



Eastern Idaho Solid Waste  
Committee

April 30, 2015

Fred Straughn, CHMM

PSC Environmental Services

# Chemical Segregation for HHW

P  
R  
M



**3 – Flammable / Combustible**

About 60-70% of waste  
Includes aerosol cans



L  
A  
B  
P  
A  
C  
K



**6 - Poison**



**8 - Corrosive** < 8A  
< 8B



**5.1 - Oxidizer**



**5.2 - Organic Peroxide**



**4.1 - Flammable Solid**



**4.2 - Spontaneously Combustible**

O  
T  
H  
E  
R



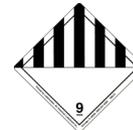
**1 - Explosive**



**2 - Compressed Gas**



**7 - Radioactive**



**9 - Miscellaneous**



**4.3- Dangerous When Wet**

# Hydrocarbons (A-Fuel)

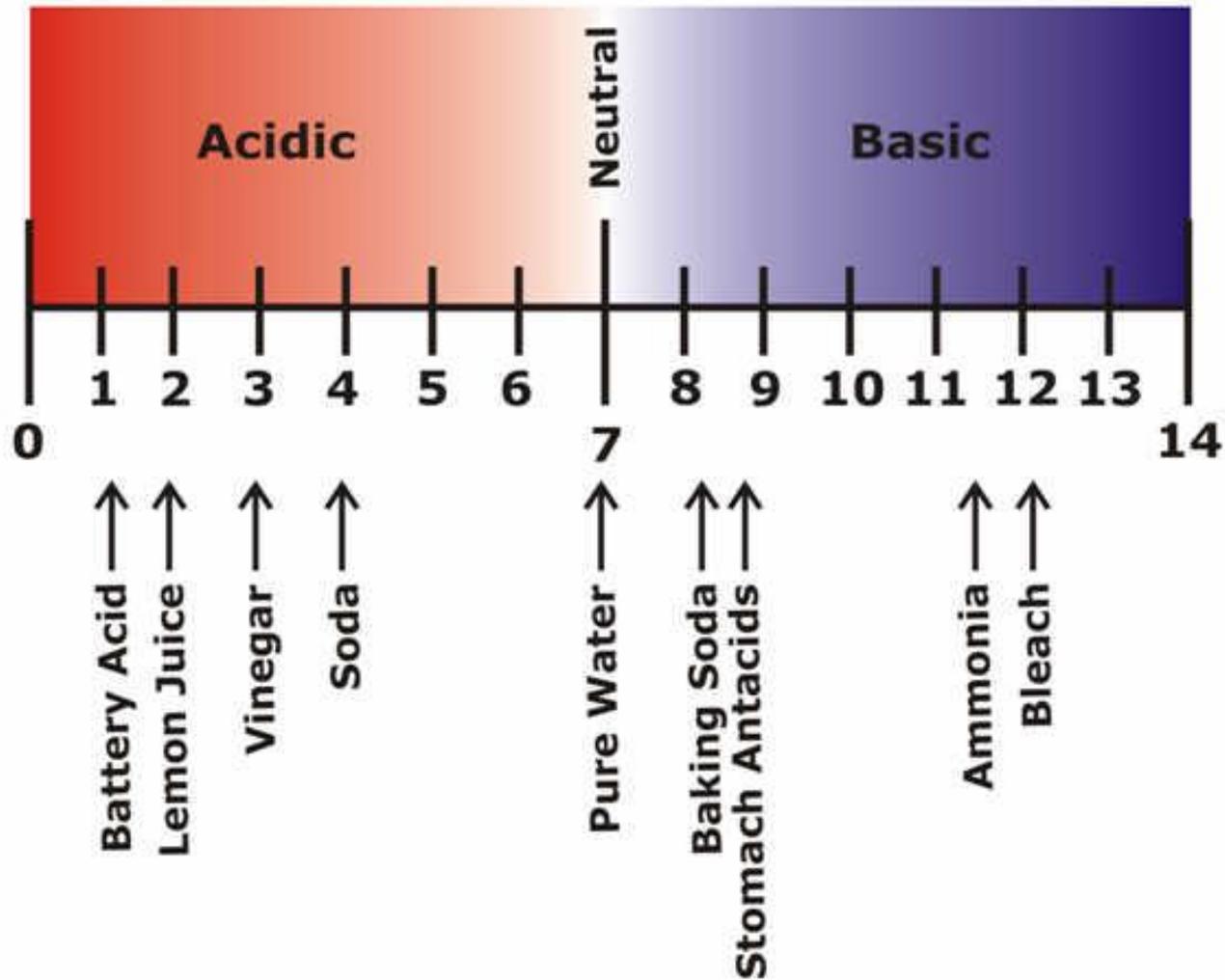
Three main groups:

- **Flammable/Combustible** – Gasoline, Motor Oil, MEK/Paint Thinner/, Kerosene, Diesel. Good fuel source, ignitable, specific density  $< 1$ , immiscible with water (FLOATS)
- **Alcohol** – 2-butoxyethanol, Methanol, Rubbing Alcohol. Fuel source, good solvents, miscible with water (and acid/alkaline) (MIXES)
- **Chlorinated/Halogenated** – freon, perchloroethylene, PCBs, fluorobromomethane. Not good fuels, non-flammable, solvents, specific density  $> 1$ , immiscible with water (SINKS)

# Corrosives and pH

- **Corrosive material** – a liquid that causes visible destruction or irreversible alteration to human skin tissue at the site of contact, or a liquid that has severe corrosion rate on steel or aluminum under certain criteria.
- A **Chemist** considers compounds with a  $\text{pH} < 7.0$  to be acid, a  $\text{pH} > 7.0$  to be alkaline/base (basic) and a  $\text{pH}$  of 7.0 is neutral.
  - Chemical compounds may have acid in their name (i.e. salicylic acid) but not have a  $\text{pH}$ . We would consider these acidic for packaging/shipping.
- The **DOT** (packaging/label/transport) defines **corrosivity** as follows:  
 **$\text{pH} \leq 2.0$  as corrosive acid;  $\text{pH} \geq 12.5$  as corrosive alkaline.**
- **HHW/Field Chemists** generally package material as follows:  
 **$\text{pH} \leq 4.0$  as ACID**  
 **$\text{pH} \geq 10.0$  as ALKALINE**

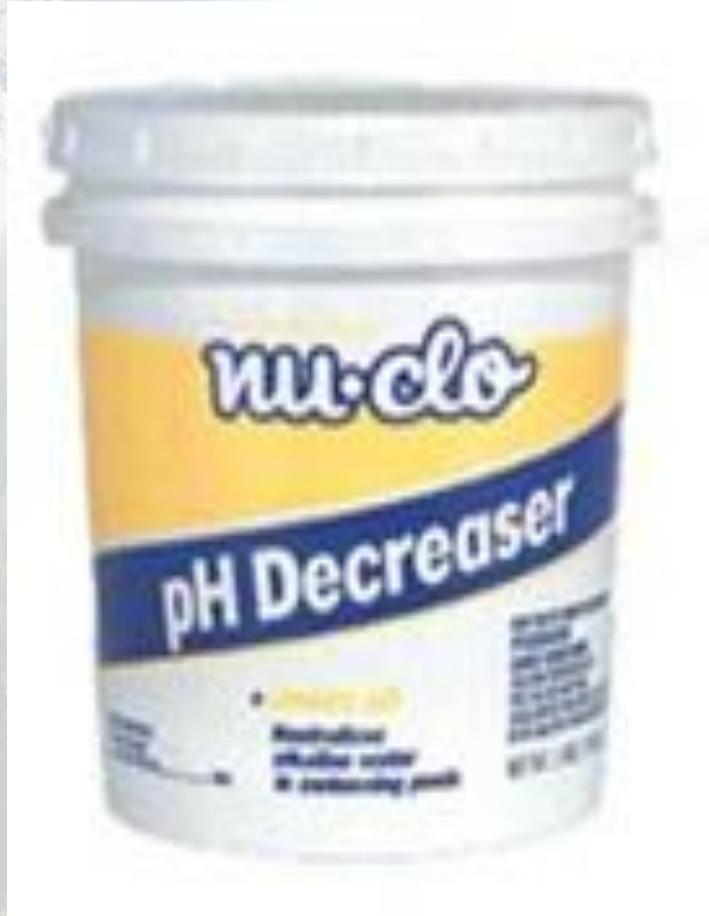
# The pH Scale



Acids are used to dissolve minerals and rust, to etch metal, glass and concrete



Acids lower the pH of pools and spas;  
degreasers - citrus oils



Alkalines are good degreasers, dirt removers, clog busters



Alkalines increase pH of pools/spas, seal concrete/grout



# Where do you find HF?

HF is used to:

- Remove rust from fixtures and fabrics
- Remove water stains on glass
- Remove tar on mag wheels
  
- Cloud light bulbs
- **Etch glass** (so you will never find it in a glass container)
- Clean cement, brick, siding
- Clean stainless steel and aluminum
- Air conditioner coil cleaners

# Where to find HF

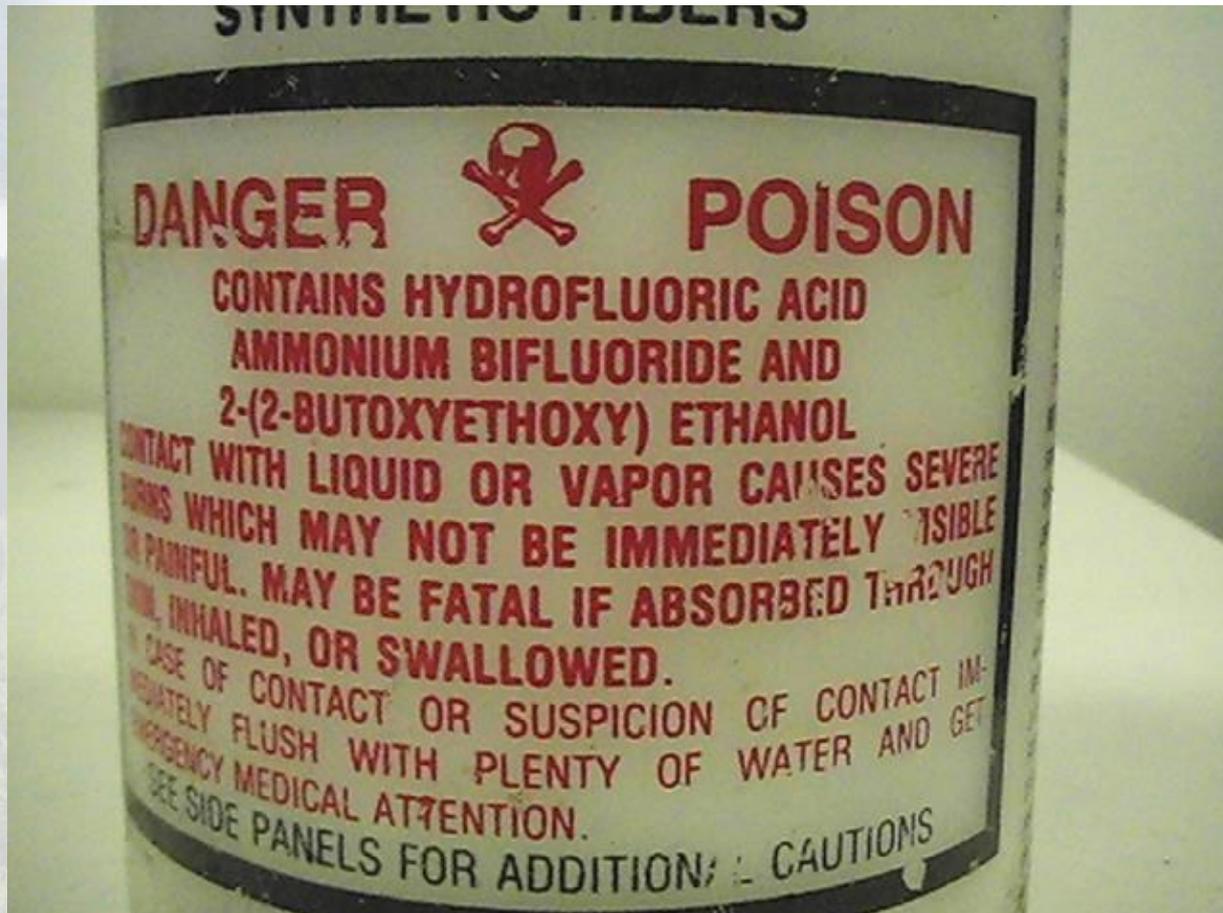


Industrial Strength



Supermarket Variety

# HF cont'd



# Coil Cleaners with HF



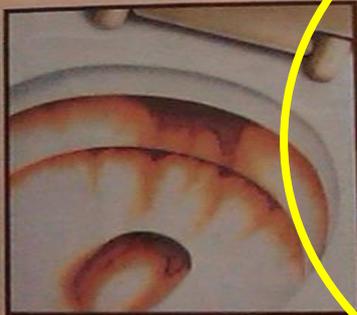
# HF Brick Cleaner



**20% MORE FREE!**

# Rust Stain Magic<sup>®</sup>

**Removes Rust Stains from  
White Toilet Bowls & Sinks  
and Colorfast Fabrics**



12 FL OZ 355 ml

**WARNING: HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE SEVERE BURNS WHICH MAY NOT BE IMMEDIATELY PAINFUL OR VISIBLE.**  
Read back panel before using

gloves  
after use.

**USE ON CLOTHING:** Never use on clothing while wearing. Test on damp hidden area for compatibility. If results are satisfactory, proceed with step 1.

1. Dampen stain with water. 2. Apply a few drops of Rust Stain Magic to the stain.  
3. When stain is gone, rinse area thoroughly with cold water. 4. Launder with detergent before wearing.

**SINKS & TUBS:** Use only on white sinks and tubs. Gently wipe stained area with a damp pad containing Rust Stain Magic. Rinse immediately with cold water. Repeat, if necessary. Carefully rinse and discard pad.

**TOILET BOWLS:** Use only on white bowls. Apply to stain *above water line*. The stain is removed as the product runs down. Flush. Repeat on tough stains.

**KEEP OUT OF REACH OF CHILDREN**

Contains Hydrofluoric acid. Avoid contact with eyes and skin. Use only with thick rubber gloves.  
**FIRST AID:** Call physician immediately.

**EXTERNAL:** Wash with soapy water. Clean under fingernails.

**INTERNAL:** Drink large quantities of water and follow with mineral oil or egg whites.

**EYES:** Remove any contact lenses. Flush with water for 15 minutes.

**Magic**

STOCK NO. BB12

# Oxidizers

- Oxidizers are compounds which are capable of reacting with, and oxidizing, other materials.
- An example of oxidation is the process we know as corrosion, where metal reacts with air to form metal oxides (rust)
- The primary industry hazard with this class of compounds is in their ability to act as an oxygen source and stimulate the combustion of organic materials.



# Oxidizers add power

- Sodium Hypochlorite
- Calcium Hypochlorite
  
- Sodium Perborate
- Sodium Percarbonate



# Hydrogen Peroxide (oxidizer)



3% solution



29% solution

# Industrial Strength

At concentration  $> 50\%$  contact with organic material (clothing) can cause **spontaneous combustion**



# Stump Remover (Potassium Nitrate)



In areas where burning is allowed, light a fire on top of the stump with charcoal briquettes. The heat created will be carried throughout the stump. The stump should smolder down to the roots until only ashes remain. Do not burn stump if it is next to any structure.

**CAUTION:** Keep out of reach of children. Harmful if swallowed. This product contains potassium nitrate. If swallowed call a physician. If in eyes or on skin wash with clean water.

**NOTICE:** Seller makes no warranty, expressed or implied, concerning the use of this product other than indicated in the label. Buyer assumes all risk of use/or handling of this material when such use/or handling is contrary to label instructions.



# PSC Packaging/ Segregation Changes

## OXIDIZERS

# Reasoning for the Changes

- Oxidizers have the potential to complete two sides of the fire triangle, typically only requiring fuel to generate a fire.
- They also tend to react with many other chemicals, including other oxidizers, often producing very violent reactions and off-gassing of toxic vapors.
- PSC modified oxidizer profiles to require more segregation to enable increased chemical compatibility.

# New PSC Profiles

- PSC has developed several new “generic” oxidizer profiles, a summary of which is listed below.
- There are many oxidizers that may not be compatible and would be required to be packaged separately.
  - e.g. all pool chemicals are not compatible—even if they serve the same purpose for a swimming pool—and cannot be packaged together.
- Additionally, this list is not inclusive of all oxidizers, just the more common oxidizers and materials with oxidizing properties which are most often found at HHW sites.
- A PSC chemist will need to be consulted to help classify materials not specifically listed herein.

# PSC Profile Groupings/Guidelines

- Sodium Hypochlorite Solutions/Chlorine Bleach-Must be packaged in Poly Drums
- Hydrogen Peroxide Solutions <40% (Solutions above 40% are required to be lab packed and shipped separately)
- Nitrates/Nitrites general inorganic oxidizers
- Inorganic solid chlorine pool chemical oxidizers such as calcium hypochlorite
- Ammonium Oxidizer Salts such as ammonium nitrate fertilizer
- Organic solid pool chemical oxidizers such as Trichloro-S-Triazinetrione

# New Oxidizer Segregation

## Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>)

00-40% solution

**Class 5.1 (8)**

pH range: 2-4 (Acidic)

Some liquid deck/wood cleaners



Solutions above 40% are required to be lab packed and shipped separately from the <40% solutions.

## Inorganic Oxidizers

**Class 5.1 (6.1)**

**Nitrates** (i.e. Sodium, Potassium, Lead, Silver)

**Nitrites** (i.e. Sodium, Potassium)  
**Permanganates** (i.e. Potassium, Calcium)

**Dichromates** (i.e. Sodium)  
**Persulfates** (i.e. Potassium, Calcium)

**Iodates** (i.e. potassium, sodium)

**Percarbonates** (i.e. sodium)

**Containers required to be packed in absorbent**

Can contain both solid and aqueous solutions of above listed chemicals.

Sodium Percarbonate (solid deck cleaner)



Potassium Nitrate (some are sodium nitrate (salt peter) stump removers)



## Household Bleach / Liquid Hypochlorites

**Class 8 (Alkali)**

Hypochlorites (i.e. Sodium, Potassium, Calcium)

Bleach solution

Hypochlorite-based cleaners w/o Organics

Household cleaner w/ Bleach

Toilet Bowl cleaner w/ Bleach

**Repackage into Poly Drum**



## Inorganic Pool Chemicals

**Class 5.1**

**Hypochlorites** (i.e. Calcium, Sodium, Lithium)

**Chlorates** (i.e. Sodium, Calcium)

**Perchlorates** (i.e. Sodium, Calcium)

Calcium Hypochlorite



## Oxidizing Ammonium Salts

**Class 5.1**

Ammonium Nitrate

Ammonium Persulfate

Ammonium Nitrate Fertilizers

must be less than 0.2% Organic



## Organic Pool Chemicals

**Class 5.1**

Potassium dichloroisocyanurate (POTASSIUM DICHLORO TRIAZINETRIONE)

Sodium dichlorocyanurate

Trichloroisocyanuric acid (TRICHLORO-S-TRIAZINETRIONE)



# Oxidizer Reactions in Drums



# More Oxidizer Reactions



# The Effect of Incompatible Oxidizers



# Fire at facility from oxidizers



“Several drums of waste oxidizers such as swimming pool chemicals spontaneously ignited, likely a factor of the heat of the day, Cleveland said. Some of the drums made a popping sound, then spontaneously caught on fire”.

# Fire at facility from oxidizers, cont'd



# Catalysts

Catalyst compounds come from several hazard classes and usually have descriptive words:

Catalyst

Curing Agent

Activator

Initiator

Accelerator

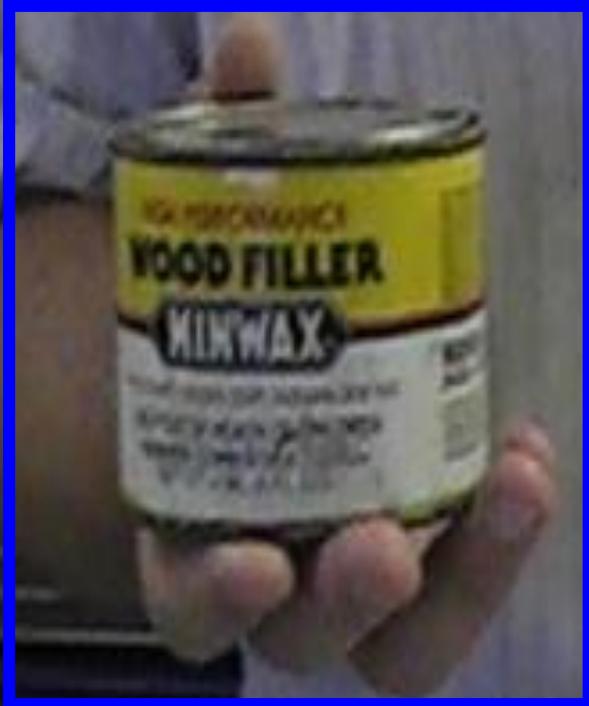
Hardener

Sometimes “part B” but not all “part B” are the same hazard class!

**Every can with a plastic lid must be checked**



Must separate the resin from the catalyst



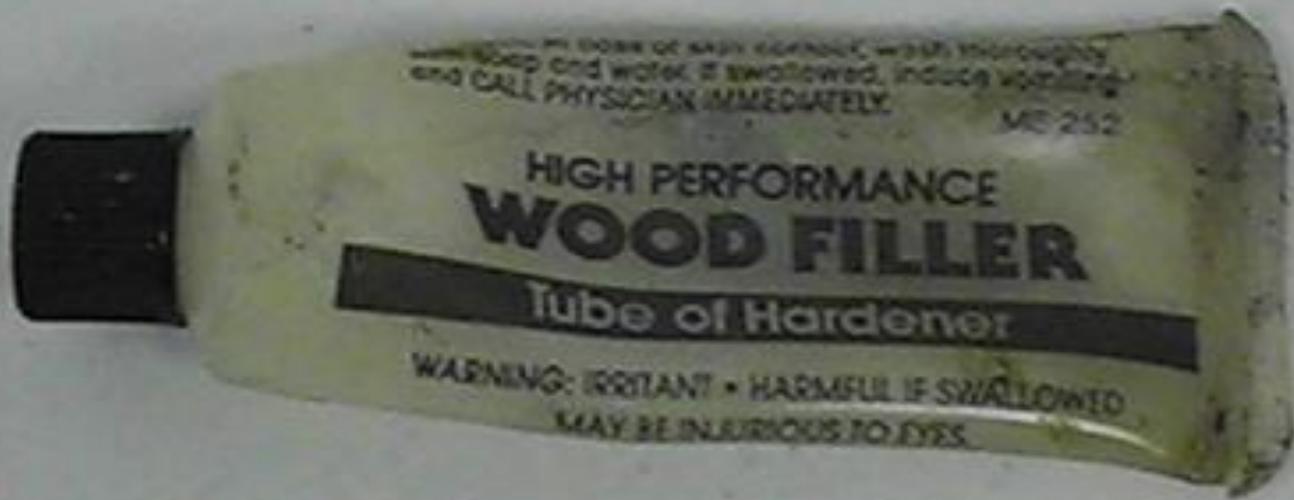


Organic Peroxides 5.2, Catalysts



Resin Kits, Resin Part = Flam/Comb, 3, PRM





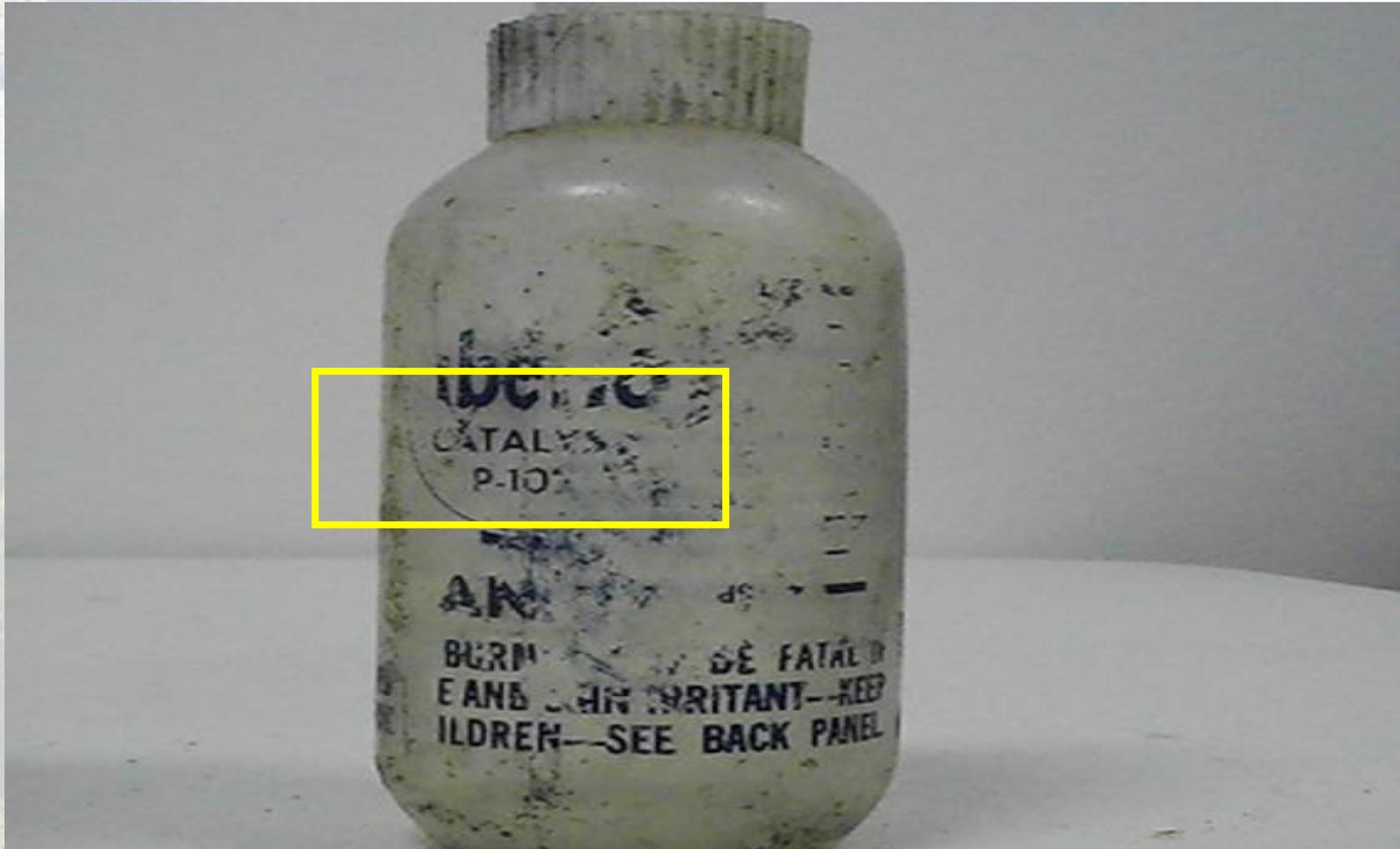
**Tubes of benzoyl peroxide or methyl ethyl ketone peroxide can range in size from 3 to 10 inches long. They will hide among tubes of adhesives and other PRM materials. Do NOT throw away if opened and dried out! Hazard Class 5.2 Organic Peroxide**



# Methyl Ethyl Ketone Peroxide



MEKP – Methyl ethyl ketone peroxide containers can be hard to read, vary in size from <1 ounce up to 1 gallon





# MEKP, cont'd



Two part Resin (Resorcinol) Glue, Catalyst = 4.1 FLAMMABLE SOLID



# RESIN PART = PRM (3)



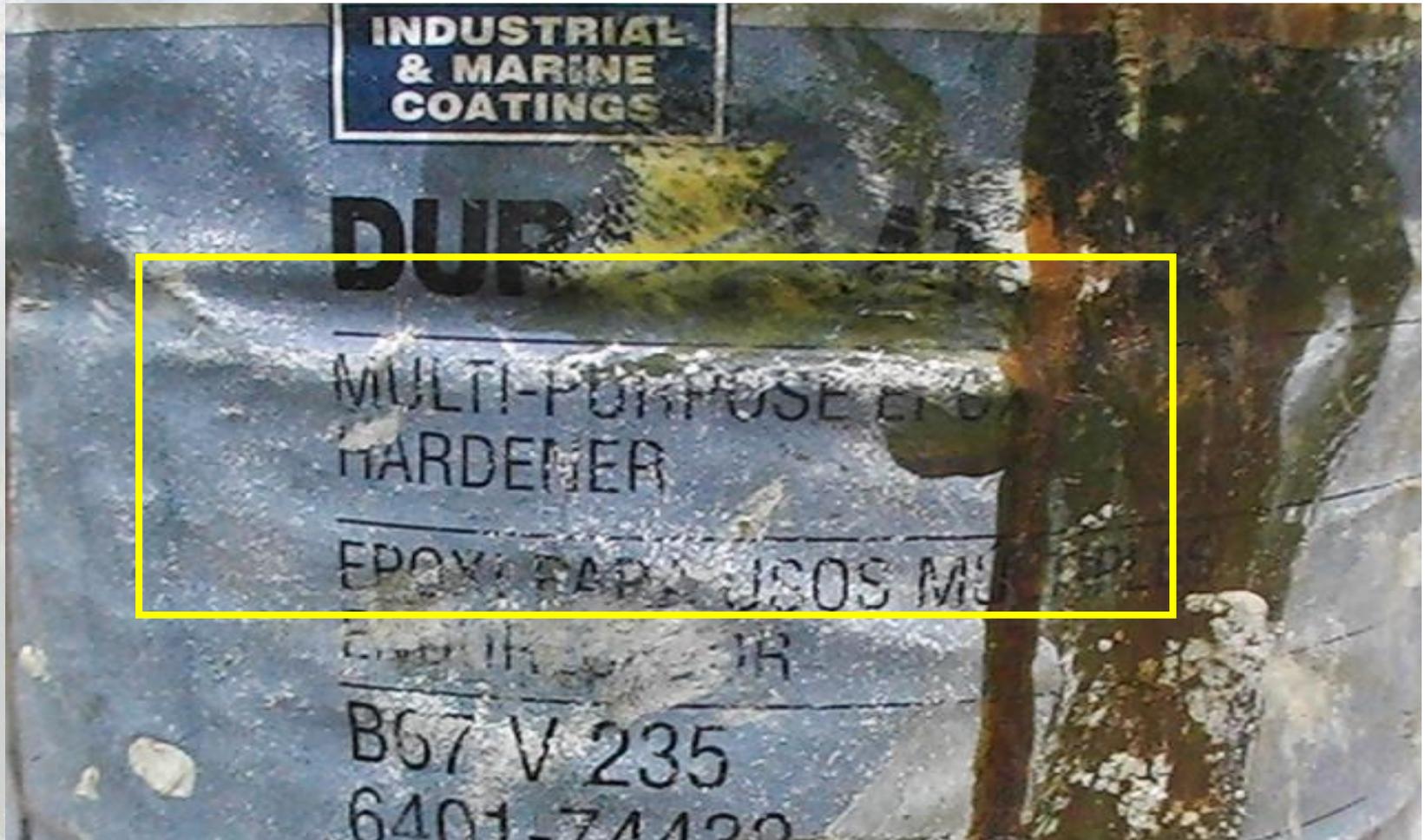
# Catalysts - Isocyanates



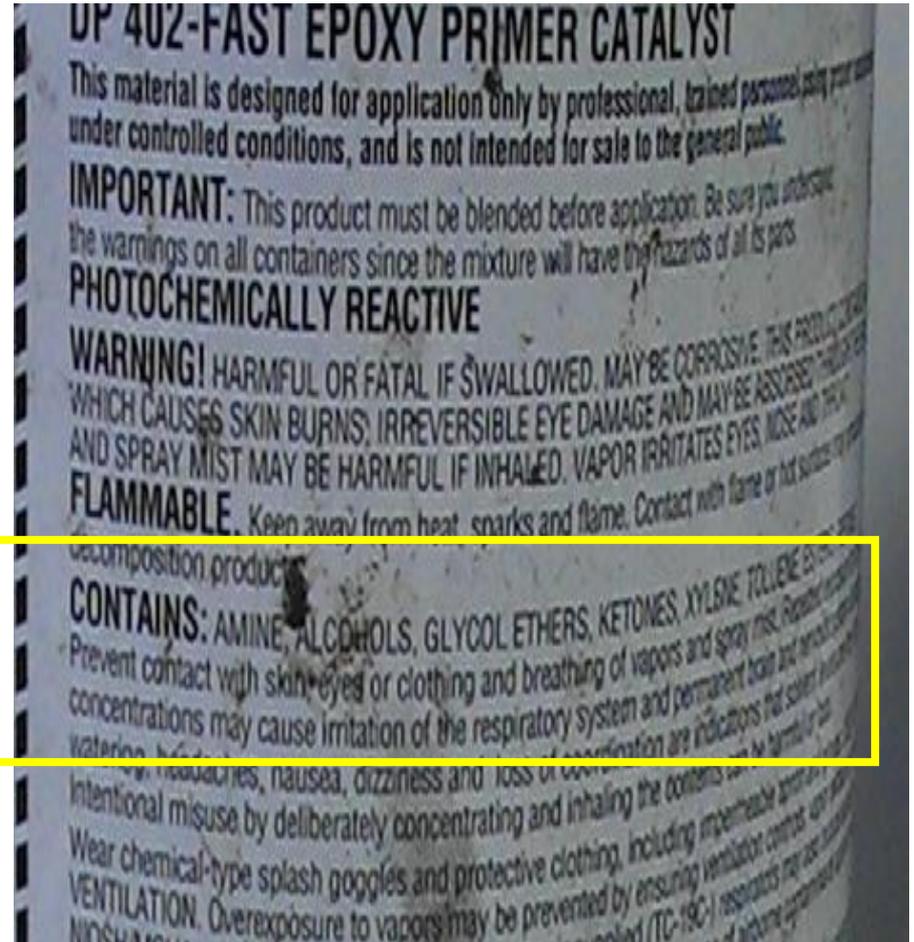
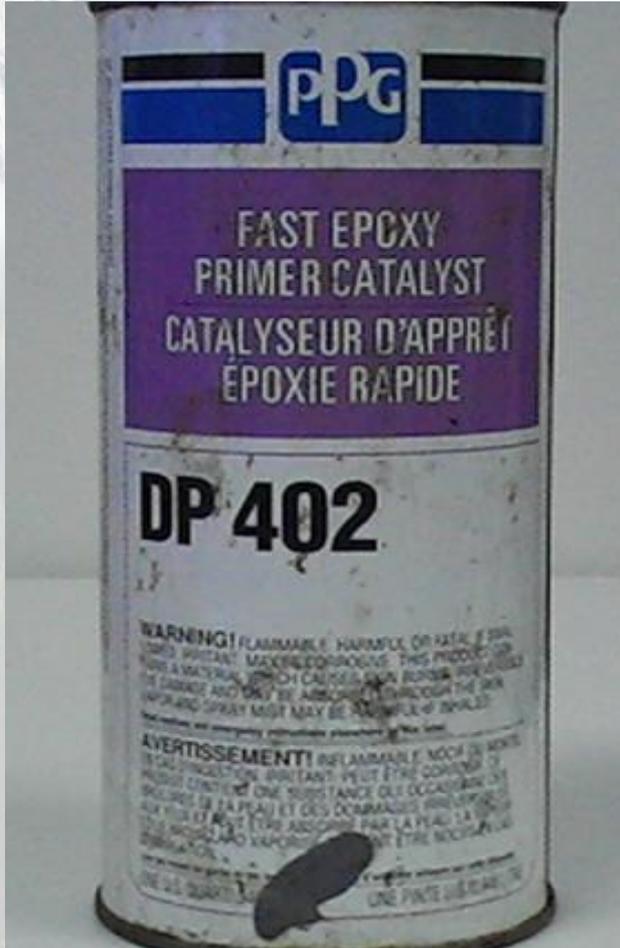
# Amine Catalysts (Part B)



# HARDENER



# Amine Catalysts



Red Phosphorus  
(4.1)

White Phosphorus (4.2) under water – turns  
yellow when exposed to light



# Calcium Carbide – 4.3



Produces flammable acetylene gas and toxic phosgene gas with water



One of the most common **4.3** materials mis-packed at HHW's, these cans are often passed over during initial sort because they are **quart cans among many PRM cans**

## SODIUM METAL - 4.3



**Sodium, Na**



C. Ophardt, c. 2003



Sodium Metal in Oil

# Word Association

- ORTHO
- Thompson's Water Seal
- Formula 409

# Example of Word Association



A

**Thompson's**  **Concrete Driveway Sealer**

**DANGER!** CONTAINS POTASSIUM HYDROXIDE. CAUSES BURNS TO EYES AND SKIN. HARMFUL IF SWALLOWED. Avoid contact with skin, eyes, and mucous membranes. Do not take internally. Use of safety goggles and gloves is required. Avoid breathing vapor or mist. Use product outdoors only. Do not mix with other chemicals. **KEEP OUT OF REACH OF CHILDREN.**

**FIRST AID:** In case of eye contact, **IMMEDIATELY** flush eyes with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. Get medical attention. If affected by inhalation, immediately move to fresh air. If symptoms persists, call a physician. For skin contact, wash thoroughly with soap and water. If irritation or burns develop, get medical attention. If swallowed, **DO NOT INDUCE VOMITING.** Rinse mouth with plenty of water. Call a physician or poison center immediately.

**aner**

B

concentrated formula  
grease, oil and most auto fluids  
stone or concrete

**Before**

**After**

**Gallon**  
**8935 L**

**DANGER!** HARMFUL OR FATAL IF  
SWALLOWED. COMBUSTIBLE. SKIN AND  
EYE IRRITANT. KEEP OUT OF THE REACH  
OF CHILDREN. Read carefully other cautions  
on back panel.



COMBUSTIBLE

ALKALINE

ALKALINE

OXIDIZER





SOME WOOD PRESERVATIVES

PENTACHLOROPHENOL    ZINC COPPER NAPHTHENATE

PARAFORMALDEHYDE (LP)

WATER REACTIVE

Not all quarts are created equal. Small cans constitute a large portion of containers brought to HHWs. Because they are mostly paints and adhesives it is easy to "get on a roll" and toss these containers into PRM drums without paying too much attention to the labels. Look for cans with powder or granular contents, or lids that may hide a small tube or plastic bottle. Reactive materials such as calcium carbide (water reactive, 4.3), hardeners and catalysts from two-part kits (organic peroxides, 5.2) and paraformaldehyde (flammable solid, 4.1) that go through processes such as shred or can crush at the facilities can cause fires, explosions or other unexpected and dangerous reactions. Old wood preservatives may contain large amounts of pentachlorophenol (penta) or copper naphthenate and are labpacked due to toxicity, not reactivity.

# Chrome/Metal Cleaner



- Alkaline



- Acidic

# Class 9 drum



# What's wrong with this Class 9 drum?

Did you say:

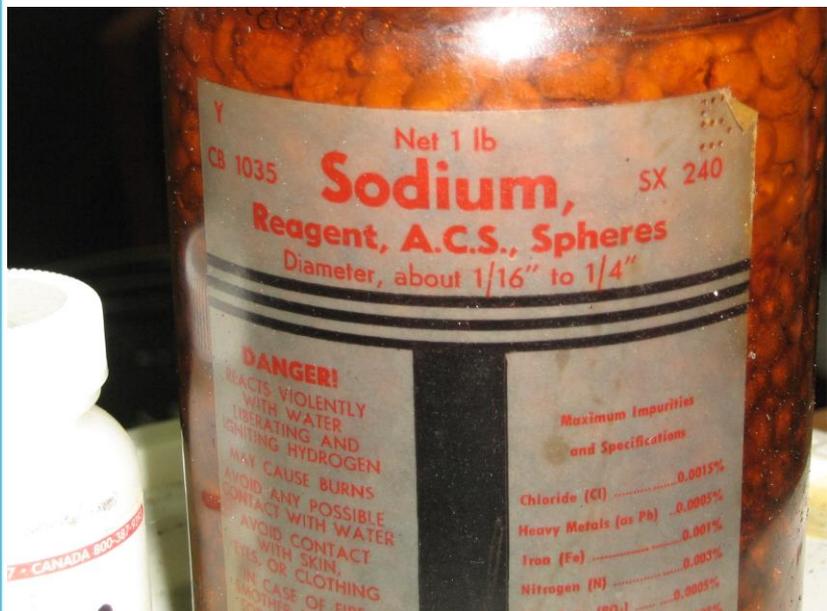
- No absorbent
- Not packed upright within the drum
- Looks like there may be incompatible materials together
- Open containers with no lids
- No drum liner

Let's see what came out...

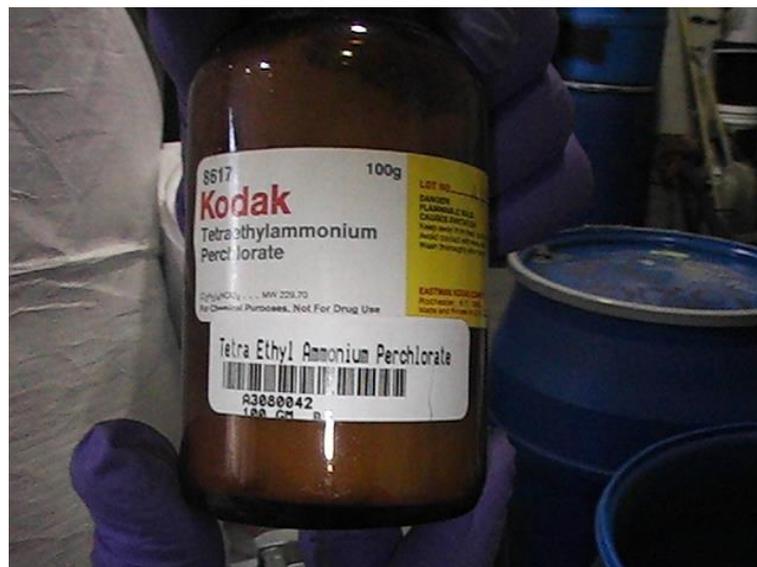
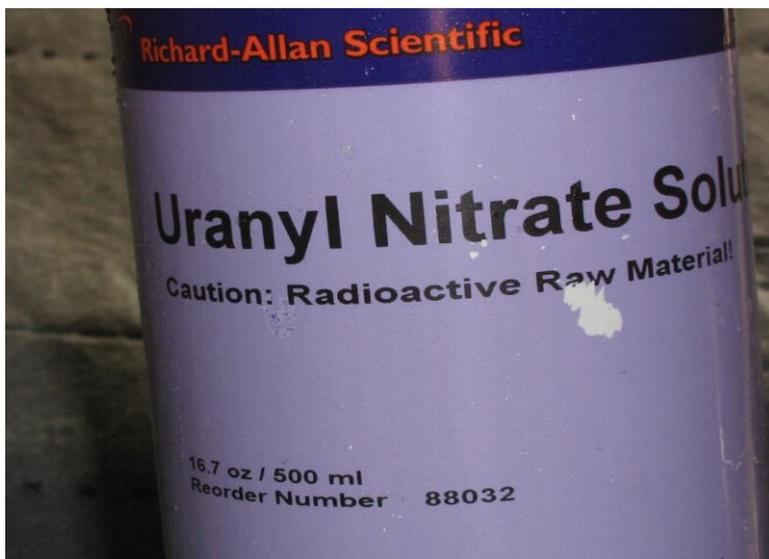




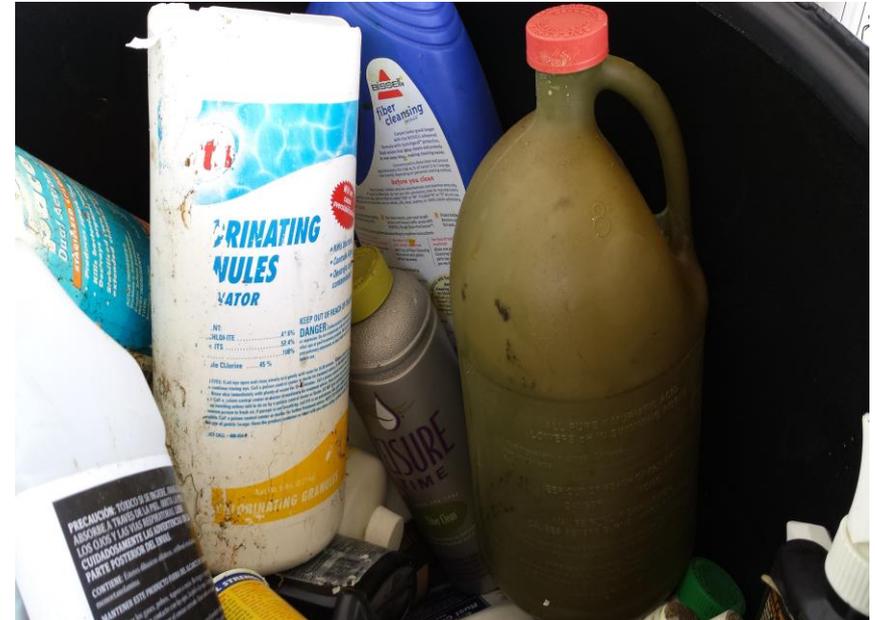
Elemental Hg



Plastic containers of MEKP inside



# Island of mis-packed drums



**Drum Contents- Hydrochloric Acid, Lithium Hypochlorite, Brominating Tablets, Ethanolamine Solution (Caustic). Inorganic –vs- organic**

# Toxic Liquid/Flammable Labpack



**Sharps with needle intact**

# Flammable Solid Labpack



**Flare Gun with Blasting caps intact**

# Flammable Solid Labpack



**Smokeless Powder, Black Powder, Fire works, Strike anywhere matches, and Charcoal Briquettes.**

**Multiple Hazard Classes- 1.1D, 1.3G, 4.1, and 4.2**

# Flammable Solid Labpack, cont'd



Other contents of drum- Road Flares

# Flammable Solid Labpack, cont'd

- 1) Road flares – must be packed in water AND in a steel drum.
- 2) Smokeless powder/black powder – must be packed in oil to be shipped as 4.1, must be packed alone, max weight: 16#'s
- 3) Strike anywhere matches – CANNOT be packed with any other material except safety matches, must be wetted to prevent accidental ignition.
- 4) Fire Works- under no circumstance can these be shipped as a 4.1 material.

# Sodium Perchlorate



**Strong oxidizer packed in Paint Related Material Drum**

# Paint Related Material Drum



**Methyl Ethyl Ketone Peroxide – VERY strong Organic Peroxide**



## Shotgun shell packed with Alkaline Batteries

# DOT Placards and Labels

Class 1: Explosives, Division 1.1 –1.6



Class 2: Compressed Gases



Class 3: Flammable Liquids (Combustible Liquids)



Class 4: Flam Solids/Self Heating Solids/Water Reactive



Class 5: Oxidizers and Organic Peroxides



Class 6: Toxic Materials



Class 7: Radioactive Material



Class 8: Corrosive Material



Class 9: Miscellaneous



## QUESTIONS ????