A Primer on Engineering Controls

As a concept, engineering controls are relatively simple. They are the preferred methods of hazard control that function by separating worker from hazard.

Seems simple enough, right’

Just the same, it creates some confusion in safety management because coming up with a concise definition that works in every situation is elusive. There are plenty of definitions floating around, but the practical application can be less obvious.

I once heard it described like this: ‘An engineering control is one that protects you even if your eyes are closed.’ That gets us part of the way there as a tongue-in-cheek definition, but needs a little elaboration. What is meant by this’

An engineering control doesn’t require any specific knowledge, compliance, awareness or practice on the part of the involved worker. They’re controls that should simply work on their own if they are properly implemented. They isolate workers from hazards through forethought and consideration of the task as it is designed: built into processes, work areas, equipment and tools. They can be sometimes confused with certain PPE controls, with a key distinction being that PPE isn’t intended to prevent an incident, but lessen its impact.

If a hazard can’t be eliminated entirely, engineering controls are the most effective ‘ but often most expensive ‘ of the control options. In pure safety terms, this method is always given priority where practicable, but cost may factor in. Engineering’s seat at the top of the control hierarchy is something any fledgling safety pro knows ‘ or, for that matter, anyone working in a hazardous industry ‘ but how well is this philosophy applied’ Do you know an engineering control when you see one’

Types of Engineering Controls

Engineering controls exist in three basic varieties: process controls, enclosure/isolation, and ventilation.

Process Controls

The classic control hierarchy diagram included *elimination* and *substitution* as their own control types, but modern teaching sometimes lumps in substitution as a type of engineering control, since it involves process design. Process controls might involve substituting a safer alternative for a hazardous one in planning the way a process is done. For example, using steam to clean equipment as an alternative to a hazardous solvent.

These control methods involve changes to processes (ideally from the start) that separate workers and hazards by design, hence the inclusion in ‘engineering controls.’ Perhaps toluene can be used in place of carcinogenic benzene for a process, thus reducing one hazard. Maybe a totally chemical-free process can stand in, or maybe the process isn’t really needed at all. This kind of evaluation at a process design stage helps prioritize and implement engineering controls from the start, rather than applying a patchwork of rules and PPE to try to make it safe later.

Enclosure and Isolation

The type of control most commonly associated with engineering controls is one in which a guard, partition or other physical barrier is put in place between a worker and a hazard.

A guardrail is usually the go-to example of this kind of control ‘ it prevents access to the hazard (in this case, a height) by physically blocking the path. It wouldn’t require the attention of the worker to do its job or any specific training, and it doesn’t rely on the worker to remember and follow rules.

This is one of the reasons engineering is considered the best hazard control (other than elimination) ‘ you can set it and forget it. The entire subdiscipline of machine guarding falls into this category.

(Learn more in 6 Things to Look for When Selecting Machine Guards)

Ventilation

The last of the engineering control subtypes, ventilation, is a familiar concept to most everyone. Making sure it is adequate, functional, compliant and safe, however, is a very technical specialty.

Ventilation is used to control the hazardous exhaust from certain processes such as chemical vapors and fumes from hot work. It involves the mechanical movement of air by either removing it from the local area or diffusing harmful substances by introducing replacement air.

Simple as it seems, on a large scale ventilation is an involved process with complex calculations. Standardization bodies such as ASHRAE and ANSI publish guidelines on air replacement, flow rates, and construction of ventilation systems. To take one glance at these standards reminds the reader where the ‘engineering’ part comes from ‘ they are a maze of formulae, graphs, and figures.

Maintaining Engineering Controls

As with any hazard control, engineering controls have to be consistently monitored to ensure they provide the desired protection without introducing secondary hazards, and they have to be inspected to make sure they do not degrade, weaken, or fail. That would include everything from structural barriers all the way down to machine guarding.

Inspections should always be carried out by a qualified person who knows what to look for. Just because a hazard is controlled by an engineered method does not mean it will be so forever. On the contrary, inspection and maintenance is always required.

There’s More to Safety Than PPE

The discussion of hazards has been a hot topic the world over recently. The public has received a crash course in all types of controls related to biological hazards like viruses.

A lot of the talk has been about PPE (an industry term that is suddenly commonplace), but you certainly see evidence of engineering controls in everyday life now, including shields and barriers or reaching devices that allow for greater separation. Some of it is inventive, and at least there seems to be an some understanding that engineered controls are preferable (where practicable) to administrative or PPE controls.

Everywhere you go with customer service involving face-to-face interactions, you find plexiglass barriers ‘ this is an engineering control application outside of industry. The hazard in this case, of course, is you.

Source: Safeopedia By Daniel Clark