



LOW TEMPERATURE RESTROOM CLEANER

By

Lois P. Sicking, Mechanical Engineer

INTRODUCTION AND SCOPE

It is important to provide a safe environment for visitors and employees at recreation site facilities with unheated restrooms which are subject to freezing conditions. It is also desirable to have a restroom cleaner that is able to withstand freezing environments because slips and falls may occur when conventional cleaners freeze on contact.

The project goal was to provide information to the field on a low temperature restroom cleaner for use in recreation site facilities prone to freezing conditions. The project objective was to either find or develop a restroom cleaner for a low temperature application. See figure 1.

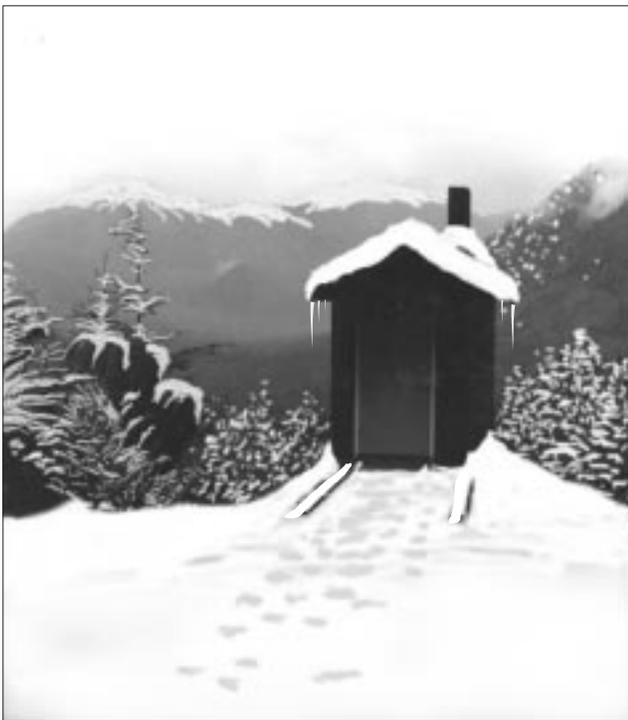


Figure 1—Typical restroom in colder climates of the country.

DESIGN CRITERIA

Criteria established by San Dimas Technology and Development Center (SDTDC) specifies that low temperature restroom cleaner for use in recreation site facilities consist of a general purpose cleaner suitable for different types of floor surfaces including tile and concrete, both sealed and unsealed. A cleaner designated as non-toxic, non-volatile, with a hazard classification of non-regulated is preferable. This hazard designation does not require additional personal protective equipment such as a chemical vapor respirator or local exhaust ventilation. Forest Service publication 9523 1206—SDTDC, *Cleaning Recreation Sites*, December 1995 and the Forest Service Handbook describes the use of general purpose restroom cleaners to include personal protective equipment. In addition, it was assumed that users typically do not visit recreation sites when temperatures are lower than -20 °F (-29 °C).

CURRENT TECHNOLOGY

SDTDC conducted a commercial marketplace search based on the design criteria developed. Several cleaners, primarily used in the food service industry for cleaning meat lockers, were found that would not freeze below 32 °F (0 °C). However, all of these cleaners required a chemical vapor respirator and/or an exhaust ventilation system.

Chemical manufacturers were solicited to develop a cleaner based on the design criteria developed by SDTDC. Tri Synergy Inc. accepted the challenge and developed a nontoxic restroom cleaner "Sub-Zero" for a low temperature application. This cleaner used in a full strength solution does not freeze at a temperature as low as -12 °F (-24 °C).

LABORATORY TESTING

Environmental testing was conducted by SDTDC on the Sub-Zero cleaner at -12 °F (-24 °C). Different



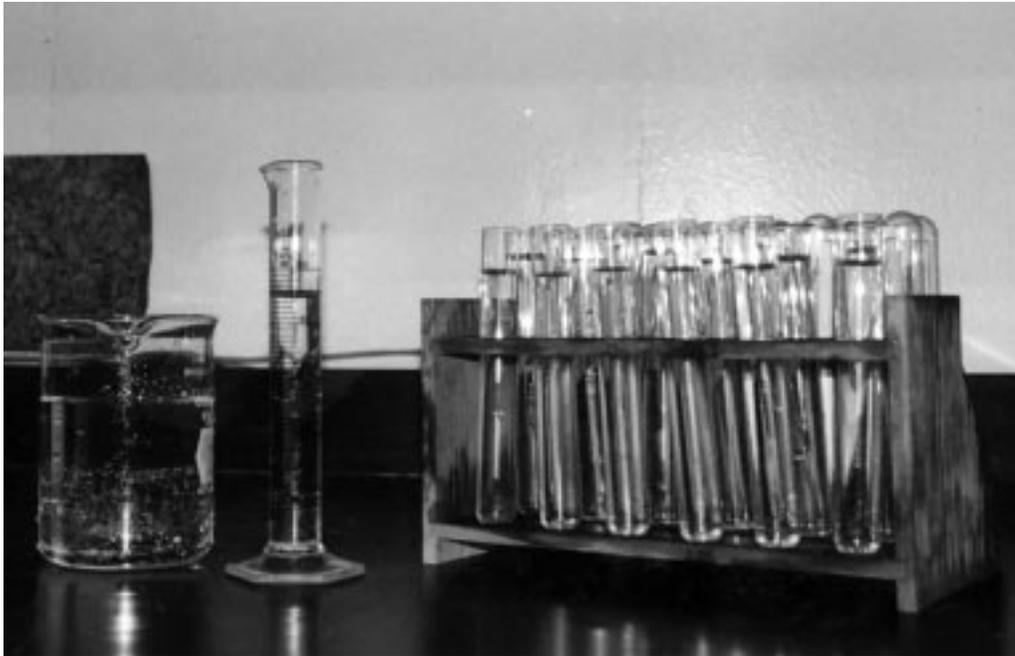


Figure 2—Test tubes with cleaner at different concentrations and subjected to -12 °F (-24 °C).



Figure 3—Concrete and riser cleaned with a full strength solution of Sub-Zero cleaner.

concentrations of the cleaner were established in test tubes and placed in the environmental chamber for 12 hours. All concentrations of less than a 65 percent solution froze. The solution at 70 percent froze to an ice slurry. The solution at 80 percent and greater remained in a liquid state. See figure 2.

Further testing was conducted by placing sealed and unsealed concrete tiles and a toilet riser in the environmental chamber. A mud slurry was applied to the tiles and toilet riser and allowed to dry over three days. The concrete and toilet riser were cleaned effectively with a full strength solution of the cleaner. See figure 3.

FIELD TESTING

Field testing was conducted in a low temperature application with good results. Field personnel reported that the low temperature cleaner is as effective as traditional cleaners—even in heavily soiled conditions—and did not freeze at low temperatures. Jim Rough, Recreation Staff, Angeles National Forest, reports that field personnel were able to effectively clean extensively smeared human waste from the floor of a restroom at 20 °F (-7 °C) with this cleaner.

Field personnel also reported that the evaporation rate is slower at this low temperature application. When large quantities of floor cleaner are used for heavy cleaning, the floor remains wet for a prolonged period. Consequently, the excess cleaner must be removed with a dry mop.

This cleaner can be applied with ice or snow on the floor. However, the ice and snow may melt and dilute the cleaner. Consequently, the cleaner should be used at full strength which provides a margin for ice melting up to 20 percent of the total amount of liquid.

CLEANER APPLICATION

Sub-Zero cleaner is a clear, unscented, nontoxic cleaner packaged in 1-gallon plastic containers. It can be sprayed from a hand sprayer, sprayed onto a cloth or mop, or applied directly with a mop. Use no more cleaner than is necessary, more is not better. In addition, due to the slow evaporation rate of the product at low temperatures, the floor should be dry mopped or manually dried if too much cleaner is used. The amount of cleaner transferred to the ground is reduced when only a minimal amount of cleaner is used initially.

SAFETY AND SANITATION

Follow the Forest Service and manufacturer regulations and guidelines for restroom disinfectants and cleaners. Before application, remove as much mud, ice and snow as possible. *Cleaning Recreation Sites* and the Forest Service Handbook both provide guidance on this subject. The Material Safety Data Sheet (MSDS) for Sub-Zero cleaner is provided in the appendix.

RECOMMENDATIONS

Based on the findings of this evaluation it is recommended:

- Sub-Zero cleaner be used at a full strength solution in temperatures ranging from 32 to -12 °F (0 to -24 °C).
- Forest Service and manufacturer regulations and guidelines for floor disinfectants and cleaners be followed.
- Use the least amount of Sub-Zero cleaner necessary to avoid buildup and excessive drying time.

MANUFACTURER INFORMATION

Sub-Zero cleaner is manufactured by Tri Synergy Inc. For further information regarding this product, contact the manufacturer at the address below.

The cleaner is supplied in 1 gallon plastic containers; packaged 4 gallons to a carton at a government cost of \$16.00 each. Shipping and handling costs are additional.

Tri Synergy Inc.

P.O. Box 27015

San Diego, CA 92198

Internet: www.trisyn.com

E-mail for technical support or sales information:

sales@trisyn.com

Phone: 800-446-6076 Fax: 619-747-1920

For additional information regarding this *Tech Tip* please contact Lois Sicking, Project Leader, at 909-599-1267 x294 or e-mail at lsicking/wo_sdtcdc@fs.fed.us

SECTION V - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE XX		
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION OR BY PRODUCTS As with any organic material, CO and CO2 may be expected as by-products of combustion.			
HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	Will not occur	XX	
SECTION VI - HEALTH HAZARD DATA			
HEALTH HAZARDS			
CARCINOGENICITY	NTP	IARC MONOGRAPHS ?	OSHA REGULATED ?
	No	No	No
SIGNS AND SYMPTOMS OF OVEREXPOSURE			
EMERGENCY AND FIRST AID PROCEDURES			
EYES Slight Irritation-Flush with water for 20 minutes lifting eyelids. Get medical attention.	SKIN Wash area with soap and water. Launder contaminated clothing before use.	SWALLOWED Ingesting large quantities cause nausea. Do not induce vomiting. Give lots of water. Get medical attention.	
SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Absorb with an inert material such as sand or Vermiculite and sweep up and dispose of in accordance with federal, state and local regulations.			
WASTE DISPOSAL METHOD Dispose of in accordance with federal, state and local regulations.			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING			
SECTION VIII - CONTROL MEASURES: For Use Where Significant Eye, Skin Or Inhalation Exposure is Likely			
RESPIRATORY PROTECTION (Specialty Type) Wear NIOSH approved respirator in presence of mists and dusts.			
VENTILATION	LOCAL EXHAUST Suggested	SPECIAL	
	MECHANICAL (General)	OTHER	
PROTECTIVE GLOVES Vinyl, rubber or nitrile	EYE PROTECTION Wear chemical splash goggles		
OTHER PROTECTIVE CLOTHING OR EQUIPMENT Protective apron			
WORK HYGIENE PRACTICES Wash hands after handling			