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# Prevention through Design (PtD): History and Future

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## 1. Introduction

To give you a history of the evolution of the Prevention through Design (PtD) concepts, upon which I will base suggestions for possible future activities, I commence with a review of how an Institute for Safety through Design was created at the National Safety Council.

In the early 1990s, several safety professionals recognized, through their studies of investigational reports of occupational injuries and illnesses, that design causal factors were not adequately addressed. For example, a study I undertook at that time indicated that although there were implications of workplace and work method design inadequacies in over 35% of the investigational reports analyzed, the corrective actions proposed did not relate to the design implications.

We also noted that designing for safety was inadequately addressed in the popular safety literature, and that safety and health management system guides infrequently included safety through design procedures. I chaired a committee at the National Safety Council to study the feasibility of the council promoting the idea of incorporating safety needs in the design process. The outcome, in 1995, was that the Council established The Institute for Safety through Design. An Advisory Committee for the Institute was formed, the members of which represented industry, academia, organized labor, and other interested persons. The mission of the Advisory Committee follows:

To reduce the risk of injury, illness, and environmental damage by integrating decisions affecting safety, health, and the environment in all stages of the design process.

The message we wanted to convey when we used the term ‘Safety through Design’ is contained in its definition:

‘Safety through Design’ is the integration of hazard analysis and risk assessment methods early in the design and engineering stages, and taking the actions necessary so that risks of injury or damage are at an acceptable level.

Integration means incorporating and combining. Hazards analyses and risk assessments are the core of the safety through design concept and PtD. Actions are to be taken so that risks of injury, illness, and damage are acceptable. By applying Safety through Design concepts, we said that these benefits would be obtained:

- Improved productivity
- Decreased operating costs
- Significant risk reduction
- Avoidance of expensive retrofitting

The strategies adopted were to:

1. Expand the knowledge and concepts of Safety through Design
2. Develop engineering curricula course materials
3. Establish liaisons with schools, societies, industry, and labor to increase awareness.

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Two groups were identified by the Institute to be given primary attention:

- Academia: professors and their students
- Practicing engineers in industry and safety professionals

A good deal was accomplished by the Institute. Seminars, workshops, and symposia were held. Proceedings were issued. Presentations were made at safety conferences. And a book entitled *Safety through Design* was published. Even though the Institute was disbanded in 2005, in accord with its sunset provision, the Safety through Design idea is still much alive throughout the world. I give you some examples.

In May 2006, the Australian Government issued *Guidance on the Principles of Safe Design for Work*, of which you will hear more about later.

The January/February 2007 issue of the magazine *Safety Science*, a European publication, is a special edition. Fourteen of its sixteen articles are the presentations made at a workshop on “Safety by Design” held by the New Technology and Work Network, a European entity.

In March 2007, the Occupational Safety and Health Administration Construction Alliance Roundtable Design for Construction Safety Group issued a 2–4 hour course entitled “Design for Construction Safety.”

On April 4, 2007, the Institution of Mechanical Engineers in the UK, with nine cosponsors, including the Health and Safety Executive, held a workshop entitled “Risk Education for Engineers.” One of its purposes was to “gain an understanding of the need to educate undergraduate engineers in risk concepts.” Studies have shown that engineering graduates, largely, are not cognizant of hazards, risks, and risk assessment techniques.

## 2. Prevention through Design

And now we are here because of the initiative at the National Institute for Occupational Safety and Health (NIOSH) to create a sustainable national strategy for PtD. The timing for the initiation of this work is excellent. The Mission for this strategy, for occupational safety and health, could be:

To reduce the risk of occupational injury and illness by integrating decisions affecting safety and health in all stages of the design process.

The definition of PtD, which appears in NIOSH literature, is well conceived and bears directly on the Mission:

Addressing occupational safety and health needs in the design process to prevent or minimize the work-related hazards and risks associated with the construction, manufacture, use, maintenance, and disposal of facilities, materials, and equipment.

(Note, the definition above has since been amended thus: in the design and redesign processes.)

To move toward fulfilling the Mission, and consider activities that NIOSH should undertake in the future, it will be well to review the past. Dr. John Howard (Director of NIOSH) has said that:

“One important area of emphasis will be to examine ways to create a demand for graduates of business, architecture, and engineering schools to have basic knowledge in occupational health and safety principles and concepts.”

That statement defines a major goal: to achieve a cultural change whereby management insists that engineers and safety science graduates have knowledge of PtD concepts.

The two groups identified by the Institute for Safety through Design to be given primary attention were:

- Academia: professors and their students
- Practicing engineers in industry, and safety professionals

Focusing on those groups is still necessary. With respect to academia — professors and their students — activities in which NIOSH was previously involved can be beneficially rejuvenated. The needs that those two activities were to address still have high priority.

- Project Shape (Safety and Health Awareness for Preventive Engineering) was a collaborative project between NIOSH, engineering professional societies, and engineering schools to enhance the education of engineering students in occupational safety and health.
- Minerva — Minerva Safety Management Education — is a not for profit corporation dedicated to improving business effectiveness through Safety Management Education.

Consideration should be given to reinstating those organizations, as their aims fit well with current needs.

To jump start creating a demand for graduates of business, architecture, and engineering schools to have basic knowledge in occupational safety and health principles and concepts, and to achieve public awareness of the initiative NIOSH has undertaken, I am assigning Dr. Howard a task. He shall have the responsibility of sending letters to the chief executive officers of the 5,000 largest companies in the United States. In the letters he shall describe what the NIOSH initiative intends to accomplish, and encourage the CEOs to write to the Deans of engineering schools, and of safety science degree programs, saying that they expect the graduates they hire to be knowledgeable about hazards, risks, and risk assessment techniques.

If CEO's insist the engineers and the safety personnel they hire have that knowledge, a cultural change will have been achieved. Upon issuance of those letters, a major press conference should be convened, by NIOSH, to attain broad publicity for the PtD initiative.

Fortunately, there is some low hanging fruit to be plucked for the training of engineers and safety professionals in PtD concepts. At least one school has developed a three-hour credit course in Safety through Design, offered as an elective. There may be others. It is proposed that:

- A research grant be made available to a group of educators and safety professionals to collect and evaluate the course data now available. The purpose of this would be to create all of the elements necessary for a three-hour course in PtD that would be made available by NIOSH to all schools, as a package.
- When that course is available, NIOSH would arrange a major gathering of educators to encourage them to adopt the course in their schools.

Some companies and organizations have developed their own courses, as they recognized that their engineers and safety professionals did not have the knowledge needed to participate in the safety aspects of the design process. Several of those companies and organizations have indicated that they would make their courses available to the public. Thus, it is suggested that:

- A committee of educators and safety professionals be provided a research grant to collect those courses, consolidate their best practices, prepare the necessary course materials, and make the resulting course on PtD publicly available.

To repeat, one of the lessons learned by the Institute for Safety through Design committee was that the most influential and lasting of our work was books, proceedings, articles, case studies — anything in print. Case studies representing real world successes in applying PtD concepts are badly needed. NIOSH could very well support:

- Applied research in which practitioners would address at-site hazard and risk situations and report on their PtD solutions, with the understanding that their work would be published and widely distributed.

My last proposal for a NIOSH undertaking has to do with serious injury and fatality prevention. If you go to [www.ncci.com](http://www.ncci.com), you will find a 13 minute video, developed by the National Council on Compensation Insurance, entitled “The Remarkable Story of Declining Frequency—Down 30% in the Past Decade.”

The case is soundly made that workers compensation claim frequency is down remarkably. But, the National Safety Council also says that there has been a larger decline in the frequency of smaller lost-time claims than in the frequency of larger lost-time claims. Bureau of Labor Statistics (BLS) data supports that of the National Council ([Bureau of Labor Statistics, 1995–2006](#)). Table 10 in that report is entitled “Percent distribution of nonfatal occupational injuries and illnesses involving days away from work.”

Consider these extrapolations.

Percent of days-away-from-work cases involving these numbers of days

	1	2	3–5	6–10	11–20	21–30	31 or more
1995	16.9	13.4	20.9	13.4	11.3	6.2	17.9
2005	14.3	11.6	19.0	12.7	11.5	6.5	24.2
% Change from 1995	-15.4	-13.4	-09.1	-5.2	+1.8	+4.8	+35.2

Note that frequency of days-away-from-work cases is down for the first four categories and up for the last three. But, please understand — you can not conclude from the BLS data that the number of severe incidents has increased. That is not the case. The data does, however, indicate that incidents resulting in severe injury or illness are a larger segment of all days-away-from-work cases reported.

Why didn't severity come down as did frequency? It has been commonly believed that focusing on reducing frequency would also encompass severity potential. Research is needed. My studies require asking whether extended application of PtD principles would reduce severe injury potential.

What NIOSH has undertaken to establish a “sustainable national strategy” for PtD is a major undertaking. Its potential for reducing occupational injuries and illnesses is immense.

### **Reference**

Bureau of Labor Statistics (1995–2006). *Lost work time injuries and illnesses: characteristics and resulting time away from work (2002)*. U.S. Department of Labor: Bureau of Labor Statistics <http://www.bls.gov/iif>