



## CALIFORNIA OFFICE OF EMERGENCY SERVICES

Fire and Rescue Division  
3650 Schriever Ave  
Mather, CA. 95655  
Phone (916) 845-8711  
Night-Weekends: (916) 845-8911  
Fax: (916) 845-8396



March 19, 2014

## Fire & Rescue Division Hazardous Materials Section

### **BULLETIN # 11 – R.E. SEL # 9.1.1, 9.1.2** (Version 2.0)

## NEUTRALIZATION of ACIDS and ALKALI

When the field intervention procedure of neutralization is applied by hazardous materials response teams, another chemical substance is usually used as the neutralizer. Separate neutralizing substances are available for acids and alkali. There are many different products marketed commercially. One of the end results is to create a salt that is far less hazardous than the acid or the alkali. Several factors should be considered when applying this procedure.

1. Some commercially available neutralizing substances do not create a truly neutral salt.
2. Some salts that are created by different brands or formulations are less environmentally harmful than others.
3. Some neutralizing substances are not approved by the EPA.

### **Acids:**

Regarding item # 9.1.1 of the Standardized Equipment List, it will be noted that for acid neutralization a substance *Granular Sesquicarbonate* is recommended. It is a very common substance that is a naturally occurring substance that is mined throughout the world. It is very inexpensive, and is very safe to containerize in bulk (usually 2 ½ to 5 gallon plastic buckets). It is often the primary ingredient in biodegradable – phosphate free car wash products. It also can be purchased directly from chemical supply houses and as such would be labelled “Granular Sesquicarbonate” on the exterior of the package. Packaging can range up to 25 to 50 pound bags.



The reasons for its use as an acid neutralizer are as follows.

1. It is a very safe, innocuous neutralizing chemical for acids.
2. It is available in easily shipped and stored bulk packaging.
3. It poses no harm when in contact with human skin tissue.
4. It creates a true neutral salt.
5. The salt produced is the least harmful to the environment (carbonate salts).
6. The neutralization reaction is not violent with this product.

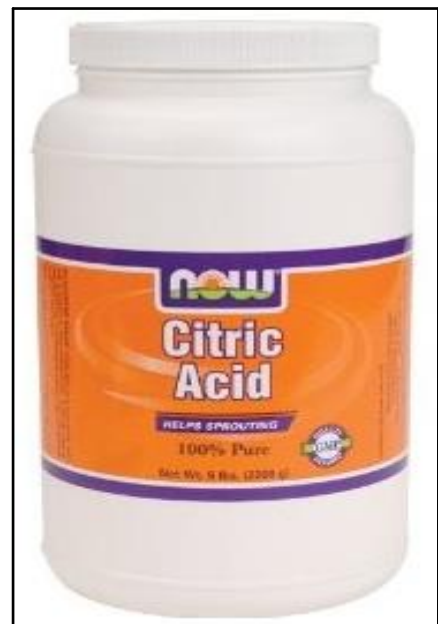


### **Alkali:**

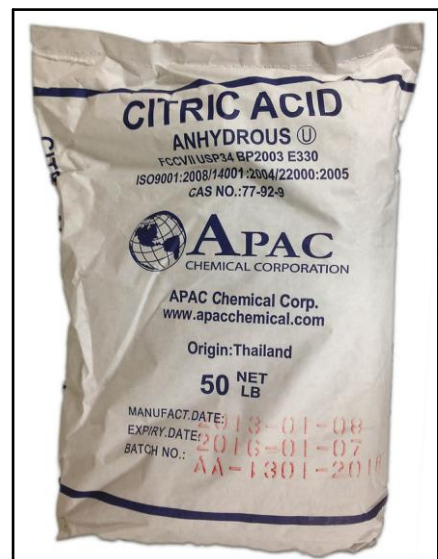
Regarding item # 9.1.2 of the Standardized Equipment List, it will be noted that for alkali neutralization a substance *Powdered Citric Acid* is recommended. It is produced in huge quantities for the food and beverage industries. It is provided in plastic pails or buckets ranging from ½ gallon to 55 gallon capacities, and in plastic or durable plastic lined multi-ply paper bags from 15 pounds up to 50 pounds. Powdered Citric Acid is very safe and easily containerized. It is very inexpensive.

The reasons are as follows.

1. It is a very safe, innocuous neutralizing chemical for acids, and is organic.
2. It is available in easily shipped and stored bulk packaging.
3. It poses no harm when in contact with human skin tissue.
4. It creates a true neutral salt.
5. The salt produced is the least harmful to the environment (citrate salts).
6. The salt produced is slightly biodegradable.
7. The neutralization reaction is not violent with this product.



The use of these products (as noted above) as neutralizing substances is the responsibility of the agency managing a hazardous materials response team program. This bulletin is provided only as an aid in assisting agencies in the decision making process. Commercially available neutralizing substances of special and proprietary formulations offered by many reputable companies are perfectly acceptable. However, they can be notably more expensive, and some require more caution in their use and application (read the instructions!).



**REMEMBER - Dilution is Not The Solution:**

Except for very small spills of concentrated acids and alkali (a few ounces), simply deciding to dilute the spill to bring the pH up to the range of 6 – 9 is often not so simple. It is true that most municipal street maintenance and/or storm water public works departments allow for flushing and drainage into their gutters and drainage systems spillage of acid or alkali so long as the pH is within (has been brought up to, - by the process of dilution) the range of 6, 7, 8, or 9. They also must approve of such action, and be on scene to supervise. However, this usually takes thousands to hundreds of thousands of gallons of water, and that is not going to be acceptable.

**A spill of just one gallon of concentrated (pH 0)** of any industrial acid, in a street or along a curb, will necessitate the **addition of over one million gallons of water** to bring it up to a pH 6. This is because the dilution process is logarithmic. Each step up to the next pH level requires 10 times the amount of water as was used in the previous step. Not many people understand this phenomenon when they argue in favor of a dilution intervention.

1 gallon of concentrated swimming pool acid (Muriatic Acid – pH 0)	Spill on ground, no dilution	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
<b>Water to be add: (In Gallons)</b>	<b>0</b>	<b>10</b>	<b>100</b>	<b>1,000</b>	<b>10,000</b>	<b>100,000</b>	<b>1,000,000</b>
In order to bring pH up to:	pH 0	pH 1	pH 2	pH 3	pH 4	pH 5	pH 6