FINABEL COORDINATING COMMITTEE
Quartier Reine Elisabeth
Rue d'Evere
B-1140 BRUSSELS

Tél Col : 02/701.41.04
Tél Maj : 02/701.41.03
Tél Srt : 02/701.68.24
FAX : 02/701.71.78
E-mail : FINABEL@mil.be

22 January 2007

FIN/SEC/27.158-G

DISPATCH NOTE

DESIGNATION OF DOCUMENT	Draft of report Finabel Nr G.24.R **WATER SUPPLY ON OPERATIONS**
SENT FOR	① Official approval. ② Agreement for diffusion to NATO and WEU. ③ Agreement for diffusion to EU ④ Agreement for diffusion to ABCA
OBSERVATION	**Silence procedure applied until 22 April 2007.**

DISTRIBUTION BY E-MAIL

ARMY STAFFS

To FRANCE
ITALY
NETHERLAND
BELGIUM
GERMANY
UNITED KINGDOM
SPAIN
GREECE
PORTUGAL

FINABEL PERMANENT SECRETARIAT

Colonel NOËL J.
Head of Finabel
Permanent Secretariat

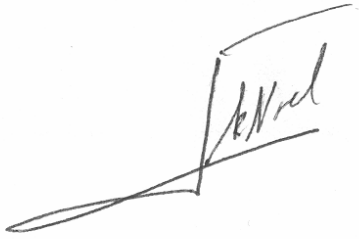

Table of contents

BIBLIOGRAPHICAL DATA STUDY G.24.R	
1. <u>References</u> : - Meeting PME 1/2004. - Draft mission paper G.24.R.	**2. <u>Other references</u>** : - Current military standards in Finabel nations. - National doctrines and assets in service or in development. - STANAG 2136 (Edition 4) "Minimum Standards of Water Potability during Field Operations and Emergency Operation". - STANAG 2885 (Edition 4) "Emergency Supply of Water in War". - STANAG 7141 "Joint NATO Doctrine for Environmental Protection during NATO led exercises and operations". - STANAG 2895 "Extreme Climatic Conditions and Derived Conditions for Use in Defining/Test Criteria for NATO Forces Materiel". - AMedP-7 "Concept of operations of medical support for nuclear, biological and chemical environments". - EU Guidelines 98/83/eg November 1998… minimum civil quality standard for peacetime. - CARE 2003 meeting: Immediate needs and minimizing loss of life: emergency relief to the water and health sector.
3. <u>Promulgation</u> : 23 April 2007	**4. <u>Revisions</u>** : N/A
5. <u>Number of pages</u> : 26	**6. <u>Classification</u>** : UNCLASSIFIED
7. <u>Title</u> : Water supply on operations	
8. <u>Originator</u> : FRANCE.	**9. <u>Address</u>** : LCL JH PINOT. CENTER FOR FORCE EMPLOYMENT DOCTRINE. Operation-Employment Division. (Engagement Section). 1, place JOFFRE. BP 53 – 00445 ARMEES. FRANCE.

10. Key words :

Force projection sustainability requirements, water supply, joint and multinational operation, doctrine of water supply, coalition plan for water supply, water resources, water treatment, storage and distribution, human consumption, quality standards, peacetime water supply system, expedient water supply, emergency water supply, daily rates of potable water consumption in emergency, standard for water control.

11. Summary :

This study deals with all the phases of water production for the use of troops on operations, from any kind of sources and whatever the tactical situation, covering the following topics :

- All categories of water used on operations (the water context);
- The water needs in function of its use;
- The elements of different phases of water production;
- The water supply organisation and responsibilities within the water production chain;
- Capacities and competences to be developed;
- Recommendations.

The study has taken into account current military standards in Finabel nations, national doctrines and assets in service or in development**.**

12. Abstract :

Future operation battle space will be shaped by the extent and discontinuity of the areas of operations. Operations are increasingly decentralized and require wider dispersion of units. A coalition plan for water supply must therefore be in place, supported by complementary equipment systems.
Consequently, the organization of “the water chain” must clearly identify individual and collective supply during all phases of the operation. Real time requires a greater reactivity to change of situation.

a) Interest / usefulness of the study

The intention of this paper is to analyze and consider all aspects of the provision of water, including potable water, required on operations by FINABEL members, adopting a unified approach wherever possible. This document includes CBR aspects.

b) Main aspects

The organization of “the water chain” must clearly identify individual and collective supply during all phases of the operation. Real time requires a greater reactivity to change of situation.

Effective control of water supply on operations requires :

- Planning and Recce at the earliest stage of the operation;
- Sufficient awareness in time and space of water resources;
- Speed of the command decisional cycle (comprehension of the situation, action and reaction).

In addition, the concept of water cannot be defined without taking into account all phases of the water cycle.
In-service equipment meets the need for water treatment, storage and distribution. However the capabilities for the initial extraction and collection phases of the water cycle are not fully coherent across European Armed Forces.
Lastly, environmental protection requires waste water treatment in order to avoid the pollution of a rare resource.

c) Main conclusions

- Interoperability of water supply doctrine, procedures, equipment and materiel should be improved.
- The installation of the water supply chain must be planned before deployment during the operational preparation phase, taking into account the nature, the foreseeable duration of the mission, the environment (climate, infrastructure), the size of the force and the amount and nature of deployed means.
- The coordination of competences by the JFC must allow fast acquisition, update, management and exchange of information to enable improved interaction between the various components of the water chain.
- The continuity of procurement of treatment products (chlorination, coagulation and flocculation) and reagents for quality control (tests and monitoring) is essential for the control of the water chain.
- Supply of potable water at the required time and space, in the required quantity and quality is the principal aim. The programs dealing with water supply will require to be increasingly flexible and reactive to harness the greatest benefit of rapidly evolving technologies. The study is the first stage of a development process for multi-national agreements concerning methodology of water reconnaissance, exploration, extraction, treatment, storage and distribution. It should lead to executive staff and management training.

d) Main recommendations

It is recommended that :

- Multi-national regulations be developed for the utilization of emergency water supply standards (as described in STANAG 2885 Ed. 4) on operations other than war.
- Finabel member nations should seek to procure water supply systems, which can meet the agreed standards developed from the relevant Public Health Codes.

1. GENERAL

1.1. Aim and purpose.

Water supply is a key component of force projection sustainability requirements. One of the most important requirements for a fighting force is an adequate water supply. This capability has to reflect operational constraints and civil standards, both national and international. So, the water supply must meet the needs for Armies in particular those of a theatre of operations. But recent engagements encourage retaining a joint vision by defining the water supply of a joint and multinational operation.
Integral resources will normally provide water supply to field units and formations. Raw water sources will be used if domestic reservoirs are not available. Liaisons with the host nation are necessary in obtaining the use of domestic water resources.

Currently promulgated STANAG do not deal with norms for :

- Water supply on operations other than emergency supply in war;
- CBRN decontamination consumption rates.

The aim of this study is to produce a coherent doctrine of water supply in operation that could be a reference for Finabel nations. Using STANAG, EU Guidelines and national or international agreements as a standard base this study proposes a general text on water supply in Finabel Nations.

1.2. Field of application.

1.2.1. Framework and limitation

The study takes into account :

- Current military standards in Finabel nations;
- National doctrines and assets in service or in development.

The scope of the study is the high intensity conflict and Crisis Response Operations (CRO). Homeland defence operations in Central Europe and the potential use of military means of water supply for humanitarian assistance to the civil populations (in case of natural disaster for example) are excluded.

1.2.2. Period of validity

The validity of the study will be affected by changing national or international standards.

1.2.3. Documents used in planning the study

- STANAG 2136 EDITION 4 “Minimum Standards of Water Potability during Field Operations and Emergency Operation”;
- STANAG 2885 EDITION 4 “Emergency Supply of Water in War”;
- STANAG 7141 “Joint NATO Doctrine for Environmental Protection during NATO led exercises and operations”;
- STANAG 2895 “Extreme Climatic Conditions and Derived Conditions for Use in Defining/Test Criteria for NATO Forces Materiel”;
- AMedP-7 “Concept of operations of medical support for nuclear, biological and chemical environments”;
- EU Guidelines 98/83/eg November 1998… minimum civil quality standard for peacetime;
- CARE 2003 meeting: Immediate needs and minimizing loss of life; emergency relief to the water and health sector …

1.3. Formulation of the problem

1.3.1. Current situation

Future operation battle space will be shaped by the extent and discontinuity of the areas of operations. Operations are increasingly decentralized and require wider dispersion of units. A coalition plan for water supply must therefore be in place, supported by complementary equipment systems.
Consequently, the organization of “the water chain” must clearly identify individual and collective supply during all phases of the operation. Real time requires a greater reactivity to change of situation.

Effective control requires :

- Planning and Recce at the earliest stage of the operation;
- Sufficient awareness in time and space of water resources;
- Speed of the command decisional cycle (comprehension of the situation, action and reaction).

It is on these three points that the concept of water in operations applies.
In addition, the concept of water cannot be defined without taking into account all phases of the water cycle.
In-service equipment meets the need for water treatment, storage and distribution. However the capabilities for the initial extraction and collection phases of the water cycle are not fully coherent across European Armed Forces.

Desalination of salt water is a very important resource. Desalination plants are in service and commercially available in different nations. Naval vessels tend to have on-board desalination plant, which can be used to fill this role, although suspended solids can hamper shallow water operation.
Lastly, environmental protection requires wastewater treatment in order to avoid the pollution of a rare resource.

1.3.2. Objectives

The global objective for water supply intended for human consumption by a force deployed in a hostile environment, must conform to standards agreed and developed by the relevant Public Health Codes.
STANAG 2885 EDITION 4 defines Emergency Supply of Water in War. There are currently no common agreed regulations defining the applicability of emergency standards in CRO.
The mobility of the forces on operations and the probability of damaged infrastructure in the area of operation are unlikely to allow national consumer protection standards to be met. The quality standards as defined by respective NATO STANAG are a minimum requirement.
Permanent quality control of water distributed for human consumption during extraction, treatment and distribution is a major requirement to maintain operational sustainability of forces during training or deployed on operations.
The concept of water should be resource, not procedure, driven.

Within this framework, the capability is required to :

- Evaluate and match the need and the resource, through quantitative, qualitative and resource protection plans;
- Organize, deploy and implement, according to the phases of the operation, the means to cover the total requirement;
- Supervise and control the quality of water intended for human consumption, mission assured jointly with the health services of the Finabel forces.

2. THE WATER CONTEXT

The supply of water is indispensable for the operational readiness of armed forces. Besides potable water a considerable amount of domestic water is required as well. The supply is effected by means of :

- Public water supply (peacetime water supply system);
- Expedient water supply (wells and tapping of springs) or
- Emergency water supply (field units).

In case of breakdown of the public system or the supply facilities prepared for times of war, armed forces must be in position to meet their requirements for potable and domestic water for maintaining operational readiness through an emergency supply provided from their own resources.
Field equipment should be replaced by permanent infrastructure for long-term supply of water.

2.1. Categories of water

This study recognizes the following categories of water, STANAG 2885 EDITION 4, which are defined at Annex 1 :

- Emergency Potable water;
- Palatable Water;
- Potable Water;
- Domestic Water;
- Raw Water.

2.2. Water needs

2.2.1. Standard consumption

The norm for standard consumption in emergency conditions for every category of water per person, per day is fixed by the STANAG 2885 EDITION 4. This rate is adequate for sustained operations for troops in field conditions, but it is not applicable in many situations.
The scales of issue can vary with several factors and conditions: season, climate, geographical area, mission, tactical situation, and users... In arctic, tropical and torrid zones the requirement for drinking water may be greater than in temperate areas, particularly if heavy work is to be done. This requirement may be further increased if dehydrated rations are issued. Lower scales are only to be applied for limited periods. The table below relates to the consumption of potable water in temperate climates. Requirements for warm or cold weather may be up to 100 % higher. A command decision by Joint Force Commander (JFC) accepting a degree of risk may be made based on the most likely situation recommended by his experts. The daily rate of potable water consumption adapted to the situation should be specified by orders.
In special emergency situations water may only be used for quenching the thirst as well as for nutrition purposes in a minimum quantity of 5 litres per individual per day over a period of 7 days. In some armies the emergency quantity may be increased up to 10 litres/man/day. Daily rates of potable water consumption in emergency conditions are defined by STANAG 2885 EDITION 4 as follows :

Serial	Use	Requirement (litres/person/day) Under Normal Conditions
1	Units in action (1)	
	a) Drinking and cooking only	25 (2)
	b) General consumption	70 (3)
2	Medical troops	
	a) Battalion Aid Station	50 (4)
	b) Clearing Station (Brigade-Corps Level)	170
	c) Evacuation Hospital	200 (4)
3	Temporary or Semi-Permanent Camps:	
	a) Drinking, cooking and laundries	100
	b) As above, plus domestic water (5)	150

(1) Includes personnel in armoured Fighting Vehicles and personnel wearing CBRN protective clothing and equipment.

(2) Normal planning figures for General Operations.

(3) As (2) but bathing included.

(4) In addition to serial 1.b.

(5) Unless a separate non-potable water distribution.

2.2.2. Particular rates (hospitals and prisoner-of-war camps)

The following rates are based on the Joint Warfare Publication 4-01.1, May 2003.
For hospitals, ONLY potable water quality is considered, even for sanitary use. The rate of consumption depends of several factors (season, climate, geographical area…) and fluctuates according to the use: Emergency Phase, Hospitalization Ward, Surgery/Maternity Ward, Health Centre, Feeding Centre, Kitchen.
For field hospitals the standard should be 100 ÷ 150 litres/bed/day.
In medical facility (Normal Rate) :

- Medical Role 1(Unit Aid Post) : 38 litres/bed/day.
- Medical Role 2 + Critical Care station : 250 litres/bed/day.
- Medical Role 3 + Field Surgical Team : 400 litres/bed/day.

For a military or a POW camp the account should not be lower than 60 litres/bed/day, recommended 100 litres/bed/day. If possible 50 % should be reutilized water.

2.3. Water used for CBR (Chemical-Biological-Radiological) defence activities

Water supply under CBRN conditions must meet the same standards of potability.
Water for decontamination does not need to be potable. Some Nations require that potable water be used for personnel decontamination.
Wastewater from decontamination facilities requires careful handling to avoid contamination of clean sources or thorough purification before release into environment.

2.4. Standard for water control.

2.4.1. Definition

The water shall be obtained from the best available source. STANAG 2136 (EDITION 4) establishes minimum requirements for quality of potable water, which is provided to troops in a theatre of operations.

MINIMUM STANDARDS FOR WATER POTABILITY DURING ARTICLE 5 OPEATIONS AND FOR SHORT TERM (EMERGENCY) CONSUMPTION DURING ALL FIELD OPERATIONS[1]

		Short term consumption		Long term consumption	
Constituent or characteristic	**Unit**	**5 l/day**	**15 l/day**	**5 l/day**	**15 l/day**
a. microbiological					
- coliforms[2]	No/100 ml	0	0	0	0
b. physical					
- colour	CU[3]	50	50	15	15
- turbidity	NTU[4]	1	1	1	1
- total dissolved solids	mg/l	1000	1000	1000	1000
- pH	-	5-9	5-9	5-9	5-9
- odour	TON[5]	3	3	3	3
c. chemical					
- arsenic	mg/l	0.3	0.1	0.06	0.02
- cyanide	mg/l	6	2	6	2
- chloride	mg/l	600	600	600	600
- lindane	mg/l	0.6	0.2	0.6	0.2
- magnesium	mg/l	100	30	100	30
- sulfate	mg/l	300	100	300	100
- BZ (incapacitants)	µg/l	7	2.3	[6]	[6]
- lewisite (arsenic fraction)	µg/l	80	27	[6]	[6]
- sulfur mustard	µg/l	140	47	[6]	[6]
- nerve agents	µg/l	12	4	[6]	[6]
- T-2 toxins	µg/l	26	8.7	[6]	[6]
d. radiological[7]					
- total	Bq/l	300000	100000	5000	2000

NOTES:

1. Health related constituents and characteristics, other than those listed in the Tale, are to be maintained at levels which are as low as is reasonably practicable. This will require sufficient effort, depending on the circumstances, to ensure that health related risks will not be expected.
2. If there is no microbiological laboratory available, ensure that residual chlorine is measurable (> 0.2 mg/l)
3. CU = Colour Unit; one Colour Unit = 1 mg platinum per liter water (cobalt-platinum method).
4. NTU = Nephelometric Turbidity Unit
5. TON = Threshold Odor Number
6. For operational reasons military personnel are not expected to be exposed to CW agents for more than 7 days. Therefore only short-term drinking water standards are recommended.
7. For areas having received fallout no absolute standard is recommended for short-term consumption. This is based on the consideration that if the risk of external radiation from fallout is such as to allow the source to be used, then the water will be suitable for drinking during the occupancy not exceeding 7 days.
   For areas not having received fallout any source showing a reading above background, as measured with a dose rate meter or other suitable method, should only be used for short-term consumption if no better source is available and the use is essential. This is based on the consideration that personnel should not be subjected to unnecessary radiation exposure. Consumption of water polluted with fallout after a nuclear detonation should be avoided the first 24 hours because of the rapid change is nuclide composition which occurs during this period.

hese standards assume that water is being supplied to a young, fit and healthy population, and are :

- (NATO) Short-term/Emergency Standard. This standard is designed to enable a force to deploy to Theatre and operate effectively, whilst the water supply is being fully established. This standard is only to be applied for a short (maximum 7 days) period. Extensions to this period may be sought from an appropriate Medical authority (for example, an Environmental Health Officer) that would then carry out an appropriate risk assessment. Water produced to this standard will meet the requirements of STANAG 2136 EDITION 4.
- (NATO) Long-term Standard. This standard is aimed for a period of up to 12 months (although this may be extended by the Force Medical Advisor following an appropriate risk assessment). It represents the minimum potability standard that could be expected to be provided by (NATO) allies during operations. It is the normal standard acceptable for war fighting operations.
  Definitive Long-term Standard (This standard is based on national water supply regulations). This is to be considered the definitive standard to which drinking water is to be provided during operational and exercise deployments, whenever feasible to do so. It should be the normal standard for all operations lasting longer than 12 months and for permanent garrisons overseas. The aim is to achieve the Definitive Long-term Standard wherever possible and as soon as possible.

2.4.2. Responsibility

The implementation of tasks with regard to the treatment, acceptability and the water control is handled differently in the armed forces of the nations involved. The ANNEX B to STANAG 2885 EDITION 4 determines the responsibilities for the reconnaissance, development, extraction, treatment, acceptability, storage and distribution of water in the field.
The establishment of the acceptability is a national responsibility and may only be effected by a medical officer (physician/Veterinary office NO/environmental health technician) after chemical, microbiological and radiological examination of the water. Treated water is to be re-examined prior to making it available.

3. ELEMENTS OF THE DIFFERENT PHASES OF WATER SUPPLY

3.1. Deployment

The establishment of stable and continuous water supplies is an essential precondition for maintaining the physical and mental resilience, motivation, discipline and sustainability of deployed soldiers.

Setting up a water supply system should rely on infrastructure already existing in the operational area. When it comes to reconnaissance and the construction of any types of accommodation, water supply must always be taken into consideration. For this purpose, fact-finding teams as well as advance parties must include such experts.
Where existing local infrastructure is used, and the water quality is deemed acceptable following tests performed by the Finabel member nation using it, the host nation is deemed to be the supplier of water.

3.2. Reconnaissance

There is no special equipment for engineers to execute water supply reconnaissance, other than the general reconnaissance equipment at hand for the engineers and the data put at disposal by the geological service appropriate to execute water supply reconnaissance.

Possible information sources may be :

- Civilian and military geographic information (engineer data) ;
- Specialist data (including air prints and especially satellite imagery) ;
- CIMIC services.

In connection with logistic planning and the issuance of orders for operations, the decision whether a comprehensive water supply system will be established in the operational area by military forces, by HNS or by a civilian contractor is made on the basis of local information and fact-finding results. Combinations are allowed if required by the operation and if cost effectiveness is taken into account.
During fact-finding, all parties involved will coordinate their procurement, process development, surveillance and quality control, contracting and funding measures. Water supply is governed by the Status of Forces Agreement (SOFA) for HNS, and by Technical Agreements (TA) or a Memorandum of Understanding (MOU) in case of support by allies. The Follow-Up Support Order and other logistic orders specify the regulations concerning rationing, provisioning, transporting and storing. This applies accordingly to the employment of forces performing water supply tasks.

3.3. Water acquisition and purification

Qualified Army engineer specialists are employed for water acquisition (drilling of wells). They ensure that raw water is transported to the water purification point. Responsibility for operation of water treatment plants by Finabel member Nations is shown at Annex B of STANAG 2885 EDITION 4.

Water extraction requires the following equipment :

- Drilling equipment;
- Surface or immersed pumps;
- Flexible as well as rigid pipes, containers and reservoirs.

This equipment in general should be available in Finabel member Nations. Mobile drilling capability to execute drilling operations to a depth of at least 200m in all geological formations should be available.

Water treatment requires :

- Individual decontamination means;
- Collective portable devices for water treatment;
- Specific machines (distillation or ultra filtration) on sites of production.

There are the following main technical types of water purification available :

- Mechanical (Filtration) ;
- Physical (Distillation) ;
- Chemical (Chlorination / Flocculation) ;
- Micro/nano filtration (Reverse osmosis).

Water purification systems should be able to produce enough potable water for emergency supply in accordance with STANAG 2885 (EDITION 4) and STANAG 2136 EDITION 4.
However, in CRO the quality of potable water has to meet the quality standards laid down by the relevant public water supply authority. Treatment methods should therefore be defined by the entities that will be responsible for this phase of water production.
One of the most suitable methods for most operational situations is reverse osmosis. For example: a reverse osmosis water purification plant can treat radiologically, bacterially or chemically contaminated water sources and meet the standards defined by STANAG 2136 EDITION 4.
High flexibility in transportation and quickness of production are also criteria regarding this equipment.

3.4. Provision

In accordance with the "carry-to-customer" principle, water is always transported up to the designated transfer points by capacities of the logistic forces. Further distribution from these points is the responsibility of the respective users allocated to each point. Water supply must be made certain even in combat situations and in case supply lines are disrupted. Special employment options may call for temporarily following differing water supply regulations. Responsibility in this respect lies with the JFC who also decides on the employment option concerned.
In principle, logistic forces support bottled water supply.

If water supplies are disrupted or stocks destroyed, the responsible commander, in coordination with the competent medical officer/physician, will opt for temporary remedial measures.
If the host nation or a civil contractor is responsible for the provision of drinking water to camps or operational infrastructure, this process includes the extraction of water, keeping a record of the relevant quantities and a regular account of supplies and services rendered. Support by medical services is provided in the shape of regular quality control checks, even if the respective water supplier has committed himself to meet the required standards.
This is also required if the contingent contributes to the establishment of a multinational water supply system by making components available. Responsibilities must be contractually laid down as for instance that for surveillance and quality control which always remains a national concern.

3.5. Rationing

Rationing and distributing of water is a task of the logistic forces. The officer responsible for water supply controls if drinking water requirements are met and coordinates additional supplies of bottled water as needed. In case of shortages he implements corrective measures to ensure the supply of water.

3.6. Water storage and distribution

The equipment for storage, treatment and distribution of water in emergency supply as described in STANAG 2885 EDITION 4 is available.
Because there are differences in consumption and production quantities, there may be a requirement to store water at different phases of production.

The following equipment is required :

- Pipeline systems ;
- Water tankers ;
- Special cooled containers ;
- Packing and bottling machines ;
- Localized distribution system and pipeline ;
- Elevated storage platforms for enabling distribution by gravity ;
- Large and small water containers.

Logistic units generally carry out transport of water. Storage of water in containers not intended for immediate supply is discouraged.

Regarding storage and transportation some principles should be applied :

- To keep only what is consumable and covering the requirement for one day. Water for service should be produced and consumed within 24 hours on the ground;

- To prevent the development of germs in the treated potable water, only suitable potable water containers and conduit system must be used for its interim storage and transport. Non-potable water and other substances must not be transported and stored in potable water containers;
- Prior to their initial employment and also periodically during their employment, the potable water containers and conduit systems will be cleaned and disinfected in accordance with the appropriate regulations or the instructions of the responsible medical officer;
- To produce as near to the consumer as possible. As a rule, units should not have to cover more than 30 km or one hour to collect water;
- The water is purified at the water point as required and stored in covered tanks. Open bulk transportation should not be used to avoid pollution;
- To separate storage of different categories of water to avoid mistakes;
- If water has been stored prior to distribution it should be tested;
- If bulk stock has to be held, conditions of darkness, chlorination and cooled storage should be met;
- In arid areas without local water sources, distribution points will be established which should be supplied with water by bulk carriers (tankers on road or rail) or by pipeline.
- In cold climate areas measures are to be taken which prevent the water from freezing during storage and distribution. Plastic containers may become brittle at a temperature below approximately minus 30°C and thus be unsuitable for the transport of water.

3.7. Waste water treatment

3.7.1. Introduction

Care is required in the treatment and disposal of wastewater in order to maintain the health of a deployed force and to minimise its effects on the environment. The inappropriate disposal of wastewater can have a serious affect on the overall health of a deployed force, especially on extended operations in semi-permanent accommodation.

Methods of treating and disposing of waste should be developed and improved as early as practicable. Specialist engineer and medical service advice is required at all stages of wastewater treatment and disposal. A plan for gradual improvement in treatment and disposal as the operation matures should be drawn up at the outset.

Environmental regulations, criteria, policies and reviews are intended to ensure that the impact of treated wastewater discharges to the receiving waters is acceptable. These factors affect not only the selection of site, discharge locations and disposal, but also the type and level of treatment required. Treatment and disposal are thus linked.

3.7.2. Protection of Water Sources

The risk of contamination of wells and water boreholes by the movement of pathogens of faecal origin from latrines to the water table is the principal concern, but contamination by petroleum products and chemicals is also possible. Care should be taken to discharge wastewater in such a way that contamination of water sources is avoided.
Existing host nation sewerage should be used where possible.
Wastewater should not be discharged into watercourses without prior treatment. Ideally, consent should also be sought from the local environmental agency. A check must always be made on the capacity of receiving water to accept and dilute the wastewater.
Specialist engineer advice should be sought on the imposition of groundwater protection zones, and regarding the sitting, level of treatment and discharge from wastewater treatment equipment.

3.7.3. Treatment of contaminated water

Wastewater resulting from CBRN decontamination operations will contain hazardous residues both from the original contaminants and from the decontaminants used to remove or neutralise them. Recovery and treatment to allow recycling is likely to be unrealistic. Accordingly, the residue must be diverted away from natural water sources, contained and marked as specified in STANAG 2002.

3.8. Control of the quality of the water during and after every phase

In most cases, the release and monitoring of drinking water is the responsibility of the medical service. Water must only be issued for consumption after it has been cleared by the responsible medical officer according to the guidelines of applicable directives. The effectiveness of water purification measures is to be ensured by the relevant procedures and to be reviewed and documented in periodical microbiological and chemical laboratory tests generally conducted by units of the Medical Services. The operator is responsible for cleaning, disinfecting, technically maintaining and servicing the water supply system.

Equipment is available to provide immediate quality control at any place, where water purification is executed :

- During storage and after transportation in case of need;
- Medical service: immediate quality control at any place, where water purification is executed;
- For small water purification groups or in CRO, they have to be autonomous in products necessary for the purification and in products of analysis.

4. WATER SUPPLY ORGANIZATION AND RESPONSIBILITIES

4.1. Role and responsibilities components

The operational context, the analysis of the dangers, followed by an evaluation of the risks, in order to ensure their control, must constitute the fundamental act of any strategy of production and distribution of the water intended for human consumption. At the end of this evaluation, the logistic or technical means are implemented according to the availability and of the nature of the resource.

4.1.1. The Joint Force Commander (JFC)

As the qualified military authority, the JFC is the only responsible authority entitled to authorize, after assessment of the Chief Engineer, the Medical adviser (JMed) and J4, the distribution of potable water. The choice of the sites of production and storage of potable water is an operational decision. Within a multinational framework, technical agreements will describe the responsibilities.

4.1.2. Engineer and Logistic Support, CBRN Defence Force and Geo-information service

In general, STANAG 2885 EDITION 4 describes the responsibility for the water supply process. In addition new units within Finabel Member Nations, for example the field accommodation units also contribute to water supply. Assets available within the logistic, engineer and CBRN defence forces ensure the extraction, pumping, transport, storage and distribution of water for military operations.

Operational forces must have assets at their disposal that will, from the designated point of transfer, take over transporting, transferring, storing and distributing drinking water in the operational area. At unit level, forward water extraction, treatment and storage may be carried out using unit equipment.

Logistic forces include sub-units to store and transport water in bulk. They transport potable water – which may be bottled - to remote mobile or stationary units up to designated points of transfer within the operational area.

Engineer forces are generally responsible for developing raw water sources, initial field-testing and treatment, purification and sterilisation, and setting up of bulk storage and pumping facilities.

CBRN Defence Forces may also provide water purification capacities for every operational area.

The Geo-information Service advises on geological, geographical, hydrological, hydrographical, social, religious, cultural, economic and geopolitical factors concerning the supply of water. It provides experts and documents for the identification and analysis of water resources, and supports – on site, if required – planning, reconnaissance as well as pumping efforts.

4.1.3. Medical service

For operations proceeding out Finabel member nation territories, the medical service is responsible for authorizing release of the water intended for human consumption. This release is carried out under the responsibility of the medical adviser of the JFC.

4.1.4. Centralised and decentralised water production

In the first phase of the operation, which may be a rapidly evolving situation, it is advisable to implement centralized and mobile means. When the situation is stabilized, employment of water treatment materials in a decentralized way is possible.
Due to the diversity of local conditions, a “standard water-purification-plant” for all operations cannot be defined. A well drilling rig, a mix of plants with different capacities, degrees of hardness and pollution of the water to be treated, storage requirement, containers, cross-country mobility and protection of transport is considered expedient.

4.2. Co-ordination between Finabel member Nations

Coordination between nations is essential in multinational military operations. The responsibility of water supply could be attributed as a mission to a specific nation (e.g. lead nation). The lead nation has to co-ordinate and control the capabilities offered by different nations and task them according to the MOU. In this case, the lead nation should take all necessary actions in order to deliver a product of a standardized quality.

4.3. Protection of water production areas (including extraction, treatment and storage)

The water extraction and purification installation, as well as the distribution net, should ideally be integrated in a military installation (and be safeguarded). For this reason, depending on the tactical situation, it might be necessary to deploy forces for the protection of military water supply installations.

5. CAPACITIES AND COMPETENCES TO BE DEVELOPED

5.1. Interoperability

Interoperability of water supply doctrine, procedures, equipment and materiel should be improved.

5.2. Exploitation of the resource

The installation of the water supply chain must be planned before deployment during the operational preparation phase, taking into account the nature, the foreseeable duration of the mission, the environment (climate, infrastructure), the size of the force and the amount and nature of deployed means.
The components in charge of the implementation of extraction, treatment and distribution of water must be capable and equipped in the fields of prospecting, drilling, treating, storing and distribution.

5.3. Competences

Coherence between the HQ, the operational units and logistic units must be developed to ensure greater effectiveness.
The executives and the staff elements can develop integration of competences by gaining experience and qualification through manoeuvres and operations.
The coordination of competences by the JFC must allow fast acquisition, update, management and exchange of information to enable improved interaction between the various components of the water chain.
Competences already placed in theatre must be able to be reinforced by an individual qualified in hydrogeology (military or civil under contract) working in close cooperation with the geographic services.

5.4. Procurement of specific products

The continuity of procurement of treatment products (chlorination, coagulation and flocculation) and reagents for quality control (tests and monitoring) is essential for the control of the water chain.

6. CONCLUSION

Supply of potable water at the required time and space in the required quantity and quality is the principal aim.
The study is the first stage of a development process for multi-national agreements concerning methodology of water reconnaissance, exploration, extraction, treatment, storage and distribution. It should lead to executive staff and management training.
The programs dealing with water supply will require being increasingly flexible and reactive to harness the greatest benefit of rapidly evolving technologies.
Due to a lack of regulations for water supply on operations other than emergency supply in war it was not possible to develop fully the required concept of water supply operations.

7. RECOMMENDATIONS

It is recommended that :

- Multi-national regulations be developed for the utilization of emergency water supply standards (as described in STANAG 2885 EDITION 4) on operations other than war;
- Finabel member nations should seek to procure water supply systems, which can meet the agreed standards developed from the relevant Public Health Codes.

A N N E X 1

DEFINITIONS

EMERGENCY POTABLE WATER

The short-term supply of water to armed forces by armed forces in war, covering reconnaissance, development, extraction, treatment, acceptability, storage and distribution of water. STANAG 2885 EDITION 4.

Water, which meets the minimum quality standards, laid down in STANAG 2136 EDITION 4. It may be consumed without constituting a health hazard only in the quantities laid down in STANAG 2136 EDITION 4. In special emergency situations water may only be used for quenching the thirst as well as for nutrition purposes in a minimum quantity of 5 litres per individual per day over a period of 7 days. In some armies the emergency quantity may be increased up to 10 litres/man/day.

PALATABLE WATER

Water pleasant to the taste without reference to quality standards.

POTABLE WATER

Water that is safe for drinking. STANAG 2885 EDITION 4.

Potable water is suitable for human consumption and meets the quality Standards laid down for water from the public water supply defined in the legislation of each State. This water is, from medical and organoleptic point of view, suitable for drinking, preparation of food and all the domestic uses, including personal hygiene

DOMESTIC WATER

Domestic water is required for a variety of other purposes such as fire fighting, decontamination, cooling of vehicles and machinery, as well as construction work. Frequently the quality of domestic water must meet the same requirements as potable water. This particularly applies if it is to be used as domestic water for food or for hygiene. For some technical purposes even higher requirements are made, e.g., with regard to salt content. STANAG 2885 EDITION 4.

RAW WATER

Water from natural water resources, which is submitted to a treatment with the aim to extract potable water. STANAG 2885 EDITION 4.

Generic term gathering the totality of water before treatment :

- Shallow and deep subsoil waters;
- Surface water;
- Seawater.

This water cannot be consumed directly without a control, a monitoring and appropriate treatment.

POTABLE WATER SUPPLY

Group of installations, services and actions which allow, starting from a raw water, to produce a water in conformity with the specified standards of potability for its distribution with the consumers. It comprises 4 stages :

- Collecting;
- Treating;
- Adducting (transport and storage);
- Distributing.

PUBLIC NETWORK

The public networks of distribution constitute a resource allowing a generally abundant and easily exploitable supply. However, the quality of water cannot be guaranteed satisfactorily in the absence of control of the whole of the installations by the whole of the components of the force.

SUBSOIL WATER

One distinguishes two types of subsoil water :

- Shallow subsoil waters, resulting from dug wells, drainage and galleries of collecting or emergent sources;
- Deep subsoil waters resulting from tablecloth accessible by drilling.

Shallow subsoil waters are vulnerable to pollution of surface and must be used only after one adapted treatment.
The deep subsoil waters, theoretically less prone to pollution of surface and generally of good bacteriological quality, are sometimes charged out of rock salt.

SURFACE WATER

The surface water coming from the rivers, the channels, the lakes and the ponds, constitute an immediately accessible resource. However, they are directly exposed to ambient pollution.
They thus require a very particular monitoring and a systematic treatment before consumption.

BRACKISH WATER AND SEAWATER

In the lawful plan, brackish water and seawater, because of their very strong dissolved salt concentration, are not regarded as usable for the production of water intended for human consumption.
However in operational situation, this water represents sometimes the only exploitable resources.
Their use requires the implementation of particular processes of treatment.

HOMOLOGATION OF THE RESOURCE

The homologation of the resource is carried out after study of its characteristics in the quantitative and qualitative plan, of its vulnerability and the needs for the forces. This study is coordinated by a person in charge for the chain water designated by the command ("chief engineer", logistician, medical advisor (a surgeon or veterinary)).

The homologation of the resource is based on the gathering result of an expertise led by a multi-field team :

- Persons in charge for producing and distributing water;
- A hydrogeology qualified person;
- Representatives of the Medical service of the armies having a competence in the methodology of analyzing the dangers, in particular biological and chemical.

It intervenes only after the evaluation of the risks (evaluation of the occurrence of the identified dangers) and leads logically and immediately to define the conditions of production and use of water and, if necessary, to specify the process of treatment to be implemented as well as the methods of the monitoring to exert on this resource.

CONTROL

Under the authority of the command of the forces, qualified military authority, the control of the quality of water is responsibility for the components in charge of the implementation with the water collection, treatment and distribution facilities. It includes, in particular, a permanent monitoring of installations and equipment operation. Qualified personnel must carry out these actions in order to meet the requirements for quality of the water used in a definite operational context. For each stage of the "water chain", the persons in charge place at the disposal of the operators all documentation necessary to the execution of the tasks, which are assigned to them and ensure, on the technical and hygienic level, their formation.

MONITORING

The monitoring of the quality of water includes, in particular :

- A permanent monitoring of the resource aiming, by an analysis of the dangers, to detect any probable agent of contamination and to know the degree of vulnerability of the installations;
- A regular examination of the installations and implemented equipment;
- A test program or analyses carried out on determined points, according to the identified risks that the resource and the installations may present;
- A medical file collecting the whole of information collected for this reason.

This monitoring is assured jointly by personnel of the components responsible for collecting, treating and distributing water and by the Medical service, which in addition ensures the medical control of distributed water.
Any incident must be carried immediately to the knowledge of the "chief engineer" and the Medical adviser or other authority designated by command, so that correct envisaged measures are applied without delay. This point can depend on the national organization.

MEDICAL CONTROL

The quality of water of resource and the water put in distribution is the medical control object, for which the responsibility belongs to the Medical adviser of the JFC.
It consists in applying a plan of control for parameters, criteria and frequencies pre-established according to directives.
However, a medical plan of control could be modified by the Medical adviser according to the risks met in the zone of engagement.