Prevention through Design

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DISCLAIMER: The findings and conclusions in this presentation have not been formally reviewed by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.
Number of Fatalities in Construction, 1992 - 2017 (All employment)


Fatal Injuries by Major Industry 2017 (All employment)

Construction Focus Four, 1992-2017 (All employment)

Construction Fatality Rates, 2003-2016, by Size of Firm (Wage & Salary workers)

Source: U.S. Bureau of Labor Statistics, 2017 Census of Fatal Occupational Injuries (Death numbers were from BLS online database).

Construction Employment & Fatalities by Size of Firm (All employment)

Hierarchy of Controls (HOC)

The Priority of PtD is “Prevention”
It doesn’t take an Einstein

“PtD requires a designer with a crystal ball!”

Some think of “PtD” as equipment designed by REALLY clever people

That isn’t the way it works …

The Process of PtD is “Design”

Move Hazard Elimination Upstream in Design Process

To move worker protection from an afterthought to a forethought in process, product and facility design

“Lessons Learned” are brought into Design Safety Reviews
PtD is NOT new ...

1750 B.C., Code of Hammurabi, Law 229: 
“If a builder builds a house for someone, and does not construct it properly, and the house which he built falls in and kills its owner, then that builder shall be put to death.”

(Punitive code. PtD implied!)

Hammurabi 2.0

“My company has had a safety program for 150 years. The program was instituted as a result of a French law requiring an explosives manufacturer to live on the premises with his family.”

— Crawford Greenwalt
Former president of DuPont
PtD is NOT new ...

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.)

... and now that we’re so advanced ...

[Moshe 1.0? Parapet? Railing?]
What was LEED® missing?

LifeCycle thinking
(Prior to the 2015 USGBC LEED® Prevention through Design Pilot Credit)

<table>
<thead>
<tr>
<th>“Occupants” over the entire LifeCycle</th>
<th>Health &amp; Well-Being (Illness)</th>
<th>Safety (Injury)</th>
<th>Ergonomics (MSD, Musculo-skeletal Disorder)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Building Occupant</td>
<td>IEQ credits, major focus</td>
<td>NO</td>
<td>Pilot credits.</td>
</tr>
<tr>
<td>Custodial Worker</td>
<td>Minor</td>
<td>NO</td>
<td>Minor</td>
</tr>
<tr>
<td>O&amp;M and Construction Worker Occupant</td>
<td>Minor</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

1795: Earliest Recorded LifeCycle PtD?

In 1795, during the Industrial Revolution, MASTER BUILDERS knew what was going on in the field, with those early Construction “Occupants” – and they changed their DESIGNS!

(Notes from William Jessop to Thomas Telford, engineers):

“The work on the piers was radical in several ways ... the engineers gave unusual attention to the safety of the workforce. Jessop had written to Telford in 1795, 'in looking forward to the time when we shall be laying the Iron Trough on the Piers I foresee some difficulties that appear to me formidable – in the first place I see the men giddy and terrified in laying stones with such an immense depth underneath them with only a space of 6 feet wide and 10 feet long to stand upon.' He recommended that the piers be widened. In 1800 he proposed the hollow upper sections: 'it will save five or six hundred pounds in the expence: and what to me appears most material, it will afford safety to the workmen.'"


PtD Design Process: Collaboration among multiple disciplines brings expertise and lessons learned
World Heritage Site & PtD: How?

- How did PtD make it into a World Heritage Site nomination package from Wales?
- Could it be that PtD IS truly becoming an expected cultural norm?
- Policy helps: U.K. requires PtD since 1994

NIOSH Prevention through Design – an Industry Standard

“Anticipating and designing out hazards in tools, equipment, processes, materials, structures, and the organization of work is the most effective way to prevent occupational injuries, illnesses, and fatalities.” - John Howard, M.D., Director of NIOSH

www.asse.org/ansi/assee-z590-3-2011-r2016-
ANSI/ASSE Z590.3 PtD Standard
(the process for PtD design safety review teams)

www.usgbc.org/credits/preventionthroughdesign
USGBC LEED PtD Pilot Credit
(LEED-specific criteria)
Education: Instruction Modules

Workplace DESIGN Solutions
Annual National Falls Prevention Campaign!
www.stopconstructionfalls.com

http://www.cdc.gov/niosh/construction/stopfalls.html
http://www.osha.gov/StopFallsStandDown

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Asphalt Paving & Milling Machine Redesign

Before-after asphalt fume emissions from highway-class pavers

15 NIOSH technical reports of Partnership field studies over 11 years in 7 states
- 50 different water-spray and ventilation control designs were evaluated.
- Most studies showed reductions in dust exposures.
- All 15 NIOSH technical reports available online at:
  www.cdc.gov/niosh/topics/asphalt

www.cdc.gov/niosh/construction/stopfalls.html
www.osha.gov/StopFallsStandDown
OSHA Silica Standard: Construction Exposure Control Methods

- Table 1 in the construction standard matches 18 tasks with effective dust control methods and, in some cases, respirator requirements.

- Employers that fully and properly implement controls on Table 1:
  - Are assumed to comply with the PEL
  - Not required to conduct exposure assessments for employees engaged in those tasks

What is the status of NIOSH PtD Efforts?

NIOSH Program Performance One-Pager (PPOP)  www.cdc.gov/niosh/docs/ppop
So WHAT?

Number of Fatalities in Construction, 1992 - 2017 (All employment)

Our fatality rates have DROPPED ...

... and yet, can practicing PtD in construction save even MORE lives?
The U.K. now saves **SEVEN** times the lives ...

**Construction Fatalities per 100,000 Full-time equivalents (FTE)**

<table>
<thead>
<tr>
<th>1 United States:</th>
<th>2 Great Britain:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9.5</strong></td>
<td><strong>1.31</strong></td>
</tr>
</tbody>
</table>

- 2 Construction Statistics in Great Britain, 2019p (pg. 11) [www.hse.gov.uk/construction/resources/statistics.htm](http://www.hse.gov.uk/construction/resources/statistics.htm)

Think about it

- The United Kingdom has a construction fatality rate 1/7th that of the USA.
- That MEANS: For every 7 people who die in our average construction, 6 of them would still be whole and healthy with their families ... had they done the same work in the U.K.
- Someone **IS** doing *something different* to save lives. **What?**
What could be making the difference?

- **Disclaimer:** Personal opinion based on contractors and workers spoken to.
- **Great** Worker Training and use of Safety Inspections are some of the tools that save many lives in the U.K. (add Leadership Accountability that makes training, inspections, and corrections happen).

  - ALSO: *Add PtD* – as it is foundational LAW in the U.K. since 1994.

- If I was now a corporate construction safety manager, I would focus on Worker Training, Project Inspections, Management Accountability, and PREVENTION THROUGH DESIGN.

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Verified* with the U.K.’s Bill Edinburgh

Mr. Bach was so impressed by what he saw at the Edinburgh castle, Scotland, that he interviewed “Bill” the construction manager.

Bill confirmed that the U.K. differences Mr. Bach knew of were true.

* NOTE: This does not meet NIOSH standards for validation!

This used family vacation standards only.

ALSO: Family Vacation standards did not include last names. Therefore, Bill is forever Bill “Edinburgh”
So WHAT?

The *Ultimate* Reason

*Savings Lives, Saving Families*