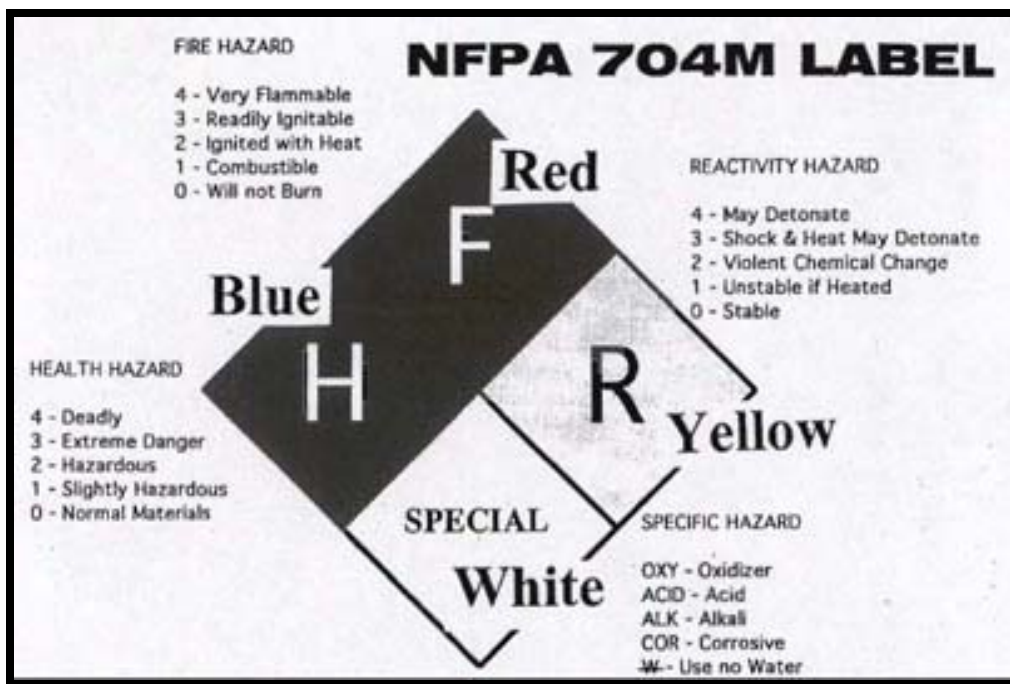


APPENDIX 4-B

Labeling and Ranking Standards

Because of the diversity of reactive materials and their potential hazard, several organizations have developed labeling systems for reactive materials. These systems are designed to give general hazard information quickly and to provide some sense of magnitude of the hazard.

Of these systems, the most widely used is the *Standard System for the Identification of the Fire Hazards of Materials* published by the National Fire Protection Association in NFPA 704. The label used is the popular "NFPA diamond" used on many manufacturers' labels and storage tanks. Reactivity information is displayed in the right-hand, yellow portion of the diamond. The reactivity hazard is ranked, as are the fire and health hazards, using an ordinal ranking system with values of 0 to 4. In addition, the lower portion of the diamond is used to note Special Warnings including water (or moisture) reactives and oxidizing materials. Some suppliers of laboratory chemicals are displaying the NFPA diamond on container labels. Fisher Scientific does this and also includes a colored bar indicating storage code.



Although it is the most common system, NFPA 704 has several important limitations. First, the influence of quantity still requires judgment by the person using the chemical. For example, how much of a very reactive material can be safely handled with a given procedure. The second limitation is evident from the official title of the Standard. Its original purpose was to "safeguard the lives of those individuals who may be concerned with fires occurring in an industrial plant or storage location where the fire hazards of materials may not be readily apparent". It was not designed directly for laboratory decision-making. Even with these limitations the NFPA labeling system is a very useful first

reference for reactivity hazards and an important emergency response information system. The following are definitions from the NFPA 704 system for reactivity.

NFPA Reactivity Rating Reactivity (Stability)

The assignment of degrees in the reactivity category is based upon the susceptibility of materials to release energy by themselves or in combination with water. Fire exposure was one of the factors considered along with conditions of shock and pressure.

NFPA Instability (Reactivity) Rating	
4	Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures. This degree usually includes materials that are sensitive to localized thermal or mechanical shock at normal temperatures and pressures.
3	Materials that in themselves are capable of detonation or of explosive decomposition or explosive reaction but that require a strong initiating source which must be heated under confinement before initiation. This degree usually includes: materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures; materials that react explosively with water without requiring heat or confinement.
2	Materials that readily undergo violent chemical change at elevated temperatures and pressures. This degree usually includes: materials that exhibit an exotherm at temperatures less than or equal to 150°C when tested by differential scanning calorimetry; and that may react violently with water or form potentially explosive mixtures with water.
1	Materials that in themselves are normally stable, but which can become unstable at elevated temperatures and pressures. This degree usually includes: materials that change or decompose on exposure to air, light, or moisture; materials that exhibit an exotherm at temperatures greater than 150°C, but less than or equal to 300°C, when tested by differential scanning calorimetry.
0	Materials that in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.

NFPA Health Rating

The assignment of degrees in the health hazard category is based upon the capability of materials to cause personal injury due to contact with or entry into the body via inhalation, ingestion, skin contact, or eye contact.

NFPA Health Rating	
4	Materials that, under emergency conditions, can be lethal.
3	Materials that, under emergency conditions, can cause serious or permanent injury.
2	Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.
1	Materials that, under emergency conditions, can cause significant irritation.
0	Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials.

NFPA Flammability Rating

The assignment of degrees in the flammability hazard category is based upon the susceptibility of materials to burning.

NFPA Flammability Rating	
4	Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily.
3	Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions.
2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air.
1	Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur.
0	Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.