DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

WATER SUPPLY AFLOAT

Headquarters, Department of the Army, Washington, DC
20 February 1990

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms),or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Blvd., St. Louis, MO 63120- 1798. A reply will be furnished directly to you.

TABLE OF CONTENTS

*This technical bulletin supersedes TB 43-0153, 27 October 1982.

1. General. All Army watercraft will use the procedures contained in this Chapter to provide and maintain a safe potable water supply. Bacteriological, physical and chemical requirements of potable water for all watercraft will meet the criteria set forth in AR 40-5 and TB MED 576. Assistance in monitoring these requirements must be obtained from medical facilities ashore since this is beyond the capability of personnel assigned to the watercraft. The basic procedures and criteria outlined in this bulletin will aid in the maintenance of a safe water supply and will prevent the transmission of waterborne disease. This bulletin is to be used in conjunction with AR 56-9.

2. Receipt of Water From External Source.

a. Improper techniques associated with the receipt of water can result in contaminated water being introduced in to the potable water system. The following actions shall be accomplished prior to receipt of water from any external source.

(1) The free available chlorine (FAC) in the water source shall be determined using the chlorine test kit available on all watercraft. If the water does not contain a FAC residual of at least 1.0 PPM, then the watercraft commander will be responsible for addition of sufficient chlorine to maintain a 1.0 FAC residual in the potable water system. See paragraph 5.

(2) If the water has a FAC residual of at least 1.0 PPM, the receiving watercraft is not required to add additional chlorine.

(3) In the event of an emergency where water must be obtained from a foreign source or is of doubtful quality, sufficient chlorine shall be added to the tanks to raise the FAC to 5.0 PPM, after 30 minutes contact time.

b. All water supplied by public or private systems outside the US should be considered of doubtful quality. Medical authorities ashore should be requested to evaluate the source and provide recommendations to the watercraft commander. If there are no local medical authorities present, the commander must use the batch Chlorination method as explained in paragraph 5, resulting in a FAC of 5.0 PPM.

3. Ship to Shore Potable Water Connections.
The following procedure will be used when making ship to shore potable water connections:

a. Before making the potable water connection, the potable water risers on the watercraft and the shore facility must be disinfected. This may be accomplished by preparing a solution of 50 PPM chlorine (dosage chart) in a container.
The risers may be immersed or swabbed with the solution.

b. Hoses to be used will be disinfected by subjecting the interior surface to a 50 PPM solution of chlorine and allowing to set for 2 minutes using the following procedure:

(1) Determine the hose diameter.

(2) Convert the hose diameter to gallons- per-foot using Table 1.

(3) Determine the water holding capacity of the hose by multiplying gallons-per-foot (Table 1) by lengths (in feet) of the hose.

(4) From the water holding capacity (gallons) determine the amount of chlorine agent required to obtain a 50 PPM solution using the chlorine dosage chart (Table 2).

(5) Both ends of the hose are to be elevated to insure the disinfecting liquid will remain inside the hose during the disinfecting process.

(6) The required quantity of the chlorine agent is to be poured into either end of the hose. The solid agent is to be in solution before pouring into the hose. See paragraph 5a for solution procedure.

(7) This hose is then to be filled with water insuring both ends of the hose are sufficiently elevated to prevent spilling.

(8) The solution of chlorine should set in the hose for 2 minutes and then drain.

c. Open the valve on the shore supply and allow to flush for 15 to 30 seconds to remove any debris or discoloration which may be present in the piping.

d. Connect the potable water hose to the shore facility riser. After disinfection of the water- craft riser, the ship connection can be made and transfer of water initiated.

e. If any time during the transfer or connections procedures, the hose is contaminated by hang-ing into or dropping into the harbor water, pump-ing operations should be stopped and the hoses disinfected.

4. Potable Water Hoses/Risers.

a. Hoses shall be labeled "POTABLE WATERONLY" at 10 foot intervals and used only for that purpose.

b. The end coupling of the hoses shall be colored coded light blue.

c. When not in use potable water hoses shall be rolled, coupled, or otherwise protected from contamination and stored aboard the watercraft.

d. Hoses shall be stored in a vermin proof, closed locker specifically designated for potable water hose storage. The locker, preferably, will be located off the weather decks, installed 18 inches above the deck and labeled "Potable Water Hose.

" e. Potable water risers shall be labeled "Potable Water" and color coded light blue. All risers shall be equipped with screw caps and keeper chains.

5. Disinfection of Water (Batch Chlorination Method).WARNING

Safety gloves, apron and face shield shall be worn by all personnel performing chlorinating procedures. Smoking is not permitted during chlorinating procedures. a. If adequate free available chlorine (1.0ppm) is not recovered from the shore facility, the watercraft commander will insure that a sufficient amount of chlorine is added to the tanks to insure maintenance of the required FAC in the water distribution system. Since there is no automatic disinfection equipment equipment aboard, the batch chlorination procedure must be used

. (1) Determine the capacity (gallons of the potable water tanks from data plate on the tank or appropriate technical manual.

(2) Using the chlorine dosage chart (Table2), determine the amount of chlorine necessary to treat the water. (Consult local medical authorities for additional information).

(3) Prepare chlorine solution. Calcium hypochlorite and chlorinated lime are solids which do not readily dissolve in water. Use of either agent will require mixing with the appropriate amount of water to form a slurry, allowing the solid to settle for 10-15 minutes and using the supernatant liquid (clean liquid) to accomplish disinfection. The remaining solid can be dissolved in more water and used for disinfection or discarded. The solid matter will not be dumped into any body of water or on any land surface .If sodium hypochlorite (common household bleach) is used, no mixing is necessary for it maybe introduced directly into the tank.

(4) Add the chlorine solution (not the granular material) into the tank preferably when empty or 1/4 full of water. The chlorine solution also may be introduced through potable water riser or sounding tube. The addition of water should provide sufficient mixing of the chlorine solution in the tank.

(5) Allow the treated water to set for 30minutes, then test for adequate free available chlorine residual in the system using the chlorine test kit. If the test reveals a FAC of less than 1.0ppm then the entire process must be repeated until this residual is available. This occurs when organic material in the system exerts a chlorine demand and utilizes the available chlorine. If the FAC chlorine residual is 1.0 PPM the water may be used.

b. In cases where a 5 PPM FAC residual is required (para 2b), the procedure outlined in "a" above should be followed, appropriately adjusting the chlorine dosage.

c. In instances where it has been determined that contamination of the water supply exists, the tank has been entered for maintenance or repair, or the tank has been filled with nonpotable water for ballast, superchlorination of the potable water tanks must be accomplished. This procedure is similar to the disinfection procedure, but in-creased amounts of chlorine are utilized over a longer period of time, in accordance with the following steps:

(1) Determine the capacity of the tank in gallons..

. (2) Using the chlorine dosage chart (Table 2), determine the amount of chlorine necessary to obtain 50 PPM chlorine in the tank.

(3) Mix the chlorine in warm water, allow to settle and introduce into the tank.

(4) Fill the tank with water to insure mixing and allow to set for 4 hours.

(5) After 4 hours, determine if a chlorine residual exists. If there is no residual, repeat the entire procedure.

(6) After 4 hours, if there is a chlorine level, the water in the tank can be dumped. Refill the tank with potable water and the water system can be used.

d. Mechanical cleaning and chemical disinfection of the tanks may be required under certain circumstances.

(1) Where extensive repairs have been completed.

(2) Where sludge or rust accumulations may impair the quality of water.

(3) Where tanks may have been loaded with contaminated water for ballast. e. Mechanical cleaning requires entry into the tank and physically scrubbing the interior of the tank with detergent and water. This is a hazardous operation and it is not considered a routine procedure and should only be accomplished at facilities where proper procedures can be employed to insure adequate breathing air is supplied to the tank and a hazardous atmosphere does not exist within the tank (installation, safety and/or industrial hygiene personnel may aid in this determination).

6. Disinfectant Agent/Storage.

a. The following list of chlorine disinfectants may be procured and used aboard Army watercraft:

(1) Calcium hypochlorite, technical 70% (HTH) NSN 6810002550471, 6 oz. jar.

(2) Sodium hypochlorite, liquid.
NSN 6810005987316, 1 gal bottle 5%
NSN 6810009006276, 5 gal., 5%

(3) In the event of an emergency, commercial liquid bleach (any common name brand) is a solution of 5% sodium hypochlorite and can be used.

b. Storage of calcium hypochlorite:

(1) Granular calcium hypochlorite is an effective disinfectant for water, but it is an oxidizing agent which is very corrosive and may result in spontaneous combustion when in contact with paint, oils, or other oxidizable material.

WARNING

Due to the hazardous nature of calcium hypochlorite, no more than three 6 oz bottles of the material will be carried onboard Army watercraft.

CAUTION

Special storage requirements for calcium hypochlorite are necessary to eliminate the potential fire hazard. Calcium hypochlorite should be stored in a cool, dry area outside of engineering or machinery spaces, flammable storerooms, or with organic products.

(2) In contrast to calcium hypochlorite, sodium hypochlorite liquid may be stored in a general storage area.

7. Free Available Chlorine Testing.

a. Use of the chlorine test kit is extremely important to provide daily assurance that the water contains the required amount of disinfectant agent.

b. The following kit may be used aboard watercraft and is available through the federal supply system:

(1) Comparator Set, Color. NSN 663001 0673827, with carrying case for free chlorine testing/bromine detection. Chlorine range 0.1, 0.2, 0.4, 1.0, 2.0, 3.0, 5.0 and 10.0 PPM. pH range 6.8, 7.0, 7.2, 7.4, 7.6, 7.8, 8.0 and 8.2 PPM

Bromine range 0.2, 0.4, 0.9, 2.2, 4.4, 6.6, 11.0 and 22.2 PPM.

(2) For replacement Phenol Red Tablets order NSN 6550010956757.

(3) For replacement Chlorine Test Tablet, order DPD Method 100, NSN 6810010440315.

8. Bacteriological Analysis.

a. Although, the presence of a free available chlorine residual in the potable water system is the most practical means of assuring safer water on a daily basis. a more decisive test for a safe, potable water supply is bacteriological analysis.

b. The laboratory determination is beyond the capability of the watercraft, therefore, samples will be submitted to the local medical facility for testing. Samples will be submitted at a frequency determined by the Director of Health Services. The shore medical facility will be responsible for providing sterile containers, and performing the bacteriological analysis. A record of these water results should be maintained by the water craft.

9. Training.

a. To properly provide the surveillance of the potable water supply through chlorine testing, storage of disinfectants, treatment of water, potable water hose storage and handling, training of watercraft personnel is absolutely essential.

b. At least one individual from each water craft, in addition to the commander, will be trained in potable water sanitation practices by medical authorities. .

APPENDIX
TABLES

Table 1. Volumes of Water Contained in Various Sized Pipes/Hoses

Pipe/Hose Diameter (inches)	Gallons per Foot of Pipe
2	0.16
2 1/2	0.25
3	0.38
3 1/2	0.51
4	0.66
5	1.04
6	1.50
8	2.61
10	4.08
12	5.88
14	10.45
16	16.32

One cubic foot of water = 7.48 U.S. gallons.
One U.S. gallon = 3,785 ml.

Table 2. Chlorine Dosage Chart
Gallons

Part Per Million Chlorine Residual (Initial)	AGENT*	5	10	25	50	100	200	500	1000	2000	5000	10,000
		Ounces of Chlorine Agent Required										
	Sodium Hypochlorite	.013	.026	.064	.13	.256	.512	1.28	2.56	5.12	12.8	25.6
1	Chlorinated Lime						.11	.28	.55	1.1	2.8	5.5
	Calcium Hypochlorite							.1	.2	.4	1.0	2.0
	Sodium Hypochlorite	.026	.052	.128	.26	.512	1.024	2.56	5.12	10.24	25.6	51.2
2	Chlorinated Lime					.108	.22	.56	1.1	2.2	5.6	11.0
	Calcium Hypochlorite						.100	.2	.4	.8	2.0	4.0
	Soldium Hypochlorite	.039	.078	.192	.39	.768	1.536	3.84	7.68	15.36	38.4	76.8
3	Chlorinated Lime				.100	.162	.33	.84	1.65	3.3	8.4	16.5
	Calcium Hypochlorite					.100	.120	.3	.6	.12	3.0	6.0
	Sodium Hypochlorite	.052	.104	.256	.52	1.024	2.048	5.12	10.24	20.48	51.2	102.4
4	Chlorinated Lime				.108	.216	.44	1.12	2.2	4.4	11.2	22.0
	Calcium Hypochlorite					.100	.160	.4	.8	1.6	4.0	8.0
	Sodium Hypochlorite	.064	.128	.32	.64	1.28	2.56	6.4	12.8	25.6	64.0	128.0
5	Chlorinated Lime				.14	.28	.56	1.4	3.0	6.0	14.0	27.0
	Calcium Hypochlorite					.10	.20	.48	.98	1.92	4.8	9.6
	Sodium Hypochlorite	.078	.154	.384	.77	1.536	3.072	7.68	1.536	30.72	76.8	153.6
6	Chlorinated Lime			.100	.162	.324	.66	1.68	3.3	6.6	16.8	37.0
	Calcium Hypochlorite					.12	.240	.6	.12	2.4	6.0	12.0
	Sodium Hypochlorite	.091	.18	.448	.9	1.792	3.584	8.96	17.92	35.84	89.6	179.2
7	Chlorinated Lime			.100	.189	.378	.77	1.96	3.85	7.77	19.6	38.5
	Calcium Hypochlorite				.100	.14	.280	.7	.14	2.8	7.0	14.0
	Sodium Hypochlorite	.104	.206	.512	1.03	2.048	4.096	10.24	20.48	40.96	102.4	204.8
8	Chlorinated Lime			.112	.216	.432	.88	2.24	4.4	8.8	22.4	44.0
	Calcium Hypochlorite				.100	.16	.320	.8	1.6	3.2	8.0	16.0
	Sodium Hypochlorite	.117	.232	.576	1.16	2.304	4.608	11.52	23.04	46.08	115.2	230.4
9	Chlorinated Lime			.126	.243	.486	.99	2.52	4.95	9.9	25.2	49.5
	Calcium Hypochlorite				.100	.18	.360	.9	1.8	3.6	9.0	18.5
	Sodium Hypochlorite	.13	.258	.64	1.29	2.56	5.12	12.8	25.6	51.2	128.0	256.0
10	Chlorinated Lime			.14	.27	.54	1.1	2.8	5.5	11.0	28.0	55.0
	Calcium Hypochlorite				.100	.20	.40	1.0	.20	4.0	10.0	20.0

Table 2. Chlorine Dosage Chart
Gallons

Part Per Million Chlorine Residual (Initial)	AGENT*	5	10	25	50	100	200	500	1000	2000	5000	10,000
		Ounces of Chlorine Agent Required										
25	Sodium Hypochlorite	.32	.64	1.6	3.2	6.4	12.8	32.0	64.0	128.0	320.0	640.0
	Chlorinated Lime		.14	.34	.68	1.35	2.68	6.72	13.6	27.0	67.6	135.2
	Calcium Hypochlorite			.12	.24	.48	.96	2.4	4.8	9.6	24.0	48.0
50	Sodium Hypochlorite	.64	1.28	3.2	6.4	12.8	25.6	64.0	128.0	256.0	640.0	1280.0
	Chlorinated Lime	.14	.3	.68	1.4	2.7	5.4	13.5	27.0	54.0	134.0	268.0
	Calcium Hypochlorite		.1	.24	.48	.96	1.92	4.8	9.6	19.3	47.2	96.0
75	Sodium Hypochlorite	.975	1.95	4.8	9.75	19.2	39.08	96.0	192.0	384.0	960.0	1920.0
	Chlorinated Lime	.225	.54	1.05	2.03	4.05	8.25	21.0	41.25	82.5	210.0	412.5
	Calcium Hypochlorite	.10	.16	.38	.75	1.5	3.0	7.5	15.0	30.0	75.0	150.0
100	Sodium Hypochlorite	1.28	2.56	6.4	12.8	25.6	51.2	128.0	256.0	512.0	1280.0	2560.0
	Chlorinated Lime	.28	.56	1.36	2.72	5.4	10.7	27.0	54.0	103.0	260.0	520.0
	Calcium Hypochlorite	.1	.192	.48	.96	1.91	3.82	9.54	19.1	38.2	95.5	192.0
200	Sodium Hypochlorite	2.56	5.12	12.8	25.5	51.2	102.4	256.0	512.0	1024.0	2560.0	5120.0
	Chlorinated Lime	.56	1.12	2.72	5.4	10.7	22.0	54.0	110.0	220.0	550.0	1100.0
	Calcium Hypochlorite	.192	.384	.96	1.91	3.82	7.64	19.1	38.2	76.4	191.0	382.0

* 5% - Sodium Hypochlorite (liquid)
25% - Chlorinated Lime (solid)
70% - Calcium Hypochlorite (solid)

** NOTE: 1 heaping tablespoon approx. = 1/2 ounce (0.50 oz.)
16 oz. = 1 pound

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN, II
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-34C, requirements for TB 43-0153: Water Supply Afloat.

* U.S. GOVERNMENT PRINTING OFFICE : 1995 0 - 388-421 (02547)

TEAR ALONG PERFORATED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

PIN: 049109-000