



These human factors bulletins focus on how workers interact with their work environments. They are based on accident investigations that examine all the workplace factors that influence the decisions and actions of the workers involved in an accident. These factors help to identify the causes of an accident. Identifying these causes can help to prevent similar workplace accidents.

## Different Controls on Similar Machines

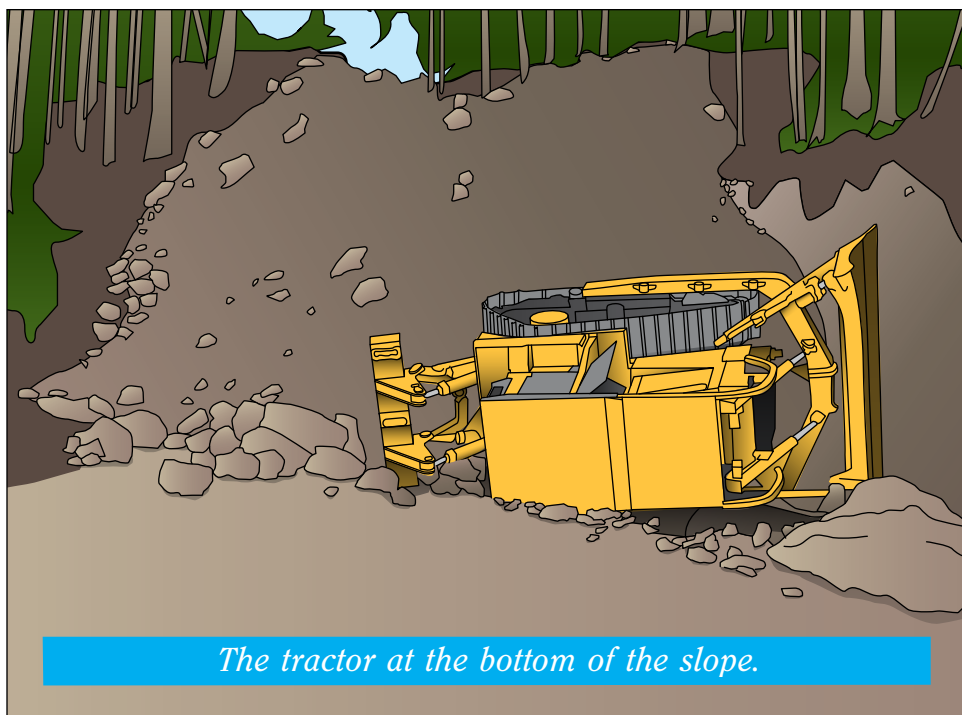
This bulletin looks at equipment controls and the lack of consistency among the controls on different machines. Operators who use different machines may need to deal with different control layouts for each machine. Design differences between safety-critical features can present significant safety concerns.

### What happened?

An experienced tractor operator was constructing a road using a downhill bulldozing technique. About two hours later, he was found out of the tractor at the bottom of the slope. Also at the bottom of the slope was the tractor, lying on its side. The operator had been fatally crushed when the tractor travelled over him.

### From a human factors perspective, why did it happen?

The evidence indicates that the operator was operating the tractor until the push arm that supports the bulldozer blade at the front of the tractor detached itself from the frame. The operator had to reattach the push arm before he could continue. Evidence also



indicates that the operator got out of the tractor's cab without setting the parking brake. Why did this happen?

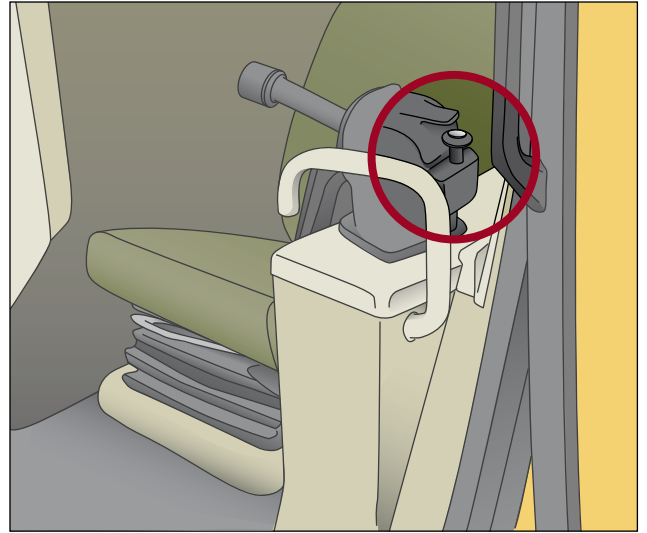
The rental tractor that the operator drove on the day of the accident was different from the tractor he usually drove. The control for the parking brake on the tractor that he usually drove is a lever, positioned so that it partially obstructs the cab's doorway. To exit the cab, the operator had to push down on this lever, thereby setting the parking brake. If the operator forgot to engage the brake, this lever-type design would obstruct his way out of the cab.

The human factors analysis focused on how the position and design of the parking brake might have influenced the operator's actions.

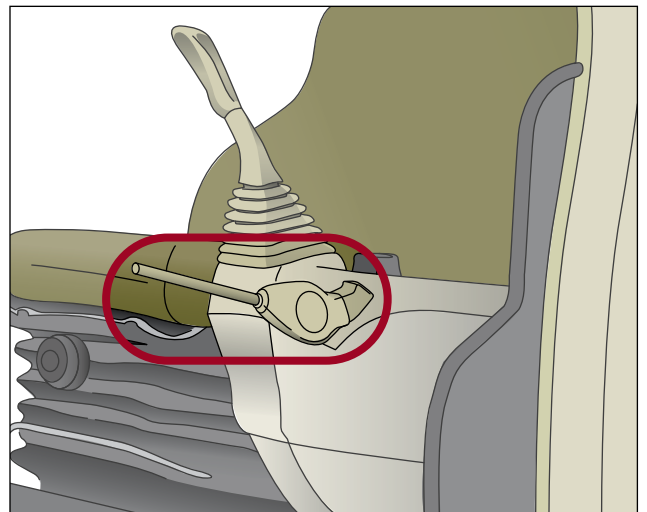
In contrast, the control for the parking brake on the rental tractor was a mushroom-cap push rod, partially hidden under the left-hand console. It was not located where the operator was used to finding the control for the parking brake. More importantly, the push rod is not designed to obstruct an operator's way out of the cab if the safety-critical step of setting the parking brake has been missed. On the day of the accident, without a lever to obstruct his way, the operator – whose attention was focused on re-attaching the blade to the frame – exited the cab without setting the parking brake. The tractor rolled forward and the operator was unsuccessful in re-entering the cab to set the brake and subsequently was run over by the tractor.

## Understanding human factors helps avoid workplace accidents

Critical controls like parking brakes may not be in the same position or operated the same way from one machine to another or from one manufacturer to another. The position and design of the rental tractor's parking brake did not support the operator in performing the critical function of setting the brake. Presumably, the operator realized that he had missed this critical step only when the tractor started to move. The control violated good design principles in that it gave him no feedback to warn him that he had missed this step. And once the machine started moving, it was too late. A standardized parking-brake design would encourage the routine action of setting the brake.



*The rental tractor has a mushroom-cap push rod to control the parking brake. The control is partially hidden.*



*The operator's regular tractor has a lever to control the parking brake. If the brake has not been set, the lever obstructs the exit.*