Your Voice in Prevention through Design (PtD)

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Presentation Outline

- Prevention through Design (PtD) Concepts
- PtD Benchmarking data for water utilities
- Barriers to PtD processes in water utilities
- A model PtD process for water utilities
- Examples of Best Practices in utility design
- Future activities and research
- Questions
“The integration of hazard identification and risk assessment methods early in the design and engineering stages and the taking of the actions necessary so that the risks of injury or damage are at an acceptable level.”

(Safety Through Design published July 1999)

(The term “Safety through Design” was replaced with “Prevention through Design” or “PtD” by the NIOSH initiative about 5 years later.)

Designing to a minimum level of risk - i.e., acceptable risk

Knowledge

Proactive Prevention

Culture
Moving Safety Upstream in the Facility Life-cycle Reduces Total Project Cost and Makes it Easier to Operate Safely
**Benefits**

- Inherently safer facilities and operations
  - Significant reduction in serious injuries, illnesses, damage to property/equipment
- Lower operating costs
  - Increased productivity
  - Decreased workers compensation and business interruption costs
- Easier EH&S program management

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**PtD Process Concept**

- **Conventional Design Approach**: Engineer applies his/her knowledge and skill to design systems that perform as well as he/she knows how to make them.

- **PtD Approach**: Apply as much of the organization's knowledge and experience as possible in the design process to minimize risk and enhance system performance.
Typical PtD Process in General Industry

1. Develop safety specifications or Fitness-For-Use Criteria (FFU's)
2. Work with design team during design – informal reviews
3. Design Safety Review near completion of design
4. Constructability Review
5. Commissioning inspection

Where Engineering is Performed in Water Utilities
(Preliminary Study Results)

- 12 (75%) organizations perform engineering and project management functions both internally and externally
- 1 (6%) performed projects exclusively internally
- 3 (19%) did not use internal resources for design at all
Safety Dept. Role in PtD for Organizations Utilizing Internal Resources for Design

- 54% always include safety specifications or fitness for use (FFU) criteria for internal design projects
- 23% indicated they never include safety specs or FFUs on internal design projects
- 50% (6 of 12 respondents) always or often conduct design safety reviews on capital projects.

Safety Dept. Role in PtD for Organizations Utilizing External Resources for Design

- 50% require the designer to incorporate “all necessary and appropriate” safety standards and features in contract
- 21% develop and provide site and project specific safety requirements to design contractors
- 21% do not provide safety requirements to design contractors
Use of Safety Reviews on Externally Designed Projects

- 43% (6 of 14) always conduct safety-focused design reviews
- 29% rarely or never conducts safety reviews
- 14% occasionally conducted reviews
- 14% did not know or left reviews to the discretion of the external design firm

Does your organization have an organized/methodical approach for considering safety in the design process?

- Yes: 31%
- No: 69%
Utility Size by PtD Process

- No PtD Process
- Has PtD Process

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<th>Respondents</th>
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<td>Medium (10,000-50,000)</td>
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<tr>
<td>Very Large (&gt;100,000)</td>
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Level of Safety Support

Formal PtD Process:

- No
- Yes

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<tr>
<th>Item</th>
<th>Respondents</th>
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<tbody>
<tr>
<td>Degreed safety professional(s) with engineering or technology degree(s) on the utility staff</td>
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<tr>
<td>Degreed (non-technical) safety professionals on the utility staff</td>
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<tr>
<td>Safety coordinator (non-degreed) on the utility staff</td>
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<tr>
<td>Safety resource at the municipal or corporate office shared with other utilities and/or departments</td>
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</tr>
<tr>
<td>External consultants relied upon for technical safety support</td>
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</tr>
<tr>
<td>Organization does not have or retain safety support expertise</td>
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% of Capital Projects Receiving Safety-Focused Design/Operability Reviews

Organizations with Systematic Safety Review Process of Capital Project Designs
Is Safety a Major Focus of Constructability Review?

If safety walk-downs or commissioning inspections are conducted prior to beginning operations of new or refurbished installations, what functions participate in the inspection process?
**Where are water utilities today?**

- Most utilities owned by municipalities - Many exempt from OSHA
- Most design/engineering work performed by outside firms
- Safety considerations frequently not a high priority when designing water facilities
- Water utilities largely uninformed regarding PtD concept and value
- No PtD provisions written into many design contracts
Major Challenges/Hurdles

- Organizational culture/attitudes
- Awareness of PtD processes by engineering
- Lack of technical expertise in safety
- Training engineers
- Allocating time for safety reviews

Unique Challenges for Water Utilities

- Most “Capital” projects designed by outside contractors
- Safety, Operability, Maintainability often not drivers in design process
- Procurement policies require “Low Cost Bidder”
- Keen attention to Security
- Senior Manager not engaged in safety process/performance
  - Safety not included in manager performance evaluations
  - Liberal leave/return-to-work policies
Reliance on External Engineering

- Sponsoring utility often not knowledgeable in PtD process and value
- Safety, Operability, Maintainability often not drivers for engineering service providers
- Water utility design/engineering contractors may lack knowledge and value of PtD process
- Design process doesn’t ask the right questions
  - Will this work?….instead of:
  - How will you access and maintain the process/equipment?
- Current contracts and specifications don’t provide detailed expectations for safety performance

PtD for Water Utilities - Metrics

- Primary performance metrics are Quality, Volume and Pressure
  - Not $$$, although this has recently changed for many utilities
- Primary “Currency” is “Wrench Time”
- Direct/indirect costs of incidents typically not tracked
- Most utilities do not have a Safety Management System in place to track performance
  - Limited audit capabilities/systems
  - Safety enforcement issues are common
- Poor incident investigation techniques – Limited root cause analysis
Model PtD Process for Water Utilities
(From Water Utility Safety and Health: Review of Best Practices - WaterRF Project #3104)

1. Project specification and safety scoping
2. Intermediate design review
3. 90% review
4. Commissioning inspection

Project Specification: Participants
- Project Manager (PM)
- Construction Manager (CM)
- Plant Manager
- Experienced Operator(s)
- Experienced Maintenance Representative(s)
- Safety
- Security
- Environmental
- Purchasing
- Public Relations / External Affairs (PR)
- Finance (Risk management & capital planning)
- Information Technology (Control systems)
Intermediate and 90% Design Reviews: Participants

- All participants from Project Specification phase
- Experienced Operations and Maintenance personnel
- Disinterested engineer
- Scheduling

Commissioning: Participants

- Operations and Maintenance field personnel who will be expected to work with the systems, or who have experience with similar systems
- Project Manager
- Plant Engineer (if different than the PM)
- Utility Plant Manager
- Construction Manager
- Site Superintendent (if different than the CM)
- Local Safety/Environmental Manager/Coordinator
Assisting Engineers *during* Design

- Understand the objectives
- Provide tools; e.g., checklists with explanations
- Reference specific codes, company standards, global standards, and technical sources

Common Technical Issues

- Permit Required Confined Spaces
- Elevated Work - Fall Protection
- Hazardous Materials Exposure
- Electrical Safety/Arc Flash
- Human Factors/Ergonomics
  - Material Handling
  - Access
- Work Zone - Vehicle Safety
- Excavations
Path Forward

- Develop technical competence within Engineering community and water utilities regarding PtD
- Develop technical competency within Safety community regarding PtD
- Implementation of Safety Management Systems (e.g. ANSI Z-10)
- Develop and require PtD process for public contracts
- Engineer to Deliver Process
  - Include safety requirements in Fitness-for-Use criteria
  - Require engineers to facilitate plan/spec review sessions with Operations/Maintenance personnel at Intermediate and 90% reviews
  - Document findings and recommendations
- Develop metrics to drive the process

Concept Behind PtD Metric

Engineers Design:
Facility Features
Processes

Safety Concern #1 – Risk
• Severe/catastrophic incidents
• Frequent incidents

Safety Concern #2 - Cost of Risk Control
• Cost of Compliance
• Cost of Doing the Job Safely (e.g. equip.)
Questions???