CHEMICAL HAZARD SYMBOL GUIDES EMERGENCY RESPONDERS

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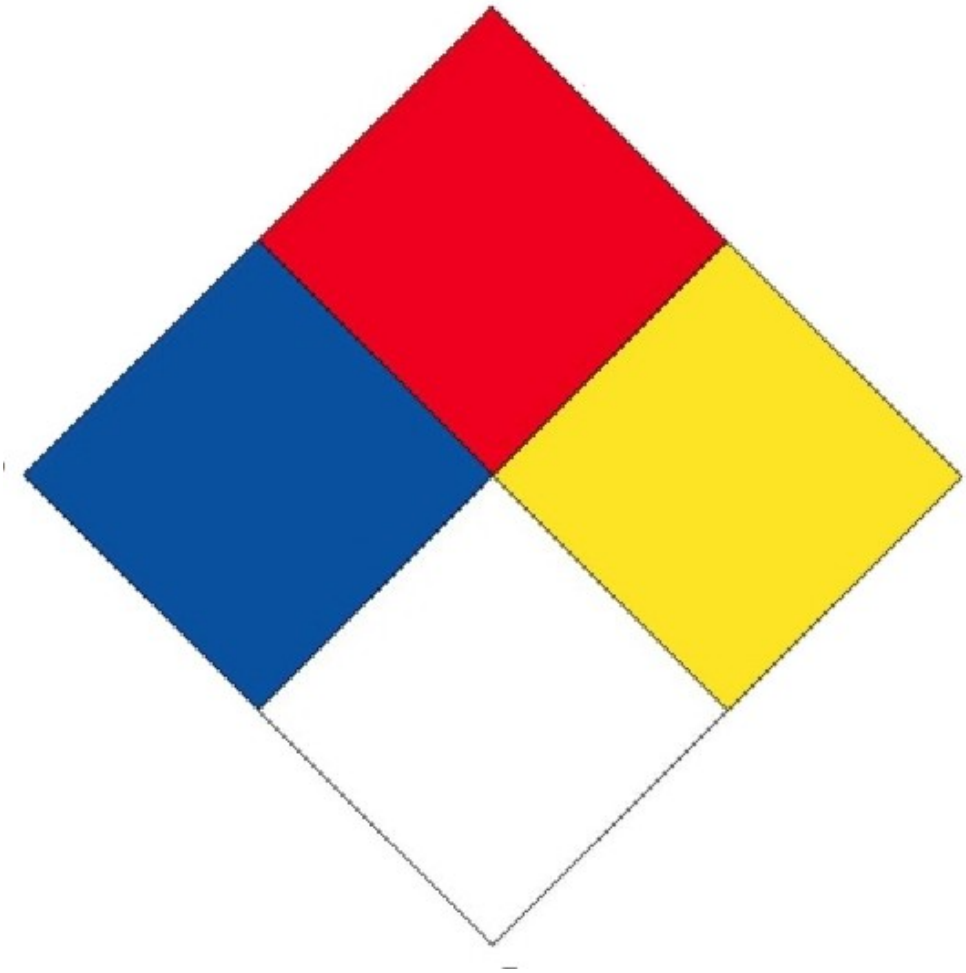
Ever been around campus and seen the diamond-shaped placard with the bright colors and numbers and wondered why it's there? What does it mean? You could have seen it on a building or storage room or in your chemistry or science lab or in the area by the swimming hall on campus. Or, if you have ever been shown a Material Safety Data Sheet (MSDS) it would even have been on that.

Since the early 1950's this image has been alerting emergency responders to the hazards of materials – specifically health, flammability and instability. This widely recognized marking system grew from an early need to classify the fire hazards of flammable liquids, which were viewed at the time as "any liquid whose vapor will burn." The NFPA committee initially identified 25 physical and chemical properties associated with flammable liquids, but eventually grouped those properties according to (1) susceptibility to or ease of ignition, (2) severity after ignition, and (3) control or fire fighting. The committee concluded that a definitive form of fire hazard classification would have to meet the following conditions: (1) identify hazard under all conditions, (2) be generally acceptable, (3) possess uniformity, and (4) be adaptable to simplified use. This system would need to meet the needs of those interested in fire prevention, fire protection, and fire fighting or emergency response. At the time of its development, this classification system was envisioned as beneficial to the process designer, transportation and storage managers, the underwriter, inspection and fire protection authorities, and the fire fighter.

Today's system (described in NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*) largely was put in place in 1956, when the three categories were established for material classification: flammability, stability (today called instability), and health. A numerical scale was proposed for each category; the higher number on the scale represents the greater hazard in each case. The flammability hazard (depicted on the symbol as red background or in the 12 o'clock position) is divided today into four levels primarily based upon flash point (those liquid materials with lower flash points relative to room temperature will generally be rated either as "3" or "4"). The instability hazard (located on the symbol at the 3 o'clock position with a yellow background) describes those materials in terms of their inherent stability; materials that are stable are rated as a "0" while ratings for those materials that become increasingly unstable due to mechanical, thermal, or pressure exposure will have ratings that increase accordingly. Another way to express the instability hazard behavior and ratings process is to consider how easily a material changes and becomes unstable; those materials requiring minimal exposure in order for a change to occur represent the less stable and thus receive the higher ratings in this category. The final hazard category – health hazard – is depicted with a blue background in the 9 o'clock position. It captures the degree of hazard associated with acute exposure to toxic substances and reflects the inherent properties of the material and not those associated with products of combustion, for example. Health hazard ratings change based on the reversible nature of the exposure; a material for which exposure produces no residual injury will be rated the lowest while a material that produces an irreversible injury will be rated at the highest end of the relative rating scale.

In order for this system to achieve the early goals of acceptability and ease of use, a symbol was required. The committee proposed a geometric figure with separate colors assigned to each hazard and the appropriate numerical rating superimposed on the color background. Often referred to as the NFPA "diamond" the shape is actually a "square-on-point." In addition to the blue,

red, and yellow quadrants, the committee recommended additional information to be included in the bottom quadrant (6 o'clock position with a white background). Their work created a fourth category relating specifically to fire fighting as it addressed material characteristics (water reactivity and oxidizer) and the use of water as a suppression agent. Highlighting the existence of a special hazard alerts responders to these unique hazards, which are not inherent to the material but only arise during the fire fighting activity.



So, what are some of the ratings for common materials? Kerosene is rated as 2-2-0 (in order of health, flammability, and instability), which means it is a serious health hazard and a combustible liquid. The diesel generator located on campus for emergency power might have a placard on its fuel tank which would read 1-2-0. If there is a service station near campus with gasoline storage tanks which display their placards the rating would be 1-3-0 (note the higher flammability rating as gasoline has a lower flash point than either kerosene or diesel). If you use liquefied propane gas (LP Gas) for your barbeque grill and were to rate the contents in the cylinder it would be 2-4-0 (again, as a flammable compressed gas the flammability rating becomes the highest, a "4"). One last example, in your chemistry lab you might find sulfuric acid which would be rated as a 3-0-3-W (while not flammable, it is corrosive to skin and extremely water reactive, thus the high instability rating and note the special hazard as well).

For over 50 years, emergency responders have relied on this simple, readily recognized system to quickly alert someone to the hazards associated with various materials. In addition to providing timely information to responders at emergency scenes, this system also provides valuable information to all who understand its guidance when assessing hazards associated with a wide range of materials and assists those in planning for safe storage, handling, and use of such materials.