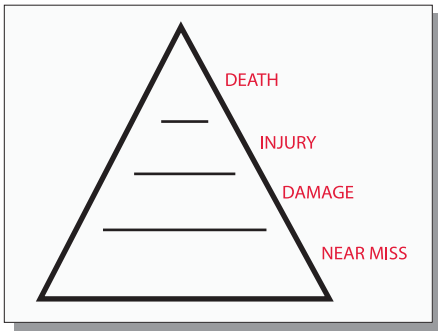
Basic Principle of Safety

A basic principle of safety can be illustrated by the accident triangle. This principle states that for each accidental death that occurs, there are X instances of human injury, Y instances of property damage, and Z instances of what we will call Near Misses (in which the hazardous situation exists but an accident does not occur). Common examples of Near Miss behavior include smoking in bed, or running a red light. This safety principle reasons that the best way to avoid death, injury and property loss is to stay out of the Near Miss zone.

- For example, consider the hazard of smoking in bed. For every death caused by smoking in bed, there are X number of people injured by smoking in bed, and Y number of bedrooms or Houses damaged by smoking in bed. And there are Z number of instances of people smoking in bed who do not die, injure themselves, or burn their houses down. These Z people are operating in the Near Miss zone. Even though nothing destructive happened to them, their behavior is unsafe because it is the same behavior observed in people who died, or were injured, or suffered property damage.



The Accident Triangle

For each death by accident, there are an increasingly greater number of injuries & incidents of property damage, and a large number of near misses (where a hazardous situation exists but no accident occurs).

The best way to stay out of the Near Miss zone is to analyze hazards and create guidelines for safe operation. We then educate people about those safety guidelines. Whenever possible, we also place warnings and indicators near the hazard.

If, instead of focusing on accident prevention, we focus only on minimizing loss after an accident has already occurred, we will seek to improve our emergency response to accidents. Emergency response is a very important part of any safety program, but it is significantly more expensive than prevention. Therefore, unless we follow safety guidelines to avoid accidents, we will spend a great deal more money and time correcting accidents after they have happened.

When combined with proper operator training, hazardous gas detection is a cost effective way to manage risk and help ensure industrial safety.

The Safe Operating Zone

The best way to avoid accidents and assure safe operation is to stay out of the Near Miss zone.

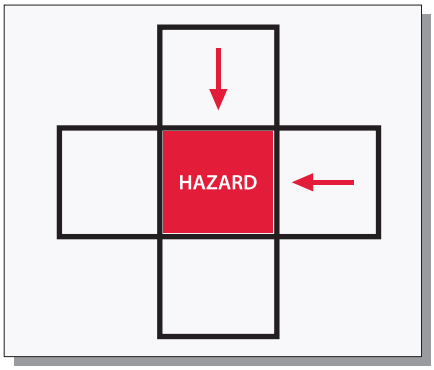
Hazardous Intersections

To prevent accidents, we study known and potential hazards, and establish guidelines for avoiding accidents. For example, the hazard of collision exists at any intersection of two roads. The degree of hazard depends on the number of cars that typically travel the two roads, and the speed at which the cars travel. After observing the type of accidents that occur in intersections, society formed a series of rules, warnings, and hazard indicators specifically for intersections.

1. Rule: Stop at intersections. Proceed only if the intersection is clear of other traffic. The rule applies everywhere and to everyone, and all drivers are expected to know this rule.

2. Warning: Stop sign or flashing light. The stop sign (warning) is placed as a reminder of the hazard. This generally low cost warning is found at almost all intersections.

3. Status Indicator: Traffic light. When the traffic level (or car speed) through an intersection warrants it, a traffic light is used to continuously indicate the status of the hazard.



Hazardous Intersection

Rules, warning signs and indicators are used to prevent accidents from occurring in hazardous situations.

Hazard Indicators

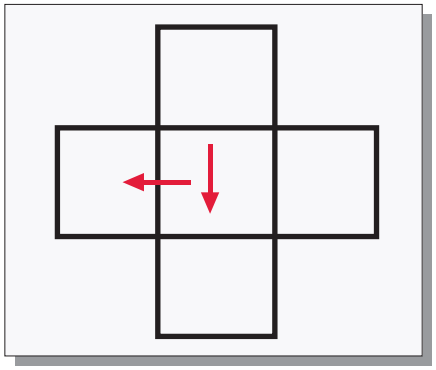
Traffic lights are very simple hazard indicators: they tell drivers when it is safe to drive. Hazard indicators can significantly reduce accidents. They are especially useful in monitoring intermittent hazards and hazards that are difficult to observe accurately (such as solvent vapor concentrations inside a printing process).

Human Error

But some people disobey hazard indicators (running red lights). Their actions can result in death, injury, and property damage. These drivers have committed a human error in judgment. Even when nothing happens, their behavior was still unsafe (because they were operating in the Near Miss zone).

In fact, human error has been found to be a major factor in almost all industrial accidents. In some of these accidents, operators where not aware of the hazard. In others, they misunderstood the danger of operating in the Near Miss zone, because their limited experience showed that nothing bad ever happened before" (this is a common statement made by people who operate in the Near Miss zone). Safety experts advise increasing education and training of personnel as the best way to avoid accidents.

Some accidents are caused by human error of a more subtle nature than clear disregard of a rule. For example, the use of calculations to empirically evaluate hazards can never be as accurate as continuous, direct observation of the hazard. In gas detection, there are many applications where data calculations have been found to be seriously inaccurate when compared with actual measurements. Such applications require continuous monitoring to provide the highest level of safety.



Unsafe behavior in Near Miss zone

A driver traveling from north to south narrowly avoids hitting a driver moving east to west. The north-south driver ran a red light, and entered the Near Miss zone. Even though nothing happened (no accident), running the light was unsafe. Note that the only thing preventing an accident in this example is time. Time is often a factor in keeping Near Miss behavior from becoming an accident, but is also often a key factor in causing accidents, and therefore is no more reliable a factor than mere luck in predicting safety. For example, is it safer to run a red light at six in the evening or at two in the morning?