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SAFETY BRIEF

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Philosophical Aspects of Dangerous Safety Systems

by Ralph L. Barnett[1] and Beth A. Hamilton[2]

Synopsis

One of the unfortunate trends developing in the product liability movement is the promotion of dangerous safeguarding devices. Such devices arise principally from insufficient research, judicial coercion, and liability proofing. The safety literature presents an unequivocal mandate against the use of safeguarding systems that sometimes present hazards themselves.

The Food and Drug Administration investigates new drugs to establish their benefits, shortcomings and side effects. Unfortunately, the safety profession has no equivalent procedure for screening safeguarding devices to determine their suitability. Dangerous safety systems typically emerge in the following categories:

I. Insufficient Research

Sidewalk Ramps

Good intentions, sometimes politically inspired, often lead to the introduction of safety systems whose drawbacks are not understood because no research has been conducted. Sidewalk ramps, adopted for the safety and convenience of wheelchair-bound citizens, illustrate this situation. Shortcomings associated with the ramps are becoming all too well known. For example:

a) Children on bicycles, skates, and skateboards are shooting down the ramps into traffic;

b) The sightless are complaining that they cannot locate the curbs with their canes; and

c) A serious trip hazard is created by the sharp differences in curb elevation at corners. Almost everyone who frequents downtown Chicago has tripped or experienced a close call. The authors are currently investigating a quadraplegic case attributable to the ramp/trip hazard.

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No Charge

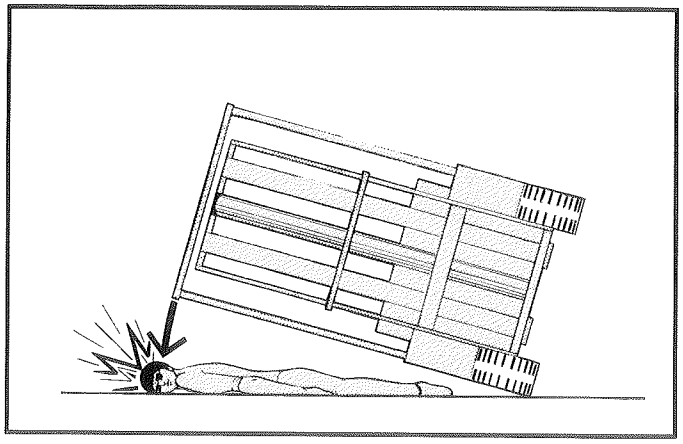
Many communities have tried to minimize the ramp drawbacks by using yellow safety markings to outline the ramp. Snow, of course, covers such markings.

d) When ice reduces the coefficient of ramp friction below the tangent of the ramp angle, one cannot stand on the ramp. On the other hand, steps or curbs can always be negotiated regardless of their slipperiness.

e) Without the curbs, vehicles can more easily invade the sidewalks.

Overhead Guards

To provide protection from falling objects, forklift trucks are required to have overhead guards. When a forklift rolls over, its operator is often thrown several inches up out of his seat, as well as sideways with the vehicle. This puts his head directly in the path of the overhead guard as the vehicle falls. The edge of the top portion of the guard strikes the operator, crushing his skull. (See Figure Below)



Alternate Designs

In many states, a successful plaintiff's position in a product liability lawsuit requires the demonstration of an alternate design which, among other things, would have prevented the plaintiff's injury.[3] Unfortunately, safety devices that ameliorate specific accident scenarios may compromise the overall system safety.

This may be illustrated by an accident involving the explosion of a low pressure gauge with an improper high pressure dial face. The unit was traded in and subsequently tested using a high pressure oxygen bottle. The traded gauge had been assembled by cannibalizing other units. The plaintiff claimed the design was unreasonably dangerous, positing that every pressure range should have unique threads. This would indeed have prevented the coupling of the subject gauge to the high pressure system; however, this solution creates a nightmare for repair departments which must consequently stock a hundred times the number of gauges and fittings to maintain their current maintenance flexibility. Very few maintenance departments could function without the present standardization and the result would be unrepaired gauges and, hence, unsafe hydraulic and pneumatic systems.

Alternate designs inspired by product liability lawsuits are typically under-researched and exert a disproportionate influence on technology.

II. Judicial Coercion

Precedent-setting judicial decisions often compel manufacturers to adopt safety systems which compromise the safety of machinery. As an example, the *Bexiga v Havir* decision from New Jersey places a non-delegable duty on manufacturers to provide safety devices. The decision arose in a trial involving a punch press. It was alleged that the manufacturer should have provided point-of-operation guarding. Unfortunately, every classical safety device for a punch press is a Type IV device,[4] that is, a device that sometimes improves, and other times compromises, the safety of the punch press. Under these circumstances, the safety of these systems can be maximized only by the user who has the input information to select the proper device, from among the many available candidates, to enhance the safety for a particular punch press operation. The required input information involves a knowledge of the in-feed system, the out-feed system, the appliance or die and the nature of the press component itself. Until these items are known, a safe safeguarding system cannot be rationally selected.

III. Liability-Proof Designs

There are massive economic pressures on manufacturers to improve their courtroom and negotiating positions in product liability situations. Significant relief is available to them if they embrace postures consistently adopted by the plaintiff's bar and reflect these positions in their product design and warnings. This is called liability proofing and to the extent that the product liability system is rational, liability proofing will improve safety. Counterexamples, however, are growing in number.

Warning Signs

It is rare that a modern machine does not contain a plethora of warning and caution signs. These rarely deal with hidden dangers; mostly they warn against hazards that are open and obvious and serve only to liability proof the machine. On the other hand, from a safety point of view, they frequently compromise the

(3) *McClellan and Orr v. CTA, 34 111. App. 3d 151.*

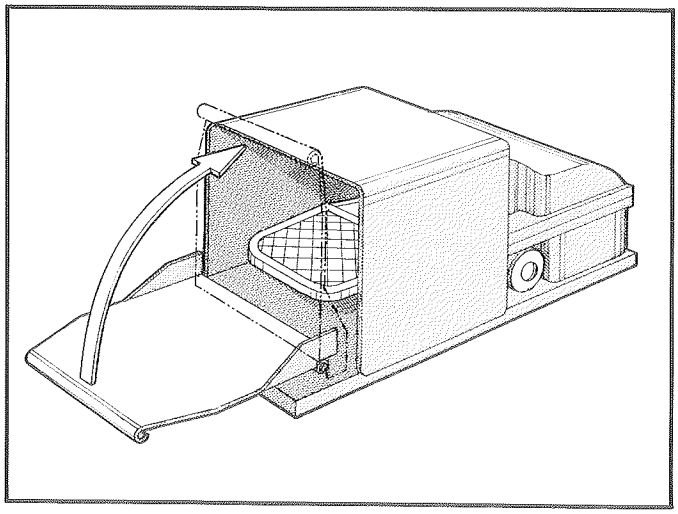
(4) Ralph L. Barnett and Peter Barroso, Jr., "On Classification of Safeguard Devices (Part 1)," *Triodyne Safety Brief* v. 1, *#1 (April 1981).*

machine. For example, too many warning signs produce clutter and increase the probability that none of the signs will be read, including the really important ones. Furthermore, it is difficult to encourage people to take safety signs seriously when most of them are silly — *Expect the Unexpected, A Clean Machine is a Safe Machine, Obey all Signs* and *Don't Place Hands Under Blade.*

These may be contrasted with warnings dealing with hidden dangers - *Danger-20,000 Volts, Machine May Start Unexpectedly in Automatic Mode, Press May Stroke After Motor is Shut Off, Wait Until Flywheel Has Stopped Before Servicing* and *Beware of Guard Dog.*

Foot Switches

Many punch press manufacturers have completely blunted the attack of the plaintiff's bar on foot switches by adopting the "mousetrap" design, i.e., foot switches guarded on all sides with a hinged door at the foot port. Recently completed research has confirmed what some press manufacturers hypothesized — the mousetrap design is unsafe for most punch press operations since it encourages the practice of "riding the pedal." (See Figure Below)



IV. Safety Philosophy

Perhaps the most unequivocal position taken in the safety literature is the admonition against the use of guards which offer accident hazards of their own. We have sampled and excerpted this literature:

1981: Willie Hammer, *Occupational Safety Management and Engineering,* Englewood Cliffs, NJ, Prentice-Hall, 1981.

> "A guard or safety device must have certain characteristics . . . 9. It should not itself constitute a hazard." pp. 220-21.

1980: *Concepts and Techniques of Machine Guarding (OSHA 3067).* Washington, DC, OSHA, 1980.

> "What must a safeguard do to protect workers against mechanical hazards? Safeguards must meet these minimum general requirements: . . . Create no new hazards. A safeguard defeats its own purpose if it creates a hazard of its own, such as a shear point, a jagged edge, or an unfinished surface which can cause a laceration." pp. 7-8

1978: "Motor-Operated Appliances," *UL 73.* Chicago, IL, Underwriters' Laboratories, Aug. 18, 1978.

> "25.4 Some guards are required to be of the self-restoring type. Other features of guards that are to be considered include: . . . E. Creation of additional risk of injury to persons such as pinch points, and the necessity of additional handling because of increased need for servicing, such as cleaning, unjamming, etc. . . ." p. 23.

1975: Merle E. Strong, ed., *Accident Prevention Manual for Training Programs.* Chicago, IL, American Technical Society, 1975.

> "Construction of guards . . . The following points have been compiled to enable the reader to construct an adequate guard or to select one that will meet accepted standards: . . . 5. They should not create additional hazards, such as tripping or obstructing." p. 199.

1975: *Code of Practice: Safeguarding of Machinery. BS 5304: 1975.* London, British Standards Institution, 1975.

> "5.1.2. Construction of safeguards . . . (c) Whatever safeguard is selected it should not itself present a hazard such as trapping or shear points, splinters, rough or sharp edges, or other sources likely to cause injury. In the case of food processing machinery the safeguard should not constitute a source of contamination of the product." p. 4

1975: *Handbook of Occupational Safety and Health.* Chicago, IL, National Safety Council, 1975.

> "It is a cardinal rule that safeguarding one hazard should not create an additional hazard." p. 138

1971: "Machine Guarding," *National Safety News,* v. 103, #5 (May 1971): 48-55.

> "In addition, a proper guard should: . . . Present no hazard itself." p. 48.

1971: "General Requirements for All Machines," *19 CFR 1910.212* (a) (2). Washington, DC, OSHA, effective August 27, 1971.

"General requirements for machine guards: Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself."

1970: *Supervisors' Safety Manual.* Chicago, IL, National Safety Council, 1970.

"To be generally acceptable, a guard should: . . . 10. Not be a source of additional hazards, such as splinters, pinch points, sharp corners, rough edges or other injury sources." p. 251.

1963: Roland P. Blake, ed. *Industrial Safety,* 3rd ed. Englewood Cliffs, NJ, Prentice-Hall, 1963.

"State codes give the broad, overall requirements for performance or construction, but the effectiveness of the guard is still dependent upon the skill of the designer and the builder to design and construct a guard that is adequate for the purpose, is sturdy enough to withstand hard service, and does not in itself create a hazard." pp. 181-82.

1962: *Guards Illustrated,* 1st ed. Chicago, IL, National Safety Council, 1962.

"To be effective and acceptable, a point-of-operation guard should have among its characteristics those listed here. It should . . . present no hazard itself, such as splinters, pinch points, shear points, sharp corners, rough edges and other sources of injury." p. xi.

1959: *The Principles and Techniques of Mechanical Guarding. Bureau of Labor Statistics Bulletin No. 197,* U.S. Dept. of Labor, 1959.

"Machine guards to be effective must be built in accordance with recognized standards of construction and of performance. They must be designed so as to eliminate the hazard, they must create no hazard of their own, they must be sturdy enough to withstand normal wear, and they should not interfere with production." p. 54.

1953: Lillian Stemp, *Safety Manual for the Graphic Arts Industry.* Chicago, IL, National Safety Council with the Education Council of the Graphic Arts Industry, Pittsburgh, 1953.

"When it is found necessary to build the guards, or have them built, these guards should have these qualifications: . . . 5. Avoidance of being a hazard in themselves (sharp edges, abrasives or splintered surfaces)." p. 7

1949: *Model Code of Safety Regulations for Industrial Establishments for the Guidance of Governments and Industry.* Geneva, International Labour Office, 1949.

"Regulation 82. Guards. General Provisions. 1. Guards should be so designed, constructed and used that they will:(1) not constitute a hazard by themselves (without splinters, sharp corners, rough edges or other sources of accidents) . . ." p. 50

1949: "Mechanical Power Transmission Apparatus," *NSC Safe Practices Pamphlet No. 110.* Chicago, IL, National Safety Council, 1949.

"A good transmission parts guard should be considered a permanent part cf the equipment on which it is installed and should . . . (a) not itself present hazards (splinters, sharp corners, rough edges or other sources of injury)." p. 2.

1948: "American Standard Safety Code for Power Presses and Foot and Hand Presses," *ANSI B11.1 -1948.* New York, American National Standards Institute, 1948.

"5.2 General Requirements for Point of Operation Guarding. 5.2.1. Every such device shall be simple and reliable in construction, application, and adjustment. It shall be permanently attached to the press or the die. It shall not offer any accident hazard of itself." pp. 9-10.

1946: *Accident Prevention Manual for Industrial Operations,* 1st ed. Chicago, IL, National Safety Council, 1946.

"Safe guard construction, design and use depend to a great extent on many of the following summarized characteristics. Generally speaking, a guard should: . . . 12. Not constitute a hazard itself (without splinters, sharp corners, rough edges, or other sources of injury)." p.117.

1944: Harry H. Judson and James M. Brown, *Occupational Accident Prevention,* New York, John Wiley, 1944.

"General Requirements for Good Guarding. The general requirements for good guarding of machines are as follows: . . . 3. The guard must not introduce any new hazards of its own: thus it must not offer any sharp corners to cause injury to the employee in passing. It must not introduce tripping hazards or unnecessary striking hazards." p. 102

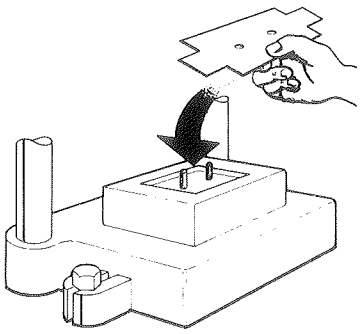
1944: *Safety Subjects. Bulletin 67 of Division of Labor Standards,* U.S. Dept. of Labor, 1944.

"Not only must a machine guard give maximum protection, but it must not interfere with operation or create or contribute to a different hazard." p. 89.

1943: C.M. Macmillan, *Foremanship and Safety.* New York, John Wiley, 1943.

POWER PRESS FEED METHODS is one of a series of safety posters available from our graphics division. The posters depict the areas where each of the classical safety devices is inapplicable and the circumstances where it is unsafe.

HAND FEED



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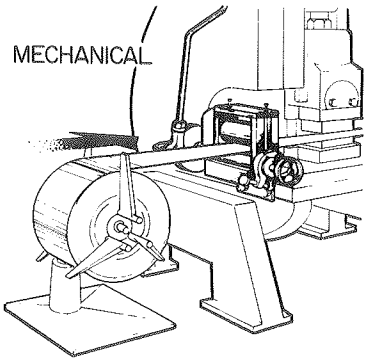

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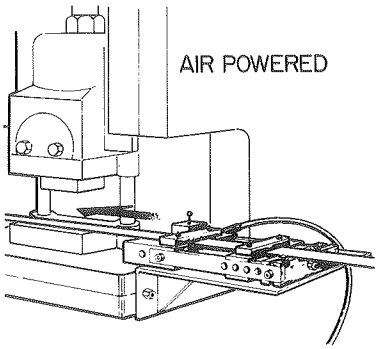
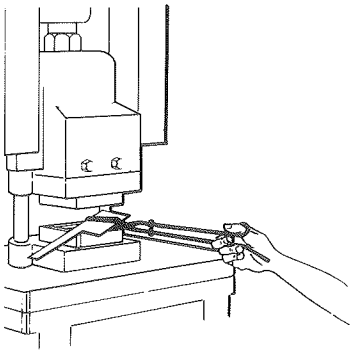


HAND TOOL



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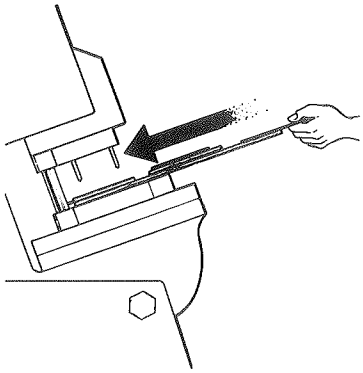
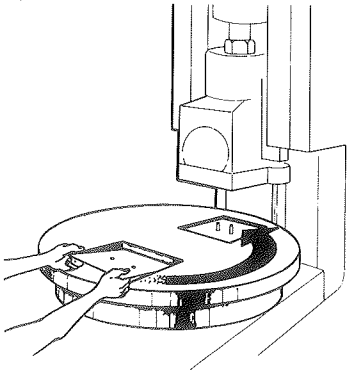
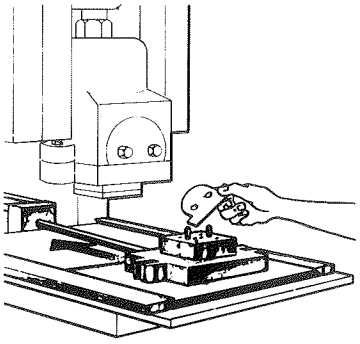


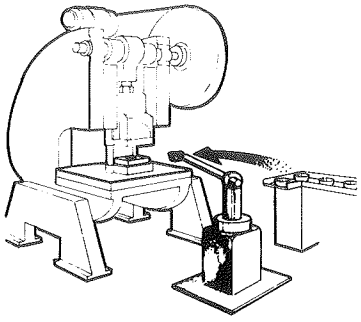
DIAL FEED



SLIDING BOLSTER PLATE



ROBOT



NOTE: CONTROLS AND GUARDS REMOVED FOR CLARITY.

Graphics by Mary A. Misiewicz

"In considering a machine guard we must realize that it has to give "tops" in protection and it must not interfere with operation. Also, care must be taken that in guarding against one hazard we do not create another." p. 46.

1916: George Alvin Cowee, *Practical Safety Methods and Devices.* New York, Van Nostrand, 1916.

"Guards should be designed to meet the requirements at hand. They should be substantially built, effectively protecting the workmen from injury. Poorly constructed, impractical, unsafe guards are far worse than none at all." p. 23.

Editor: Paula Barnett **Produced by Triodyne Graphic Communications Group**

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