

enclosure is a protective barrier of some sort that separates the lift operator from the hazard of foreign objects entering the workspace.



Incomplete guarding of the operator workspace can result in collision accidents

There are a wide variety of types and brands of forklifts with various operator workspace sizes and shapes. Regardless of the type of lift, one principle applies to them all – a fully enclosed operator stance. The authors have seen many forklifts with partial guarding or no guarding at all – an operator enclosure that covers the bottom half of the operator, an unguarded operator stance on walkie-rider lifts, an operator enclosure without overhead protection, etc. The authors have been involved in forklift product litigation cases with insufficient guarding of the operator enclosure. Alternate designs were developed to show that guards can be used to protect the operator workspace. The following photograph shows one such guarding solution.



Forklift from previous figure shown with added operator enclosure

The existence of an operator enclosure on a lift does not ensure the safety of the operator. Enclosures must be subjected to a rigorous engineering analysis of the maximum force an operator enclosure will encounter and the potential different vectors that forces will act on the enclosure. In lay terms, the forklift operator enclosure must be designed so that it is strong enough and enclosed enough to truly protect the operator in the worst-case scenario. Factors of safety must be built into the design as well. Factors of safety are an engineering concept that accounts for any variables not taken into the design. Especially where people are at potential risk for injury, it is imperative to design protection elements such as an operator enclosure to be stronger than the worst-case scenario would dictate. A factor of safety accounts for factors such as elemental conditions, use, mis-use, etc. Factors of safety ensure that a product will be viable years down the line.

The operator enclosure should be designed to be able to withstand an overturn. This means that the operator cab must be designed to be strong enough to remain intact if the lift should overturn and become upside-down. A high-strength operator enclosure such as this would also prevent injury to the operator in the event of a heavy object falling from above. An operator enclosure randomly designed without calculations and engineering analysis is very likely to be under designed. Dynamic forces should be considered in the design of the operator enclosure, both from an overturn and from a dropped object. These dynamic forces are dependent on the weight and movement of an object. Some lifts have operator enclosures with guarding, but some of these are inadequate. An inadequate operator enclosure can be extremely detrimental to operator health because the operator will likely think that she or he is safe and protected in the enclosure. Enclosures that protect against certain hazards and collisions from certain directions but fail to protect against collisions from all directions are not safe and do not follow the design hierarchy.



Reach Truck with post protecting operator

Openings in the operator enclosure should be small enough to prevent entry through the enclosure by small falling objects and by small stationary objects that may be a collision hazard. The motion of a lift truck must also be considered when designing an operator enclosure. An operator guard that protects the operator from a frontal, overhead, and side collision must also protect the operator when the lift truck is driving in a curved path.

In many industrial lift-truck accidents where the operator is injured, incomplete enclosures are often found to be at blame. Lift manufacturers that refuse to equip their lifts with operator enclosures because proper operation will prevent the need for an enclosure, are neglecting the human factors aspect of design. Human factors is a part of engineering design. Human error is an absolute, human error WILL