# APPENDIX C

# STANDARD, NONSTANDARD, AND NATURAL DECONTAMINANTS

**RETAIN FOR FUTURE USE**

## Table C-1. Standard Decontaminants **

**Decontaminant -- Decon Solution No. 2 (DS2)**

**Use -- Biological/Chemical**

**Remarks**

If sufficient contact time is allowed, effective against all known toxic chemical agents and biological materials, except bacterial spores. Allow to remain in contact with contaminated surface for approximately 30 minutes. Rinse with water; recheck for contamination.

DS2 can be used at temperatures from -15° F. It is used with the ABC-M11 (1-1/3 qt.) portable decon apparatus, M13 DAP, or can be applied with brooms and swabs. It is most effective when applied by scrubbing.

**Caution**

Extremely irritating to the eyes and skin. Protective mask and rubber gloves must be worn. If DS2 contacts skin, wash the area with water. Do not inhale vapors. It will cause a green to black color change upon contact with ABC-M8 Detector Paper and cause a false/positive with M9 Paper.

It ignites spontaneously on contact with STB and HTH. It is a combustible liquid with a flash point of 160° F. Spraying DS2 onto heated surfaces above 168° F. will ignite the DS2. Do not confuse with fire extinguisher.

Do not use on M17-Series Mask. It damages Mylar diaphragm in the voicemitter assembly.

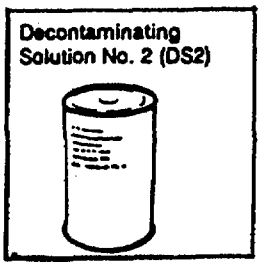
It corrodes aluminum, cadium, tin, and zinc, and it softens leather. It may soften, remove, or discolor paint. Rinse well after use and oil metal surfaces.

Avoid spilling DS2 on chemical protective overgarment.

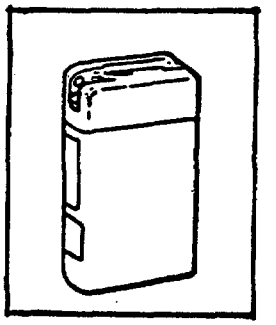
**Preparation**

No mixing is required. It is issued in ready-to-use solutions.

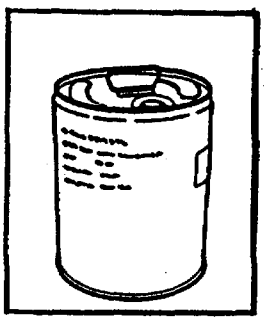
**(These are used most often and are available in supply system)




DS2 in 1-1/3 Quart Can
NSN 6850-00-753-4827



DS2 in 14-liter Container for M13 DAP
NSN 4230-01-136-8888



DS2 in a 5-gallon Pail
NSN 6850-00-753-4870

**Decontaminant -- Supertropical Bleach (STB)**

**Use -- Biological/Chemical**

**Remarks**

Effective against Lewisite, V and G Agents, and biological agents.

Allow to remain in contact with contaminated surface for at least 30 minutes, then wash off with clear water.

**Caution**

The protective mask or other respiratory device should be worn when preparing slurry. STB should not be inhaled or come into contact with skin. It gives off toxic vapors on contact with G Agent.

STB mixtures, dry and slurry, do not effectively decon Mustard Agent, if it has solidified at low temperatures.

Porous surfaces may require several applications.

STB ignites spontaneously on contact with liquid blister agent or DS2.

It is corrosive to most metals and injurious to most fabrics. Rinse thoroughly and oil metal surfaces.

It is not recommended for ship use. Top deck storage only.

Store in unheated warehouse isolated from combustibles and metals subject to corrosion.

**Preparation**

**Slurry Paste**

Mix one 50-lb.drum of STB with 6 gallons of water. Slurry paste consists of approximately equal parts (by weight) of STB and water.

**Slurry Mix for Chemical Decontamination**

Slurry mix consists of 40 parts STB to 60 parts water (by weight). To mix in M12A1, use 1300 lbs. STB, 225 gal. water, 12-1/2 lb. antiset, and 24 oz. antifoam.

### Slurry Mix for Biological Decontamination

Slurry mix consists of 7 parts STB to 93 parts water (by weight). To mix in M12A1, use 150 lb. STB, 225 gal. water, 1-1/2 lb. antiset, and 24 oz. antifoam.

### Dry Mix

2 shovels of STB to 3 shovels of earth or inert material, such as ashes.

### Camouflage

Lamp black or dye mixes may be added for camouflage. No mixing is required.

**Supertropical Bleach (STB)**
**NSN 6850-00-297-6653**

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### Decontaminant -- Mask Sanitizing Solution

### Use -- Biological/Chemical

### Remarks

Use on previously cleaned masks with filter elements removed. Place mask face up. Attach canteen to mask at the drinking tube. Brain one canteen full of sanitizing solution through the mask. Follow with two canteens of clean water as a rinse. Immerse mask and outserts in sanitizing solution. Agitate for 5 minutes. Rinse twice in clear water, agitating 2 or 3 minutes each time. Dry all parts and reassemble mask.

**Caution**

One gallon of solution is needed for every ten masks.

**Preparation**

Fill standard plastic canteen to shoulder with water. Add one 0.5 gram tube of Calcium Hypochlorite from Water Purification Kit (NSN 6810-00-266-6979). Cover canteen and shake vigorously for 30 seconds.

Mix bulk quantities as follows: Add 2.0 grams (.08 oz.) of Calcium Hypochlorite from 6 oz. jar (NSN 6810-00-255-0471) to 1 gallon of water.

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**Decontaminant -- Soap and Detergents**
**General Purpose Liquid Detergent (NSN 7930-00-282-9699)**

**Use -- Biological/Chemical**

**Remarks**

Scrub or wipe contaminated surfaces with hot, soapy water solution or immerse item in the solution.

**Caution**

Soaps and detergents are effective in physically removing contamination. However, casualty-producing levels of contamination may remain in the runoff water which must be considered contaminated.

**Preparation**

Mix 75 pounds of powdered soap into 350 gallons of water. If powdered soap is not available, bar laundry soap may be used. Cut 75 pounds of soap into 1-inch pieces and dissolve in 350 gallons of hot water. For smaller amounts of soap solution, use a ration of approximately 1 lb. soap per gallon of water. Mix 2 pints of detergent to 450 gallons of water in M12A1 PDDE.

## Table C-2. Nonstandard Decontaminants (Used infrequently)

### Decontaminant -- Oxidizing Agents Potassium Permanganate, Potassium or Sodium Dichromate, Nitric Acid or Aqua Regia

**Use -- Nuclear**

**Remarks**

Effective in dissolving surfaces containing adsorbed or absorbed radioactive contamination.

Dip into or coat surface with oxidizing agent. Exposure must be limited due to corrosive nature of solution. Rinse thoroughly with water and detergent, then with clear water.

**Caution**

These agents are extremely corrosive. Use only under the supervision of an individual who is trained in their use.

Neoprene or rubber protective apron, gloves, boots, and safety glasses must be worn. Rubber offers only limited protection.

**Preparation**

Aqua Regia is prepared by mixing 3 parts of concentrated Hydrochloric Acid and 1 part concentrated Nitric Acid. Other oxidizing agents do not require mixing.

### Decontaminating -- Complexing or Chelating Agents Versene, Sequestrene, Citric Acid, Sodium Citrate, Tartaric Acid, Sodium Tartrate, Oxalic Acid, Sodium Oxalate, Orthophosphoric Acid, and Similar Agents

**Use -- Nuclear**

**Remarks**

Aids in removal of contamination that is absorbed on surfaces.

Apply as a film over contaminated surface using PDDA, fire-fighting apparatus, or tree and garden sprayer. Allow 30 minutes contact time and flush with water.

**Caution**

Aids in physical removal of contamination but does not neutralize contamination. Runoff will be contaminated.

**Preparation**

Mix 3 to 5% of agent (by weight) in water.

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**Decontaminant -- Iodine Water Purification Tablets**

**Use -- Biological**

**Remarks**

This is effective against most biological agents. Where boiling of drinking water is impractical, add 2 iodine tablets per canteen of water. Instructions are on container.

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**Decontaminant -- Disinfectant, Chlorine, Food Service**
**NSN 6840-00-270-8172**

**Use -- Biological**

**Remarks**

This is effective for decon of utensils, mess gear, the exteriors of sealed containers, and food products that can withstand soaking.

Dispose of any food or vegetable that is damaged and any outer leaves that are bruised or torn. Do not cut or peel fruits and vegetables before disinfecting them. Leave items in solution for 30 minutes and stir occasionally to ensure that surfaces are kept thoroughly wet.

Utensils may be disinfected by immersing in solution for 30 seconds. Rinse thoroughly in potable water. Do not use solutions more than once.

If this disinfectant is not available, and emergency solution prepared by mixing at least one level mess kit spoonful of Calcium Hypochlorite (water disinfecting powder) to each 10 gallons of water. If liquid Chlorine Bleach is available, it may be used. About 1/3 canteen cup of 5% Chlorine Bleach to each 10 gallons of water will produce the same disinfecting strength.

Fresh solutions must be made for rinsing and disinfecting utensils for each 100 persons.

**Preparation**

Dissolve one package of disinfectant in 20 gallons of warm potable water (100° F).

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**Decontaminant -- Formalin (Formaldehyde)**

**Use -- Biological**

**Remarks**

This is effective against all microorganisms, including bacterial spores.

It is recommended as interior decontaminant for relatively closed areas. Allow vapors to remain 16 hours in a closed structure, then aerate until odor is no longer objectionable.

Optimum conditions for spraying are 70° to 80° F. and with 85% relative humidity. The minimum effective temperature is 60° F. and the minimum effective relative humidity is 70%, at which the exposure time should be increased to 24 hours.

Apply as vapor from standard insecticide sprayers or vaporize by heat or bubbling steam through a pan of decontaminant.

**Caution**

Formalin vapors are very toxic.

A self-contained breathing apparatus should be worn when remaining for more than a few minutes in a building containing Formalin vapors. Personnel handling or spraying Formalin should wear impermeable protective clothing. Personnel entering an area containing Formalin vapor for only a few minutes should:

- Wear protective mask.
- Wear washable outer clothing, fastened to prevent vapor from entering at wrist, ankles, or neck.
- Remove outer clothing after emerging from vapor.
- Shower and put on clean clothing as soon as possible.

Up to 72 hours aeration may be required.

Vapors of Formalin are not flammable. Open flame should not be used for vaporizing when Methanol has been added to Formalin.

When steam is used, the source of sream should be outside the area being decontaminated.

**Preparation**

No mixing is required. However, less residue remains and less aeration is required, if mixture of 5 parts Formalin and 3 parts Methanol are used. Use this mixture at rate of 4/5 qt. per 1000 cu. ft. of space.

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**Decontaminant -- Detrochlorite**

**Use -- Biological**

**Remarks**

This is a thickened bleach useful on vertical surfaces. It is applied by PDDA. Allow 30 minutes contact time, then rinse with water. Coverage is 1 gal. per 8 sq. yd.

**Caution**

It is very corrosive.

**Preparation**

Mix by weight 19.3% diatomaceous earth, 0.5% anionic wetting agent, 2.9% Calcium Hypochlorite (70% available Chlorine), and 77.3% water.

Mix wetting agent and diatomaceous earth with water befor adding the Calcium Hypochlorite. Mixing the wetting agent and Calcium Hypochlorite in a dry undiluted state may cause and explosion.

**Decontaminant --Peracetic Acid (PAA)**

**Use -- Biological**

**Remarks**

Effective against all microorganizms to include bacterial spores.

Wipe item with rag or swab, remove excess acid, and aerate 10 to 15 minutes, or until no objectionable odor remains.

Immerse small items for 10 minutes, remove excess acid, and aerate until no objectionable odor remains.

Allow 10 minutes contact time.

**Caution**

Protective clothing and mask are required

Peracetic Acid will cause burns and blister skin. Fumes are highly irritating.

Prolonged exposure will damage most materials. It will corrode iron and deteriorate rubber, plastics, and leather. A violent explosion may result if heavy metal ions come into contact with Paracetic Acid.

40% solution has a low flash point (105° F); 3% solution is nonflammable.

It must be stored in original containers under refrigeration to prevent decomposition.

**Preparation**

It is available as 40% solution. Mix 1 qt. to 3 1/2 gallons of water. Add Peracetic Acid to water.

**Decontaminant -- Ethylene Oxide (ETO)**

**Use -- Biological**

**Remarks**

This is effective against all microorganisms, including spores.

Allow 6 hours contact time. Contact time must be doubled for each 20° F. drop in temperature below 75 ° F.

Apply 30 lb. for every 1000 cu. ft.

Airtight enclosure required.

**Caution**

Ethylene Oxide is flammable. It is not recommended for interior use.

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**Decontaminant -- Carboxide**

**Use -- Biological**

**Remarks**

Carboxide is a mixture of Ethylene Oxide and Carbon Dioxide that is effective against all microorganisms, including spores.

Allow 12 hour contact time. Contact time must be doubled for each 20° F. drop in temperature below 75° F.

Carboxide is nonflammable and is recommended for interior use.

Apply 30 lb. for every 1000 cu. ft.

Airtight enclosure is required.

**Caution**

Carboxide will blister skin. Items worn next to skin must be aerated 18 to 24 hours.

**Decontaminant -- Hyamine (Benzethonium Chloride)**

**Use -- Biological**

**Remarks**

Hyamine is effective against all bacteria. Allow 5 to 30 minutes contact time.

**Caution**

It is very toxic. The estimated fatal dose is 1 to 3 grams.

Care should be taken when mixing to avoid inhalation of powder.

It is not to be used on ships.

**Preparation**

Use a 0.1 to 1% solution. One pound of Hyamine for every 12 gallons of water yields 1% solution.

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**Decontaminant -- Sodium Hypochlorite Solution Household Bleach**

**Use --Biological/Chemical**

**Remarks**

Sodium Hypochlorite Solution is effective against blister and V Agents and all biological materials. It reacts within 5 minutes with blister and V Agents. Allow 10 to 15 minutes contact time for biological materials.

Apply undiluted with brooms, brushes, or swabs. It is the preferred decontaminant for ship use. The concentration recommended is 5 to 1.

Possible sources are commercial laundry (19 to 14% solution) or food store (5% solution, such as Purex or Clorox).

It has a limited storage problem.

### Caution

It is harmful to use undiluted on skin or clothing. Remove from skin and clothing by flushing with water.

It is corrosive to metals unless rinsed, dried, and lubricated after decontamination.

Store in a cool place.

### Preparation

No mixing is required for chemical decontamination. For biological decon, dilute by adding 2 parts bleach to 10 parts water.

For decon of cotton clothing and utensils, bleach should be diluted 1/2 cup bleach to 1 gallon water.

Dilute half and half with water and spray from PDDE.

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**Decontaminant -- Calcium Hypochlorite (HTH)**
**or High Test Bleach (HTB)**
**NSN 6810-264-6591 (25 lb.) or NSN 6810-664-0402 (100 Lb.)**

**Use -- Biological/Chemical**

### Remarks

It is effective against Lewisite, V Agents, and all biological materials, including bacterial spores.

It reacts within 5 minutes with Mustard and Lewisite.

Allow 15 minutes contact time for biological materials. It is faster acting than STB. It can be used as a dry mix or a slurry.

It is not recommended for ships. Top deck storage only. It is not allowed in slurry or dry form in holds of vessels.

Possible sources are commercial laundries, drug stores, or chemical firms.

**Caution**

Use only if STB is not available.
Observe same precautions as STB.

Pure undiluted Calcium Hypochlorite will burn on contact with VX, HD, or DS2. The protective mask and rubber gloves are the minimum protective equipment for handling Calcium Hypochlorite.

It is more corrosive than STB. It has a toxic vapor, will burn the skin, and will destroy clothing. Skin or clothing that comes into contact with decontaminant should be flushed with large amounts of water.

Equipment used to spray decontaminant must be thoroughly cleaned after the spray mission. Rinse thoroughly with hot water, 80° C. or 176° F.

**Preparation**

| | |
|---|---|
| **Chemical** | Mix 5 pounds decontaminant to 6 gallons of water (10% solution). |
| **Biological** | Mix 1 pounds decontaminant to 6 gallons of water (2% solution). |
| **PDDE** | Mix a slurry of 1 part decontaminant to 2 parts water. Slurry that is any heavier will clog the decon apparatus. |

A slurry of 3 parts HTH and 97 parts water can be used for horizontal surfaces. Approximate coverage is 1 gallon per 8 sq. yd.

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**Decontaminant -- 2-Propanone or Acetone**

**Use -- Chemical**

**Remarks**

This is a good decontaminant for use in Arctic regions. It evaporates rapidly. The melting point is -95.35° C. and the boiling point is 56.2° C.

it is commonly obtained as fingernail polish remover or paint thinner. Scrubbing increases the effectiveness. It is effective for dissolving and flushing agents by physically removing them.

**Caution**

It is extremely flammable.

It does not neutralize agents.

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**Decontaminant -- Diethyl Ether**

**Use -- Chemical**

**Remarks**

It is a good decontaminant for use in Arctic regions. The melting point is -116.2° C. and the boiling point is 34.15° C. Scrubbing increases the effectiveness.

It is avaialable through medical supply facilities.

**Caution**

Same as 2-propanone or acetone.

**Preparation**

Same as 2-propanone or acetone.

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**Decontaminant -- Ethylene Glycol**

**Use -- Chemical**

**Remarks**

Contaminated surfaces should be scrubbed with decontaminant and thoroughly rinsed.

**Caution**

It is effective in physically removing contamination, but does not neutralize the contamination. Runoff must be considered contaminated.

**Preparation**

Mix 50% solution to 50% water.

**Decontaminant -- Solvents, Gasoline, JP-4, Diesel Fuel, Kerosene and similar solvents**

**Use -- Chemical**

**Remarks**

Contaminated surfaces should be scrubbed with decontaminant and thoroughly rinsed.

**Caution**

The same precautions listed for Ethylene Glycol are applicable to solvents. Solvents may damage materials such as rubber and plastic.

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**Decontaminant -- Sodium Hydroxide (Caustic Soda or Lye) NSN 6810-174-6581 (100 lb.)**

**Use -- Biological/Chemical**

**Remarks**

It is effective against G Agents, Lewisite, and all biological materials including bacterial spores. It neutralizes G Agents on contact. Allow it to remain in contact with the surface contaminated with chemical agents for approximately 15 minutes.

**Caution**

Inhalation of the dust or concentrated mist can cause upper respiratory or lung damage. It is damaging to the skin, eyes, and clothing on contact in either solution or solid form. Full rubber protective clothing, gloves, boots and mask are required.

In case of contact, was the area immediately with large amounts of water, flush with diluted acetic acid or vinegar. Remove affected clothing immediately. If eyes are involved, flush them at once with large amounts of warm water and get immediate medical attention.

It is corrosive to most metals. The M12A1 PDDE will withstand the highly corrosive action of Caustic Soda solutions. However, thorough rinsing after use is necessary.

All equipment should be flushed with large amounts of clear water to minimize the danger of operators being burned by residual deposits.

Runoff from decon operations is highly corrosive and toxic. Drain runoff into sump and bury.

It is not recommended for ship use. Top deck storage only.

The effectiveness is directly proportional to strength of the solution.

Lye is not recommended as a decontaminant, if less caustic decontaminants are available. It will cause a red color change upon contact with M8 Paper.

**Preparation**

Mix in an iron or steel container. Never use aluminum, zinc, or tin. Do not handle mixing container with bare hands.

Add lye to water to prevent boiling and splattering due to excessive heat emitted.

**Small Amount** 10 pounds of lye to 12 gallons of water (10% solution).

**Large Amount** For PDDE use, prepare a solution of 227 grams (1/2 lb.) of lye for each gallon of water. Pump 350 gallons of water into tank unit. Connect tank unit and pump unit and heater together. Heat water to 50° C (122°F). Disconnect heater unit and add 79 kg (175 lb.) of lye (1 3/4 drum) to the heated water. Circulate solution with the pump unit until all lye is dissolved. The temperature will increase noticeably. . Use while hot.

**Simultaneous Mixing and Applying** -- Sprinkle dry lye on the contaminated area and then dissolve it with a spray of steam or hot water. Do not wash the lye off the surface while applying the steam or hot water.

**Paint Removal** One pound of lye per 2 1/2 gallons of water is capable of removing an average coat of paint from about 11 sq. yd. of surface. This solution is effective in removing paint into which chemical contamination has absorbed.

Calcium Hydroxide, Potassium Hydroxide, or Trisodium Phosphate may be substituted for Sodium Hydroxide.

**Decontaminant -- Sodium Carbonate**
**(Washing Soda, Soda Ash, Sal Soda, or Laundry Soda)**

**Use -- Chemical**

**Remarks**

This is effective against G Agents and CN. It reacts within 5 minutes with G Agents.

It is the preferred decontaminant for ship use. 5% by weight concentration is recommended. There is no storage problem.

A hot solution is the most effective means of decontaminating CN.

**Caution**

Do not use for VX.
It can not detoxify VX and creates extremely toxic by-products.
HD does not dissolve in solution and is not detoxified.

**Preparation**

Mix 10 pounds of Washing Soda to 12 gallons of water for a 10% solution.

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**Decontaminant --Potassium Hydroxide**
**(Caustic Potash)**

**Use -- Biological/Chemical**

**Remarks**

The same remarks applicable to Sodium Hydroxide apply.

**Caution**

The same remarks applicable to Sodium Hydroxide apply.

**Preparation**

The same remarks applicable to Sodium Hydroxide apply.

**Decontaminant -- Hexachloramelamine**

**Use -- Chemical**

**Remarks**

It is effective against Mustard Agents.

**Caution**

The protective mask and rubber gloves should be worn when working with Hexachloramelamine. It is corrosive to metal.

**Preparation**

This decontaminant is a powder that is not solube in water, but is soluble in organic solvents, such as gasoline, kerosene, and paint thinner.

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**Decontaminant -- Ammonia or Ammonium Hydroxide (Household Ammonia)**

**Use -- Chemical**

**Remarks**

This is effective against G Agents. It is slower acting than Sodium Hydroxide or Potassium Hydroxide.

**Caution**

A self-contained breathing apparatus or special purpose mask required when working with Ammonia or Ammonium Hydroxide.

**Preparation**

Ammonium Hydroxide is a water solution of Ammonia. No further mixing is required.

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**Decontaminant -- Perchloroethylene (Tetrachloroethylene)**

**Use -- Chemical**

**Remarks**

A nonflammable synthetic solvent widely used in dry cleaning plants. It has low toxicity. It dissolves H and V Agents but not G. The melting point -22° C; boiling point 121° C. It is good for Arctic climates.

**Caution**

It physically dissolves and removes contamination but does not neutralize it.

**Preparation**

No mixing is required. Since it is practically insoluble in water, use as is. Its effectiveness is increased with scrubbing.

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**Decontaminant -- Dichloramine-B and Dichloramine-T**

**Use -- Chemical**

**Remarks**

It is effective against Mustard Agents.

**Caution**

Protective mask and rubber gloves should be worn when working with decontaminant. It is corrosive to metal.

**Preparation**

Decontaminant is a powder that is not soluble in water but is soluble in certain organic solvents. It is normally mixed as a 10% solution in Dichloroethane.

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**Decontaminants -- Acids**
**(Sulphuric Acid, Hydochloric Acid, Acetic Acid, Oxalic Acid)**

**Use -- Nuclear**

**Remarks**

Solvents are effective for rust and mineral deposits holding radioactive material on metal surfaces. Allow 1 hour contact time normally. Flush with water, scrub with a water-detergent solution, and flush with water again.

**Decontaminant -- Miscellaneous Solutions**

**Use -- Chemical**

**Remarks**

To be effective, these solutions should be scrubbed onto the contaminated surfaces.

**Preparation**

| | |
|---|---|
| MEA Solution | 10% Monoethanolamine, 1.0% 9N9-nonionic surfactant (Triton X100) in water. |
| ASH Solution | 0.2% pure $Ca(OCl)_2$ from STB in water buffered to a pH of 7.53 with $NaH_2HPO_4Na_2HPO_4$ and .05% Triton X100 surfactant. |
| Slash Solution | Aqueous Hypochlorite Salt, Aqueous Citric Acid, Sodium Citrate buffer with detergent in equal proportion (pH7.5). |
| WGD (C-8) Solution | 302 gallons of water, 250 pounds of HTH, 36 gallons Perchloroethylene, and 33 pounds IHF emulsifier. |

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**Decontaminant -- Water**

**Use -- Biological/Chemical/Nuclear**

**Remarks**

Flush surface contamination with large amounts of water.

**Caution**

Effective in physically removing contamination, but does not neutralize the contamination.

**Decontaminant -- Steam**

**Use -- Biological/Chemical/Nuclear**

**Remarks**

The use of steam accompanied by scrubbing is more effective than the use of steam alone.

**Caution**

Effective in physically removing contamination, but does not neutralize the contamination.

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**Decontaminant -- Absorbents**
**(Earth, sawdust, ashes, rags, and similar material)**

**Use -- Chemical**

**Remarks**

Used to physically remove gross contamination from surfaces.

**Caution**

The contamination is transferred from the surface to the absorbent. The absorbent becomes contaminated and must be disposed of accordingly.

Sufficient contamination to produce casualties may remain on surfaces.

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**Decontaminant -- Sealants**
**(Concrete, Asphalt, Earth, Paint, and similar material)**

**Use -- Biological/Chemical/Nuclear**

**Remarks**

It is used to physically seal in or shield contamination. Various sealants are effective as follows:

- Twelve inches of earth provides good protection from fallout. Three inches will reduce the dose rate by about one half.
- One inch of asphalt or concrete completely absorbs Alpha and Beta Radiation.

- 1/4 inch of grout shields Alpha and Beta Radiation.
- Burying items contaminated with biological agents is an effective means of sealing off contamination.
- Four inches of earth provides good protection from chemical contamination.

**Caution**

- A break in the surface of the sealant will expose the contamination. Contaminated areas covered with sealants must be marked with appropriate NBC warning signs.