



## Ahead of Schedule and Under Budget

The role of system safety engineers is to ensure the inclusion of design-based safety so that projects are completed ahead of schedule and under budget. Removal of hazards during planning and project design includes examining each piece of equipment to be used on the construction project. Most serious construction injuries and deaths caused by workplace accidents can be traced to inherent hazardous design defects. Construction workers are often unaware of these defects and, even if they are aware, they have no authority to improve on the design.

In the Spring 2017 issue of *Journal of System Safety*, Charles Hoes made it clear that the development of flood control projects that include multiple dams and dykes needs to be considered as a single system — not as unrelated separate projects — to better develop safe design. In addition, the article “Risk-Taking Too High” in the May 8, 2017 issue of *Engineering News Record* is about a shameful study undertaken at Oregon State University School of Engineering. The study *assumes* that many workers take more risks than they should, which is a gross disregard of the need for design-based safety that removes the hazard that is a source of “risk” taking. I would argue that the study could even be considered racist, as it targets Hispanic workers, who account for 20 percent of highway and road deaths, and are a disproportionate number of victims of fatalities. This type of speculative study by a Ph.D. graduate candidate seems to blame the victim for his or her crippling injury or death. Interviews of 149 workers, all of whom sustained injuries, in some 36 states failed to identify the hazards that created an unsafe workplace.

It is a well-known response of injured people to blame themselves for taking a risk, as they do not want to appear stupid for not being aware of a hazard. I believe that some in academia have little understanding that safety controls are best when they *eliminate the hazard* rather than try to manipulate behavior.

The role of educators is to give those who seek a degree in engineering the skills to identify and elimi-

nate hazards at time of design, so projects will be completed in a timely manner and within budget. This is the key role of design-based safety — to prevent the project from being compromised by design defects that can cause damage or injury.

The adoption of automation creates a great priority for design-based safety because human performance is eliminated from the equation. With this new priority for safe design, reliability becomes a key measure.

Projects that develop the design of huge driverless ore trucks used in open pit mining, for example, require many new skills of the safety engineer. Engineers need to understand the diversity of the supportive systems that allow the driverless truck to continuously operate 24/7. First comes global positioning, which defines the route of travel. Next is an array of sensors that collect data. Then there is the software that stores this information and is able to continuously sort and monitor for a dangerous change in condition. All this must be considered in designing a fail-safe automated ore truck and other machines.

Safety in this new world of automation becomes a key issue in design. Gone are the days of monitoring construction, manufacturing, mining and other production activities that create the possibility of worker error. Automated systems should include prevention of serious failures. Automobile collision prevention, with automatic braking capability now being advertised in many makes and models, enables the prevention of car collisions by using technology that senses and prevents failure faster than human perception could.

“Ahead of schedule and under budget” proclaims a new role for system safety engineers. A comprehensive test and evaluation is required so that automated projects function flawlessly. This is the key to ensure a reliable and safe performance. The concept of “ahead of schedule and under budget” heralds a new profession of safety engineering with many niches in professional practice. ●