Session No. 667

A New Era in Visual Safety Communications: ANSI Z535.2-2011

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Introduction – Thomas Bresnahan

The issue of safety signage in industrial, commercial, and business establishments continues to be a significant issue for S/H&E professionals. This session will discuss in-depth the newly published *ANSI Z535.2- 2011 Standard for Environmental and Facility Safety Signs* using real-world examples and presenting issues of standards compliance and risk reduction that show how a system of safety signs protects people and improves liability risk management.

The opening of our discussion will focus on a current, on-going survey of how manufacturers are actually using safety signs. This survey is a two page snapshot of safety signage used in facilities and corporate campuses where products are fabricated and made.

But before getting into the nuts and bolts of the survey (all 28 issues), let me cite a conversation from my favorite comedic author of mysteries, Donald Westlake. If you remember the movie with Robert Redford "Hot Rocks," you will recall the John Dortmunder gang of second-story burglars. In Westlake's *Bad News,* the gang is driving on unfamiliar roads to case an estate to be looted when Stan Kelp, the expert wheel-man says, "This signage stinks," and Dortmunder looks over at Kelp and asks, "Signage, is that a word?" and Kelp replies, "Not for those pitiful markers they had back there."

Our objective in this presentation is that you come away with an understanding of the principles behind the new ANSI Z535 safety signs and how you should use them as a "system" to visually communicate critical safety information to protect your people and improve overall risk management. And moreover, so you'll have an answer to the John Dortmunder in your future who asks, "Signage, is that a word?"

The first issue to be dealt with in the survey was the need to distinguish between ANSI Z535.2 facility safety signs and ANSI Z535.4 product safety signs and labels. This was done with a note under the header of the survey form that read: "*Environmental and facility safety signs are those signs the facility employer installs and posts, that is, they are not those safety signs and labels found on machinery and equipment purchased by the facility employer*." Making this distinction was essential to differentiate the two types of visual safety signs found in a manufacturing environment – safety signs that are the responsibility of the facility owner and safety signs and labels that are the responsibility of the equipment manufacturer. If product safety labels were mistakenly included in the survey responses, the data collected would not accurately reflect the use of facility safety signs.

The survey (see Appendix A) asks the demographics of the facility, number of signs used in each category of signage, whether a log of the signs is kept, if inspections occur, and how signs are defined and procured. Three interesting points that have come out of the surveys to date are:

1) By completing the survey, manufacturers are finding they are establishing a baseline or benchmark for their sign program and its performance.

2) The auditing/inspecting of safety signs on a regular periodic basis is done by few facilities.

3) Of the 28 or so issues derived from the survey so far, a handful seems conducive to inclusion in the next Z535.2 revision, or so the case will made.

The data from the survey is still being collected and compiled at the time this proceedings paper is being written and the survey's complete findings will be presented at the 2012 ASSE PDC.

The ANSI Z535.2-2011 Standard's "System" of Signs – Geoffrey Peckham

It's important to understand that the ANSI Z535.2 standard applies to all safety signs installed inside facilities, outside facilities, and on fences, walls, and posts, in both public and private venues. In short, it applies to practically every safety sign you encounter in workplace and public-space environments. It's also important to understand that the 2011 ANSI Z535.2 standard lays out a systematic approach to communicating safety. The end result of a well-defined ANSI Z535.2 project is not a hodge-podge set of signs that get stuck up on the wall. Instead, use of the ANSI Z535.2 standard requires the people designing the system to consider safety signage as a "system" of visual communication, a "system" that is built in three ways.

1) The ANSI Z535.2 standard for signs utilizes a "system" of design elements that are aligned with the other five standards that make up the family of ANSI Z535 standards. As a group, these standards are the primary A-level standards used in the United States for communicating safety information in a visual format. The six standards cover the following topics:

- safety colors (ANSI Z535.1)

- environmental/facility safety signs (ANSI Z535.2)

- design and testing criteria for safety symbols (ANSI Z535.3)

- product safety signs and labels (ANSI Z535.4)

- temporary tags and barricade tapes (ANSI Z535.5)

- safety information presented in product manuals and collateral material (ANSI Z535.6)

The theory behind standardizing a system of design components for safety signs is that through the common use of uniform principles for layout, color and content, people will more easily notice, recognize and understand safety messages, distilling them out of the background of the thousands of messages they see on a daily basis. The overall goal for all of the individual company efforts in this area is to create a *national uniform system* for hazard recognition, and this can only be done through the consistent application of the ANSI Z535 system of design principles. Those responsible for safety must understand how to apply these design principles, looking at them as a system of interwoven components that, taken together, can effectively communicate safety in public and private environments.

2) The ANSI Z535.2 standard establishes clearly defined "categories" of safety signs, each with their own distinct purpose, that when used together, create a *system* of signage intended to reduce risk and protect people. Once the categorization system is understood, you will see how your plant's safety signs work in combination with one another to convey safety in a variety of ways. In the end, your safety signs will play a new and more integral role in your facility's risk reduction and safety training programs.

3) The content displayed on each type or category of ANSI Z535.2 sign has a *systematic* structure to it. When you understand this structure, you will see why the ANSI Z535 system is significantly better at communicating safety messages than the older sign formats that may still be in use at your facility.

The ANSI Z535.2 Categories of Signs

There are four categories of safety signs according to the ANSI Z535.2-2011 standard. Each of these types of signs will be described below.

Hazard Alerting Signs – Signal word selection

The best place to start to understand how the ANSI Z535.2 sign system works is to see how the different sign categories are defined and what they look like. The first category of signs is "hazard alerting" signs. These signs use the large colored signal words DANGER, WARNING or CAUTION on the top of the sign to catch people's attention and inform them that they need to be aware of a nearby hazard, a hazard that could result in personal injury or death. Each of these three signal words communicates a different level of risk (risk being defined as a combination of severity of injury and probability of the accident/injury occurring if the sign's message is ignored). I have underlined the words in each ANSI Z535 signal word definition, below, so the reader will see how the interplay of injury severity and probability combine to indicate a distinct level of risk severity for each hazard alerting sign.

- DANGER is used to indicate a hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

- WARNING is used to indicate a hazardous situation which, if not avoided, could result in death or serious injury.

- CAUTION is used to indicate a hazardous situation which, if not avoided, could result in minor or moderate injury.

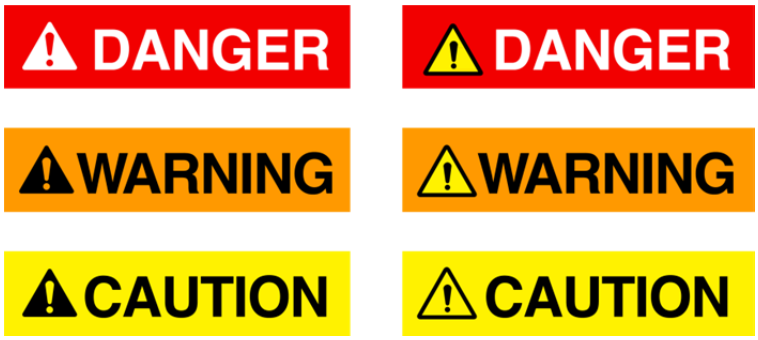

Exhibit 1. ANSI Z535.2-2011 Signal word panels for hazard alerting safety signs (Older style on left, ISO harmonized style on right – both styles are acceptable)

This system of choosing the DANGER, WARNING, CAUTION signal words for various types of hazardous situations dovetails nicely into present-day risk reduction methodologies. This is one reason why the ANSI Z535.2 sign system is an improvement over the old 1971 OSHA-style signage that was actually first created in 1941 in the *ASA Z35.1 Standard for Accident Prevention Signs* (i.e. a standard that was written back in the time when processes were often less complex and modern-day risk assessment methodologies did not exist). This old system of accident prevention signs used either DANGER or CAUTION for signal words and the choice of which word to use was based solely on the "immediacy" of the hazard. It did not take into account the severity of the injury. That is why it's common to see "DANGER – HOT" signs placed in facilities that also have "DANGER – HIGH VOLTAGE" signs installed. Yes, both types of hazards result in "immediate" injury. But in one instance interaction with the hazard most often results in a slight burn. Yet interaction with the voltage hazard results in electrocution. Not exactly the same level of risk! In the ANSI Z535.2 system of signal word risk level communication, the signal word for most burn hazard signs would be CAUTION because the result of interaction with the hazard is usually minor or moderate injury. And, applying ANSI Z535 signal word definitions, DANGER or WARNING would be the correct choice for the signal word for high voltage signs because interaction with this type of hazard "will" or "could" result in death or serious injury.

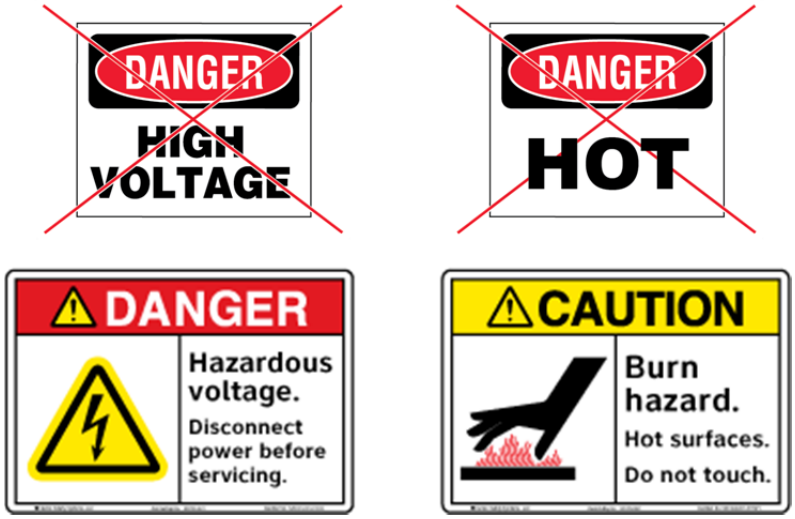

Exhibit 2. OSHA-style Z35.1 safety signs (top), 2011 ANSI Z535.2 safety signs (bottom)

Hazard Alerting Signs – Content Selection

First, like the signal words, the content components for ANSI Z535.2-2011 facility hazard alerting signs are defined exactly in the same way that the content components for product hazard alerting signs are defined in the *ANSI Z535.4-2011 Standard for Product Safety Signs and Labels*. This is important for several reasons. First, for the sake of achieving a national system of hazard recognition, it's necessary for the safety signs on a factory's walls and the signs posted in public areas to be consistent in their design with safety signs found on consumer and industrial machinery products. A person should not be confronted with two distinctly different sign systems. Second, having the same safety sign content component structure for facility safety signs is highly important because the ANSI Z535 committee based these content components on human factors research and U.S. court decisions that define what constitutes an "adequate" warning. Thus, use of the ANSI Z535.2 system for defining the proper content for each of your facility's hazard alerting safety signs should be useful to your company's liability and litigation position should an accident occur and the issue of whether or not you gave an adequate warning is raised.

According to the ANSI Z535.2 and ANSI Z535.4 definition, the content of a hazard alerting sign identifies the hazard, the level of hazard seriousness, the probably consequence of involvement with the hazard, and how to avoid the hazard. Note that both standards allow for information on consequence, avoidance or type of hazard to be omitted if it can be readily inferred. But both standards also caution the reader to consider many factors when deciding whether to omit any of these content components.

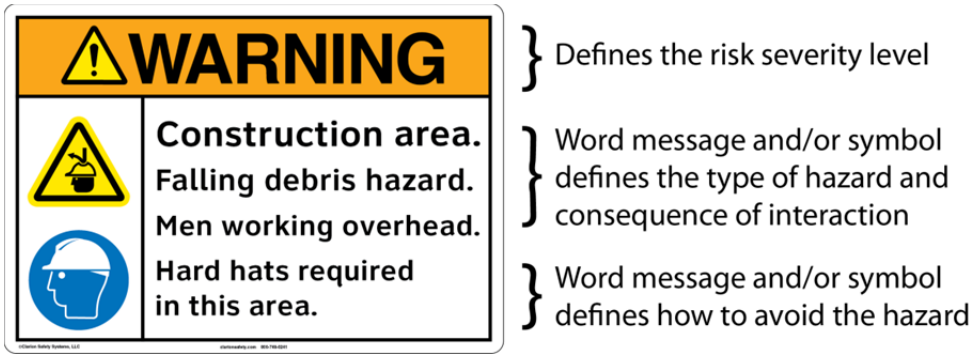

Exhibit 3. Example of a typical ANSI Z535.2 hazard alerting safety sign

The fuller amount of content on the typical ANSI Z535.2-2011 safety sign is another reason why this sign system is an improvement over the older OSHA-style signs. Take the "DANGER – HIGH VOLTAGE" sign. What is the exact nature of the hazard – are there two sources of power to this electrical panel? How do I properly perform maintenance on this panel? Do I need to perform a lockout/tagout procedure? Do I disconnect the power? What form of PPE should I be wearing? Is there a danger of an arc flash explosion, and if so, what level of PPE should I wear before performing maintenance on this panel. A well-crafted ANSI Z535.2 safety sign will contain detailed information so the viewer gains an understanding not only of what the hazard is, but also how to avoid it. When lives are on the line, this level of information can be crucial to accident prevention.

NOTICE Signs

The second category of safety signs according to the ANSI Z535.2-2011 standard is signs that use the signal word "NOTICE." These signs display information that is considered important but not hazard-related, meaning disobeying the sign's message won't result in possible personal injury or death. For these signs, the safety alert symbol is not used since this symbol is only used when potential personal

injury is at risk. For environmental/facility signs, NOTICE is typically the choice of signal word for messages relating to property damage, security, sanitation, and housekeeping rules.

Exhibit 4. ANSI Z535.2-2011 Signal word panel for notice safety signs

Safety Instruction Signs

The third category of safety signs according to the ANSI Z535.2-2011 standard is signs that use the signal "SAFETY INSTRUCTIONS" or similar words to convey specific safety-related instructions or procedures. More definitive signal words are encouraged with this type of sign, where practical, (e.g., SAFE SHUTDOWN PROCEDURE, SAFETY OPERATING PROCEDURES, BOILER SHUTDOWN PROCEDURE, LOCKOUT PROCEDURE, EMERGENCY SHUTDOWN INSTRUCTIONS). Again, the safety alert symbol is not used with this classification of signal word. One interesting point made in the ANSI Z535.2 standard is that this type of sign can actually appear as a separate panel on another safety sign, thereby segmenting typically lengthy instructional information from a hazard alerting or notice sign's core message.

Exhibit 5. ANSI Z535.2-2011 Signal word panel for safety instruction signs
(Note: More definitive signal words can be used for this type of safety sign)

Safety and Fire Equipment Location Signs

The fourth and final category of safety signs according to the ANSI Z535.2-2011 standard is signs that are used to indicate the direction to or location of safety and fire equipment. These signs do not use signal words though they may contain a word message to define the type of equipment (e.g. Eyewash, Fire Extinguisher, First Aid Kit). Fire equipment signs use white letters on a red background and safety equipment signs use white letters on a green background.

On the Importance of Safety Signs – Ann Minzner Conley

From an insurance loss control perspective, we view safety signage as a critical element in the loss prevention hierarchy of: hazard elimination, hazard reduction and hazard instruction/warning. When hazards cannot be eliminated or reduced, safety signage that clearly communicates the hazard, how to avoid the hazard, and consequences from failing to avoid the hazard are an important element in incident reduction. Safety signage can be especially important where hazards exist and the population of individuals potentially exposed is extremely fluid. Examples might include research laboratories at an educational institution, swimming pools at a hotel, country club, etc. and risk features at other recreational facilities.

All risk management programs generally encompass incident prevention, incident mitigation and incident response. From an insurance loss control perspective, we encourage our insured's to also

consider risk transfer, especially for those risks that a company may not have control over, and defensibility, which means putting yourself in a position to defend the responsible risk management measures you have implemented, even when an incident occurs despite these measures. Defensibility can encompass a wide range of factors. In the case of safety signage, this can include being able to demonstrate diligence in determining when to use signage, what to communicate and how to communicate it, where to place the signage and how to design the sign so that it triggers appropriate attention. Compliance with ANSI Z525.2 can clearly be an important part of demonstrating that diligence.

Case Studies - Implementing a New ANSI Z535.2 System of Signs

When it comes to understanding how standards work, there is nothing like a well-illustrated set of case studies to understand how theory gets put into practice…in this case, best practices for safety signs designed in compliance with the *ANSI Z535.2 – 2011 Standard for Environmental and Facility Safety Signs*.

Examples of three different applications of the ANSI Z535.2 standard will be presented at the 2012 PDC.

Conclusion

When applied well by the safety profession, ANSI Z535.2 – 2011 signs will be an important part of practically every safety engineer's tool kit, providing them with the means to better identify hazards, hazard avoidance procedures, and levels of risk severity. The end result should be improved communication of safety-related information leading to significant reductions in risk.

Bibliography

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American Standards Association, *ASA Z35.1 Specifications for Industrial Accident Prevention Signs*, 1941.

Occupational Safety and Health Administration CFR 1910.145*, Specifications for Accident Prevention Signs and Tags*, 1971.

Westlake, Donald L. *Bad News*, Warner Books, Inc. New York, N.Y. 10020, 2011.

Appendix A

Survey: Use of the ANSI Z535.2 Standard for Environmental and Facility Safety Signs

Note: Environmental and facility safety signs are those signs the facility employer installs and posts (i.e. they are not those safety signs/labels found on machinery and equipment purchased by the facility employer**).**

Survey completed by: Plant Superintendent / Safety Director / Supervisor / Purchasing Mgr. Personnel Mgr. / Other: _____

Demographics of Your Facility

Facility consists of (number of) _____ building(s) with (number of) _____ loading dock(s)
Surrounding fenced ___ or Unfenced ____ Approx. total size of campus _____ sq. ft.
Facility occupies _____ Sq. Ft.
Number of total employees: _____
Number of office personnel including company officers: _____
Number of plant personnel including supervisors: _____

Specific Information on Your Safety Signs

Total number of environmental/facility signs in your facility (estimate):_____
Number of signs using each of the signal words, below:
DANGER_____ **WARNING** _____ **CAUTION** _____ **NOTICE** _____
SAFETY INSTRUCTION _____ (Note: This signal word type can actually be a specific set of words referring to a safety instruction or procedure, like "Lockout/Tagout Procedure.")
SAFETY/FIRE EQUIPMENT_____ (Note: This signal word typically refers to a specific type of equipment, for example, "First Aid", Emergency Eyewash", "Safety Shower", "Fire Extinguisher", "Fire Hose", and "Fire Alarm")

A. Is there a Master List or Log of the above signs? YES NO
B. Does the list or log include the location of each sign? YES NO

- If the answer to A and B is "NO", would you develop such a log for signage? YES NO
- Without a log how do you know when to replace worn or defaced signs?
  Employee report____ Supervisory observation___ Other_____
- Are signs inspected on a regular periodic basis? YES NO
- If so, are they inspected Quarterly?____ Semi-annually?____ Yearly?____ Other_____
- How do you generally select a sign for a hazardous or "need to know" situation?
  List in ( ) the top three determining factors, ranking them from highest to lowest 1 to 3
  ( ) OSHA regulatory mandate ( ) Actual injuries ( ) near miss injury
  ( ) injury reports ( ) recommended by ANSI standards ( ) supervisors determine
  Other_____

C Who makes the determination as to what sign is needed? (Circle one)

Plant superintendent	Purchasing department
Safety director	Engineering department
Supervisor	Maintenance personnel
Safety Committee	Other_____

D. Is a sign manufacturer's catalog used to select or determine a safety sign? YES NO
If YES, is this done in consultation with the manufacturer's representative? YES NO

E. Do you customize the messages on your safety signs? YES NO
If, YES, what percent of your safety signs have customized messages? _____

F. Roughly what percent of your safety signs use symbols? _____

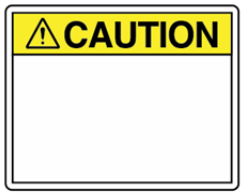
G. Do you still purchase signs with the following signal word panel designs?

Yes No

Yes No

Yes No

H. Are you aware of the changes in sign design contained in the current *ANSI Z535.2 Standard for Environmental and Facility Safety Signs*, shown below? YES NO



I. Will your company adopt the current ANSI Z535.2 designs shown in H above? YES NO
If NO, could you please explain your choice of continuing to use the older style signs?_____
_____

Employee Sign Recognition Training

Does your company's Employee Orientation and subsequent specific safety training include recognition training of safety signs as a means to prevent potential injury and property damage? YES NO

Who would generally give such training? ( ) Immediate supervisor ( ) Lead person on job
( ) Human resources ( ) Other _____

Does your company's Employee Handbook currently provide safety sign recognition training? YES NO