Domesticated guinea pigs are a valuable laboratory research animal for testing new medicines. Far too often, the testing of new machines and products is done on 300 million U.S. citizens who are used as research animals (guinea pigs) to identify hazards. In most instances, design-based safety hazard identification is easy. It is a shameful Stone Age methodology to wait until someone is maimed or killed to identify hazards inherent in machines or products. It is no wonder that the safety profession is often considered to be suspect when it attempts to manage hazards as a function of lifecycle performance, rather than eliminating them at time of design.

The financial, judicial and regulatory standards establishments offer little assistance or support at time of design when trying to eliminate hazards that produce a series of serious unintended consequences. Financiers rely on speculative “risk” assessments when estimating monetary losses so that for-profit insurance companies can pay for the damage that unidentified hazards may cause. Little concern is shown for protecting people from injuries from these unidentified hazards.

The goal of the justice system is to assess the validity of injury and loss claims so that a reasonable recovery is provided. It is beyond its scope of authority to ensure design-based safety. Oversight by government or voluntary agencies is a toothless effort to ensure the use of standard operating procedures that will accommodate hazardous conditions and circumstances. The development of safe practices after a hazard has caused a history of misery and deaths. Design-based safety provides product developers with the foresight to identify and eliminate hazards by analysis and/or testing before the product enters the public marketplace. For our safety profession to have credibility, we must shift our primary emphasis toward the elimination of hazards at the time of planning and design. Safety training needs to be refocused to ensure that the vice presidents of finance, legal, procurement, engineering and operations have a basic knowledge of the profitability of design-based safety. With the proliferation of countless environmental, human rights, safety and taxpayer activists, the survival of enterprise has become totally dependent on its ability to eliminate unsafe products and services before they reach the marketplace. The recall of dangerous automobiles, machines, medicines and toys is an archaic and costly method of removing such dangerous products and services.

To meet the public’s democratic involvement, which demands safety and environmental protection, the safety profession must develop a strong public relations program that shows how alternate, safer design has eliminated hazards and saved millions of lives. Everyone knows that the Salk vaccine prevents polio. What the public does not know are the many safe design features that, in the past, have prevented hazards from causing many wrongful deaths and injuries. The public needs to be made aware of how Rollover Protective Structures (ROPS) on mobile construction and farm equipment save thousands of lives every year. The list of safety features on automobiles, cranes and all sorts of other machines and tools goes on and on, but fails to include information about the lives that have been saved and can be saved. The other evening, a television news commentator used Stone Age guinea pig injury data in telling how many lives are lost in grain silos when the collapse of an arching dome entraps and suffocates young farm workers who enter the storage area to restart the flow of grain into the conveyor in the bottom of the silo. (Arching occurs when the grain at the top of the silo forms a dome, causing the grain to fall away from underneath it. This void collapses when someone walks out onto it, trapping the individual.) All the reporter did was cite the employer’s negligence. He said not one word about how an alternate mechanical safer design could automatically ensure the constant movement of the grain, thereby preventing arching and eliminating the need for workers to have to enter the silo in the first place.

We need to shout from the mountaintops how design is the first step in safety.

Stone Age guinea pig hazard identification endangers the public. Reliance on an injury occurrence to identify a dangerously hazardous machine design gives
Exposed moving handrail on escalators can pose a serious safety hazard. Accidents may be rare, but when they happen, they can be debilitating or fatal.

no priority to, nor does it ensure for, the allocation of well-established safe design criteria. Design-based safety is not a mystery — the danger created by mechanical hazards has been well known for years. The following well-known safe design standard proves the point that blind acceptance of a hazard does exist:

“All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels or other reciprocating, rotating or moving parts shall be guarded when exposed to contact by persons or when they otherwise create a hazard.” (Emphasis added).

An escalator’s handrail speed of 1.5 feet per second is the only information available to identify this serious hazard. Additionally, international standards research specifically shows that Norway requires that any exposed moving handrail belt that rotates 180 degrees to reach the top of the handrail be guarded. So what happened? There is really no need to identify who, where or what when discussing the pending litigation about this hazard. Stone Age guinea pig hazard identification was used in this hazard occurrence. While waiting at this landing for his companion to make a cell phone call before going down the escalator, a young teenager backed into the portion of the exposed rotating handrail escalator belt, was propelled instantaneously upward and over the handrail and fell three stories, head first. It is a medical miracle that he survived, but he is in a vegetative state on a respirator.

It is an inexcusable management culture that overlooks a hazard that may cause a rare event. This terrible injury proves the acceptable risk theory to be anti-safety. After-the-fact investigations revealed other similar occurrences, but they were without such devastating unintended consequences.

Design-based safety is not a casual process. It requires diligent review at the time of machine design and again at the time of installation. My previous column, “15 Secrets of Hazard Prevention,” (Journal of System Safety, p. 19 and 20, September-October 2012) tells of the third flight of seven steps in the seven categories of hazards. The first step is “Natural Hazards,” which discusses the variable of human performance and the constants of physical conditions. There is no way that the teenager would be aware of the hazard that the rotating portion of the handrail presented. The second step is “Mechanical and Structural Hazards,” which reveals that the rotating portion of the moving hazard is a hazard that always requires guarding.

Design-based safety has the tools to reliably identify and eliminate hazards, so Stone Age guinea pig hazard identification can be discarded. The good news is the gas and oil industries have adopted design-based safety to overcome the hazards of fracking when pumping high-pressure fluids underground to crack the rock to extract natural gas or oil. This came about when environmental groups, to advance their cause, unrealistically proclaimed that gas and oil should remain in the ground. Developing our own natural fuel resources allows our country to discontinue purchases of oil from unstable countries and reduces our trade imbalance. Development of our gas reserves allows time to convert more of our energy needs to renewable sources of solar and wind. Natural gas is clean burning, producing only half the CO2.

Major oil and gas companies, along with major established environmental groups and green engineering firms, have chosen to engage in design-based safety to ensure the prevention of water-table contamination and other hazards by establishing design standards and providing oversight through the Center for Sustainable Shale Development. A task force has been formed to develop environmental safe design requirements and provide a certificate of compliance for both design and installation. This will provide many opportunities for engineers with the transferable skills of system safety. Stone Age guinea pig identification of hazards will be relegated to a dustbin of safety archeology.

Exposed moving handrail on escalators can pose a serious safety hazard. Accidents may be rare, but when they happen, they can be debilitating or fatal.