## Prevention through Design "Moving from Risk Management to Risk Elimination"

TJ Lyons Stephen Gauthier

Boston Region Roundtable April 2025 1440 B.C., Bible, Moses, Deuteronomy 22:8: *"When you build a new house, make a parapet around your roof so that you may not bring the guilt of bloodshed on your house if someone falls from the roof."* 

(Design code. PtD specific.)

### Safety Pays, Safety Earlier Pays Better..." John Gambatese

"With safety typically resting on the shoulders of the construction contractor and project manager, Matthew Combs, Erland's project manager, says he found it "refreshing" to have the project's architects and engineers involved as well." ENR Magazine



Change 141: Column Splice Location

When configuring the specifications for the steel columns in the far right of the photo, the project team decided to move overhead splice connections to waist height. This simple design change eliminated work from ladders and reduced discomfort and the possibility of long-term back injury for ironworkers forced to reach up to complete the connections.

### **PtD Defining terms**

 According to NIOSH, PtD encompasses all of the efforts to anticipate and design out hazards to workers in facilities, work methods, operations,

processes, equipment, tools, products, new technologies, and the organization of work. The focus of PtD is on workers who execute the designs or have to work with the products of the design.

 The initiative was developed to support designing out hazards, which is the most reliable and effective type of prevention. PtD is important to keep in mind in all business decisions, and it requires planning and buy-in from the top-down for the most effective implementation. <u>Mission</u>: To prevent occupational injuries, illnesses, and fatalities through the inclusion of prevention principles in all designs that impact workers



### Incentives

- PtD provides a framework to deliver on the vision of an injury and illness-free workplace
- Planning for success by integrating EH&S with key business processes
- Limited resources drive the need for increased efficiency and cost effectiveness
- PtD lays the foundation for EH&S sustainability (cradle to grave)

### **Benefits of PtD**

- Reduced site hazards and thus fewer injuries
- Reduced workers' compensation insurance costs
- Increased productivity
- Fewer delays due to accidents
- Reduced absenteeism
- Improved morale
- Reduced employee turnover
- Increases a company's Competitive Advantage

### "What's in this for me?"



### The NEED: Return on Investment



(Adapted from: Szymberski, R., "Construction Project Safety Planning." TAPPI Journal, Vol. 80, No. 11, pp. 69-74.)

### **Integrating Occupational Safety and Health**

Stage	Activities
<b>Conceptual design</b>	Establish occupational safety and health goals, identify occupational hazards
Preliminary design	Eliminate hazards, if possible; substitute less hazardous agents/processes; Establish risk minimization targets for remaining hazards; assess risk; and develop Risk control alternatives. Write project specifications.
Detailed design	Select controls; conduct process hazard reviews
Procurement	Develop equipment specifications and include in procurements; develop " checks And tests "for factory acceptance testing and commissioning
Commissioning	Conduct "checks and tests," including factory acceptance; pre-start up safety reviews; development to standard operating procedures (SOPs); risk/exposure assessment; and management of residual risks
Start up and occupancy	Educate; manage changes; modify SOPs

### **The Power of Procurement**

**Pre-specification Meeting – opportunity (requiring off-site prefabrication for example)** 

The most important stage in preparing to purchase a materials or machine tool is the technical specification. This specification will articulate the requirements and options the team has identified as essential to choosing the right materials or machine tool for the company.



# Hazards to take into consideration prior and how to *Eliminate*

- Electrical capacitors; high voltage, static
- Hydraulics high pressure fluids
- Pneumatic high pressure steam, gases, vapors
- Engulfment oxygen deficient atmospheres; radiation
- Fire/explosion extreme heat/cold; noise; vibration
- Work at Height gravity falls
- Weather
- Ergonomics
- Visibility

### **Emergency Safe Stop**

Safe Stop is probably the most one important safety action of all when operating self-propelled machinery such as:

- Tractors
- Cranes
- JLG's boom lifts
- Powered industrial trucks
- Trucks



■ Fishing boats, gear hauling winches

These essential simple steps can be applied across all industries.

### **Focus on The Installation Phase**

#### **Create the Machine Tool Installation Specification:**

The Machine Tool Installation Specification is a document that details the agreed upon items to install the machine tool to Original Equipment Manufactures (OEM) standards by the buyer or an independent installation company.

Develop a Product Stewardship process with suppliers as part of PtD

### **Personal Protective Equipment**

#### Appropriate (PPE) must be available and used.

- Many entanglement accidents occur because of loose clothing or gloves coming into contact with rotating parts, tools and movement of the machinery.
- Often maintenance work increases the risk level e.g., dust exposure levels may be significantly higher for maintenance workers meaning respiratory protective equipment is required.

### **Absence of Voltage**

Absence of Voltage Tester simplifies things by automating the absence of voltage verification process. With the push of a button, workers can quickly determine voltage status and see an active indication when the absence of voltage is confirmed. This provides a new and innovative way to simplify voltage detection and meter safety by verifying the absence of voltage before accessing potentially dangerous electrical equipment.







### **The Power of Additional Contract Provisions**

All Powered Industrial Trucks (rough terrain) must be designed to allow operator unobstructed vision to the left and the right.

In the event the contractor must work on a roof or similar exposure they are required to guard all existing skylights to prevent falls.

If skylights are installed or replaced, they must be designed to support a person's weight.



### **Restricted Vision Rough Terrain Lifts**



#### John J. Hanson Sr.

FUNERAL HOM

BARRIL NY 1212

Obituary



Hanson, John J. Sr. CASTLETON John J. Hanson Sr., 82, passed away suddenly Friday, October 7,

2011. Born March 20, 1929 in Old Chatham, N.Y.,

### Redesign and Rethinking Some Examples "Well...we have always done it this way..."

 Number of fatalities in construction, struck-by and other fatalities, 2011-2019 (All employment)



Source: U.S. Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

### **Conventional Table Saws**

#### \$1.5 Million Award in Table Saw Injury Lawsuit

In March 2010, a jury awarded Carlos Osorio \$1.5 million in damages he suffered after using a table saw. He filed a table saw lawsuit after his lawyer saw a demonstration of the SawStop, a safety device that can detect when the blade comes in contact with flesh, and stops the blade. The table saw lawsuit was filed against One World Technologies, Inc., the makers of Ryobi table saws.



technology could prevent most of those injuries.

Table Saw Injury Lawyers - Ferrer, Poirot & Wansbrough https://www.lawyerworks.com/personal-Striving For A Safer Table Saw : NPR injury/table- saw-injury-lawyer/ If you or someone you https://www.npr.org/series/137392806/striving-for-a-saferlove suffered **table saw** injuries, the **lawyers** at table-saw Ferrer, Poirot & Wansbrough want to help you get the Table saws are the country's most dangerous commonly compensation you deserve for your medical bills, used power tool. Forty-thousand Americans end up in lost wages, and pain and suffering. We know that emergency rooms every year with injuries — 4000 of them many table saw manufacturers often put profits over suffer amputations, according to the Consumer Product safety when designing their products, and we ... Safety Commission. Safety advocates say a new

### Table Saws

WORKER – FINGER AMPUTATIONS BY TABLE SAW	COST
Direct Cost to Business Region	\$504,846.00
Total Profit for Project	\$3,309.00
Cost of one SawStop <sup>©</sup> Table Saw	\$1,779.00
Additional Sales Needed to Recover Injury Cost	\$16.8 Million

"To this day the company says SawStop has never been involved in a serious table saw accident and has documented more than 5,000 'finger saves.' He estimates his saws are '99 percent' effective at preventing injuries."

Morning Edition, NPR, August 10, 2017



The industry's efforts to date have failed to reduce serious injuries. So the Consumer Product Safety Commission staff says a new rule is needed to make table saws safer.

NPR/Consumer Product Safety Commission

### **Powder Actuated Tools**

"The results suggest an oversight in health information. Currently, many workers may be overexposed to lead from these tools. The tools have been used for decades without protective equipment; overexposures likely occurred. Moreover, the results indicate that workplace parties should question the accuracy of health information on SDSs."



"...exceeding the TLV by 7.0 and 4.3 times"



Clean-Tec

"Features - Free of lead and other heavy metals"

#### PtD Intervention: Manufacturing Tooling Short Handle MSD'S Repetitive Motion

Product Stewardship Deliverers New Tooling

leverage and inconsistent tightening





Spanner wrench had provision for added torque wrench Torque wrench

provides greater leverage and consistent tightening



### Rebar Protection/ROI as the Motivator





Lattice Protection



Carnie Caps (Manufactured)



Common Trough Covers



Candy-Cane Protection



*16' -2 rows of 24 (48) Impalements (initial cost)	Candy-Cane	Carnie Cap	Wood Trough	Rebar Cap
Device or fasteners	\$0.51	\$12.04	\$1.00	\$60.00
Lumber needed Labor (55/hr)install/Remove/Store or		\$13.04	\$42.16	
assemble	\$0.35	\$21.84	\$15.90	\$25.48
Total Cost	<u>\$41.28</u>	\$46.92	<u>\$59.06</u>	<u>\$85.48</u>
Cost per impalement protected	\$0.86	\$0.97	\$1.23	\$1.78
	0.00%	12.00%	43.00%	106.00%

### Tapered Pin Puller:





Homemade Tapered Pin Puller 56 lbs.

### Case and Pin puller





Jergens Industrial Supply

#121-060404 Cylinder, <sup>1</sup>/<sub>2</sub> Hollo-Rod Thru Hole Single-Acting .24 Stroke

### Steel Studs

- " "Employee was receiving a piece of spiral duct work that was being passed from a lower level up to him. The duct work made contact with the employee's forearm resulting in a laceration requiring stiches"
- "Employee cut his hand when he dropped a bracket and went to grab it. His hand hit stud."



"The EDGE<sup>™</sup> keeps injuries down and my crews working. Injuries cost money and this is the safest drywall stud I've ever handled." -Nick Latino, Owner of Drywall Specialties, Inc. (New Orleans, LA) "The rolled edge combined with milder steel makes The EDGE<sup>™</sup> safer and easier to work with than any other product we've tried." -John Punis, Vice President of Prince Carpentry, Inc. (Manhasset, NY)

### Most PtD Design Interventions \$ave





### Most PtD Design Interventions \$ave



### Most PtD Design Interventions \$ave





Cutting time reduced from 1:43 to 0.11 seconds

### Effectiveness of Design Intervention



Figure 5. Fatal injury rates in the UK before and after the Construction, Design, and Management (CDM) regulations [Gambatese 2013].



Course Description: What you learn in this course will save lives. Prevention through Design (PtD) is best defined as designing out or eliminating safety and health hazards associated with processes, structures, equipment, tools, and/or work organization. Reduce or...



Wisdom to make a difference.

#### NCSH 488: Prevention Through Design

Moving From Risk Management to Hazard Elimination



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