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Risk Management to Risk Elimination – Incident Prevention Using Data and Design

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Introduction

Having been involved in safety inspections for decades the authors have seen that inspection data collected has been muted by operational indifference and contaminated by corporate caveat. The result is firms can beat their chests and announce they have collected "over 1-million unsafe observations" yet still enter whole numbers in the OSHA 300 fatality column.

The following paper will focus on two areas only. How best to collect real observation data, what to do with that data, the care and feeding of those who find those unsafe conditions and then offer several ideas where you can eliminate hazards and yes, increase your profits. What the authors have discovered will make a difference using data from farming to pharmaceuticals but first the reader will need to accept that risk management is a temporary thing while risk elimination – that is forever.

Collecting Real Observation Data

We have to consider how data is collected so that it can be used effectively. Can this data be used to predict workplace injuries so they can be prevented? The simple answer is yes. This has been confirmed by research by teams from private companies and Carnegie Mellon University (CMU) – the same CMU team that helped develop the Watson supercomputer that gained fame by beating the top "Jeopardy" champions and has since been applied to helping doctors diagnose rare and complicated diseases.

Using a data set of over 112 million safety observations and their associated safety incidents recorded from over 15,000 individual worksites, the researchers proved that workplace incidents can indeed be predicted before they happen with high levels of accuracy. Once it was

determined that predictive analytic models could accurately predict workplace incidents, the next step was to identify factors that influence incident levels and what steps organizations can take to optimize their injury prevention programs and ensure employee safety. What they found were four barriers that fall into two subsets – how safety data is collected (both quantity and quality) and how safety data is managed and used.

Typically data is collected and the unsafe or at-risk finding symptoms are treated – oftentimes superficially. This process is interestingly coined as 'Whack-a-mole' in a book of the same name by author David Marx. What occurs is causal factors – what led to the unsafe or at-risk event – are rarely discovered and the unsafe events continue at the next, earliest opportunity. This can be avoided with clear expectations and diligent feedback to observers through a detailed coaching process.

Besides data collection, we have to consider how best to use the data to drive continuous improvement as part of a management cycle. W. Edwards Deming introduced a simple, yet effective, continuous improvement cycle that produced tremendous results called the Shewhart cycle. The cycle can be broken out into four components – Plan-Do-Check-Act. In order for continuous improvement to occur, this PDCA cycle must be a closed loop – no steps can be removed.

What the authors typically witness during data collection of safety observations is a focus on the Plan and Do aspects of this cycle but very little is done on the Check and Act. Karl Weick and Kathleen Sutcliffe, in their book "*Managing the Unexpected*", introduce a concept known as 'mindfulness', accomplished by embracing failure through critical learning and acting on 'weak signals' before significant incidents occur.

This enhanced data collection and review process will provide the necessary data that can, and should, lead to preventative efforts and, in particular, prevention through design techniques.

The Move from Risk Management to Risk Elimination

What We Know

The traditional role of the safety cop applying discipline and fear to good people just trying to work is fading away. The safety inspector who carried a knife to cut unsafe cords is being recognized as an artifact by the new generations of safety professional.

The data we collect from inspections now focuses on those high hazards we want to eliminate from the worksites like falls from height or onto rebar. Slowly the emphasis on counting how many people are wearing their safety glasses is being replaced with a focus on those small contributors that when aligned - will allow people to fall or a crane to tip. When someone's father is on the ground, shattered and leaking after falling through rotten scaffold planks – his kids don't care if he was wearing his safety glasses before he died.

Firms that accrue millions of safety observations – of the same thing…are blind to the need for a remedy. One firm was concerned over rigging condition after a significant event and their quarterly inspections of all rigging continued *for years.* If your observations highlight a hazard after a few months – further inspections are not the answer.

Consider that each day we continually collect loss and inspection data to show what activities are unsafe, like working from a ladder, yet we don't focus on the ladder. Although a useful tool for some activities, ladders present well recognized hazards to the user. But moving from ladders to a safer work platform is difficult for the "*that's how we have always done it* "characteristics of some firms is a tough barrier to break.

Two examples are offered. One contractor recognizing the cost of their ladder falls from injuries and data collection arranged a program for "permits" to be obtained for a ladder to be used to control their use. A second firm rolled out a contest looking to the field for "smarter ladders". One of the suggestions awarded was an alarm that would sound when someone placed their feet on the upper steps. Not one of the suggestions for improving safety mentioned replacing the ladder. Honorable attempts certainly, but when the opportunity to replace a hazard is found, it must be embraced, always. Risk management is applying a permit to use a ladder but *risk elimination* is replacing ladder use as often as you can. The author refers to that philosophy as "Ladders Last".

A simple but powerful example of incident prevention using PtD is offered. When a mechanic came off a snow covered roof and entered the elevator room he slipped on the smooth surface of the concrete floor breaking his arm. When the architect was later interviewed on why a smooth floor was chosen and not a brushed surface with that added traction his answer was *"smoother is easier to sweep"*. That fall condition, and hazard will exist during the life of that building but would have been prevented through smart design – at no additional cost during construction. Dave MacCollum, an expert in the field of safety, calls these conditions "Armed Hazards".

What is working?

Inspections of today are often seen as a time for a "correcting conversations" and the opportunity for talking with people who simply many not know what right and wrong look like. Instead of scolding those who do wrong (though some of that may be needed) we are now working *with* those doing the task.

Efforts in coaching now trend toward motivation and recognition of the individual to make the right choice when confronted with a hazard. Eliminating someone from making the wrong choice can be resolved using Prevention through Design and that is the focus of this presentation. Conflicts in the field (when someone acting unsafe) need to be corrected but can be avoided - when the concern is eliminated. As Chris Golden, CSP once noted about PtD "*You can engineer out that conversation"*.

Data-driven Prevention through Design (PtD)

The savvy safety professional recognizes that in most cases the "unsafe" worker is only trying to do his or her job in a system designed by others and using the tools they are given. They would rather not use a ladder that is too short – but that is what they were handed. Inspections will tally the unsafes but the operational decision allowed that condition to exist.

Workplace design takes place early when the project is conceptualized. Goals must be established as Peter Furst notes based on "zero-harm" and "value" to the owner for the life of their building. For example, mechanical room gauges are often put well off the floor to keep them

from damage. PtD would define that boiler gauge to be installed out of the way but at eye level. This prevents through design the need for those installing the gauge to work at height and later the user of the gauge – can stand safely on the floor to read it. But for this example to be realized and the worker/user protected, PtD must be considered as the project team designs.

Following are just some examples where data has driven Prevention through Design through work planning:

Construction and Renovation of Buildings

- *Nothing Hits the Ground (NHG)*: Housekeeping was a consistent inspection finding across many sites. The trip and fall potential a messy site offers had to be remedied. Correctly named by safety professional Paul Huntley a site is now designed so no debris can accumulate on a walking or working surface. All materials delivered or used are in bins, or on wheels or other methods that make moving them easy. In the NHG workplace design, if a stud is cut, the end falls into a container. When pipe is threaded those cuttings and oil (that otherwise would get tracked across the floor) fall into a bucket for proper disposal. The NHG philosophy is being embraced across the country for there is also a significant return on investment for the handling of material is significantly reduced. Consider that on many construction sites the waste end of a steel-stud is handled four times for disposal but using NHG – twice. Labor is cut in half and your site is cleaner.
- *Ladders Last*: After a review of ladder incidents and unsafe observations from field inspections, the author was tasked to find a solution. A brainstorming session with a team of site safety managers on how best to approach working at height was initiated. They considered the inspection findings and the likely motivators for unsafe work at height and produced a list of recommendations. Based on these findings, some provided by Crown House Technologies in the UK Mobile Elevated Work Platforms (like a scissor lift) were found three times more efficient than other methods so the "Ladders Last" approach was rolled out. Though there are locations where ladders may be needed (final work in a finished mechanical room) the potential for ladder falls can be reduced by placing workers within the safer confines of a lift or work platform like a Perry-type scaffold where he or she does not need to make a decision to tie-off or step on the top of a ladder. Ladders can still be used but, as a last resort – Ladder Last.
- *Powered Industrial Trucks*: Such trucks, like a Lull or Telehandler, by design often eliminate the chance for an operator to see to the right due to the arm of the boom placed at eye level. Several manufacturers have redesigned their equipment so this dangerous obstruction is eliminated. The additional visibility provided by PtD increase site safety and likely efficiency as well. A smart owner and contractor would insist only these types of lifts are used for soon a clever attorney will questions why one was not used after an incident and further drive replacement of this sight-limiting equipment.
- *Get Bent*: Impalement hazards from rebar are a consistent threat on a construction site and a high-hazard finding during field inspections. A study on the types of protection that were available was conducted including all related costs from storage to maintenance. Though caps and wooden troughs can be used, they often are dislodged or the caps or wood covers "borrowed" by other trades. It was confirmed that simply designing the rebar to have a candy-can bend on the top – eliminated the threat. *It was also the cheapest method of protection* and did not require any maintenance. Additional protection was also realized during the pour for in most cases that is when impalement protection is removed to place the

concrete – exposing the workers. Using the "Get Bent" approach that hazard is being engineered out and the risk – eliminated.

- *Skylights:* A common hazard on the U.S. is people falling through skylights when servicing air handlers on roofs or clearing roofs of snow. A failure of engineering in the US is most skylights (unlike Europe) will not support the weight of a person. Using prevention through design – only skylights rated for such protection would be installed.

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