NATO STANDARDIZATION AGENCY
AGENCE OTAN DE NORMALISATION

MILITARY COMMITTEE LAND STANDARDIZATION BOARD (MCLSB)

13 January 2010 NSA(ARMY)0040(2010)MILENG/2885

MCLSB

STANAG 2885 MILENG (EDITION 5) – EMERGENCY SUPPLY OF WATER IN OPERATIONS

References:
A. NSA(ARMY)0178-ENGR/2885 dated 18 February 2004 (Edition 4)
B. NSA(ARMY)0446(2009)MILENG/2885 dated 16 April 2009 (Edition 5) (Ratification Draft 1)

1. The enclosed NATO Standardization Agreement, which has been ratified by nations as reflected in the NATO Standardization Document Database (NSDD), is promulgated herewith.

2. The references listed above are to be destroyed in accordance with local document destruction procedures.

ACTION BY NATIONAL STAFFS

3. National staffs are requested to examine their ratification status of the STANAG and, if they have not already done so, advise the MCLSB NSA, through their national delegation as appropriate of their intention regarding its ratification and implementation.

Juan A. Moreno
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

Enclosure:

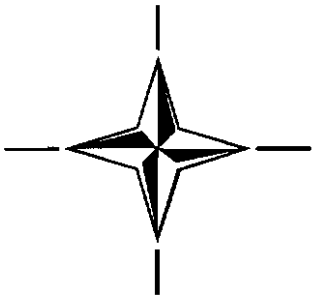
STANAG 2885 (Edition 5)

NATO Standardization Agency – Agence OTAN de normalisation
B-1110 Brussels, Belgium - Internet site: http://nsa.nato.int
E-mail: army@nsa.nato.int – Tel +32 2 707 5584 – Fax +32 2 707 5718

STANAG 2885
(Edition 5)

NORTH ATLANTIC TREATY ORGANIZATION

(NATO)



NATO STANDARDIZATION AGENCY
(NSA)

STANDARDIZATION AGREEMENT
(STANAG)

SUBJECT: EMERGENCY SUPPLY OF WATER IN OPERATIONS

Promulgated on 13 January 2010

Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Director NATO Standardization Agency under the authority vested in him by the NATO Standardization Organisation Charter.

2. No departure may be made from the agreement without informing the tasking authority in the form of a reservation. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

4. Ratification, implementation and reservation details are available on request or through the NSA websites (internet http://nsa.nato.int; NATO Secure WAN http://nsa.hq.nato.int).

FEEDBACK

5. Any comments concerning this publication should be directed to NATO/NSA – Bvd Leopold III - 1110 Brussels - Belgium.

STANAG 2885
(Edition 5)

NATO STANDARDIZATION AGREEMENT (STANAG)

EMERGENCY SUPPLY OF WATER IN OPERATIONS

Annexes:

A. Principles
B. Responsibilities for the reconnaissance, development / extraction, treatment, acceptability, storage and distribution of the emergency supply of water in the field
C. Water sources
D. Reconnaissance, development/extraction, treatment, acceptability, storage and distribution
E. Water points
F. Special problems

Related documents:

STANAG 2002 CBRN	WARNING SIGNS FOR THE MARKING OF NUCLEAR, BIOLOGICAL AND CHEMICAL CONTAMINATIONS
STANAG 2035 LO	SIGNING OF HEADQUARTERS AND INSTALLATIONS
STANAG 2136 FHTVS	MINIMUM STANDARDS OF WATER POTABILITY DURING FIELD OPERATIONS – AMedP-18

AIM

1. The aim of this agreement is to standardize the procedures for the emergency supply of NATO forces with water in operations if the public water supply breaks down.

AGREEMENT

2. Participating nations agree to use the procedures contained in this STANAG for the emergency supply of NATO forces with water in operations if both the public water supply and the expedient water supply have broken down.

DEFINITIONS

3. The following terms and definitions are used for the purpose of this agreement:

   a. Emergency Water Supply (Field Units). The short-term supply of water to the armed forces by the armed forces in operations, covering the reconnaissance, development / extraction, treatment, acceptability, storage and distribution of water.

   b. Potable Water. Water that is safe for drinking.

c. Emergency Potable Water. Water which meets the minimum quality standards, laid down in STANAG 2136. It may be consumed without constituting a health hazard only in the quantities laid down in STANAG 2136.

d. Raw Water. Water from natural water resources which is submitted to a water treatment with the aim to extract potable water.

e. Filtration. The removal of undesirable particles by filter.

f. Sedimentation. The removal of suspended matter by settlement.

g. Disinfection. The destruction, inactivation or reduction of the amount of micro-organisms by chemical or physicochemical procedures.

h. Water Point. An installation for development, treatment, storage and distribution of water.

i. Water Supply. The supply of water from fixed facilities of the public supply of potable water or from other water sources, e.g. supply facilities for industrial use, which are assigned by the appropriate authorities for the intake of water when required.

GENERAL

4. 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:

a. Public water supply (peacetime water supply system),

b. Expedient water supply (wells and tapping of springs) or

c. Emergency water supply (field units).

The procedures in this agreement cover the emergency water supply (reconnaissance, development / extraction, treatment, acceptability as well as storage and distribution of potable and domestic water) both under conventional and CBRN warfare conditions.

DETAILS OF THE AGREEMENT

5. For ease of reference, the details of the agreement are contained in Annex A to Annex F.

IMPLEMENTATION OF THE AGREEMENT

6. This STANAG will be implemented by transferring the procedures detailed in this agreement into orders / instructions.

ANNEX A TO
STANAG 2885
(Edition 5)

PRINCIPLES

APPENDIX 1 Impurities in Water

REQUIREMENT FOR EMERGENCY WATER SUPPLY (Field Units)

1. Normally the provision of water for the armed forces is effected from public water supply facilities. In case of a breakdown of the public supply system or the supply facilities prepared for times of operations which are independent of the public supply system, armed forces must be in a position to meet their requirements for potable and domestic water for maintaining operational readiness through an emergency supply provided from their own resources.

EMERGENCY WATER SUPPLY MEASURES

2. The following measures are required for an emergency water supply:

a. Assessment of existing public and private water supply facilities.

b. Reconnaissance and assessment of other hitherto undeveloped water sources for the extraction of raw water by using sub-surface and surface water.

c. Examination of the quality of raw water and decision on its acceptability either as potable water or for purification into potable water.

d. Purification of raw water to become potable water.

e. Establishment of the acceptability of the purified water.

f. Provision of such water through storage, transport and distribution.

QUALITY AND QUANTITY

3. a. Potable Water. Potable water must meet the quality standards laid down for water from the public water supply.

b. Emergency Potable Water. 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. It must meet the minimum quality standards laid down in STANAG 2136. In some armies the emergency quantity may be increased to 7 litres/man/day or more.

c. Domestic Water. Domestic water is required for a variety of other purposes such as fire fighting, decontamination (of vehicles, equipment, ground surfaces, etc.), 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.

d. Scales of Issue. The scales of issue can vary with climatic conditions. 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.

DAILY RATES OF POTABLE WATER CONSUMPTION

Serial	Use	Requirement (litres/individual/day)
		Under Normal Conditions
1.	Units in action (1)	
	a. Drinking and cooking only (individual soldiers)	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

* does not apply for DEU

Remarks:

(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 system is provided.

IMPURITIES

4. Impurities in water can be classified into natural and artificial impurities. A more detailed description of the nature of impurities and their effects is given in Appendix 1.

EFFECTS OF THE EMPLOYMENT OF CBRN MUNITIONS

5. The employment of CBRN munitions may contaminate surface water supplies over a wide area.

6. Sub-surface water resources are unlikely to be contaminated initially. Earth or rock layers are, due to their particular filter capacity, more or less effective in diminishing contamination.

APPENDIX 1 TO
ANNEX A TO
STANAG 2885
(Edition 5)

IMPURITIES IN WATER

1. Nature of Impurities. A systematic classification of all impurities is not possible. However, classification can usually be made of the causes, the nature and the qualitative effects of impurities.

2. Natural Pollution Factors

   a. Organic Matter. This may take the form of suspended matter in water. The extent and nature of the impurities can be detected by taking some of the water in a glass container and by examining colour, cloudiness and smell.

   b. Disease Bearing Organisms. These include, for example, the pathological germs of diseases such as Bacillary Dysentery, Typhoid Fever and Cholera, or amoebic dysentery and others. Their detection requires that the water be examined by professionally trained personnel under laboratory conditions which is not normally practicable in the field. It is assumed that these microorganisms are always present in surface water, hence this water is to be purified and disinfected in any case.

   c. Inorganic Matter. Depending on nature and quantity, these will affect the chemical and physical characteristics and thus the quality of the water. Water must always be tested with respect to chemical impurities before it is released for drinking purposes.

3. Artificial Pollution Factors

   a. Environmental Pollution. Waste water arising from industrial, agricultural or domestic use is likely to be contaminated. The extent and nature of the pollution can only be determined by special tests.

   b. Nuclear Contamination. The employment of nuclear munitions will probably cause contamination by radioactive material. The amount of contamination depends on the yield of weapon, location of detonation in relation to the water supply, and whether it is an air, surface or sub-surface burst.

   c. Biological Contamination. The majority of biological agents present in water can usually be removed by normal chlorination or boiling.

   d. Chemical Contamination. Chemical agents may contaminate surface water sources to dangerous levels and will persist in water for periods ranging from a few hours to many days or even months especially in freezing or very cold temperatures.

ANNEX B TO
STANAG 2885
(Edition 5)

RESPONSIBILITIES FOR THE RECONNAISSANCE, DEVELOPMENT / EXTRACTION, TREATMENT, ACCEPTABILITY, STORAGE AND DISTRIBUTION OF THE EMERGENCY SUPPLY OF WATER IN THE FIELD

Appendix: 1 Responsibilities in Individual Member Nations for the Reconnaissance, Development / Extraction, Treatment, Acceptability, Storage and Distribution of Water in the Field

HOST NATION

1. The reconnaissance, development / extraction, treatment, acceptability, storage and distribution of water is, in principle, the responsibility of the Host nation. As it cannot be assumed that purification can also be ensured, the field units of all armed forces must be capable of providing their own supply of water if the host nation is no longer in a position to do so due to hostile acts.

MILITARY COMMAND AND CONTROL

2. Military command and control includes responsibility for:

   a. Deciding on the scales of issue of potable and domestic water within the framework of the quantities provided by the host nation.

   b. Notifying formations / units of:

      (1) The location of water points and times of operation.

      (2) Any special precautions or testing that may be necessary.

   c. Monitoring the operation of water points.

   d. Organizing the provision of water and its transport.

IMPLEMENTATION

3. The implementation of tasks with regard to the reconnaissance development / extraction, treatment, acceptability, storage and distribution of water is handled differently in the armed forces of the nations involved. An overview of responsibilities is shown in Appendix 1.

APPENDIX 1 TO
ANNEX B TO
STANAG 2885
(Edition 5)

RESPONSIBILITIES IN INDIVIDUAL MEMBER NATIONS FOR THE RECONNAISSANCSE, DEVELOPMENT / EXTRACTION, TREATMENT, ACCEPTABILITY, STORAGE AND DISTRIBUTION OF WATER IN THE FIELD

Nation	Type of Water Supply a. Normal Supply b. Emergency Supply	Reconnaissance / Development / Extraction	Treatment	Acceptability	Storage and Distribution
BEL	a.	- Public / Municipal Water Supply System			
	b.	- Engineers	- Logistic Service and Engineers	- Medical Services	- Logistic Service
CAN	a.	- Public / Municipal Water Supply System	- Public / Municipal Water Supply System	- Public Health Authority / Public Utilities	- User Units draw Water from selected water points, or service support will deliver to units as necessary
	b.	- Engineers	- Engineers	- Medical Service	- User Units draw Water from selected water points, or service support will deliver to units as necessary
CZE	a.	- Public supply network of towns and municipalities			
	b.	- Logistic service with support of engineers	- Logistic service with support of Engineers and CBRN specialists	- Medical Service	- Logistic service

Nation	Type of Water Supply a. Normal Supply b. Emergency Supply	Reconnaissance / Development / Extraction	Treatment	Acceptability	Storage and Distribution
DNK	a.	- Public supply network of towns and municipalities			
	b.	- Engineers (With support of military geographic agencies and Territorial Commands)	- Engineers	- Medical Service	- User Units draw Water from selected water points, or service support will deliver to units as necessary
FRA GRC LUX NLD	a.	- Public supply network of towns and municipalities			
	b.	- Engineers (With support of military geographic agencies and Territorial Commands)	- CBRN Defence	- Medical Service	- Service support
ITA	a.	- Public supply network of towns and municipalities			
	b.	- Engineers	- Engineers	- Health Care Services	- Service Support
HUN	a.	- Public supply network of towns and municipalities			
	b.	- Engineers	- Engineers	- Medical service	- Logistic service

Nation	Type of Water Supply a. Normal Supply b. Emergency Supply	Reconnaissance / Development / Extraction	Treatment	Acceptability	Storage and Distribution
DEU	a. b.	- Public supply system of towns and municipalities - Area - covering emergency potable water supply of the armed forces by public water supply facilities independent of the supply network under civilian administration (in particular in rural districts and towns without appertaining administrative districts) in accordance with national legal provisions Otherwise - Engineers - Military Geographic Service	- CBRN Defence/Engineers	Public Health Authority - Medical services	- Civilian Supply Services - Logistic Service
NOR	a. b.	- Public supply network of towns and municipalities - Quartermaster / service support with support of territorial command	- Quartermaster / Service Support	- Public Health Authority	- Quartermaster/Service Support (Logistic Service) draw water from selected water points
POL	a. b.	- Public / Municipal Water Supply System - Engineers	- Public / Municipal Water Supply System - Engineers	- Public Health Authority / Public Utilities - Logistic and Medical Services	- Civilian Supply Services - Logistic Service

Nation	Type of Water Supply a. Normal Supply b. Emergency Supply	Reconnaissance / Development / Extraction	Treatment	Acceptability	Storage and Distribution
PRT	a.	- Public supply network of towns and municipalities			
	b.	- Engineers	- Engineers with medical support	- Medical service (initial) - Engineers with medical support (subsequent)	- Tactical units on water points or service support
ESP	a.	- Public supply network			
	b.	- Field Engineers, Watering units	- Combat Engineers, Field Engineers, watering units	- Medical service	- Supply units, logistic services
TUR	a.	- Engineers	- Engineers	- Medical	- Engineers
	b.	- All units	- All units	- Medical	- All units
GBR	a.	- Public supply network			
	b.	- Combat Engineers (1) Reconnaissance and assessment of existing public and other supplies (2) Development of existing or undeveloped sources	- Combat Engineers (1) Assess quality of damage, and new sources (2) Purification of above after consultation with medical services	- Medical services	- Quartermaster (army, marine)

Nation	Type of Water Supply a. Normal Supply b. Emergency Supply	Reconnaissance / Development / Extraction	Treatment	Acceptability	Storage and Distribution
USA	a.	- Public supply network of towns and municipalities			
	b.	- Engineers (army, marine, air force)	- Quartermaster (army) - Engineers (marine, air force)	- Medical services	- Quartermaster (army, marine)
EST LVA LTU ROU SVK SVN	a.	n.t.r.	n.t.r.	n.t.r.	n.t.r.
	b.	n.t.r.	n.t.r.	n.t.r.	n.t.r.

ANNEX C TO
STANAG 2885
(Edition 5)

WATER SOURCES

DEVELOPED WATER SOURCES

1. Public Water-Supply Facilities. Before water is taken from the public supply network or the expedient water supply facilities prepared for the state of defence which are independent of the network, contact will be established with civilian operators through the regionally responsible territorial commands.

2. Private Water-Supply Facilities. Private water-supply facilities, basically wells, are to be found primarily in agricultural facilities and industrial plants such as breweries, laundries, refrigeration plants, mineral water factories and chemical works. Relevant documentation is available at the regional territorial commands.

UNDEVELOPED WATER SOURCES

3. Wells and boreholes which are operational or may be rendered operational with minimum effort should be used where possible.

4. If neither public nor private supply facilities or emergency potable water supply facilities are usable or available, undeveloped water sources must be located.

5. Underground Water Sources. In order to locate such water sources, hydrological knowledge of the area concerned and of its accessory catchment areas is required which can be obtained from special maps or information provided by the appropriate authorities, e.g. the Military Geographic Service.

6. Surface Water Sources. These include all standing or flowing bodies of surface water, springs and unused wells as well as water sources in solid form such as ice and snow. Sea and brackish water may only be used for the supply of potable water in special cases, but it is always suited for fighting fires and for decontamination (of vehicles, equipment, ground surfaces, etc.). Since, as a rule, raw water from bodies of surface water must be purified, this supply option is subject to restrictions. Public swimming pools may also be useful as a source of already chlorinated water for use in decontamination.

7. Waste Water. Waste water from households and industrial plants will be used in extreme emergencies only and even then only for fighting fires or for decontaminating material.

8. Meteoric Water. Meteoric water may be recovered if the environmental pollution, and above all the storage containers used for recovery, are taken into consideration.

ANNEX D TO
STANAG 2885
(Edition 5)

RECONNAISSANCE, DEVELOPMENT/EXTRACTION, TREATMENT, ACCEPTABILITY, STORAGE AND DISTRIBUTION

Appendixes:
1. Suggested Standard Well Cap for Boreholes
2. Suggested Information Plate for Well Cap
3. Other Methods of Water Treatment in the Field

RECONNAISSANCE

1. In the reconnaissance of water resources, it is of importance to determine the quantity and quality of the water available, as well as the effort required for development, extraction and treatment at the water points. In principle, all surface water resources in a contaminated area are suspicious.

2. Information on the following points is required for all water resources:

   a. The type of water resource with map reference and sketch.

   b. The amount of water available.

   c. The quality as determined by chemical, physical and microbiological examination.

   d. Origin of the water with special consideration as to possible pollution.

   e. Existing facilities for extraction, storage and distribution.

   f. In the case of springs, streams and rivers, information as to the feasibility of impounding water by construction of dams or infiltration trenches is required.

   g. Road access to the designated water point and dispersal areas for vehicles.

3. To the extent possible, this information shall be assembled in peacetime by the regionally responsible commands of the host nation and kept ready for the time it is needed.

ACCEPTABILITY

4. The establishment of the acceptability may only be effected by a medical officer (physician veterinary office (N0)) after chemical, microbiological and radiological examination of the water eligible as potable water. Purified water is to be re-examined prior to making it available.

DEVELOPMENT/EXTRACTION

5. Equipment for the Development and Extraction of Water Sources. Drilling equipment as well as pumps and filters are required for the development and extraction of sub-surface water. As a rule, the extraction of surface water requires less effort.

6. Wells. Wells drilled by field units are to be closed in accordance with Appendix 1 and marked in accordance with Appendix 2.

TREATMENT

7. Purification is required when the quality of the available raw water does not meet the minimum requirements laid down in STANAG 2136.

8. For natural and artificial impurities in water see Appendix 1 to Annex A.

9. Depending on the equipment available polluted raw water can be purified and converted into potable water in the field by different procedures (boiling, chlorination, sedimentation, coagulation, filtration, distillation and treatment with activated charcoal).

TREATMENT IN THE FIELD

10. The procedures and equipment used in the field for removing or reducing impurities differ with regard to type and design characteristics, but operate always in accordance with certain principles, the most common of which are described in Appendix 3 to Annex D.

a. Sedimentation. Sedimentation results by leaving water standing quietly for a few hours in a tank or container with the suspended matter sinking to the bottom. The process of sedimentation can be accelerated by adding coagulants. Nevertheless, it is a lengthy process that should be applied in case of serious impurities.

b. Coagulation. By adding coagulants to the raw water, impurities of colloidal magnitude can be converted into bigger, more easily subsiding or more easily filterable particles. The colloidal organic impurities especially, which are otherwise difficult to remove, can be eliminated. Moreover, the coagulation contributes to the removal of micro- organisms and viruses.

c. Filtration. With most filter devices the raw water is massed through fine-meshed sieve membranes coated with filter powder by means of a pump. lf the raw water contains much suspended matter, it is useful to arrange for a certain sedimentation prior to filtering since otherwise the filters clog too fast.

d. Chlorination. Most of the micro-organisms are killed or inactivated by adding chlorine or compounds releasing chlorine to the raw water. Under normal climatic conditions a time of reaction or contact time of 15 minutes is sufficient; in very cold water 30 minutes is required. In order to ensure optimum potability 2 mg/1 (2 ppm) of free chlorine should not be exceeded in the water at the filling taps. A chlorination or super-chlorination causes on the one hand, the chemical removal of numerous noxious chemical substances, and on the other hand, the development of other noxious substances, such as chlorophenol.

11. Treatment with Activated Charcoal. A series of noxious substances can be eliminated or reduced by bringing raw water into contact with activated charcoal or similarly adsorptive substances.

STORAGE

12. Units in the field carry only a limited supply of water. In some armies, units may hold a reserve of 5 days supply.

13. Non-potable water must not be stored or transported in potable water containers.

14. In contaminated areas, only water from closed containers is usable provided the outside of the container is decontaminated before use. Some plastic containers do not offer any effective protection against liquid chemical agents.

15. The filler necks of all potable water containers will be marked with white paint. In addition, each nation may add some national identification. Containers not used for potable water remain unmarked.

DISTRIBUTION

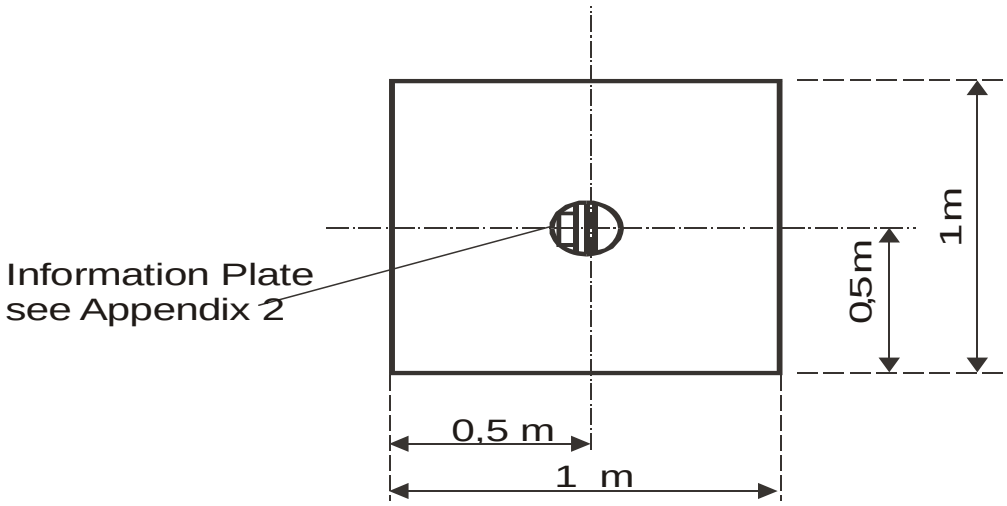
16. Water for emergency supply is collected from water points normally established in the rear areas - possibly in the vicinity of logistic facilities. The number of water points depends on the deployment of troops to be supplied and the available water sources.

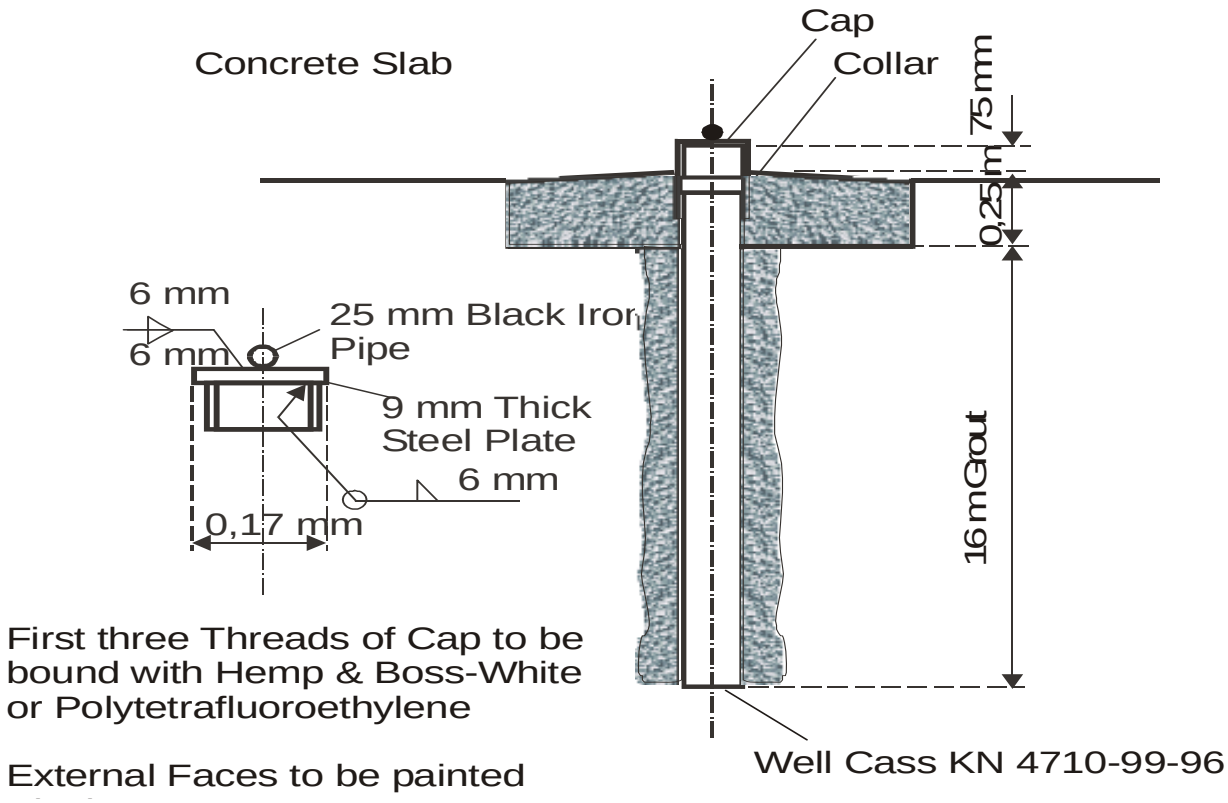
17. As a rule, units should not have to cover more than 30 km to collect water.

18. The water is purified at the water point as required and – if possible – stored in covered tanks.

APPENDIX 1 TO
ANNEX D TO
STANAG 2885
(Edition 5)

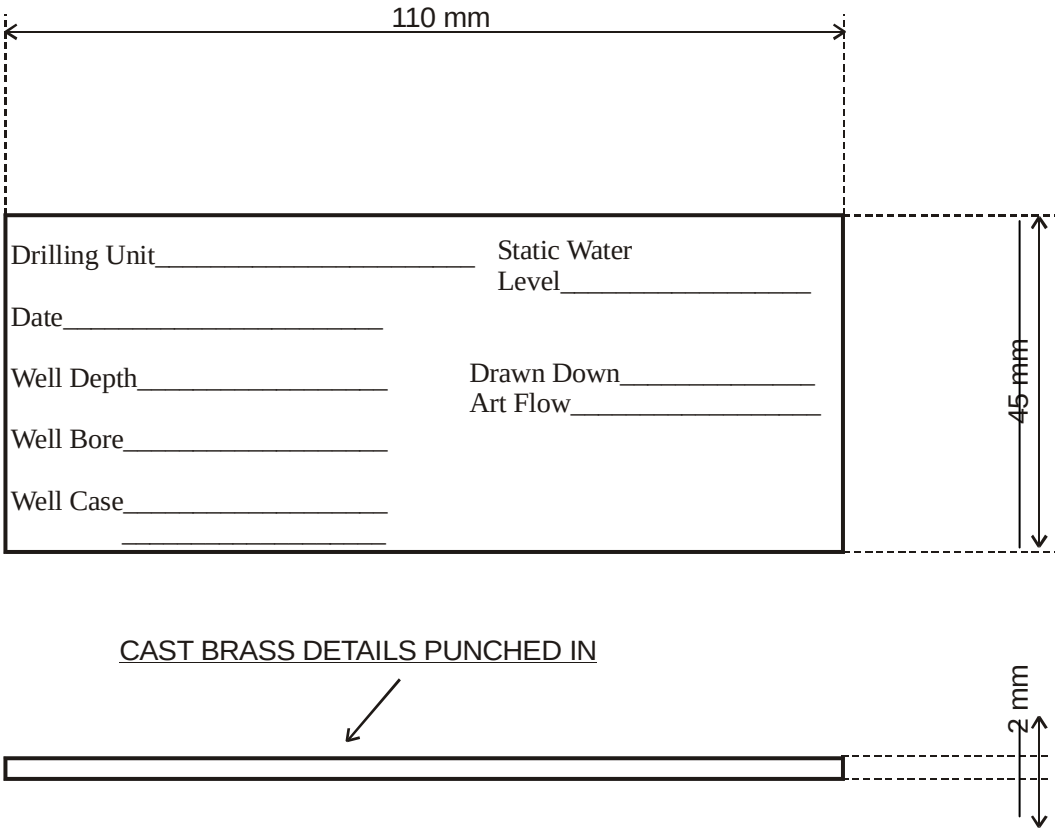
SUGGESTED STANDARD WELL CAP FOR BOREHOLES





APPENDIX 2 TO
ANNEX D TO
STANAG 2885
(Edition 5)

SUGGESTED INFORMATION PLATE FOR WELL CAP



APPENDIX 3 TO
ANNEX D TO
STANAG 2885
(Edition 5)

OTHER METHODS OF WATER TREATMENT IN THE FIELD

In some armies, the procedure for water treatment in field may be as follows:

PHYSICAL TREATMENT WITHOUT SEPARATION OF MICRO-ORGANISMS

1. Boiling. The simplest means of obtaining bacteriologically pure water, if sufficient time is allowed for treatment (15 to 20 minutes).

2. Ultraviolet Rays. These rays (wavelength: 253.7 nm) have bactericidal and virucidal properties. As they are nonionizing, they do not pose hazard to the operator, unless he is exposed over a prolonged period. Both turbidity and excessive depth of water undergoing treatment will affect the propagation of rays.

PHYSIOLOGICAL TREATMENT

3. Sedimentation. Same text as in para 10.a., Annex D.

4. Coagulation. Same text as in para 10.b., Annex D.

5. Flocculation. By adding flocculants (activated silica or organic polymers), colloidal suspended matter can be converted into small flocs (floccules).

6. Adsorption. The adsorption capacity of a body is determined by the ability of its surface to retain gas molecules or suspended matter.

7. There are natural adsorbents (clay) and artificial adsorbents, activated charcoal being the most important. The carbon atoms at the surface of the charcoal attract the molecules of ambient liquids and gases. The porosity of activated charcoal permits a large number of specific pollutant to be adsorbed (phenols, hydrocarbons, pesticides). It suppresses the taste and odours of water thus treated.

PHYSICAL TREATMENT INCLUDING SEPARATION OF MICRO-ORGANISME

8. Filtration. A technique whereby water containing suspended matter is clarified under the action of a pressure gradient (differential) on contact with a micro porous barrier with pores of a diameter smaller than that of the particles to be retained. Filtration may take the form of:

a. Microfiltration
Filters with pores of a diameter: > 0,1 to 0,5 µm
Osmotic pressure: 2 to 3 bar

b. Ultrafiltration
Filters with pores of a diameter: >0,04 to 0,1 µm
Osmotic pressure: 4 to 6 bar

c. Nanofiltration
Filters with pores of a diameter: >0,001 µm
Osmotic pressure: approximately 20 bar

d. Reverse Osmosis
Filters with pores of a diameter: >0,002 to 0,0001 µm
Osmotic pressure: 20 bar or more

9. Electrodialysis. Process of separation by means of membranes permeable alternately to cations and anions. By applying a DC voltage between two electrodes placed at either end of the cell (compartment), a migration of ions and a reduction of the concentration of mineral salts will be achieved.

CHEMICAL TREATMENT WITHOUT SEPARATION OF MICRO-ORGANISMS

10. Chlorination. Same text as in para 10.d., Annex D.

11. Iodine. lodine has disinfectant properties equivalent to those of chlorine. However, as it may induce hypersensitive reactions in some individuals, the use of iodine as a disinfectant for public utility systems is prohibited under French law. Concurrently, its use has been approved by the US Environmental Protection Agency, and the NASA employs a process whereby iodine is extracted from tri-iodine resin.

12. Ozone. Ozone is ten times as active as chlorine with regard to bacteria. In water treatment, the oxidizing potential of ozone is used to suppress the colours and odours of water. However, its instability at ambient temperatures requires constant operation of a cooling system. Ozone is in widespread use as disinfectant in water treatment plants.

TREATMENT ACTING ON CHEMICAL COMPOUNDS

13. In most cases, ion exchange resins are employed, consisting of granules of porous polystyrene containing mobile exchangeable ions.

14. There are anionic resins (exchange of OH - + ions) which will increase the hardness of water and cationic resins (NA+ cations) which will reduce its hardness.

TREATMENT BY MEANS OF PHASE TRANSITION

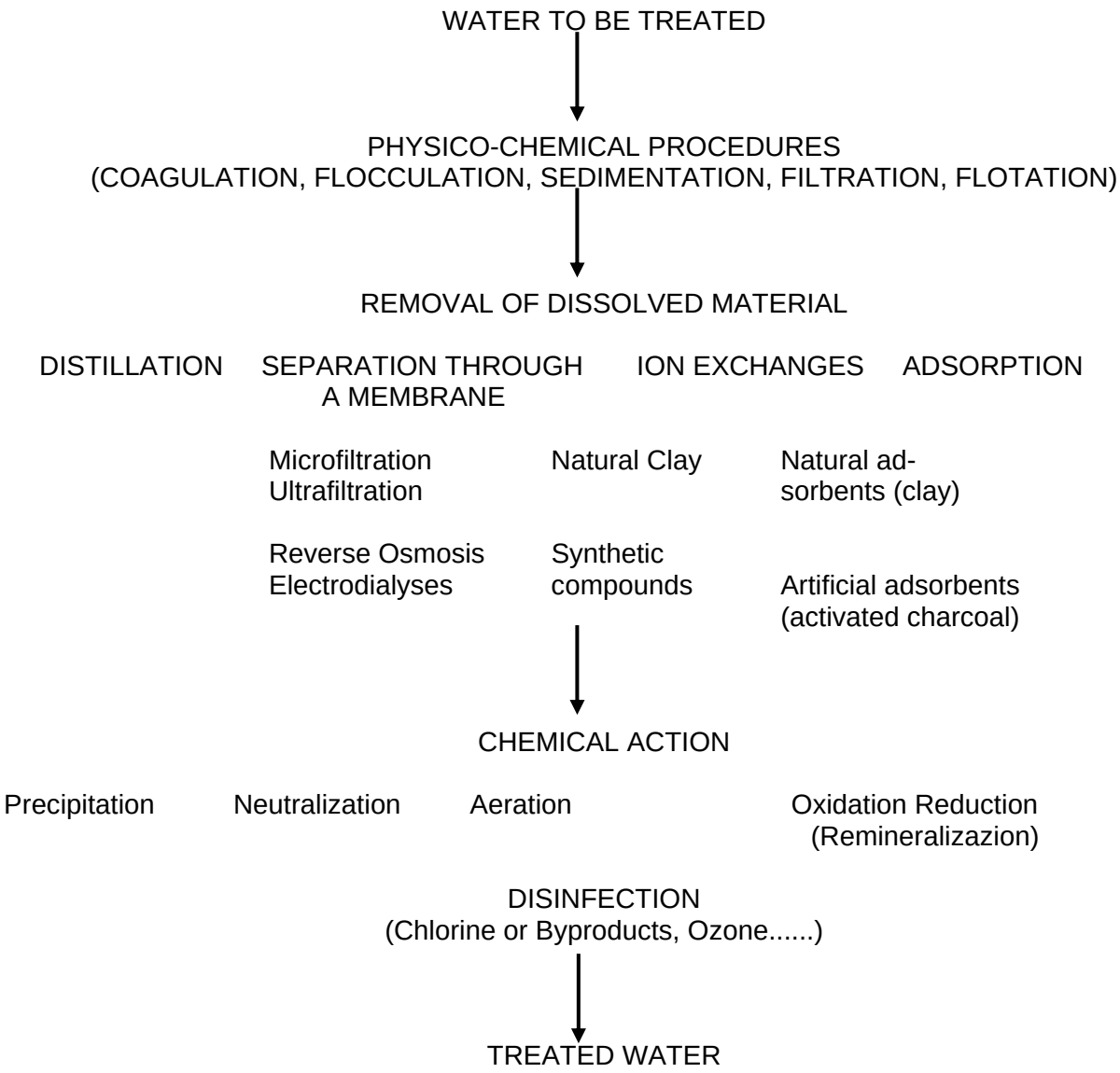
15. The process of distillation changes the state of aggregation and is, therefore, largely independent of the salt concentration of water being treated. Water is brought to boiling point in a watertight container at a low temperature and at reduced pressure. Principal distillation techniques include:

a. straight or fractional distillation

b. expansion evaporation (flashing)

c. steam distillation

WATER TREATMENT PROCESS



ANNEX E TO
STANAG 2885
(Edition 5)

WATER POINTS

APPENDIX 1Diagrammatic Layout of a Water Point at a Body of Surface Water

SITE REQUIREMENTS

LOCATION

1. The location should meet the following requirements or be capable of development to meet them:

   a. Easy and short access to and from a main route.

   b. Waiting areas for vehicles near the entrance to the water point.

   c. Good access to the filling points so that a vehicle being filled does not block the traffic.

   d. Well-drained hard standings at the filling points.

   e. Ground with good natural drainage, if possible at a slope with sufficient inclination to enable deliveries to be made by gravity from tanks to vehicles and from sedimentation tanks to sterilising tanks. It should be possible to erect the tanks on level ground.

   f. Wherever possible, water should be pumped directly from purification equipment into vehicles

2. A diagrammatic layout of a water point is shown at Appendix 1.

DISPENSING OF WATER

3. Water points will be so arranged that vehicles, water cans or water bottles can be filled separately but at the same time.

4. Vehicle Filling Points. Filler hoses should be not less than 50 mm in diameter and should be spaced 9-18 metres apart, if possible. They should normally be erected at a height of 4 metres above the road surface.

5. Filling Points for Water Bottles and Water cans. Flexible hoses enable water containers to be filled while on the transport vehicles. For occasional filling of individual water cans or water bottles, a rigid pipe with a number of taps to be operated manually should be provided. Loading platforms at a suitable height for loading cans on the vehicles are useful.

PROTECTIVE MEASURES

6. The following protective measures are required for water points:

a. Fencing. If the water point remains in use for a longer period of time, it should be guarded and fenced.

b. Sanitation. Latrines will not be provided in the immediate vicinity of the water point. If required they will be constructed at a distance of approximately 100 metres from the water point.

c. Pollution by Fuels. Measures will be taken to prevent the water point from being polluted by fuels used in transport vehicles, pump units, generators, etc..

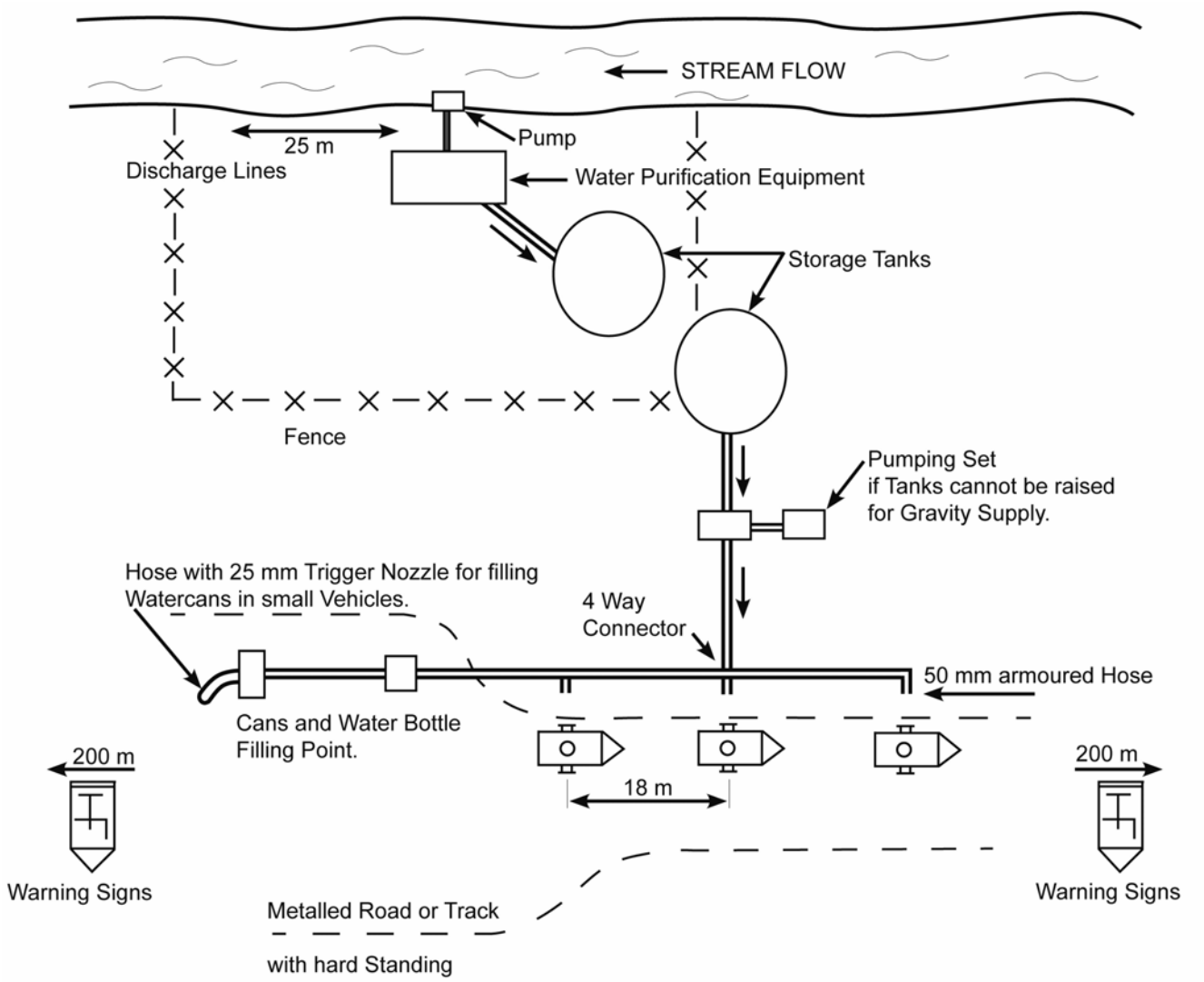
SIGNS

7. Warning signs (in accordance with Annex A of STANAG 2035, paragraph 2) will be placed on the main route about 200 metres from the entrance to the water point.

APPENDIX 1 TO
ANNEX E TO
STANAG 2885
(Edition 5)

DIAGRAMMATIC LAYOUT OF WATER POINT AT A BODY OF SURFACEWATER

WATER SOURCE



ANNEX F TO
STANAG 2885
(Edition 5)

SPECIAL PROBLEMS

ARID AREAS

1. In arid areas without local water sources, distribution points will be established which shall be supplied with water by bulk carriers (tankers on road or rail) or by pipeline.

COLD CLIMATE AREAS

2. In cold climate areas measures are to be taken which prevent the water from freezing during storage or distribution. Plastic containers may become brittle at temperatures below approximately minus 30° C and thus be unsuitable for the transport of water.

3. The purification methods described in Annex D, paragraphs 7-11, also apply to water extracted from melted ice or from snow.