

Caterpillar 24H Motor Grader Rear Window Access System

New Acland Coal

Background

New Acland Coal (NAC) has a high focus on continuous improvement in all areas of the business. The mine site also operates a number of proactive procedures that are aimed at identifying potential hazards that give rise to early rectification in an attempt to reduce the risk of incidence or injury.

Equipment operators are required to perform formal pre-start inspections on all mobile & ancillary equipment at the start of each shift or accompanying a change in operator. Additionally, all employees are issued with a 'Hazard Report' booklet through the site induction process that is utilised to formally identify potential hazards and deliver applicable corrective actions through the supervision hierarchy. Hazard reports form part of the sites 'lead' indicator pool which has proven to have a distinct correlation with the reduction of incidents on site.

With regard to equipment operation, prior to the end of each shift, the operators of all equipment are required to ensure the cab is clean and all mirrors, windows and windscreens are also cleaned for the oncoming operator. This practice has been implemented to ensure that the oncoming operator is assured of entering a piece of equipment with no visual impediments.

New Acland Coal currently operates 2 x Caterpillar 24H Motor Graders and 1 x Caterpillar 16G Motor Grader in its production equipment fleet. All graders have limited accessibility to the rear windscreens for cleaning purposes.

The Problem (Hazard)

During the end of shift process of cleaning the rear windows of the 24H Caterpillar Motor Grader, it was identified that cleaning of the rear windows presented a slip or fall hazard due to accessibility issues. The practice was to access the windows for cleaning via the tandem housing steps. In turn, this process would see the operator standing in the articulation area while utilising a long handle squeegee mop to access the windows. There was also an ever present risk of over stretching, potentially resulting in muscle tear or strain.

Through the site 'Hazard Reporting' process, this practice was noted as a potential hazard. The 'Hazard report' was forwarded to the relevant Production Supervisor/OCE who in turn followed site protocol by forwarding the report to the NAC Maintenance and Safety Departments for action.

A corrective action was issued to the NAC Maintenance Superintendent (responsible for all site Mobile Maintenance) for investigation into alternate methods that would reduce the risk of injury to personal while completing the task and decreasing the individual's exposure to risk.

The Solution

It was resolved that the solution to the problem identified through the hazard identification process needed to reduce the exposure of an operator to potential serious injury due to slip or fall and/or overstress. A risk assessment was completed on the task, and utilising the recognised 'Hierarchy of Control' methodology, it was decided by the Mobile Maintenance team to engineer a solution.

Due to existing platforms located around the front and side sections of the cab, and with the existing hydraulically activated access steps, the solution that appeared 'best fit' was to utilise an extension of the existing platforms. Interestingly, this scenario presented logistical issues due to the articulation of the motor grader in operation. As such, a 'fixed' platform was not deemed a possibility. A retractable platform was viewed as the most practical outcome utilising the existing hydraulic circuitry of the in-situ hydraulic access steps as a trigger to lower and/or raise the platform. This outcome meant that operation of the motor grader would not be compromised yet a safe and effective means of accessing the rear windows could be incorporated into the design of the machine.

After an initial site inspection, and after determining the required specifications, an external contractor (MRG) was engaged to assist in design and preliminary design drawings were drafted. Consideration was given to operator safety, maintenance issues, visibility, access, and emergency egress.

The initial design drawings incorporated a fold-down platform design but was deemed not acceptable due to the fact that the platform's default position meant that it was not a fail-safe system for the operator. Through the risk evaluation process, it was noted that should an operator be standing on the access platform and a mechanical failure occur, the platform would fold down to its default position, trapping or dislodging the operator. The second attempt at design proposed a design in which the platform defaulted to a lowered position in the case of mechanical failure. While this new design presented a limited amount of risk of platform damage if the platform was to lower while in operation, warning systems from the existing hydraulic access systems already incorporated in the operator cab meant that this risk was minimal and adequately controlled when considering potential outcomes. As such, this design was approved for construction and trial. In conclusion, the final design incorporated the platform in a fold-up state when actuated by the existing stairs hydraulic circuitry with a fail safe to the deployed position. Additionally, a set of emergency egress steps were incorporated into the design for redundancy. This unit has now been operational in trial for more than 12 months, with positive feedback from all operators on safety, operation and visibility. There has been no case of mechanical failure of the platform or operating systems.

Benefits

This access system has allowed unfettered access to safely clean rear windows on the right hand side of the 24H Motor Grader with minimal reach to clean all rear window areas of the machine. Emergency egress stairs are manually folded up with sufficient clearance for full functionality of the blade and all other operations of the motor grader. These stairs are easily deployed with a foot lever – further reducing the likelihood of manual handling related incidents. The platform is automated as it raises to the 'hold' position as soon as the hydraulic steps are powered and raises. As soon as this function is actuated, the rear access platform folds up allowing full articulation and use of grader functions. Until the existing hydraulic stairs are fully retracted and the machine handbrake released, the machine is safe guarded and will not move.

Transferability

With the platform made to fit location tabs on the existing cab, the platform system can be manufactured to fit to any Caterpillar 24H Grader with confidence and minimal effort. This design with minimal changes, could be fitted to any Motor Grader fitted with a hydraulically powered step or alternatively with a self contained hydraulic power supply. Additionally, the concept of utilising existing systems to be integrated with additional safety controls has endless possibilities.

Innovation

The platform system has allowed the operators to clean all the windows on the Caterpillar 24H by safely folding up, and interlocking with the existing stairs without additional control panels or switches.

In summary, the Mobile Maintenance team was presented with a problem. A solution was found by utilising risk assessment tools and techniques, recognising the hierarchy of control and integration with existing systems. The team has shown that with innovation, team work and dedication, it is possible to remove potential hazards, reduce risk and improve safety at the workplace. During the initial design concept, the team identified a number of changes required, came up with solutions as a team and drove this innovation from an idea to a solution.

This innovation and outcome demonstrates the value of early identification and reporting processes with redundancy. The Caterpillar 24H Motor Grader Rear Window Access System is testimony to a process that starts from the initial identification through the site 'hazard reporting process' through to the final outcome. It demonstrates that all reports are treated with a view to true resolution and reflects a robust safety culture in which all staff feel confident in reporting hazards.

Approximate Cost

The approximate cost of the design and fabrication of the Caterpillar 24H Motor Grader Rear Window Access System is approximately \$9,450 (including initial prototype development costs). It is anticipated that with a number of systems being fabricated concurrently this cost would substantially reduce.



Picture 1
Rear access platform in the 'raised' position.



Picture 2
Rear access platform and emergency egress steps in raised position.



Picture 3
Access platform in the deployed position.