

# SAFETY BRIEF

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Matthew J. Ulmenstine

## Model Laboratory

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Sandie Christilansen  
Rita Curtis  
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Peter Warner  
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Jose Rivera

## SAFETY RESEARCH:

**Institute for Advanced  
Safety Studies**

(Est. 1984)  
5950 West Touhy Avenue  
Niles, IL 60714-4610  
(847) 647-1101

## Chairman

Ralph L. Barnett

## Director of Operations

Paula L. Barnett

## Information Services

Marna S. Sanders

## Senior Science Advisor

Theodore Liber, Ph.D.

## SAFETY PRODUCTS:

**Triodyne Safety  
Systems, L.L.C.**

(Est. 1998)  
5950 West Touhy Avenue  
Niles, IL 60714-4610  
(847) 677-4730  
FAX: (847) 647-2047

## Officers/Directors

Ralph L. Barnett  
Paula L. Barnett  
Joel I. Barnett

## President

Peter J. Poczynok

## Vice President of Operations

Peter W. Warner

## Senior Science Advisor

Theodore Liber, Ph.D.

## Mechanical Engineering

Ralph L. Barnett  
Peter J. Poczynok

## Aquatatics Safety Consultant

Ronald M. Schroader

September 2000

**Triodyne Inc.**

Consulting Engineers & Scientists – Safety Philosophy & Technology  
5950 West Touhy Avenue Niles, IL 60714-4610 (847) 677-4730

FAX: (847) 647-2047

e-mail: [infoserv@triodyne.com](mailto:infoserv@triodyne.com)[www.triodyne.com](http://www.triodyne.com)

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## International Safety Alert Symbol

By Ralph L. Barnett\* and  
Raymond Wambaja\*\*



Figure 1 - International Safety Alert Symbol

### ABSTRACT

With the adoption of the international safety alert symbol, the safety profession has lost an important weapon in the war against injury. The symbol is not uniquely associated with safety, it does not have an optimum shape and it has no intrinsic pictorial to communicate danger to untrained people from every culture. The symbol represents a tragic "missed opportunity" for mobilizing personal vigilance.

### I. INTRODUCTION

In 1968, Margaret Mead and Rudolph Modley (Ref. 1) noted that people spoke at least twenty-eight hundred languages. These people are exposed to all of the dangers associated with technology and nature. Because the unwary and untrained are always in jeopardy, motivation exists for the development of effective safety communication systems. This, in turn, gives rise to the establishment of a universally understood safety alert symbol (Ref. 2).

Symbols provide a number of advantages to safety professionals, e.g.,

- A symbol engenders a faster reaction than any combination of words and/or symbols (Ref. 3).
- Symbols are language independent and require less space than text (Ref. 4).
- On average, the threshold size for symbolic signs was approximately half that of the corresponding text version (Ref. 5).
- A symbol sign can withstand greater degradation and still be recognizable (Ref. 6).
- Warnings printed conspicuously and paired with pictorial icons would produce greater comprehension and memory than would warnings in plain print without pictorial icons (Ref. 7).
- A symbol used as an icon attracts attention to warnings and safety related matters (Ref. 8).

Safety related issues are sometimes overt and sometimes subtle. A safety alert symbol serves to flag safety problems and activate personal vigilance. For this reason, the safety alert symbol (Fig. 1) was developed and standardized.

\* Professor, Mechanical and Aerospace Engineering, Illinois Institute of Technology, Chicago, and Chairman, Triodyne Inc., Niles, IL

\*\* Mechanical Engineer, Triodyne Inc., Niles, IL

## ENVIRONMENTAL:

**Triodyne Environmental  
Engineering, Inc.**

(Est. 1989)  
5950 West Touhy Avenue  
Niles, IL 60714-4610  
(847) 677-4730  
FAX: (847) 647-2047

## Officers

Ralph L. Barnett  
S. Carl Uzgriris, Ph.D.

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(Est. 1945)  
91 East Wilcox Street  
Maywood, IL 60153-2397  
(773) 261-1712  
(708) 345-5444  
FAX: (708) 345-4004

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**Triodyne-Wangler  
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(Est. 1993)  
5950 West Touhy Avenue  
Niles, IL 60714-4610  
(847) 647-8866  
FAX: (847) 647-0785

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William A. Wangler  
Joseph Wangler  
Ralph L. Barnett  
S. Carl Uzgriris, Ph.D.

## CONSTRUCTION PRODUCTS:

**Triodyne-Wangler  
Construction  
Specialties, L.L.C.**

(Est. 1999)  
5950 West Touhy Avenue  
Niles, IL 60714-4610  
(847) 647-8866  
FAX: (847) 647-0785

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Joel I. Barnett  
William A. Wangler  
Joseph Wangler  
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S. Carl Uzgriris, Ph.D.

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Maintenance Corporation**

(Est. 1999)  
5950 West Touhy Avenue  
Niles, IL 60714-4610  
(847) 647-1379  
FAX: (847) 647-0785

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## II. BACKGROUND

The earliest written languages of Egypt, China and Mesopotamia used pictures to represent ideas. It seems ironic that today we are returning to our roots after developing a modern alphabet that has evolved far beyond the simple representation of familiar objects. (Ref. 9)

### A. Highway Signs

In the twentieth century the most prevalent use of symbols has been for highway signs (Ref. 10). One of the first attempts at standardizing symbols for roadways was undertaken in Paris in 1909 at the Convention with Respect to the International Circulation of Motor Vehicles. Standard symbols were developed to eliminate language barriers and communicate messages universally and simply (Ref. 11). The triangle was approved as the shape for warning signs in 1926 at another convention on motor traffic. The triangular warning sign was standardized by the United Nations in 1949 in their protocol on Road Signs and Symbols. The symbol is used throughout Europe.

The original use of the arbitrary exclamation point for warning was in the highway context. (Ref. 2)

### B. Agricultural, Construction and Industrial Equipment

The tractor technical committee of the Society of Automotive Engineers (SAE) approved the safety alert symbol shown in Fig. 1 in December 1972. It was introduced in the SAE Recommended Practice: SAE J284a - Safety Alert Symbol for Agricultural, Construction and Industrial Equipment. The general purpose nature of this recommended practice may be inferred from the concise language in its purpose, scope, description and applications, to wit:

#### *“1. Purpose*

*1.1 To establish a safety alert symbol for use on agricultural, construction and industrial equipment.*

*1.2 To provide a symbol which means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!*

*2. Scope - This recommended practice presents the general uses, limitations on use, and appearance of the safety alert symbol.*

#### *3. Description*

*3.1 The safety alert symbol shall be an equilateral triangle with rounded corners and with an “exclamation mark” located in the center as shown in Fig. 1. The dimensions are optional.*

*3.2 The safety alert symbol should be of contrasting colors which will cause the “exclamation mark” to stand out.*

## 4. Applications

### 4.1 The symbol should be used as:

*4.1.1 A symbol which can be used in conjunction with warning statements and signs.*

*4.1.2 A symbol in instruction manuals.*

*4.1.3 A symbol in connection with agricultural, construction and industrial equipment safety standards.*

*4.1.4 A symbol to appear on communications which concern agricultural, construction and industrial equipment safety.*

### 4.2 The symbol should not be used:

*4.2.1 To indicate safety compliance or a safety characteristic.*

*4.2.2 Alone on equipment for safety purposes.”*

It should be noted that the American Society of Agricultural Engineers (ASAE) adopted SAE J284 in 1972. It is currently part of the ASAE standards.

### C. American National Standards Institute (ANSI)

On July 24, 1980, a draft of ANSI Z535.4, Product Safety Signs and Labels, adopts the SAE J284a Safety Alert Symbol in Fig. 1. In 1991 the symbol was specified in both ANSI Z535.3, Criteria for Safety Symbols, and Z535.4-1991. Its purpose is to indicate a potential personal safety hazard (Ref. 12).

### D. Symbol Sourcebook

In 1972, Henry Dreyfuss published an authoritative guide to international graphic symbols. (Ref. 2) The safety alert symbol in Fig. 1 is shown under *Safety* and under *Graphic Form*. Further, the triangle is featured without the exclamation point in a number of safety related applications.

### E. Handbook of Pictorial Symbols

Rudolph Modley, in 1976, published a handbook containing 3,250 examples of symbols from international sources. (Ref. 13) The safety alert symbol, , is presented as a Danger symbol (Ibid. pp. 110, 132). More specific safety signs are developed by replacing the exclamation point with a dedicated pictogram. Examples of triangular safety symbols are illustrated throughout Modley's handbook (Ibid. pp. 72, 108, 132).

### III. SIGN GEOMETRY

Safety signs are typically fashioned by the artistically challenged. Their world does not extend beyond the straight-edge and the compass. This accounts for the predominant use of regular polyhedra such as the equilateral triangle, the square, the hexagon and the octagon used for roadway stop signs. The rectangle is very popular; the trapezoid is not. Circles have been adopted for railway demarcation and, when used in conjunction with a single diagonal slash, connote a prohibition against any pictogram included within the circular border. All safety signs have a convex shape and are simply connected (mathematical term).

Safety signs may be contrasted with advertising signs and product labels, whose creators are highly skilled graphic designers who use free form curves and combinations of convex and concave borders (e.g. the valentine heart). They

may use holes and other forms of multiply connected labels. Stick figures are seldom used; colored likenesses are.

Riley, Cochran and Ballard, in 1982, investigated 19 simple geometric shapes of warning labels to establish the preferred shapes for warning indicators (Ref. 14). Table 1 defines the shapes and presents them in decreasing order of preference. The ranking shows that when shape alone is the determining factor in describing a warning, an equilateral triangle on its vertex is the preferred warning shape. This means that the widely used safety alert symbol in Fig. 1 is upside-down! The study suggests that shapes that appear unstable tend to be preferred as warnings.

Another observation from Table 1 seems appropriate. The worst candidate, 19 out of 19, is the six sided tag shaped figure; this is the most popular shape used for lockout/tagout applications (Ref. 15).

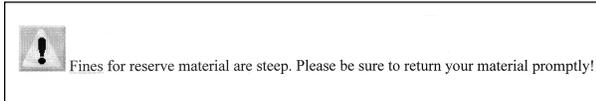
*Table 1 - Preferred Shapes for Warning Indicators*

Ranking	Shape	Description
1		Equilateral triangle pointing downward (traffic yield shape)
2.5		Square on a point or diamond (traffic warning sign)
2.5		Octagon (traffic stop sign shape)
4.5		Equilateral triangle pointing right (traffic no passing shape)
4.5		Equilateral triangle pointing upward (traffic yield shape)
6		Hexagon
7		Six-sided figure (slow moving vehicle sign shape)
8.5		Equilateral triangle pointing left
8.5		Parallelogram on a point
10		Pentagon (similar to school crossing roadway sign)
11.5		Trapezoid on its long base
11.5		Trapezoid on its short base
13		Parallelogram on its side
14		Circle (railroad crossing roadway sign shape)
15		Rectangle on its long base (similar to traffic information sign)
16.5		Square on its base
16.5		Ellipse on its major axis
18		Rectangle on its short base (traffic regulator sign)
19		Six-sided figure (tag shape)

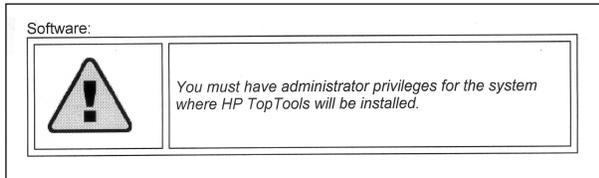
## IV. UNIQUENESS

The power of the safety alert symbol to highlight a safety concern is diluted when the symbol is used for a myriad of lesser tasks. Each non-safety appearance of the symbol produces an “anti-teaching” effect. It is, unfortunately, too late to restrict the symbol to safety related matters; its other uses are too widespread. For example:

1. The Fine Arts Library, Cornell University, uses the symbol for reserve materials:



2. The Top Tools Company uses the symbol in their Requirements Check:



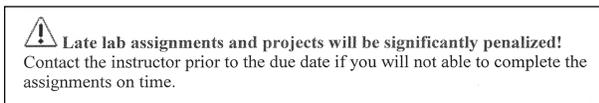
3. The web site for Worldwide Riche\$ (1998) uses the symbol to arrest the reader's attention:



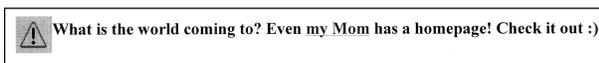
4. The use of the symbol as a non-safety related icon may be found at <http://www.gemini.edu/sciops/OThelp/bugs.html> :



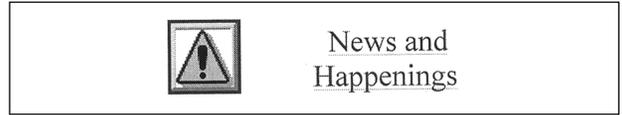
5. The Nicholas School of the Environment adopts the symbol in their course syllabus, NSOE ENV351 Course Outline:



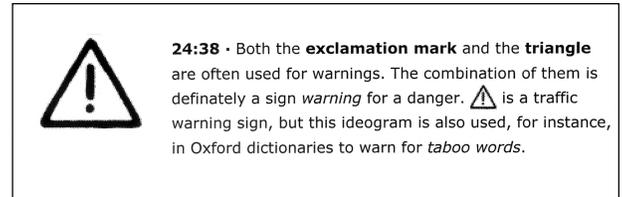
6. From a personal homepage for Dr. Kim Ainsworth-Darnell,



7. The symbol is used by the Boston Public Schools Office of Technology to announce newsworthy items:



8. The symbol is sometimes used in dictionaries to demarcate “words that are likely to cause embarrassment or anger if they are used in the wrong situation.” The following comment is from Melody IS., 1997 -1999 HME Media (Ref. 16).



## V. REPRESENTATIONAL SYMBOLS

There are three categories of symbols that have been identified by both Modley (Ref. 13) and Dreyfuss (Ref. 2): representational or image related, abstract or concept related, and arbitrary. Examples of these are illustrated in Fig. 2. Clearly, the safety alert symbol falls into the arbitrary category.

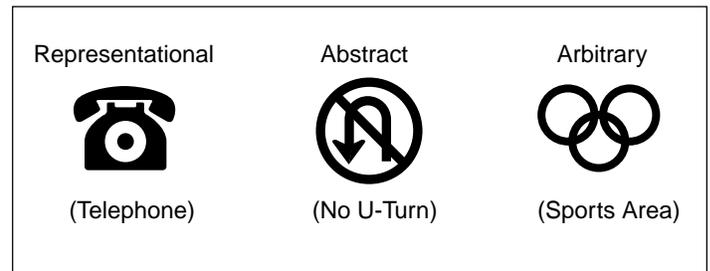


Figure 2 - Symbol Categories

“Arbitrary symbols are those where the meaning is arbitrarily assigned to the graphic. Thus an exclamation mark does not depict any aspect of the real world object, but has a meaning that has been arbitrarily assigned to it and that we have had to learn to understand without any assistance from representational elements within the graphic itself. Where such arbitrary symbols are used the graphic image should be simple and clearly distinct from any other symbol that might be used in a similar context.” Edgeworthy (Ref. 6)

In summary, the safety alert symbol has no intrinsic meaning; every viewer must be trained to take advantage of its safety significance. Furthermore, it is neither distinct nor unique.

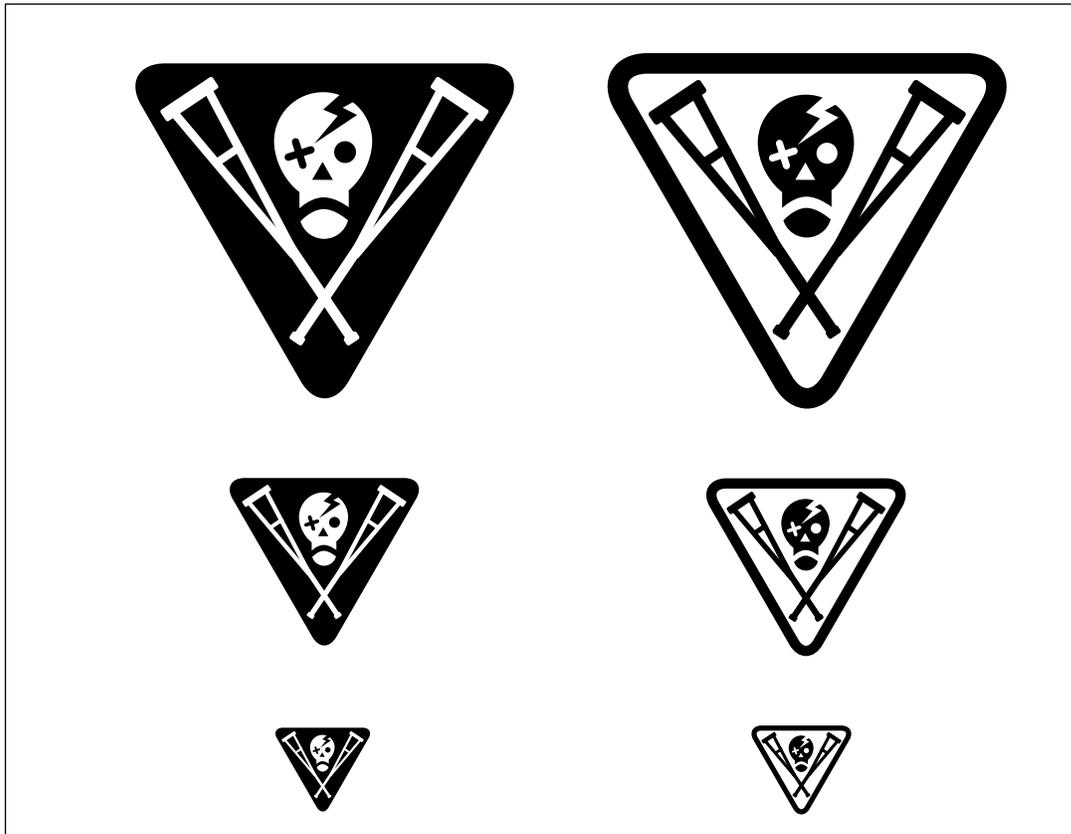


Figure 3 - Proposed International Safety Alert Symbol

For the sake of concreteness, the authors have prepared the safety alert symbol in Fig. 3 in various sizes. The triangle with its downward facing vertex was selected since it is the optimum shape; furthermore, the particular collection of graphics is clearly unique. An attempt was made to depict a general image of danger as opposed to a specific accident scenario. The crossed crutches are supposed to imply a leg injury; an eye injury is represented; a head fracture is illustrated; and finally, a death skull with a pained expression is included. It was hoped that this combination of maladies would not suggest a common cause and that the smorgasbord of mischief would imply a general notion of danger. Whether this goal was achieved with this symbol is not important. What is important is that some symbol attain such a goal so that all viewers will perceive a danger communication.

With respect to the proposed safety alert symbol shown in Fig. 3, there are some characteristics that should be noted:

- The salient features of the graphic symbol are preserved in the smaller sizes.
- The symbol retains some classic characteristics of the skull and crossbones used in the old poison symbol.
- Both injury and death are represented in the graphic.
- Because the symbol has not been tested, it is not known whether its imagery will translate among cultures.
- Either danger or its antonym, safety, could have been used as a safety alert symbol.

The development of an effective general danger graphic is a sophisticated task that should be undertaken by the safety profession. If you imagine a protocol that assembles focus groups from every culture, this will give some indication of the magnitude of such a project. In the meantime a little doodling seems in order.

## VI. CONCLUSIONS

1. The international safety alert symbol depicted in Fig. 1 evolved through the process of consensus; it is not the product of research.
2. Research shows that the shape of the safety alert symbol is not optimal; indeed, it is upside-down. We have standardized an inferior shape.
3. As a further object lesson in research vs. consensus, we note that the least desirable warning shape has been reserved for the safety lockout tag.
4. The safety alert symbol enjoys widespread use in dozens of non-safety related applications. This may be explained, in part, by the fact that no talent is required to draw the symbol.

5. Because the safety alert symbol is an “arbitrary” graphic, its meaning must be taught. This teaching effort is diluted by the proliferation of uses outside of the safety arena.
6. It is reprehensible that the safety alert symbol is an “arbitrary” symbol without intrinsic meaning. It cannot communicate the notion of safety to the community of untrained people that dominate the world.
7. An untested safety alert symbol is proposed that has an optimum shape and a unique image that attempts to reflect a sense of danger without focusing on a specific safety scenario.
8. To restrict the application of any new symbol to safety-related issues, it will be necessary for one of the safety organizations to appeal to intellectual property attorneys.

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