

# The Prevention through Design National Initiative

Industrial Water, Waste & Sewage  
Group, (IWSSG)

January 15, 2019

# Prevention through Design (PtD)

**Mission:** Design out hazards and minimize risks associated with:



Facilities



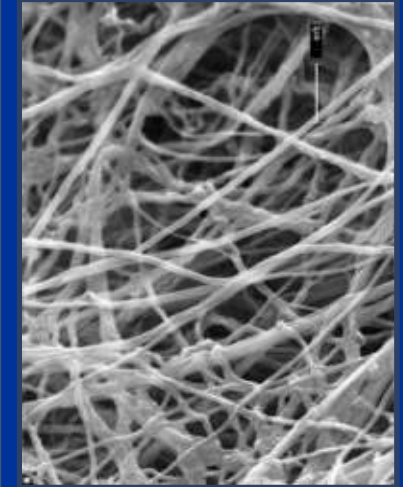
Work  
methods



Processes



Equipment



Products & new  
technologies

# PtD Incorporates Hierarchy of Controls



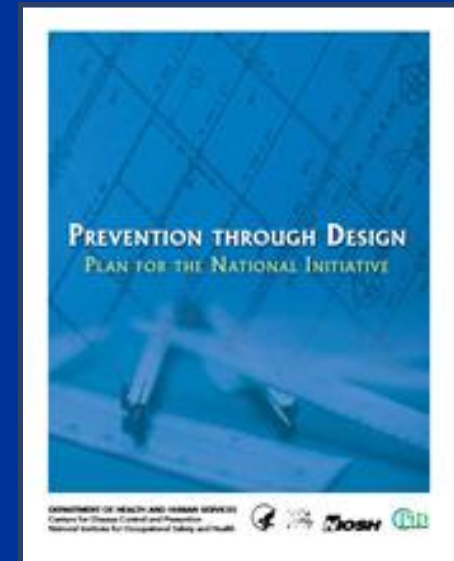
# Annual Burden of Occupational Disease and Injury

- 5071 deaths
- 3.7 million serious injuries
- 187,000 work-related illnesses
- \$128–155 billion in direct and indirect costs
- Untold pain, suffering, and impact on families

These figures represent under-estimates

# PtD is a National Initiative: 2007–2020

- Extensive stakeholder input into the goals
- Organizational partner project support
- NIOSH leadership
  - Overall program management and coordination
  - Partner and stakeholder interface
  - Project planning and execution
  - r2p translation and dissemination



# Partners in the PtD Initiative

- American Industrial Hygiene Association
- American Society of Safety Professionals
- Association of Equipment Manufacturers
- The Center for Construction Research and Training
- Kaiser Permanente
- Liberty Mutual
- Mercer ORC Networks
- National Safety Council
- Occupational Safety and Health Administration

# Research

- Evaluation of PtD legislation implemented in the UK in 1994
  - Focus group and survey of UK construction industry
  - Safety and health spread throughout project team
  - PtD recognized as important by 49% of respondents
  - Safety notes on drawings
  - Now “safety constructability” vs “constructability”

# Survey Findings

- Cost: 49% indicated no change or decrease
- Design duration: 77% indicated no change or decrease in time
- Construction worker productivity: 67% indicated increase
- Construction worker health and safety: 90% indicated increase



## Economic Evaluation of PtD [Biddle 2010]

- Return on Investment (ROI)
- Net present value (NPV)
- Internal rate of return (IRR)
- Selected design solutions
  - Mechanical Lifting Program
  - Wine Grape Harvesting Tubs
  - Wet Cleaning

# Mechanical Lifting Program Plus Zero Lift Policy

- Focus
  - Injuries while lifting
  - Workers' compensation claims
- ROI 129%
- Payback period 1.03 years

# Wine Grape Harvesting

## Designed small tubs

- Focus
  - Back pain
  - Injury
- Reduced worker turnover
- Improved worker morale
- Decrease worker pain and injury

# Wet Garment Cleaning

- Focus
  - 85% of dry cleaners use perchloroethylene
  - Exposure to neurotoxin/carcinogen
- Compared various methods including wet cleaning process
- Wet garment cleaner had highest net present value

# Practice

- Mercer/ORC survey [Newell et al. 2010]
- Survey of 35 companies – nonrandom/volunteer

# Mercer/ORC Survey Results

- 80% Knew what PtD principles are
- 66% Included PtD principles in operation
- 43% Require it for both contractors and suppliers
- 74% Identify design-related factors in incident investigations
- 66% PtD integrated into management system
- 17% of companies have established performance measures for PtD
- 34% have audit criteria to assess adherence to PtD requirements
- 21% say PtD has been successful in meeting company objective

## Survey Results (cont'd)

- Many corporate leaders still mistakenly believe that design solutions are cost prohibitive
  - They do not understand real cost of using lower levels of control

## Guidance for Including PtD in Capital Projects (CPP) [Renshaw 2011]

- Coatings manufacturing plant
- Identified effective practices for
  - Policy and standards
  - Work processes and procedure
  - Tools and practice



# Policy and Standards

- How to incorporate PtD
- Model policy
- Inclusion of PtD in ANSI/ASSP Z10 standard

# Work Processes and Procedure

- Summary made by stages, stage gates
- Safety related design variables and OSH deliverables
- Schedules
- Focus on management of change
  - Assess OSH impact before change is made
  - Every change must be managed
- Match type of OSH review to the level of change

# Tools and Practices

- Robust and in sync with CPP
- Applied properly and consistently
- By competent people
- Working together
- Straight forward and simple as possible
- Process hazard analysis

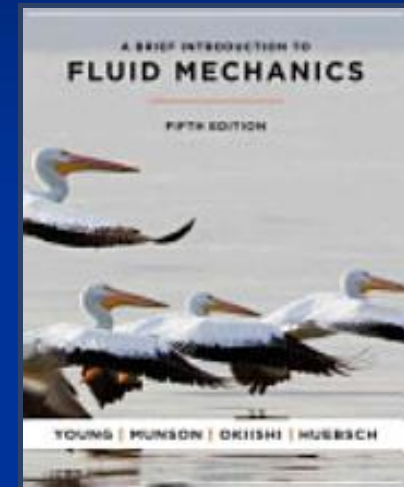
# Policy

- Establishment of consensus standard (Z590.3 R2016)
- Inclusion of PtD in ANSI-Z10 Occupational Health and Safety Management System
- PTD has been or is being included in 14 additional consensus standards



# Education

- Influence the inclusion of PtD in engineering textbooks and curricula
- Engineering textbooks
  - 3 published, expect 5 additional in the next year
- 4 engineering education modules developed



A Brief Introduction to Fluid Mechanics, 5th Edition, published by John Wiley & Sons, November 23, 2010.

# Education

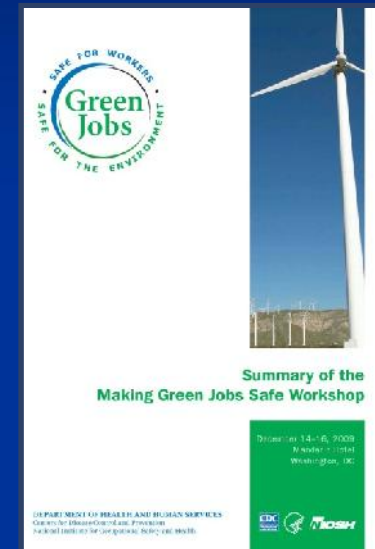
- PtD courses at Virginia Tech, University of Alabama at Birmingham, Virginia Commonwealth
- PtD integrated into engineering courses
  - Harvard, University of Massachusetts Lowell, Bucknell, Oregon State, Purdue, University of Utah
- PtD included in H&S courses at numerous universities
- PtD ASSP and AIHA professional development courses

# Education

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# Special Focus Areas

- Including PtD in the “Green Economy”
  - Developed conceptual framework for considering green job
  - Conducted a national workshop
    - 77 recommendations
  - Build PtD into LEED scoring
- Developing a hazard and control banding framework to drive PtD implementation
- Developing a workshop to include PtD in nanotechnology at the process and molecule level





# Future Needs

- Continue to build PtD into education system include other professions: businesses, architecture, and design
- Promote efforts to influence purchasers of designs to value PtD
- Increase role of workers in PtD
- Continue to assess role of design in occupational disease, injury, and death
- Improve surveillance
- Assess and overcome barriers to achieving a culture change

# Now to the ANSI /ASSP Standards Process – Z590.3

- Consensus to launch a standard
- Approval by the committee and ASSP
- Notification of the standard being launched
- Announcement in appropriate media
- Public review
- Mandatory response
- Opportunity for appeal
- Examples – A10.40

ANSI/ASSP  
Z590.3 –  
2011 (R2016)  
Prevention  
through  
Design

**NEW!**

[www.assp.org](http://www.assp.org)



ANSI®  
ANSI/ASSE Z590.3 – 2011

American National Standard

Prevention through Design

Guidelines for Addressing Occupational Hazards and  
Risks in Design and Redesign Processes

Secretariat

American Society of Safety Engineers  
1800 East Oakton Street  
Des Plaines, Illinois 60018-2187

Approved September 2011

American National Standards Institute, Inc.

# Z590.3 – Short History

- The standard has been approved –  
hurrahhh!!!

ANSI/ASSP Z590.3-2011 (R2016)

Prevention through Design: Guidelines for  
Addressing Occupational Risks in Design and  
Redesign Processes

Approval Date of Final Action: 12/14/2015

Effective Date - 2016

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# Z590.3 – The Scope

- **The Scope:** This standard provides guidance on including prevention through design concepts within an occupational safety and health management system. Through the application of these concepts, decisions pertaining to occupational hazards and risks can be incorporated into the process of design and redesign of work premises, tools, equipment, machinery, substances, and work processes including their construction, manufacture, use, maintenance, and ultimate disposal or reuse. This standard provides guidance for a life-cycle assessment and design model that balances environmental and occupational safety and health goals over the life span of a facility, process, or product.

# Example risk assessment process

ANSI/ASSP Z590.3  
2011 (R2016)

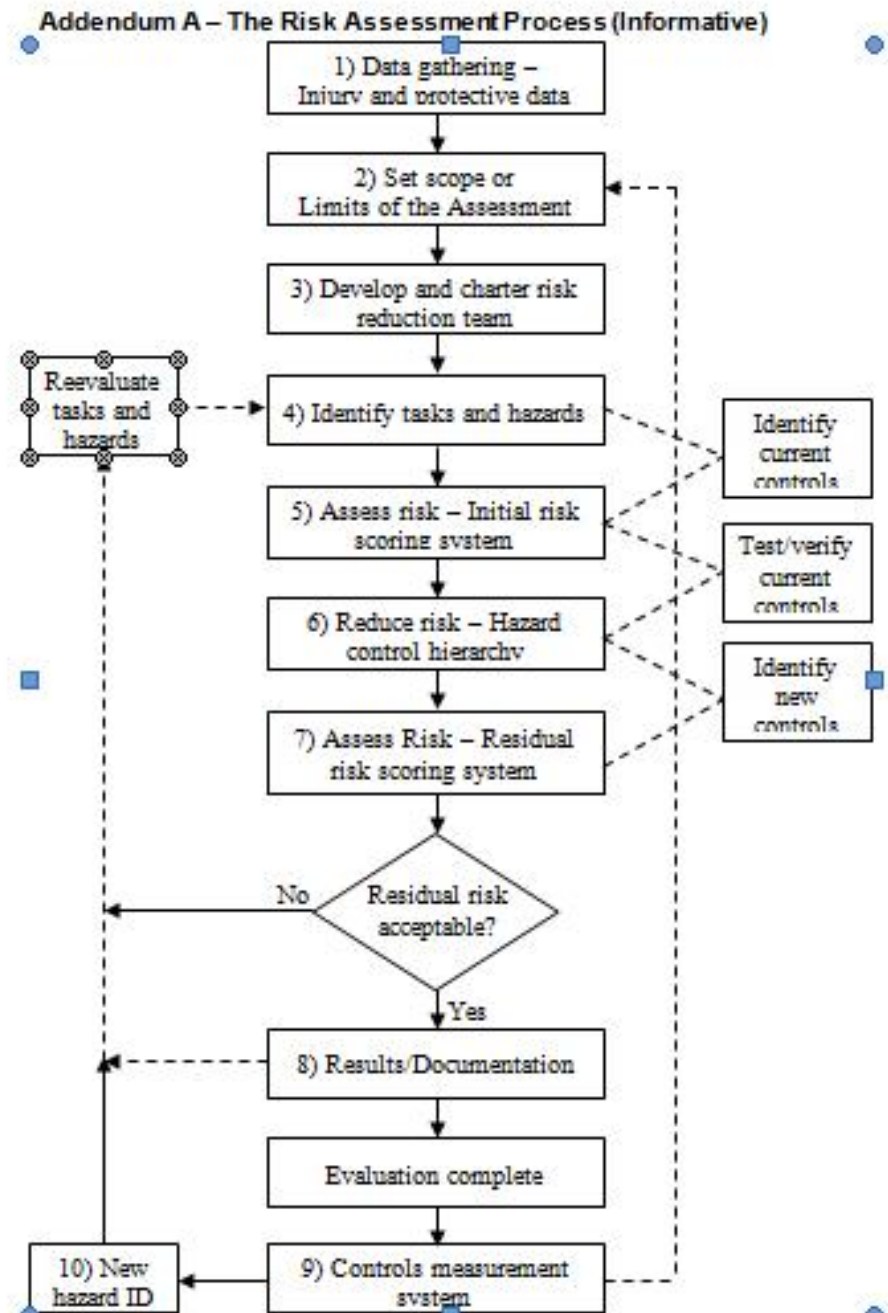


Figure A-1. Example risk assessment process  
(Others are acceptable)

# *What is RISK?*


$$\text{Risk} = \text{Severity} \times \text{Probability}$$



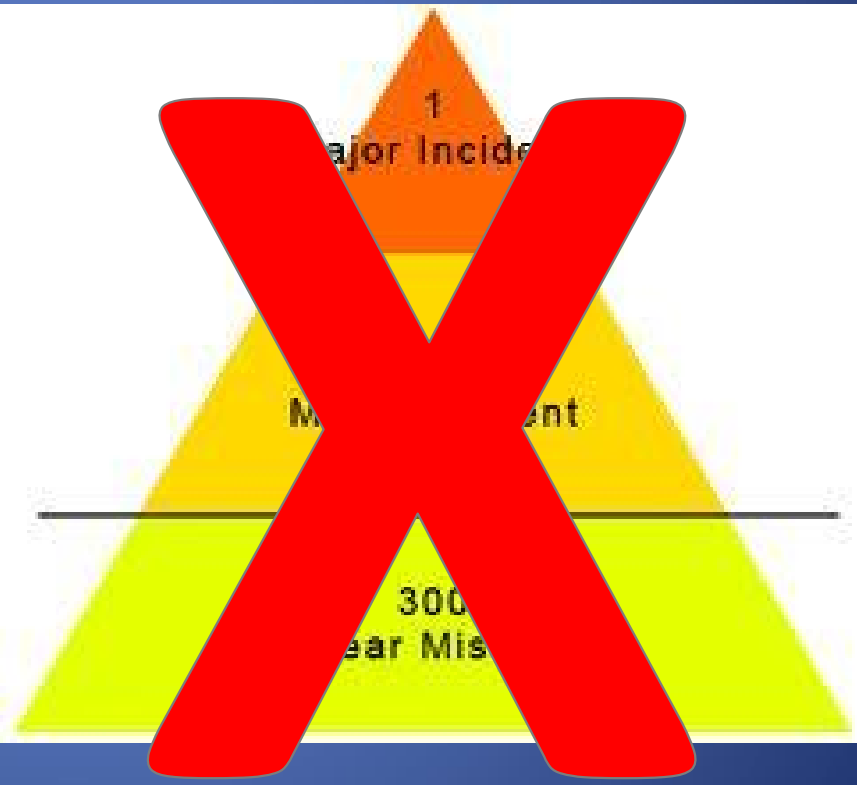
# The Objective...

- Reduce risks to an acceptable level
- Not zero!



# Heinrich...

**Was Wrong!**



**Professional Development**

Peer-Reviewed

# Reviewing Heinrich

## Dislodging Two Myths From the Practice of Safety

By Fred A. Manuele

**I**n *The Standardization of Error*, Stefansson (1928) makes the case that people are willing to accept as fact what is written or spoken without adequate supporting evidence. When studies show that a supposed fact is not true, dislodging

They can be found in the four editions of *Industrial Accident Prevention: A Scientific Approach*. Although some safety practitioners may not recognize Heinrich's name, his misleading premises are perpetuated as they are frequently cited

# Fred Manuele

- Few cases contribute very significantly to the majority of the costs
- 80/20 rule generally applies
  - 80% of costs from 20% of incidents
- May be even more significant
  - 70 – 80% of the costs from 6 – 7.5% of incidents

Heinrich - No

**PtD — YES!**

# ANSI B11.0 - Safety of Machinery

[www.assp.org](http://www.assp.org)



ANSI B11.0 – 2010

*American National Standard  
Safety of Machinery –  
General Requirements and Risk  
Assessment*

Secretariat and Accredited Standards Developer:  
B11 Standards, Inc.,  
42293 Young Lane  
Leesburg, VA 20176, USA

APPROVED: 2 DECEMBER 2010

American National Standards Institute



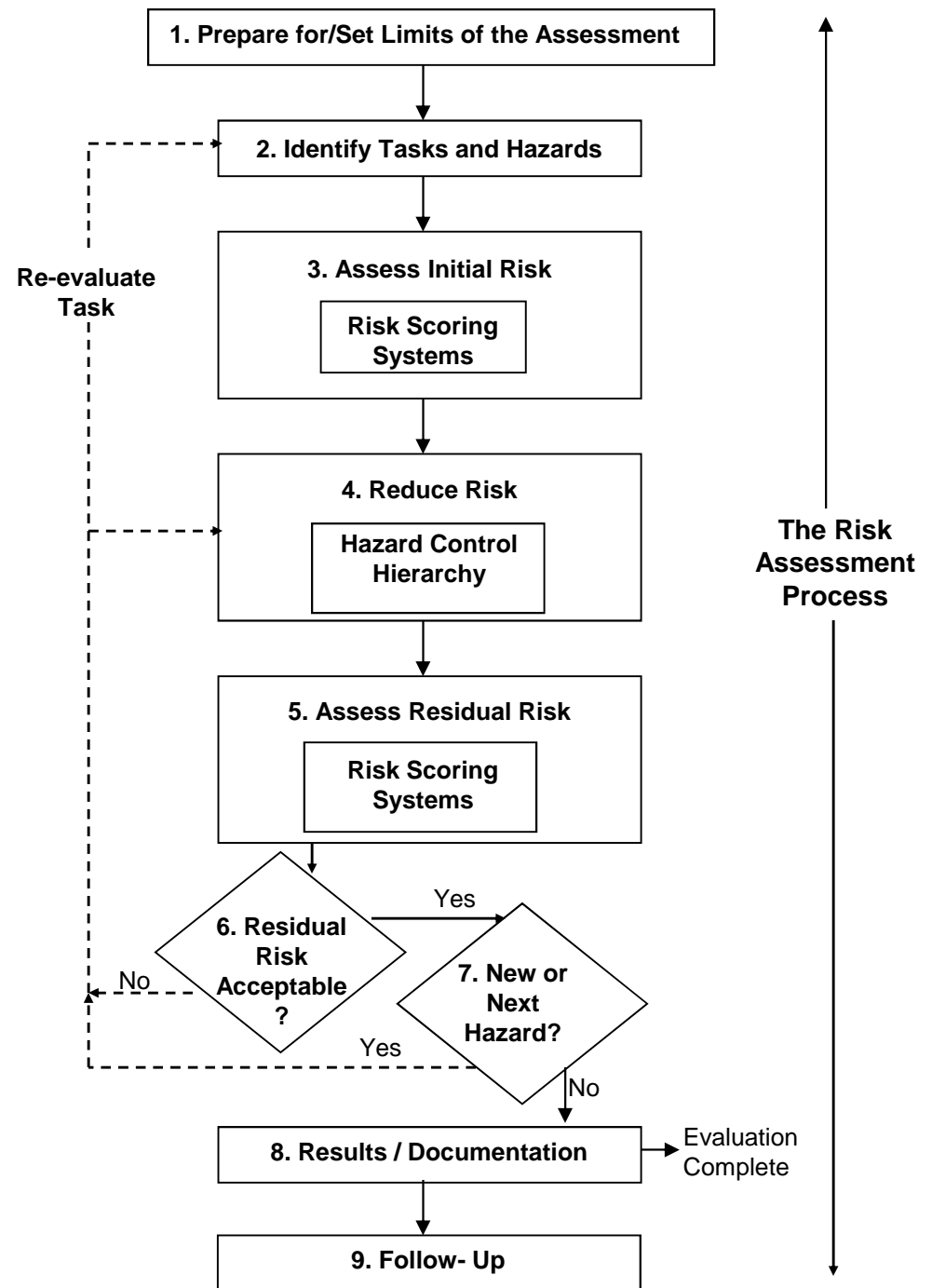
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# The Risk Assessment Process

- Identify hazards
- Assess risk
- Reduce risk
- Document results
- Follow up



# ASSP Risk Assessment

- Council on Professional Affairs
- Begun February 2011
- Ongoing activity into 2020 and beyond
- Risk Assessment Moving Forward



# Top 5 Method

- What are the Top 5 risks to your business unit?
  - Create the list
  - Make it visible
  - Work on the issues
  - Continuous improvement

# More on Z590.3 and ANSI

## ANSI Standards – Who Really Cares???

- How are these standards used?
- Are these standards used only for litigants?
- How are such standards used by OSHA and other regulatory agencies?
- Why should OSH Professionals be interested and hopefully participate on committees?

# The Grand Finale

Questions and Comments?

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