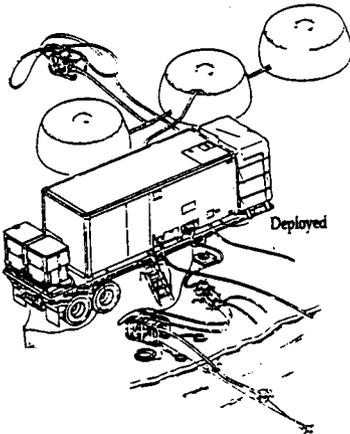
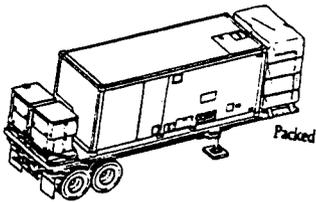




Just the Facts

55-002-1293

Personal Protective Equipment and Procedures for Handling Reverse Osmosis Water Purification Unit (ROWPU) Elements



- ◆ **PVNTMED Personnel & ROWPU Operators**
- ◆ **Guidance/Training**
- ◆ **Personal Protection Procedure & Instruction**

This fact sheet offers guidance on the proper procedures for protecting the health of operators of the Reverse Osmosis Water Purification Unit (ROWPU). The Office of The Surgeon General (OTSG) asked USAEHA to assist the U.S. Army Belvoir Research, Development and Engineering Center (BRDEC) in developing procedures for the handling of reverse osmosis membranes (ROMs).

Exposure Potential

The U.S. Army uses the reverse osmosis process as the primary method to supply drinking water for soldiers in the field. The reverse osmosis equipment configuration is called a ROWPU. The ROWPU uses several types of filter and membrane elements to clean water. In normal operation, a ROWPU uses a multimedia filter (anthracite, sand, garnet and gravel), a pre-filter (woven polypropylene) and a bank of ROMs. The ROMs are 3 to 6 feet in length and 6 to 8 inches in diameter. In addition, in a nuclear-biological-chemical (NBC) agent environment, the Army uses an activated carbon element to remove chemical warfare agents and an ion exchange column to remove nuclear contamination.

Reversing the flow of water through the system cleans the filters. The cleaning process will only work for a finite number of times before the ROMs must be changed. During removal and replacement of the filters and ROMs, the ROWPU operators may be exposed to several types of military NBC agents. Furthermore, the ROWPUs are routinely used in third-world countries and areas where there is a high potential for exposure to water-borne disease organisms.

In addition to the potential environmental and military contaminants, ROWPU operators are also exposed to several different chemicals used in the ROWPU process. Preservatives and descalers are the two basic types of chemicals used in ROWPUs. The preservatives and descalers are skin irritants, and the operator's skin and eyes must be protected from contact with these chemicals.

Preservatives are used because some of the Army units (such as the Army National Guard) operate the ROWPUs for only short periods of time. A preservative protects the ROWPU membrane from bacterial growth when in storage. The Army uses three ROM manufacturers, and the manufacturers use different types of preservative systems. One manufacturer uses glutaraldehyde for both long- and short-term storage; the other two manufacturers use a 1-percent solution of sodium bisulfite for short-term storage and propylene glycol for long-term storage. During the changing of the elements, the ROWPU operators may be exposed to the preservatives.

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Descalers are weak acids or bases used to prevent mineral buildup on the inside of the pipes and tanks. The Army uses various types of descalers. The type of personal protective equipment (PPE) used must be based on the type of descaler used. Therefore, the ROWPU operator must check with the supporting Preventive Medicine personnel to determine which type of PPE is required for the type of descaler being used.

Reducing Exposure Potential

Under normal operation, ROWPU operators must use shoulder-length butyl rubber gloves, rubber aprons and rubber boots when handling potentially contaminated ROMs and filter elements.

Operators should wash their hands and face with water and soap (antibacterial) at the completion of operations or before they eat or smoke.

When there is potential for the water from the ROMs to be aerosolized, operators must wear a face shield and a National Institute for Occupational Safety and Health-approved dust mask. The operators can only substitute the military chemical protective mask when there is potential for an NBC environment.

Procedures to monitor ROWPU elements potentially contaminated with NBC agents need further development. Currently, there is no definitive method to determine the appropriate level of mission-oriented protective posture (MOPP) or toxicological agent protective (TAP) equipment to be used based on results of monitoring. Therefore, if limited monitoring is not practical, MOPP level 4 or TAP level 1 must be used.

The elements that are potentially NBC-contaminated must be stored and labeled as "surety waste."

Disposal of Material

All material associated with ROWPU operations should be disposed of according to Army, Federal, state, local, and host nation regulations. Of particular concern are the preservatives (glutaraldehyde, sodium bisulfate, and propylene glycol), the descalers (weak acids and bases), and "surety waste."

The ROMs must be tested before they are disposed of. If the ROMs are not contaminated, they may be disposed of as normal sanitary waste. If the ROMs are contaminated, they must be disposed of as hazardous waste or "surety waste" depending on the contaminant.

Guidance for the disposal of the preservatives and descalers can be found in USAEHA Technical Guide 126, Waste Disposal Instructions, and the Military Item Disposal Instructions (MIDI).

Guidance for the disposal of "surety waste" can be found in AR 50-6.

References

Army Regulation 11-34, 15 February 1990, The Army Respiratory Protection Program.

Army Regulation 50-6, 12 December 1986, Nuclear and Chemical Weapons and Materiel - Chemical Surety.

USAEHA Technical Guide 126, January 1992, Waste Disposal Instructions.

Manual of Practice OM-10, Operation and Maintenance of Tricking Filters, RBCs (Rotating Biological Contractors), and Related Processes, 1988, Water Pollution Control Federation.

Biological Hazards at Waste Water Treatment Facilities, 1991, Water Pollution Control Federation.