

Table 14.2 Area and material decontamination\*

| Method <sup>b</sup> | Surface   | Action                                | Technique   | Advantages   | Disadvantages   |
|---------------------|---|---------------------------------------|---|--|---|
| Vacuum cleaning     | Dry surfaces  | Removes contaminated dust by suction. | Use conventional vacuum technique with efficient filter.  | Good on dry, porous surfaces. Avoids water reactions.  | All dust must be filtered out of exhaust. Machine is contaminated.  |
| Water               | All nonporous surfaces (metal, painted, plastic, etc.)    | Dissolves and erodes                  | <p><u>For Large Surfaces:</u> Hose with high-pressure water at optimum distance of 15 to 20 feet. Spray vertical surfaces at an angle of incidence of 30° to 40°; work from top to bottom to avoid recontamination. Work upward to avoid spray. Determine cleaning rate experimentally, if possible; otherwise, use a rate of 4 square feet per minute.</p> <p><u>For Small Surfaces:</u> Blot up liquid and hemwipe with water and appropriate commercial detergent.</p> | All water equipment may be utilized. Allows operation to be carried out from a distance. Contamination may be reduced by 50%. Water equipment may be used for solutions of other decontaminating agents. | Drainage must be controlled. Not suitable for porous materials. Oiled surfaces cannot be decontaminated. Not applicable on dry contaminated surfaces (use vacuum); not applicable on porous surfaces such as wood, concrete, canvas, etc. Spray will be contaminated. |
| Steam               | All surfaces  | Dissolves and erodes                  | Work from top to bottom and from upwind. Clean surface at a rate of 4 square feet per minute. The cleaning efficiency of steam will be greatly increased by using detergents.   | Extremely effective if done immediately after spill and on nonporous surfaces.   | Of little value in the decontamination of large areas, longstanding contaminants and porous surfaces.   |
| Steam               | Nonporous surfaces (especially painted or oiled surfaces) | Dissolves and erodes                  | Work from top to bottom and from upwind. Clean surface at a rate of 4 square feet per minute. The cleaning efficiency of steam will be greatly increased by using detergents.   | Contamination may be reduced on approximately 90% of painted surfaces.   | Steam subject to same limitations as water. Spray hazard makes the wearing of water-proof outfits necessary.  |
| Strippable coating  | Surfaces  | Contains contamination                | Paint on surface that will get contaminated and allow to dry.   | Contamination contained on the coating which may be stripped off after work completed.   | Contaminated coating needs to be stripped and disposed.   |

\*Modified from "Radiological Health Handbook," PB-230 846, U.S. Department of Health, Education, and Welfare, Rockville, MD 20852, Revised edition, January 1970.

<sup>b</sup>Begin with method listed and then proceed step by step to the more severe methods, as necessary.

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| Method            | Surface  | Action  | Technique   | Advantages   | Disadvantages   |
|-------------------|--|---|---|--|---|
| Detergents        | Nonporous surfaces (metal, painted, glass, plastic, etc.)  | Emulsifies contaminant and increases wetting power of water and cleaning efficiency of steam. | Rub surface 1 minute with a rag moistened with detergent solution, then wipe with dry rag; use clean surface of the rag for each application. Use a power rotary brush with pressure feed for more efficient cleaning. Apply solution from a distance with a pressure proportioner. Do not allow solution to drip onto other surfaces. Mist application is all that is necessary.                       | Dissolves industrial film and other materials which hold contamination. Contamination may be reduced by 90%.   | May require personal contact with surface. May not be efficient on long-standing contamination.   |
| Complexing agents | Nonporous surfaces (especially unweathered surfaces, i.e., no rust or calcareous growth).                    | Forms soluble complexes with contaminated material.   | Complexing agent solution should contain 3% (by weight) of agent. Spray surface with solution. Keep surface moist 30 minutes by spraying with solution periodically. After 30 minutes, flush material off with water. Complexing agents may be used on vertical and overhead surfaces by adding chemical foam (sodium carbonate or aluminum sulfate).   | Holds contamination in solution. Contamination may be reduced by 75% in 4 minutes on unweathered surfaces. Easily stored; carbonates and citrates are nontoxic and noncorrosive. | Requires application for 5 to 30 minutes. Little penetrating power; of small value on weathered surfaces.   |
| Organic solvents  | Nonporous surfaces (greasy or waxed surfaces, paint, or plastic finishes, etc.)                              | Dissolves organic materials (oil, paint, etc.)  | Immerse entire unit in solvent or apply by wiping procedure (see Detergents).   | Quick dissolving action. Recovery of solvent possible by distillation.   | Requires good ventilation and fire precautions. Toxic to personnel. Material bulky.   |
| Inorganic acids   | Metal surfaces (especially with porous deposits; i.e., rust or calcareous growth); circulatory pipe systems. | Dissolves porous deposits.  | Use dip-bath procedure for removable items. Acid should be kept at a concentration of 1 to 2 normal (9 to 18% hydrochloric, 3 to 6% sulfuric acid). Leave on weathered surfaces for 1 hour. Flush surface with water, scrub with a water-detergent solution, and rinse. Leave in pipe circulatory system 2 to 4 hours; flush with plain water, a water-detergent solution, then again with plain water. | Corrosive action on metal and porous deposits. Corrosive action may be moderated by addition of corrosion inhibitors to solution.  | Personal hazard. Wear goggles, rubber boots, gloves, and aprons. Good ventilation required because of toxic and explosive gases. Acid mixtures should not be heated. Possibility of excessive corrosion if used without inhibitors. Sulfuric acid not effective on calcareous deposits. |

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|--|---|---|---|---|---|
| Acid mixtures: hydrochloric, sulfuric, acetic, citric acids, acetates, citrates. | Nonporous surfaces (especially with porous deposits); circulatory pipe systems. | Dissolves porous deposits.                              | Same as for inorganic acids. A typical mixture consists of 0.1 gal hydrochloric acid, 0.2 lb sodium acetate and 1 gal water.  | Contamination may be reduced by 90% in 1 hour (unweathered surfaces). More easily handled than inorganic acid solution. | Weathered surfaces may require prolonged treatment. Same safety precautions as required for inorganic acids.  |
| Causatics: lye (sodium hydroxide), calcium hydroxide, potassium hydroxide        | Painted surfaces (horizontal)   | Softens paint (fresh method)                            | Allow paint-remover solution to remain on surface until paint is softened to the point where it may be washed off with water. Remove remaining paint with long-handled scrapers. Typical paint remover solution: 10 gal water, 4 lb lye, 6 lb boiler compound, 0.75 lb cornstarch | Minimum contact with contaminated surfaces. Easily stored.  | Personal hazard (will cause burns). Reaction is slow; thus it is not efficient on vertical or overhead surfaces. Should not be used on aluminum or magnesium. |
| Trisodium phosphate  | Painted surfaces (vertical, overhead)   | Softens paint (mild method)                             | Apply hot 10% solution by rubbing and wiping procedure (see Detergent).   | Contamination may be reduced to tolerance in one or two applications.   | Destructive effect on paint. Should not be used on aluminum or magnesium.   |
| Abraision  | Nonporous surfaces  | Removes surface   | Use conventional procedures, such as sanding, filing, and chipping. Keep surface damp to avoid dust hazard.   | Contamination may be reduced to as low a level as desired.  | Inoperable for porous surfaces because of penetration by moisture.  |
| Sandblasting   | Nonporous surfaces  | Removes surface   | Keep sand wet to lessen spread of contamination. Collect used abrasive or flush away with water.  | Practical for large surface areas.  | Contamination spread over area must be removed. Contaminated dust is personal hazard.   |
| Vacuum blasting  | Porous and nonporous surfaces   | Removes surface; traps and controls contaminated waste. | Hold tool flush to surface to prevent escape of contamination.  | Contaminated waste ready for disposal. Safest abraision method.   | Contamination of equipment.   |