Deflections

Dropped objects that deflect off of a surface can pose just as great a risk to workers as objects that do not bounce or deflect. That’s because, while designated “Drop Zones” may keep workers and others outside of a designated at-height work area, tools like the 8.3 lb. (3.6 kg) wrench referenced in the falling object deflections illustration below could theoretically deflect and travel horizontally up to 420 ft. (128 m). It’s unlikely that distance would be accounted for by a “Drop Zone” barricade, so potential victims would be unsuspecting and unprepared.

Falling Object Deflections

“Dropped Object Deflection Study,” Southern Polytechnic State University.

Objects don’t just fall straight down!

The diagram below illustrates how far an 8.3 lb. (3.6 kg) wrench could theoretically deflect after hitting a 20 ft. (6 m) off the ground.

Hand tools and materials can become drop hazards in three ways:

1. During usage: Vigorous use and other factors such as overtiring of the worker, loss of balance or proper grip, etc., can cause the user to lose control of the tool. Vibrations of heavy machinery may also cause unsecured tools to fall from surfaces they are resting on in between use.

2. Transportation of tools: Transporting tools to or from location of work, sharing and handing tools to other personnel, and worksite collisions involving personnel or materials are common occurrences whereby tools may be dropped.

3. Improper housekeeping issues: After use, tools may be unintentionally left behind or placed aside on the working surface where they are no longer secured or being controlled.

Fatality Alert – U.S.

A truck driver came onsite to offload a pallet of materials. A worker 50 stories above dropped his tape measure. It hit an object on the ground, and deflected upwards, striking the driver in the temple and killing him. Media reports following the incident noted that, “He wasn’t wearing a hard hat.” Even if he had one, he was struck from below on the temple where a hard hat would not likely have protected him.

Drop Prevention

The term “Drop Prevention” encompasses a spectrum of techniques and equipment designed to minimize injury, downtime and costs due to drops. The primary and secondary approach to dropped object prevention states that employees should always have two lines of defense against dropped objects.

Primary Drop Systems are those employed to prevent an object’s ability to become a drop hazard in the first place. A primary system is typically the worker’s grip on the tool but may also include the tool’s main support system (i.e. if it is holstered or left sitting on a work platform). For example, if a worker is overtired and his/her hand slips, the tool may fall, thus losing the primary form of drop prevention. If a tool is left on a work platform after use, wind, personnel, or vibrations of heavy machinery nearby may cause the tool to drop over an edge.

Secondary Drop Systems are utilized as a backup system in case the primary system fails. Secondary systems may include passive systems such as guardrails with toe-board and mesh netting, screens, floor/hole coverings, and tool canopies that have side protection. They may also include tool restraint systems which are utilized to secure a tool or object to an employee or stationary structure to prevent it from falling (these include pouches and spill control buckets). Tool arrest systems include tool tethers, which prevent damage from a dropped or falling object after it has fallen. The tether arrests the fall of the tool and prevents the tool from striking a lower level and others below.

Like the Hierarchy of Fall Protection, which should be familiar to many at-height workers, dropped object solutions can be categorized similarly:

While eliminating or even substituting the hazard is typically the preferential action—such as performing a task at ground level—this is often not feasible for tools or materials.

Passive Systems include tool canopies with both top (and added side protection if the potential for deflection exists), guardrails with toe-boards and mesh netting or screens small enough to prevent passage of tools through the railing, and floor/hole coverings.

Tool Restraint may consist of tool holsters, pouches, and transport buckets such as the Safe Bucket, which allow tools to be safely secured inside until they are needed. Small and large tools, bolts, and accessories can be contained inside tool pouches and bags with hook and loop closures, a zipper or neoprene sleeve, which may be attached to the worker’s harness or work platform.