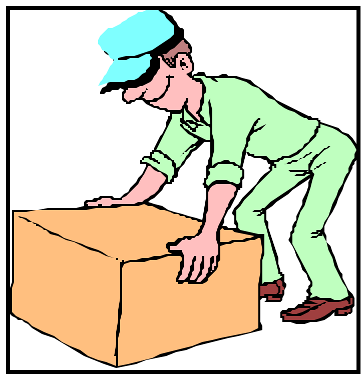
Warning!
Behavior-Based Safety Can Be Hazardous To Your Health and Safety Program!

A Union Critique of Behavior-Based Safety



System Approach

- Conveyor
- Hoist, lift assist
- Lift table
- Reduce weight and size
- Lift truck

Behavior Safety

- Lift with your legs
- Lifting training
- Find safer workers
- Bingo contest
- Back belt
- Safety Procedure
- Weight loss program
- Stretching exercises

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Introduction

This paper is a critique of behavior-based safety programs. Such programs were born from seriously flawed research conducted in the 1930s and 1940s. These programs blame workers (the victims of occupational health and safety exposures to hazards) by focusing on worker behavior rather than problems of the system, such as hazards inherent to the work process. By focusing on workers' "unsafe acts" as the causes of injuries and illnesses, companies do little to address the root causes of safety and health risks.

This document will:

1. Define behavior-based safety;
2. Reveal where it came from;
3. Show why behavior-based safety programs are popular;
4. Explain the real causes of occupational injuries and illnesses;
5. List the most effective methods of controlling hazards;
6. Review where hazards come from;
7. Provide examples of effective hazard control;
8. Compare professional health and safety approaches and behavior-based safety;
9. Discuss the strengths and limitations of worker involvement and participation;
10. Evaluate whether behavior-based safety is consistent with modern approaches to quality and Dr. Deming's teachings;
11. Describe countermeasures to address human mistakes and errors;
12. Review the problems with incentive programs, which are often implemented as part of a behavior-based safety program; and
13. Examine how behavior-based safety programs are "de-skilling" the health and safety profession.

What Is Behavior Based Safety?

Behavior-based safety programs include a broad array of programs that focus almost entirely on modifying the behavior of workers in order to prevent occupational injuries and illnesses. The fundamental premise of these programs is that the overwhelming majority of injuries and illnesses are the result of "unsafe acts."

The first step in a behavior-based program is usually listing "critical" worker behaviors. Next, inspectors (observers) are selected to periodically monitor the work activities of workers. Most of the programs recommend that hourly workers be selected as inspectors. Each inspection is followed by positive or negative reinforcement.

Origin of Behavior-Based Safety

Behavior-based safety is not new. In fact, it is one of the oldest and most outdated approaches to health and safety. Behavior-based safety has its origin in work by H. W. Heinrich (Assistant Superintendent, Engineering and Inspection Division of Travelers Insurance Company) in the 1930s and 1940s. Heinrich reviewed 12,000 insurance company accident claims and 63,000 injury and illness records submitted by plant owners. The cases had been classified as caused by either unsafe acts or unsafe conditions (physical or mechanical). The plant owners had attributed 25% of the cases to unsafe conditions and 73%

to unsafe acts. Heinrich reclassified 15% of the 25% originally classified as unsafe conditions to unsafe acts – "man failures." By adding the 15% to the 73% that were initially recorded as man failures, he concluded that 88% of all industrial accidents were caused primarily by unsafe acts of persons. During the same period of time the National Safety Council published a study that indicated that 87% of industrial accidents were caused by unsafe acts and 78% by mechanical hazards. (The National Safety Council study allowed cases to be classified with multiple causes.)

	Conclusion	Source
Heinrich	88% of all industrial accidents caused primarily by unsafe acts	*Industrial Accident Prevention, A Scientific Approach*, H.W. Heinrich, page 19, second edition, McGraw-Hill Book Company, Inc, 1941, New York and London
DuPont	96% of injuries and illnesses are caused by unsafe acts, 4% other causes	Results of ten year DuPont study, Safety Training Observation Program, E.I. Du Pont, Wilmington, Deleware (1986)
Behavioral Science Technology (BST)	80-95% of all accidents are caused by unsafe behavior *	*The Behavior-Based Safety Process, Managing Involvement For An Injury-Free Culture*, Thomas R, Krause, John H. Hidley, Stanley J. Hodson, page 12, Van Nostrand Reinhold, 1990, New York
Quality Safety Edge	76% of all accidents caused by behavior, 20% by behavior and conditions, 4% caused by conditions only	The Values-Based Safety Process: An Overview, page 3, Terry E. McSween, Ph.D., President and Grainne A Mathews, Ph.D., Project Manager, Quality Safety Edge, Copyright 1997

***BST used these statistics for many years. Tom Krause, CEO of BST, explained to me in a private conversation that he has directed his staff to remove all references to these statistics from all of the company's publications. The statistics were not included in Tom's most recent book. In spite of this change, BST implementations continue to focus primarily on the behavior of workers while ignoring hazards and the management system.**

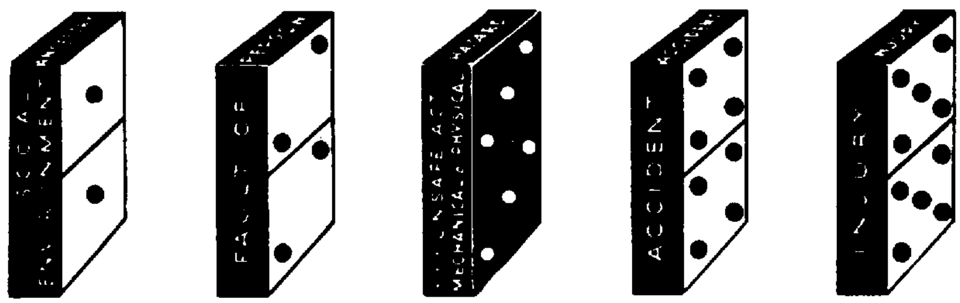
The accident reports in Heinrich's "research" were primarily completed by supervisors. Supervisor accident reports have always tended to blame workers for injuries and illnesses and suggest low-level ineffective controls, such as, advising workers to "be more careful next time," follow a safety procedure or use personal protective equipment. Supervisors complete accident reports this way because they don't have adequate time to investigate and they think this is the way higher management wants them filled out. Supervisor accident reports at most companies would be the same, and the result would be equally mistaken. Most supervisors feel that they have little upper management support and that resources for improved safeguarding, ergonomics, or chemical control are not available. Despite this, the behavior-based safety advocates have continued to report Heinrich's flawed research as fact.

Next, Heinrich developed a model that included what he thought were five factors in the accident sequence. This basic idea has been incorporated into most of the behavior-based safety programs.

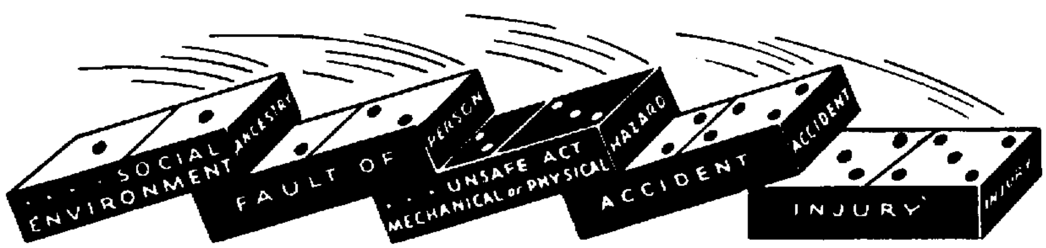
These factors in chronological order are as follows:

1) Ancestry and social environment
2) Fault of person
3) Unsafe act and/or mechanical or physical hazards
4) Accident
5) Injury

Ancestry and Social Environment	Fault of Person	Unsafe Act and/or Mechanical or Physical Hazard	Accident	Injury



"The five factors in the accident."



"The injury is caused by the action of the preceding factors."

Accident Factors	Explanation of Factors
1. Ancestry and social environment	Reckless, stubbornness, avariciousness, and other undesirable traits of character may be passed along through inheritance. Environment may develop undesirable traits of character or may interfere with education.
2. Fault of person	Inherited or acquired faults of person; such as recklessness, violent temper, nervousness, excitability, inconsiderateness, ignorance of safe practice, etc., constitute proximate reasons for committing unsafe acts or for the existence of mechanical or physical hazards.

The first and second elements – "ancestry and social environment" and "fault of person," which again, were the result of Heinrich's "research" deserve further explanation.

Heinrich said that, "The accident is caused by the action of the preceding factors." In other words, ancestry and social environment are factors in every accident according to Heinrich's theory, which he called "Scientific Management."

This view of accident causation compels the conclusion that 95% of industrial accidents were the result of unsafe acts. Heinrich was talking primarily about the actions of workers.

> "Many safety practitioners, for years, based their work on Heinrich's theorems, working very hard to overcome "man failure," believing with great certainty that 88% of accidents were primarily caused by unsafe acts of employees. How sad that we were so much in error."
>
> Fred Manuele, On The Practice of Safety, Second Edition, 1997, John Wiley & Sons, page 135

Proponents of behavior based safety programs all claim that the overwhelming percentage of injuries and illnesses in the workplace are the result of unsafe acts by workers. Some behavior-based programs make token statements about the actions of management being included in unsafe acts but, every one of the programs focuses at least 90% percent of the activity on workers.

Heinrich's domino theory implies that in most cases a single cause (unsafe act) produced the injury. This is seldom the case. Even minor injuries have multiple causal factors. In almost every case, you can find a system problem. Trickery is used by those that say that 90% of injuries are caused by unsafe acts. The trickery involves focusing attention on the last act of the worker (victim) rather than the multiple underlying causes that set stage for the incident to occur. Such statements do a disservice by directing attention away from root causes and designs that are error provocative.

Major Points To Remember

1. Behavior-based safety is not new. It is one of the oldest and most outdated theories and approaches to safety.
2. Behavior-based safety had its origin in the 1930s and 1940s in the work of Heinrich.
3. Victim blaming is at the heart of behavior-based safety programs. The original theory that 95% of accidents are the result of unsafe acts was developed based on seriously flawed research. The companies selling behavior- based programs, which continue to support this position, have a financial interest in promoting this folklore.
4. During the past 40 to 50 years, this approach to safety, focusing primarily on unsafe acts, has been used widely in the United States. It has been one of the major barriers to improved injury and illness prevention. One need only review the supervisor accident reports at most any workplace and notice the accident cause and the corrective measures suggested. Ninety-five percent contain behavior-based countermeasures such as: more procedures, training, "be more careful next time," or, wear personal protective equipment. This approach has been tried and proven an utter failure in the past.

Why Are Behavior-Based Safety Programs Popular?

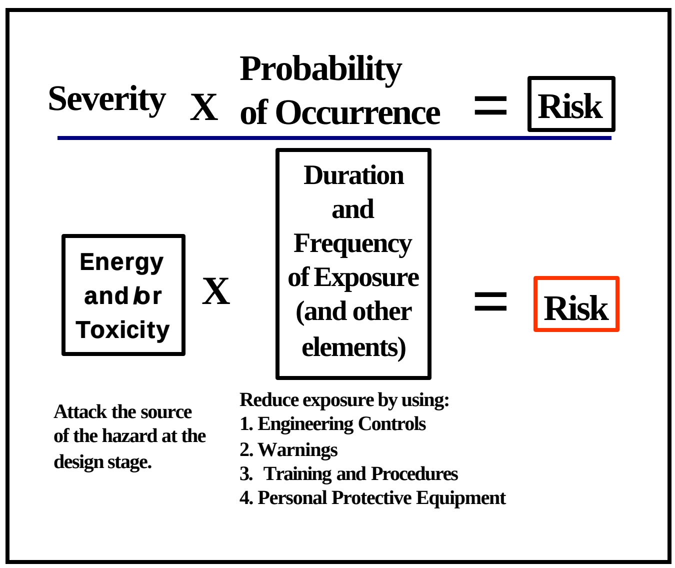
Behavior-based safety programs are popular for several reasons. Some managers and union representatives are frustrated with their current program and its lack of progress. They want to try something that they think is new. One cannot fault them for their desire to improve. Unfortunately, behavior-based safety programs are just a retread of old outdated ideas and strategies that have never been proven effective. Other managers are interested in behavior-based safety because they realize this approach shifts responsibility for health and safety to their workers and does not require significant change in the management system. They understand that the emphasis will be on changing the worker and holding the worker responsible for injuries and illnesses.

Companies that sell behavior-based safety programs show charts of declining OSHA incidence rates, and, most commonly, lost workdays and lost workday case rates. Lost time accidents are recognized as the least reliable measures in determining the effectiveness of a health and safety program. Lost workdays and lost workday case rates are more dependant on a company's ability to place injured workers in light duty jobs than preventive measures implemented to reduce injuries and illnesses. I am unaware of any data presented by proponents of behavior-based programs that demonstrates reductions in fatalities or catastrophic events.

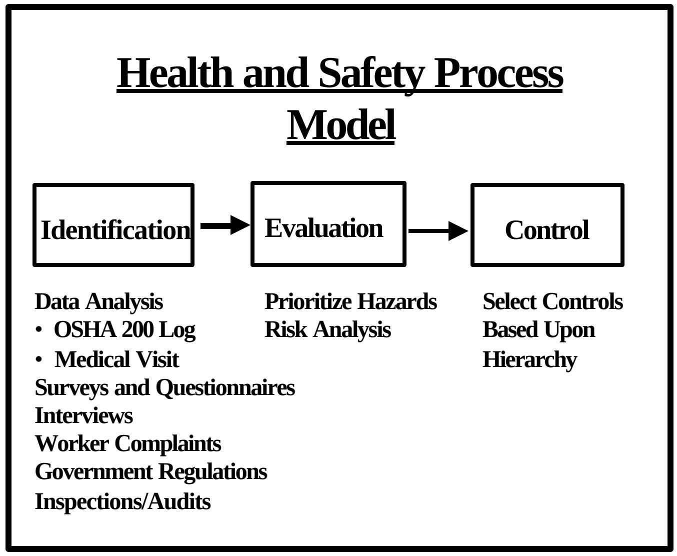
> **Why Behavior Based Programs Can Be Attractive**
>
> - New management commitment to health and safety
> - Involves workers, allows them to impact the work environment
> - Gives management authority to workers
> - Does address some fraction of injury and illness causation
> - Many workers and victims believe this stuff

What Really Causes Injuries and Illnesses?

Every injury and illness is caused by exposure to a hazard and there are no exceptions. Hazards include any aspect of technology or activity that produces risk. If the work methods designed and prescribed put employees at risk, those work methods are hazardous. Hazards vary in level of risk. Injuries and illnesses occur when our bodies come in contact with levels of energy or toxic material that are greater than the threshold that our bodies can withstand. Normally, the greater the amount of energy or the more toxic the material, the greater the severity of injury or illness. However, many illnesses can occur when we are exposed repeatedly to low levels of energy or toxic materials.

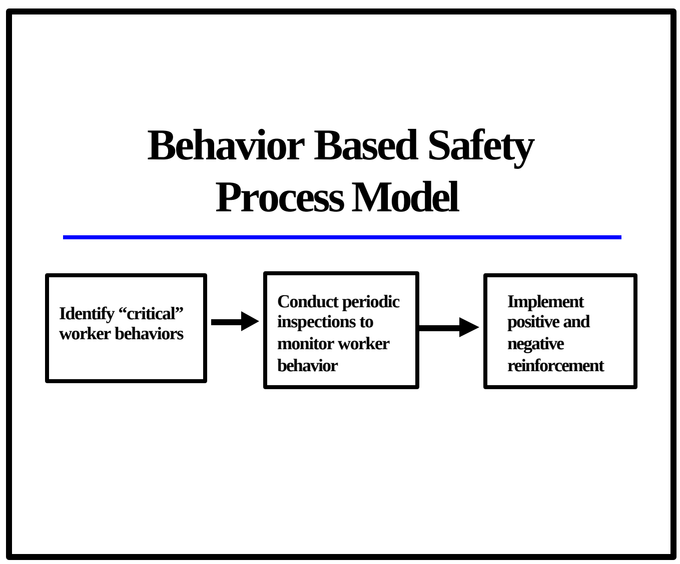


The model illustrates this relationship. The most important elements of risk are severity potential (energy or toxicity) and probability of occurrence, which is primarily duration and frequency of exposure. There are other factors, but for the purpose of this paper I will focus on the two major elements of probability of occurrence. Our government uses this method of describing risks to assess and reduce risks of military hardware. It is embodied in Military Standard 882. This military standard is the most widely accepted method of identifying and evaluating risks in the United States. It has been used on the most sophisticated weapons systems, as well as large construction projects such as the super collider, military equipment, non-military machinery, vehicles, and processes. It has broad acceptance. It is taught during American Society of Safety Engineers professional development risk assessment seminars. However, behavior safety companies ignore it because it calls for efforts upstream and requires evaluation of system energy and toxicity. Extensive technical knowledge (engineering, safety and industrial hygiene) is required to reduce the energy or toxicity and/or the level of exposure. Such information cannot be found in the training materials for behavior-based safety programs.



The models compare the method used by health and safety professionals versus the method used by behavior-based safety programs.

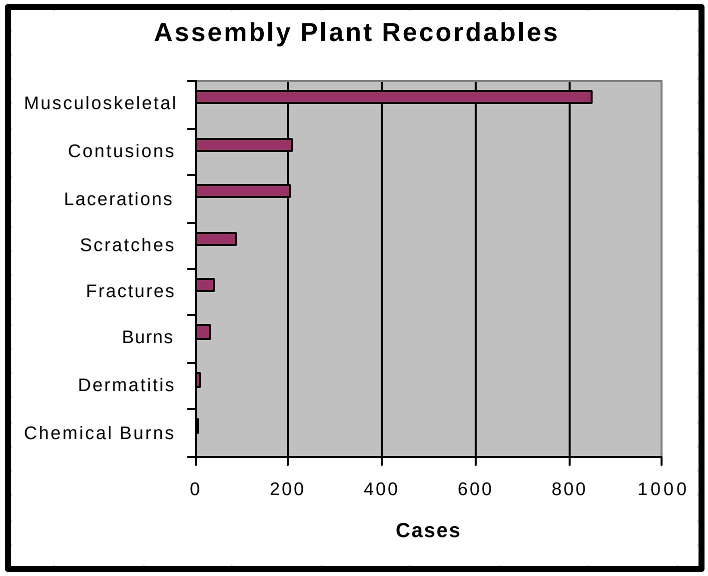
The health and safety process uses all the information available for identifying hazards and controls. Past experience and knowledge are embodied in standards and regulations. This method seeks input from workers in a wide variety of ways and includes systematic analysis of injury and illness records. The review is objective, not prejudiced by an assumption that the overwhelming majority of injuries and illnesses are caused by unsafe acts. The hazards are prioritized based on the risk level according to the risk analysis model above. Finally, the hazards are controlled using the most effective methods designated by the hierarchy of controls (discussed in the next section).



The behavior-based safety system is severely limited because it primarily considers the behavior of workers. It does not include risk analysis because severity and exposure are not determined. It ignores standards and regulations, which define many hazardous exposures. All "unsafe" behaviors are considered equal in risk – which of course is not true. Next it establishes an elaborate system of inspection with positive and negative reinforcement to modify worker behavior. Finally, it assumes that the most effective method to address worker mistakes, errors, and unsafe acts is through behavior change. This essentially turns the hierarchy of controls upside down, contradicting one of the most widely accepted concepts in injury and illness prevention.

A concrete example may help clarify the difference between these two methods. In 1996, a major chemical company safety consultant was hired to conduct leadership health and safety training at an auto assembly plant. One of the instructors, who travels around the country teaching the company's system of behavior-based safety, toured the assembly plant. After touring the plant, he told one of the classes of union and management leaders that the "biggest problems that he could see were lack of wearing personal protective equipment and fork trucks driving too fast."

The chart shows the actual OSHA recordable data for the plant. Typically, in auto assembly plants more than 50% of all cases are musculoskeletal in nature and most the result of poor workplace methods and design. The instructor couldn't have been more wrong. His mistaken view is understandable. When you begin with a biased view that workers are always the problem and their unsafe acts cause almost all accidents, there is no need to analyze real data.



Which methods of controlling hazards are most effective?

In 1950, the National Safety Council began describing a hierarchy of controls, or order of preference when selecting methods to controls hazards. The hierarchy recognizes that design, elimination, and engineering controls are more effective in reducing risk than lower level controls such as warnings, training, procedures, and personal protective equipment. The hierarchy can be found in almost every competent manual on health and safety.

Hierarchy of Health and Safety Controls

Most Effective ↓ **Least Effective**

1) Elimination or Substitution	• substitute for hazardous material • reduce energy; speed, pressure, voltage, sound level, force • change process to eliminate noise • perform task at ground level • automated material handling
2) Engineering Controls	• ventilation systems • machine guarding • sound enclosures • circuit breakers • platforms and guard railing • interlocks • lift tables, conveyors, balancers
3) Warnings	• computer warnings • odor in natural gas • signs • backup alarms • beepers • horns • labels
4) Training and Procedures Administrative Controls	• safe job procedures • rotation of workers • safety equipment inspections • hazard communication training • lockout • confined space entry
5) Personal Protective Equipment	• safety glasses • ear plugs • face shields • safety harnesses and lanyards • back belts

The hierarchy has not been mentioned or included in behavior-based safety program materials from DuPont, Safety Performance Solutions (Scott Geller), or Quality Safety Edge (Terry McSween) that the UAW has reviewed. The hierarchy can be found in OSHA standards, Military Standard 882, European and International Standards. It is accepted on a worldwide basis–***<u>except by proponents of behavior-based safety programs</u>***. They do not support it because it contradicts their theory that the overwhelming majority of accidents are caused by unsafe acts. It demands use of higher level more effective controls when feasible rather than the use of procedures and personal protective equipment. It demands detailed technical knowledge of exposures, hazards, and standards. Health and safety professionals start at the top and move down the chart, selecting the highest level feasible control or a combination of controls. Behavior-based safety proponents start at the bottom of the chart and remain there.

As we move down the hierarchy of controls, the methods of protection are less effective because they require more effort on the part of supervisors and workers each and every time the hazard is encountered.

Often, a combination of controls may be necessary to address the original hazards as well as hazards created by installation of higher-level safeguards. For example, if a ventilation system is installed to control a respiratory hazard, it is also necessary to train the workers and supervisors, place warnings, and establish a preventive maintenance program.

While Heinrich's theory of injury causation had serious flaws, listed below are the methods he recommended for the control of occupational disease. You will notice it is the hierarchy.

1) Elimination of the injurious substance or sources
2) Reduction of the original amounts or volumes or frequency of use of the injurious substances or sources
3) Removal of injurious substances or sources after use
4) Isolation, guarding, or enclosing of the injurious substances or sources
5) Control of unsafe personal acts
6) Provision of personal protective devices

While Heinrich was wrong about injuries, he was at least right about the control of occupational disease. Proponents of behavior-based safety get it wrong on both counts.

Susan Baker was the founding Director of the Injury Prevention Center at Johns Hopkins University and is one of the most highly regarded injury researchers in the United States. She has spent her entire career in the field and has written over 100 articles and several books on the subject. She summarizes the problems with behavior-safety programs well in her quote:

In summary, health and safety professionals advocate the use of the hierarchy of controls as described above. Behavior-based safety advocates turn the hierarchy upside down, blaming workers for almost all health and safety problems.

"All too often, however, victim-blaming has characterized responses to the problem, and emphasis on training and education have taken precedence over more effective ergonomic and 'passive' approaches that do not place the burden of prevention on the workers."

Susan Baker, Professor of Health Policy and Management
Founding Director of the Johns Hopkins University Injury Prevention Center

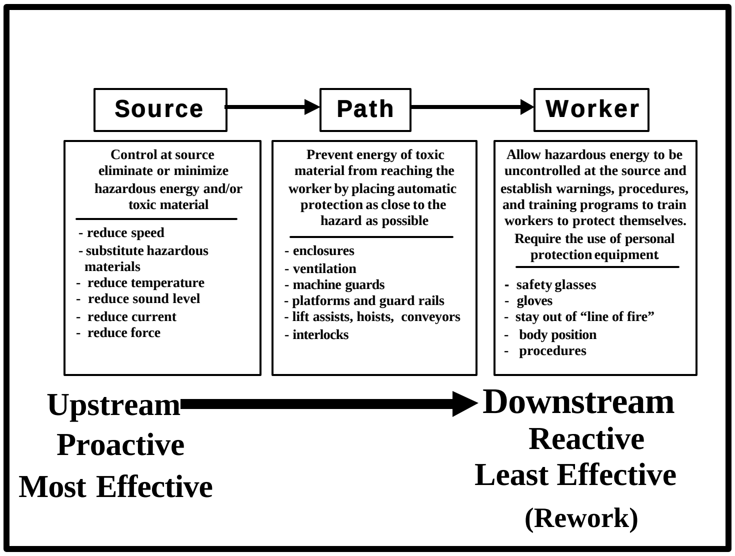
Another way to think about hazard control is the model, on page 12, used in many health and safety textbooks.

High-level controls modify the source by reducing energy or toxicity. Engineering controls interrupt the path of energy as close to the source as possible. Low-level controls such as procedures and personal protective equipment require the worker to take some action each and every time the hazard is encountered to interrupt the path.

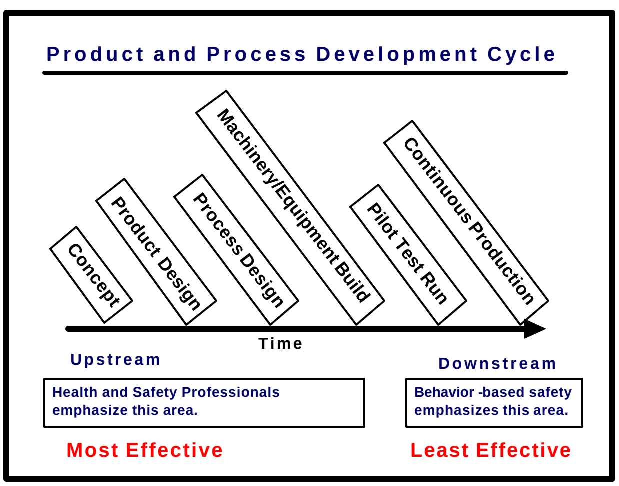
Behavior-based programs emphasize working downstream, implementing the least effective lowest-level controls rather than controlling the hazard at the source. Behavior-based safety programs are completely reactive, recommending the use of the most outdated ineffective methods of control, such as safety procedures (staying out of the "line of fire") and personal protective equipment.

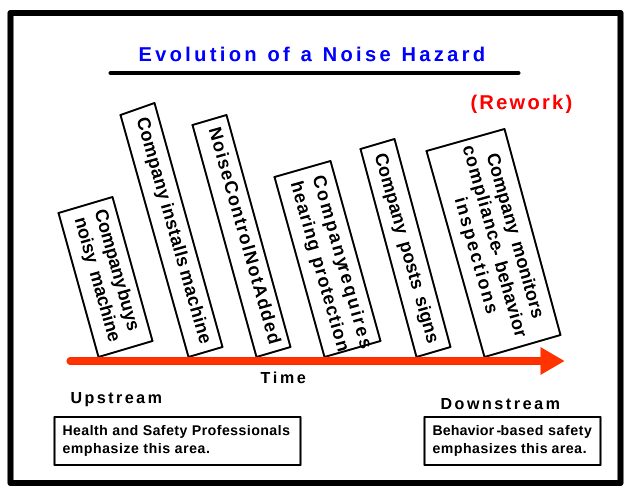
Source of Hazards

We need to think about where hazards come from. If we understand the product and process development cycle, which is the origin of most hazards, we can be the most effective in addressing the root cause. The slide below illustrates the product and process development process that is typical in auto manufacturing. During the 1980s Ford Motor conducted a study to evaluate various aspects of quality. One of the main conclusions of the study was that after the product and process development is complete and the manufacturing machinery built about 85% of the quality defects were "baked" into the system. That means that no matter what the workers and managers did at the assembly plant, they could only correct 15% of the quality defects. If doors were designed that would not fit, water leaks would occur. If the paint system could not adequately maintain proper temperature and humidity or if the air were contaminated, paint defects would occur.



Health and safety hazards are just the same. Once the product and process is completed, workers and their supervisors have a difficult time correcting health and safety problems that are "baked" into the system. Examples are parts that don't fit, parts that are difficult to install because access is obstructed, noisy machinery, highly hazardous materials, lack of fall hazard controls when maintenance is performed, high torque tools, self-drilling fasteners, congested work areas, etc.

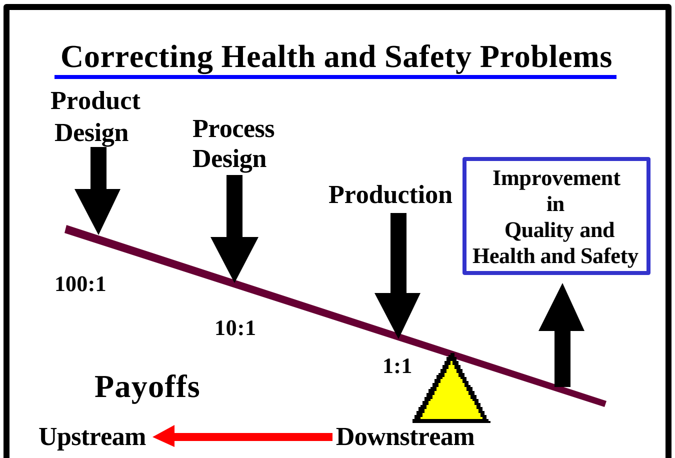




<u>Again, where do the behavior safety proponents spend most of the their time?</u> Downstream where the payoff is the least. Downstream is the place where change is the most costly and the benefit the least. Improvements and changes made upstream at the concept and design stage have the lowest cost and greatest payoff. A few examples may help clarify this point.

Eliminating a hazardous material or choosing a material with a very low toxicity or enclosing a hazardous material operation and installing ventilation instead of using respirators eliminates the cost of:

1) Respirator fit tests,
2) Routine environmental monitoring,
3) Respirator training for workers and supervisors,
4) Establishing cleaning stations and procedures,
5) Installing appropriate storage facilities,
6) Conducting medical exams for respirator fitness, and
7) Compliance inspections to make sure that all of the above items are in place and the respirators are being used and used properly.



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Almost all of these costs are ongoing. Remember high-level controls, such as design and engineering controls, require a changed process and may have high initial costs but have low long-term costs that are stable. Low-level controls, such as procedures and personal protective equipment, may have low initial costs, but have high long-term costs and require constant effort to maintain and enforce.

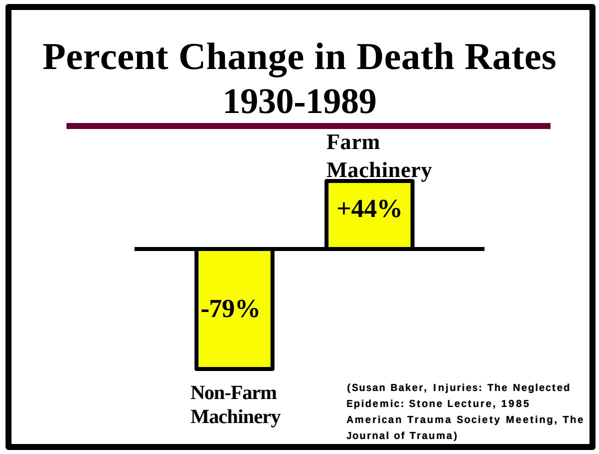
The table below, which was used during training in fall prevention at General Motors, describes the reliability and cost consequences of the different levels of control. (UAW-GM Fall Prevention Program 1992)

Priority	Control Method	Reliability	Long-Term/ Recurring Costs
First Priority	Eliminate the Hazard and/or risk	Eliminates reliance on supervisor & worker behavior for effectiveness – 100% reliability	Eliminates long-term costs
Second Priority	Prevention – use stairs, catwalks, platforms, guardrails	Relies minimally on inspection, maintenance, training and behavior for effectiveness	Minimal long-term cost associated with inspection and maintenance
Third Priority	Warning Signs	Relies heavily on supervisor and worker behavior for effectiveness	Minimal costs to maintain warning signs
Fourth Priority	Training and instruction	Relies heavily on supervisor and worker behavior for effectiveness	Significant recurring costs due to supervision and re-training
Fifth Priority	Personal Protective Equipment	Relies heavily on supervisor and worker behavior as well as inspection, maintenance and training for effectiveness	Significant recurring costs due to supervision, inspection and maintenance

The hazards, injuries, and illnesses are built in. Health and safety professionals advocate working upstream on the purchase, design, and selection of materials as the most effective method of controlling hazards. This is the area that requires the greatest change on the part of management. Often, the entire purchasing, procurement, and engineering practices of a company must be radically changed. Engineering retrofits are also effective. Behavior-based safety, again, directs attention downstream in the process and places virtually all of the burden and responsibility for controlling hazards on the workers.

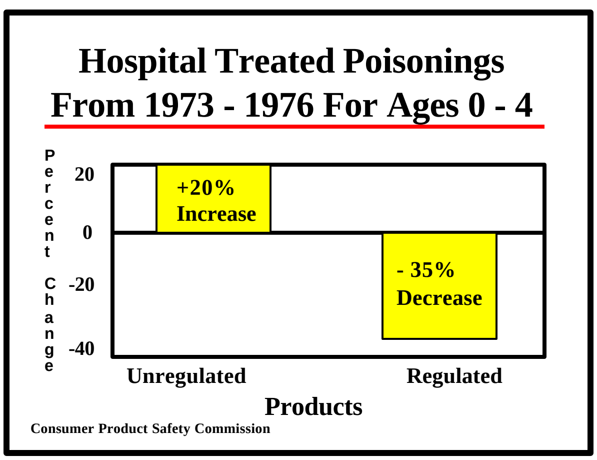
Examples of Effective Hazard Control

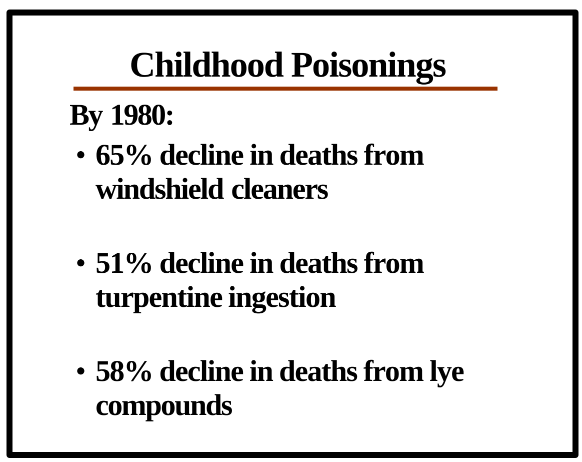
Next we will review examples of high-level controls that have been extremely effective. Many behavior-based safety proponents say that regulations and standards are not needed - all that is needed is a focus on behavior. This seems to be based on the assumption that most companies voluntarily address unsafe conditions.



Let's look at some facts. Compare, for example, the death rates of non-farm machinery that has been the subject of stringent safety regulation, to farm machinery not so regulated. The death rate for the regulated non-farm machinery from 1930 to 1989 has declined by 79%. During the same period of time the death rate for non-regulated farm machinery has increased by 44%. ***During the first 25 years of OSHA the occupational fatality rate has declined by 50%.***

A few consumer examples may demonstrate the vital role of safety standards, regulations, and engineering controls. Prior to the 1970s there was a major problem with children being poisoned in our country. The poisonings were from materials such as prescription drugs, paints, lye, and cleaning products. For decades, behavior-based countermeasures were promoted. Parents were told to watch their children and to store hazardous products in safe places. Television commercials, newspaper, magazine, and radio ads, as well as warnings on labels encouraged "safe behavior."





Nonetheless, children continued to die. Fortunately, a high-level engineering control was written into law by a regulation. In the early 1970s manufacturers were required to put child-proof lids on selected containers. The charts describe the results.

Another such example is the Refrigerator Safety Act. This was described in a very important book by Willie Hammer, Product Safety For Engineers, distributed by the American Society for Safety Engineers (ASSE). The Act was passed because children were being trapped and suffocated in refrigerators. Behavior change approaches had been used for decades and children continued to die. Manufacturers bitterly fought the regulation to eliminate locks on doors and to establish a very low maximum force needed to push the door open from the inside. They alleged that parents were the problem. After passage of the Act, Hammer said, “No child has died in a refrigerator designed within the provisions of the Act.” Nancy Lessin, President of Local 9267 of the United Steelworkers of America described the need for regulation well. “In the 1800’s in Massachusetts mill girls went before the Massachusetts legislature and described the conditions in the mills - the dust in the air and the long hours and what they called the “breathing disease.” The legislature listened, reviewed the information and concluded that they agree that the dust levels were too high and that there was disease. However, they said that the answer did not lie in regulation as that would cause mills to move to Connecticut or Rhode Island. They suggested that increasing Christian principles among mill owners was the answer. For the next 140 years workers continued to work, suffer, become ill and die from cotton dust exposure. Finally a cotton dust standard was promulgated which finally caused massive improvements.”

Safety Can Be Legislated

The Refrigerator Safety Act was passed because children were being trapped and suffocated in refrigerators. No child has died in a refrigerator that was designed within the provisions of the Act.

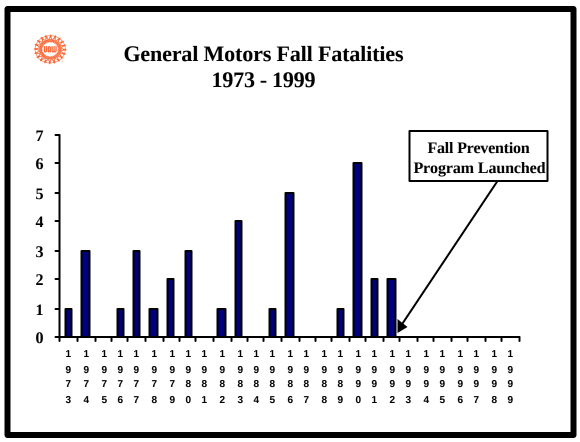
Product Safety Management and Engineering, 1993
by Willie Hammer

Elements of UAW-GM Fall Prevention Program

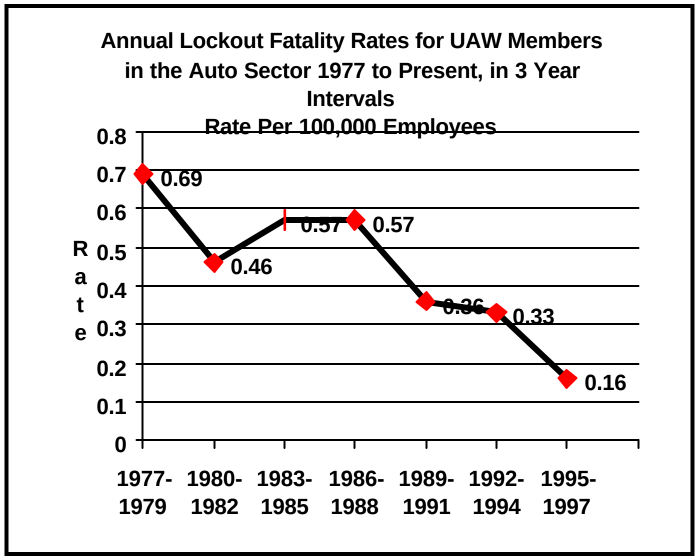
- **Establishment of joint fall prevention committees**
- **Workplace evaluations that include worker participation**
- **Surveys**
- **Evaluation of risk**
- **Installation of engineering controls**
- **Personal fall protection equipment**
- **Training**

Highly Successful Examples

One of the most successful efforts in occupational fatality prevention was implemented at General Motors in 1992. General Motors had a long history of fall fatalities. The UAW and General Motors were determined to address this problem. A fall prevention program was developed and implemented at all of General Motor’s United States operations. The program applied the identification, evaluation and control model. Methods of control were selected using the hierarchy. Major emphasis was placed on eliminating work at heights whenever possible and installing engineering controls. Personal fall protection equipment was used as a last resort. The last fall fatality in General Motors was on August 11, 1992.



Another UAW example involves the substantial reduction in fatalities among members performing service and maintenance tasks. The UAW has collected detailed information on fatalities of members since 1973. Since 1973, 439 UAW members have been killed on the job. Workers performing service and maintenance tasks have suffered a four-fold higher fatality rate than the average for the UAW. This caused our union to focus efforts in areas such as lockout and confined space entry. Energy lockout was a major collective bargaining issue in health and safety. As a result of these efforts, and aided by the promulgation of the lockout standard in 1989, there has been a drastic reduction in lockout fatalities.



To put this dramatic downward trend of lockout-related fatalities in proper perspective, one must consider the increase in proportion of UAW members exposed to the hazards of service and maintenance tasks. In the 1970's, about 15% of the work force in the big three auto manufacturers was in skilled trades jobs, typically assigned to service and maintenance.

With the introduction of greater automation and more complex manufacturing machinery and equipment, the percentage of workers in skilled trades climbed to the current level of about 21%, a 36% increase in the population of skilled trades workers. In addition, production workers are now expected to perform more complex tasks that include setup, minor troubleshooting, un-jamming of parts, preventive maintenance, and fault clearance. In short, the major decline in UAW auto sector lockout fatalities happened during the time of tremendous increase in advanced manufacturing technology increasing the proportion of the work force exposed to hazards related to service and maintenance.

The efforts included the following:

1. Establishment of written lockout programs
2. Installation of additional safeguards, and machinery modifications to enable workers to perform tasks outside of the hazardous area that had previously required lockout (gauges, valves and lubrication systems moved outside safeguarded area)
3. A review of all machines and equipment with multiple energy sources and those with single energy sources where the energy isolation devices were not conspicuously located
4. Evaluation to insure that energy isolation devices were capable of being locked out
5. Posting of identification labels on energy isolation devices
6. Formulation of machine or equipment-specific lockout procedures and posting of procedures on placards
7. Training of appropriate personnel
8. Establishment of periodic audits

The process also uncovered major deficiencies, including machinery that could not be locked out, tasks that could not be performed with the machinery locked out and for which alternative safeguards were not available.

Comparison of Professional Health and Safety and Behavior-Based Safety

	Professional Health and Safety	Behavior-Based Safety
Where to control hazards	Control at the source, apply hierarchy of controls	Control at worker by emphasizing procedures and personal protection equipment
Relationship to modern quality as advocated by Deming	Consistent by emphasizing work on correcting common cause failures in the system and recognizing that management must change the most.	Old school quality, opposite of Deming philosophy. Inspect safety in, emphasis on inspection of workers. Blaming system faults on workers. Addresses symptoms not root causes.
Responsibility of management	Address fundamental system problems. Mobilize every part of the business to carry out its role in preventing injuries and illnesses.	Write policy and communicate statements of support for behavior safety.
Hierarchy of controls	1. Elimination/substitution 2. Engineering controls 3. Warnings 4. Procedures and training 5. Personal protection equipment	6. Personal protection equipment 7. Procedures and training 8. Warnings 9. Engineering controls (seldom used) 10. Elimination/substitution (seldom used)
Employee involvement	Establish joint health and safety committees. Workers trained in hazard identification and methods of control. Employees to have input on job/workstation design and opportunity to communicate problems. Union representatives receive special technical training in hazard identification.	Workers participate in developing list of critical behaviors. Workers may serve as monitors to check behaviors of other workers. Major emphasis on procedures and personal protective equipment.
Ergonomics	Emphasis on evaluating current and proposed jobs for risk factors; force, repetition, and posture. Apply controls based on the hierarchy (design and engineering).	Focus on "body position" and emphasize administrative controls and safety procedures such as "lifting safely."
Chemical exposure	Analyze injury and illness data. Comply with standards and latest research findings. Record and analyze symptom complaints, not just recordables. Reduce chemical use, maintain well-designed ventilation systems.	Ignore all issues where exposure is below PEL (permissible exposure level). Rely on respirators and ear plugs.
Examples of strategy-noise exposure	Buy quiet machinery and equipment. Apply engineering noise control to sources of noise.	Instruct workers to wear hearing protection. Periodically inspect and monitor work compliance. Discipline, reward, give away prizes, run bingo games.
Where to work most effectively for process improvement	Work upstream on the procurement, design, and modification of processes.	Work downstream by attempting to inspect safety into the process and emphasize modification of worker attitudes and behaviors.

Ford Motor Company is an example of a company that has been transformed as a result of its willingness to work with our union, involve its workers, and apply the teaching of Dr. Deming. This transformation has affected every aspect of doing business in Ford. The Ford Health and Safety Improvement table below describes the differences between the new and old focus of doing health and safety at Ford.

The left column that describes the old focus should be familiar to proponents of behavior-based safety programs.

Ford Health and Safety Improvement Process

Old Focus	New Process Focus
Employees are the problem	**The process is the problem**
Employees	**People**
Doing my job	**Helping get things done**
Understanding my job	**Knowing how my job fits into the total process**
Measuring individuals	**Measuring the process**
Change the person	**Change the Process**
Can always find a safer employee	**Can always improve the process**
Motivate People	**Remove barriers**
Controlling employees	**Developing people**
Don't trust anyone	**We are all in this together**
Who made the error?	**What allowed the unsafe act to happen?**
Correcting behaviors	**Reducing hazards**
Bottom-line driven	**Safe work environment**

The emphasis is on "how" and "what" rather than "who."

(Presented at UAW-Ford Joint Training Conference, 1994)

Worker Involvement and Participation

Proponents of behavior safety do encourage a specific limited form of worker involvement and participation in health and safety. Input is normally limited to identifying "critical behaviors" and observing fellow workers to assess compliance with the specified behaviors. "Critical behaviors" are almost exclusively things workers are supposed to do to protect themselves from hazards that were not properly controlled by management. Ninety-five percent of the time this means procedures and personal protective equipment. Ergonomic problems are blamed on "poor body position."

While behavior safety proponents give lip service to the role of management behavior, seldom are workers asked what actions management could take that would eliminate the need for personal protective equipment and cumbersome, ineffective, time-consuming procedures.

The UAW has a long history of building worker involvement and participation in health and safety. Prior to the 1970s, our union raised the issue of health and safety during contract bargaining, suggesting the establishment of joint health and safety committees or regular inspections of the workplace. Most employers, however, responded by saying that health and safety was a management prerogative, and denied the request. Finally, in the 1970s this changed and a few large employers agreed to joint union-management programs. Since then, at many plants workers received extensive health and safety training. Workers selected by the union receive extensive advanced training in a broad array of the health and safety subjects. Workers are specially trained in ergonomics and conduct risk-factor analyses of jobs, recommend solutions, analyze injury and illness records, and maintain records to track problem jobs. At General Motors, hourly workers have been trained to perform air sampling, implement the environmental monitoring plan, perform noise measurements, evaluate ventilation systems, and recommend controls. At some plants, workers implement virtually every aspect of programs such as hazard communications, lockout, powered material handling vehicles, fall prevention, and ergonomics. Workers have been assigned to advanced engineering on a full-time basis with the sole purpose of making health, safety, and ergonomics improvements upstream at the earliest stages of the design process. Today there are workers and union representatives working on the 2001, 2002, and 2003 car and truck programs. I believe that today our union has achieved the highest levels of worker involvement and participation in health and safety in the United States.

Although worker involvement is important, it has limitations and is not a substitute for technically competent health and safety experts reviewing both existing and future operations to insure that hazards are identified and controlled. Workers can provide valuable insight into the tasks that they need to perform and the problems that they encounter, as well as into injuries, illnesses, near--misses and close calls that have occurred. At times they can explain how and why certain hazards occur and suggest solutions. On the other hand, I can't tell you how many times I have visited injured workers in a hospital who said things like, "I didn't know that the machine was that fast," or "I didn't know that the machine was that powerful or forceful." Workers have told me that they assumed the operation was safe. They would say, "I didn't think the company would put me on a job where I could get hurt."

Few workers have been trained in hazard identification, risk evaluation, or methods of control (hierarchy). Workers rely on their past work history, which may be quite limited, for ideas about possible methods to control hazards. Most workers exposed to machining fluids don't know that machines and machining lines are being built and installed all over the world with enclosures and ventilation. Most workers in stamping plants don't know that drastic reductions in noise levels have been achieved on new presses. A few examples of UAW fatalities demonstrate this point:

> On August 12, 1990, Richard Jankowski and another millwright went to the roof of the foundry to replace a steel cable. Upon completing the job, they walked across the roof to return to the shop. A section of roof, a deteriorated cement slab, collapsed and Richard fell to his death. He didn't know that heating and cooling had weakened the structure, and that fragments had already fallen.
>
> On May 16, 1992, Chester Gordon, an electrician, was steam cleaning a roof-mounted air conditioning unit. While inside the unit, he fell through the rusted-out floor of the air conditioner 26 feet to the floor below. The contractor who installed the unit had not provided any structural support below the sheet metal floor.

> On August 22, 1996, Doyle Hurd was sorting billets near a forging press. All of a sudden, a 300-pound section of cast iron blew off the press and came down, striking Doyle on the head, causing fatal injuries.
>
> On January 12, 1993, an outside contractor relocated a paint spray booth in an assembly plant. The contractor then, by mistake, attached an argon gas line to the respirator airline. A few days later Mitchell Guffey donned an airline respirator to begin work. He collapsed and died. His death was ruled a heart attack when the investigation failed to reveal the argon connection. The cause of death was determined after a second worker collapsed. When he hit the floor, the respirator was dislodged from his face. He was revived and, the investigation revealed the argon line.

In each of these cases, I am certain that the victims as well as co-workers could not have identified the hazards that caused the fatalities. Significant knowledge in heath and safety and engineering would have been necessary to do so. This is a major fallacy of the behavior-based safety, or any approach that relies exclusively or primarily on workers to identify hazards. Although workers are very good at describing certain hazards, trained health and safety experts and engineers are needed to identify the hazards, evaluate the risks and determine the ultimate methods of control.

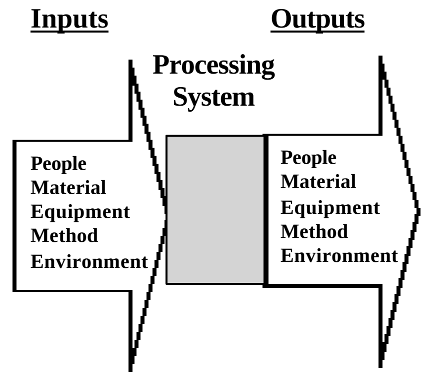
Similarly, workers often do not know about the hazards and level of risk associated with exposure to hazardous materials. For example, between 1965 and 1979, workers at two DuPont plants worked with and around asbestos-containing materials. Workers were given semi-annual physical exams from company doctors. Workers were told that they were in good health in spite of the fact that their x-rays identified illnesses resulting from prolonged inhalation of asbestos. They were not informed until 1978 or 1979, after OSHA had investigated plant conditions. In May of 1989, the New Jersey Supreme Court upheld a 1987 jury verdict in which six DuPont employees successfully sued their employer for fraudulently concealing medical records that indicated they were suffering from asbestos-related disease. The jury awarded the plaintiffs $1.4 million dollars. The law firm representing the employees revealed that they had about 250 asbestos-injury cases against DuPont in 1989. (Ohio Monitor, December, 1989)

Fear and Under-Reporting of Injuries and Illnesses

> **"There are two ways to improve figures:**
>
> **1. Cheat or lie; just change the numbers, don't count injuries or defective parts**
> **2. Improve the process"**
>
> (Dr. Deming, seminar 1982)

Behavior-based safety programs drive problems underground, inject fear into the workplace and discourage workers from reporting injuries and illnesses. Workers know that they will be blamed when they get hurt because they've been told unsafe acts cause all injuries. They can be sure management will find some fault.

I remember that while working in a steel mill in 1971 as a millwright apprentice, there were many of these programs and posters. The company would brag about so many hours without a lost-time accident. If someone were seriously hurt, they would have a member of plant security go to their house and pick them up and bring them to work. The injured worker would sit in the locker room all day. At the end of the day, plant security would drive them home. One day in the machine shop, I remember a worker was running a large drill press. The drill shattered and a piece was embedded in his stomach. He was a middle-aged worker around 45 to 50 years old. He was afraid to report the injury. Many of us encouraged him to go to medical, but he said he would just go home. He put on his coat to cover his bloody shirt, went to the supervisor, told him that he didn't feel well and asked for a pass to go home. As a 20-year-old apprentice, I didn't understand all of the ramifications, but I did understand the power of fear.



The Deming Route To Quality and Productivity, William Scherkenbach, 1988, page 25

Is behavior-based safety consistent with Dr. Deming's teachings?

Dr. W. Edwards Deming was the best-known quality expert in the world. I was fortunate to attend my first of several Deming seminars in 1982 when he came to my plant. I was also able to work with Bill Scherkenbach, whom Dr. Deming called his greatest student. Bill taught with Dr. Deming during many seminars. He was hired by Ford to implement the Deming philosophy and later hired by General Motors. At one point, he taught a class on applying the Deming philosophy to health and safety professionals at GM. I also participated in a Deming study group during the latter 1980's and was fortunate to meet Dr. Deming in 1987.

> "**Unaided by statistical techniques, man's natural reaction to trouble of any kind, such as an accident, high rejection rate, stoppage of production, is to blame the operators.**"
>
> Quality, Productivity, and Competitive Position, W. Edwards Deming

From this background I can state that behavior-based safety programs are as far as one can get from the teachings of Dr. Deming. In fact, focusing on worker behavior and blaming workers for the faults of the system was precisely what Dr. Deming fought all his life.
It is this approach to quality that put companies in the crisis that he spoke and wrote about. In the past, the auto industry used this approach to quality: attempting to inspect quality in, rather than improve processes, blaming workers for faults of the system, and establishing numeric goals and targets that discouraged supervisors and workers from reporting quality problems. This approach almost cost this country its auto industry. Fortunately, a major transformation took place, the old blame-the- worker approach was scrapped, and attention was directed to process improvement. The Deming philosophy focuses on process improvement. Processes involve material, methods, people, environment, and machinery. It is the blending of these input resources (the process) that results in the outputs. The outputs may be healthy or injured workers, good or bad parts, damaged machinery, or modified methods. The behavior-based approach is never used for quality because it ignores all inputs except the people. A company utilizing the narrow behavior-based approach in the area of quality would soon be out of business. Many companies have learned this lesson the hard way.

Countermeasures to Address Human Mistakes and Errors

One of the major assumptions of behavior-based safety programs is that human error and mistakes arising from the intended use or foreseeable misuse of tools, machinery, and equipment are most effectively addressed using behavior modification methods. If we each just think about experiences in our daily lives, the error of this approach will be obvious. The chart below lists some examples.

Countermeasures to Human Mistakes and Errors		
Mistake or Error	**Professional Approach**	**Behavior Approach**
Computer Operator instructs computer to format wrong disk drive	Software design-warning, “Are you sure, all data on drive x will be erased?” The operator is given an oppotunity to turn back and correct mistake.	Training and procedures, post signs and warnings – “Be Careful.” Observe operators formatting disks.
Overcurrent Protection at Home Plugging in too many electrical devices and overloading a circuit (fire hazard)	Circuit breakers and fuses. Automatic and passive protection designed in. Error-forgiving design. No training needed.	Safety procedures, instruct people to check all devices on a circuit and calculate amperage prior to plugging in or turning on a device. Training and periodic retraining needed. Procedure manual written.
Microwave Oven Operating the microwave with the door open (Exposure to microwave radiation)	Interlock switch on door designed in. Prevents operation when door is open. Glass door enables viewing of food with door closed.	Safety procedure–don’t operate the microwave with the door open. Instructions in owners manual. Warning sticker.
Industrial, Mechanical Hazard Accidently reaching into a machine to reposition a part after the cycle start has been initiated	Installation of guard or presence sensing device. Prevents access to hazard or stops machine if detection field broken. Minimal training needed.	Safety procedure – do not reach into machine. Periodic inspections of “safe behavior.” Postive and negative reinforcement. Signs, motivation, and warnings.

Companies that have achieved world-class quality are well-known for error proofing processes. This means that the system is analyzed to determine errors and mistakes that can occur. Design and engineering modifications are used to prevent the mistakes. Examples of this strategy include: parts that can only be assembled in the correct way, parts presented to assemblers in kits to insure that parts are not left out, electrical connectors that fit only the correct way. <u>There is not today, and there never will be, a behavior-based program that can insure that people will never forget or make a mistake.</u>

Incentive Programs – A Close Relative of Behavior- Based Safety Programs

Most behavior-based safety programs often incorporate incentive programs, bingo games, and other forms of “rewards” that discourage workers from reporting injuries and illnesses. These programs pit workers and departments against one another. Modern quality programs suggest that it is best to “make problems visible.” Incentive programs demean workers and make problems invisible, insuring that they will go uncorrected.

Remember, the most difficult health and safety problem to correct is the one that we don’t know about.

Incentive programs are the other side of discipline. Both create fear and stifle communication. Many of the companies that sell behavior-based safety programs call these techniques “modern management,” being proactive, caring, and creating a new safety culture. What would you call it?

How behavior-based safety is de-skilling the profession

Behavior-based safety is reducing the required skill level of the health and safety profession. Companies are being misled into thinking that people walking around the plant with clipboards inspecting for compliance with procedures and personal protective equipment compliance is health and safety. Trained, experienced health and safety professionals are being replaced with consultants with no training in the field.

"Several Tools Available to Direct and Motivate Employee Involvement in Achieving a Total Safety Culture" **(Scott Geller, ASSE Conference, 1994)**	**Typical tasks of a health and safety professional**
Worker-Designated Safety Slogans	Anticipate hazards
"Near Miss" & Corrective Action Discussion	Evaluation of toxicology of hazardous materials
"Near Miss" & Corrective Action Videotaping	Safeguarding of machinery and equipment
Group "Safety Share"	Analysis of injury and illness data
Group Safety Celebration	Implementation of ergonomics program. Risk factor analysis on all jobs.
Safe Behavior Promise Cards	Review of new machinery, equipment and processes at the design stage
Public Safety Declaration	Recommendation of control measure based on the hierarchy
Public Posting of Safe Behavior Percentages per Safe Behavior Opportunity	Assist in the implementation of preventive maintenance for health and safety
Rewarding & Correcting Verbal Feedback	Review processes to insure compliance with regulations and standards
Safe Behavior "Thank You" Cards	Task based risk assessment on all jobs.
Actively Caring START Cards	Evaluation of ventilation systems and other environmental controls and development of recommendations for improvement.
Unsafe Behavior STOP Cards	Industrial hygiene sampling. Interpretation and formulation of recommendations based on results.
Observation & Feedback Process	Risk mapping for hazardous materials
One-on-one Actively Caring Coaching	Error proofing of the process for health and safety
Trinket Rewards for Safe Behaviors	

Compare the knowledge and skills needed to perform typical behavior-based safety tasks and those of health and safety professionals using the table above.

What does Mr. Geller's list imply about his assumptions about workers? Doesn't his list imply that that workers don't care about their own safety and that they need to be bribed with "trinkets" to perform "safe behaviors"? I remember what Dr. Deming would say when he would see quality programs, signs, and posters similar to Mr. Geller's list. He would say that such things "communicate quite eloquently to the hourly workers that management doesn't have the slightest idea what the real issues of quality and productivity are at the facility."

Conclusion

Companies know that the behavior-based approach to solving workplace problems doesn't work. If it did work, management would apply this process to quality. How many companies are increasing inspection by auditing critical quality behaviors? How many companies have hired psychologists to run their quality efforts? I have been to many auto plants that produce products that have received the very top positions of the J.D. Powers Customer quality ratings. These plants have achieved true world-class quality. I can assure you that the success is not driven by people walking around with clipboards auditing worker behaviors. Nor is it the result of bingo games, pizza parties, or the work of psychologists. It is the result of a productive process that has been designed from start to finish to produce products that meet or exceed customer expectations. This is an important question, why don't companies that use the behavior-based approach to safety apply it to quality?

Behavior-based safety programs sentence workers to a work life of exposure to serious health and safety hazards. They offer a do-it-yourself approach to health and safety that requires workers to wear uncomfortable personal protective equipment that offers only minimal protection. Research shows that personal protective equipment places additional physical burden on the workers. It can create new hazards, limit communication, and obstruct vision. In addition, the program establishes a maze of safety procedures that often make the job more difficult to perform, and frequently are impossible to implement such as, "stay out of the line of fire."

These programs force companies to waste precious limited resources on behavior surveys and other low-level controls instead of attacking the root cause of exposures at the source with high-level controls.

Some companies that sell behavior-based safety programs have asked the question, "Why don't unions support behavior-based safety?" I suspect that they now have the answer.