking the tractor for work, as some checks may cause the operator to climb onto parts of the machine or bodywork, such as the mudguards, and again they could slip or fall.

## Working safely and with others *(Working safely)*

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- As tractors are used to drive a static implement using the PTO system, such as a water pump, the engine needs to be left running whilst the operator is out of the cab. When they leave the seat of the tractor, they must ensure the parking brake is fully applied and that all transmission levers are in neutral.
- This ensures that the tractor cannot move unintentionally as accidents have occurred on other plant after the operator has accidentally moved a gear lever into drive when exiting the cab, and the machine has moved unintentionally.
- Operators sometimes communicate with other workers whilst remaining in the seat of the tractor. In these situations, the handbrake must be applied and the engine stopped. Severe injuries have occurred after a tractor was left in gear with the engine running and, during a conversation with a worker standing by the cab, the operator's foot had slipped off the clutch pedal with the result that the tractor moved.
- Talking to others at ground level whilst leaning out of the back window is also hazardous and operators have leant on hydraulic operating levers, unintentionally moving an attachment.
- Tractors are used to haul trailers which are loaded by other plant such as excavators. Once positioned but before the trailer is loaded, the tractor operator should exit the cab and stand in a safe place clear of the excavator's working zone. This is because the majority of tractor cabs are not always effective falling object protective structures (FOPS).
- When tipping a load, care must be taken to keep a minimum distance from overhead power lines. Guidance issued by the energy networks utilities indicates what minimum distances must be kept and the higher the voltage in the

power line, the greater the distance that must be kept. This is to reduce the danger of arcing if the trailer is close to but not actually touching the power line.

- A fully loaded trailer or water bowser places weight onto the rear of the tractor so that less weight is applied through the front wheels. This can have an effect on both the steering and braking meaning that operators need to drive at a speed which allows them to maintain control.
- The majority of agricultural based tractors are equipped with independent brakes that allow, in certain situations, either the left or right hand side brake to be applied. Under normal operating conditions, and particularly when towing, the operator must ensure that both brake pedals are locked together – otherwise on braking a roll over could occur.
- The majority of tractor cabs are approved roll over protective structures (ROPS) which, if the machine rolls over, the ROPS cab can minimise, but not eliminate, injuries to an operator providing the seatbelt is being worn.

## **Fitting and using attachments** *(Working tasks)*

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- Attaching implements to the tractor is hazardous and the results of many injuries, for which extreme care needs to be taken. Before any implement is to be fitted, its compatibility with the tractor needs to be checked. For example, if a trailer or bowser is to be connected, the weight of a fully loaded bowser (which is considerable) or trailer must be taken into account and it must be determined whether the tractor is designed to pull such a load.
- After connecting a bowser or trailer, the brake system of the trailer must be checked for correct function. If the brakes on a trailer are not working properly, a tractor can overturn when the operator brakes sharply.
- After connecting a drawbar or trailer implement, the tractor's rear link arms need to be raised or kept clear of the implement's drawbar otherwise, during turning, a link arm can foul the drawbar.
- When mounting an implement onto the tractor's rear (three-point) linkage arms, the area directly behind the tractor and implement should be kept clear of personnel.
- When minor adjustments need to be made when connecting the implement, the operator or others should not operate the hydraulic lever by leaning into the cab from the rear, as operators have been trapped and crushed between the cab and a raised implement when the hydraulics have overreacted.
- Many tractors are now fitted with external controls that operate the link arms, with the controls normally fitted on one or both sides of the rear mudguards. To avoid any trapping, the lift zone or area must be kept clear of all personnel when the controls are activated.
- After an implement is connected, the link arm check chains must be adjusted so that any sideways swing of a fully mounted implement is minimised. A swinging implement could, when turning sharply, make the tractor unstable and cause it to overturn.
- Removing implements also requires care. Before any implement or trailer is disconnected, the operator needs to ensure that the implement is left in a safe place and is chocked, braked and/or supported so that that it is stable when it is disconnected from the tractor.

## **Power take off systems** *(PTO)*

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- Within the construction and allied sectors, tractors are increasingly used to drive powered implements such as brushes, water pumps, and bowser pumps that require the connection and disconnection of the power take-off shaft. This requires extreme care as many fatalities have occurred as a result of PTO shaft operation.
- Before the PTO shaft is connected to the tractor, the engine must be switched off and the tractor's handbrake applied. Implements have different operating speeds, usually 540 r/m and 1000 r/m, so the speed of the implement must be checked against the speed setting or configuration of the tractor. An implement driven at too high a speed could have serious consequences.
- When a PTO shaft is connected, the operator must ensure that the spring-loaded locking pin on the shaft's universal joint is fully engaged when sliding it onto the tractor's splined shaft, so that the PTO shaft cannot slide off.

- The outer guards of the PTO shaft should have securing or restraining chains at either end of the shaft. One chain should be secured to the tractor and one chain should be secured to the implement, preventing the outer guard from rotating when the PTO drive is rotating.
- If the guards do not fully cover the rotating universal joints then the PTO shaft cannot be used until this has been corrected. Operators have been killed after becoming tangled in exposed parts of a rotating shaft.
- Prior to use, the operator should check that the PTO shaft does not foul any part of the tractor or implement, such as such as the drawbar or drawbar pin of a bowser fitted with a pump.
- The function of the drive must be checked, particularly that the PTO drive disengages when the PTO operating lever or switch is placed into neutral.
- All personnel must be kept well clear of any rotating parts of the implement as material may fly out from a previously used implement when the operator is carrying out checks or when the tractor is working.
- On certain implements such as flails, blockages can occur and stall the implement. Before any clearing work takes place, the PTO lever or switch must be placed into neutral and the tractor's engine switched off.
- The same situation applies to hydraulically-driven implements. Operator clearing blockages have been killed when the implement has restarted unintentionally.

## Sample questions

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The following questions are based on the text within this factsheet and indicate how the questions and answers are structured. Based on the factsheet, there is only one correct answer. The correct answer to each question is indicated at the end of this factsheet.

**Q1. What action must be taken if the guard of a power take off (PTO) shaft does not fully cover one of the shafts' universal joints?**



Only 540 rpm operations can be used



The shaft cannot be used until the problem is put right



The linkage arms must be positioned so that entry within the working area is restricted



An exclusion zone of 2 metres must be applied when in use

**Q2. In certain conditions, it is acceptable to leave the cab with the engine running. What must be ensured?**



That the handbrake is fully applied and all drive wheels chocked



That the engine is left running at idle speed



That the handbrake is applied and the differential lock applied



That the handbrake is fully applied and all transmission levers are in neutral

## Study checklist

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This checklist aims to act as a study aid to ensure that the reader has identified and understood the relevant parts of this factsheet.

### Do you know?

1. Where the information for the carrying out of pre-use checks may be found.
2. Why is important that the effectiveness of the handbrake is thoroughly checked before work starts.
3. What could occur when cleaning the cab glass and standing on various parts of the tractor such as the wheels.
4. What procedures to take when exiting the cab with the engine running for PTO drive use.
5. Why the operator needs to stand clear of the machine if their trailer is being loaded by an excavator.
6. Why a distance needs to be kept from overhead power lines if using a tipping trailer.
7. How a heavily loaded trailer or bowser can affect the tractor when travelling.
8. What the dangers are of leaving the independent brakes unlatched.
9. What needs to be taken into account before connecting a trailer or implement to a tractor.
10. What the dangers are if the braking system of a trailer being towed is not functioning correctly.
11. Why when towing a trailer should the tractor's rear linkage arms be in the raised position.
12. How trapping can occur when connecting an implement to the linkage arms of the tractor.
13. Why the check chains of the linkage arms need to be adjusted before transporting a mounted implement.
14. What must be taken into account before detaching or disconnecting a trailed or mounted implement.
15. What is the cause of many fatalities with agricultural-based tractors.
16. Why knowing the operating speed of a PTO driven implement is important before use.
17. Why the PTO shaft should be fully covered at all times.
18. What procedures must be followed if a blockage occurs with a PTO driven implement.

**Answers to sample questions: Q1: B and Q2: D**