DEPARTMENT OF WATER AFFAIRS & FORESTRY

STANDARD FOR

BOTTLED WATER

- **Bottled Natural Water**
- **Processed Water**
- **Mineral Water**
- **Carbonated Water**
- **Flavoured Water**

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TABLE OF CONTENTS

DEFINITIONS **4**

1. SCOPE **6**

2. MANUFACTURING AND OPERATIONAL REQUIREMENTS **6**

2.1 FACTORY AND PROCESSING AREA 6
2.1.1 General *6*
2.1.2 Factory construction, layout and conditions *6*
2.2 WATER (OTHER THAN THE PRODUCT) 6
2.3 HYGIENIC OPERATING REQUIREMENTS 7
2.4 EMPLOYEES 7
2.4.1 Health *7*
2.4.2 Protective clothing *7*
2.4.3 Personal hygiene *8*

3. SOURCE REQUIREMENTS (NATURAL WATER) **8**

3.1 Abstraction area *8*
3.2 Source *8*

4. UNTREATED WATER REQUIREMENTS **9**

5. PRODUCT REQUIREMENTS **12**

5.1 PERMISSIBLE TREATMENT 12
5.1.1 Natural water *12*
5.1.2 Water other than natural water *13*
5.2 CHEMICAL AND PHYSICAL TESTS 13
5.3 GENERAL REQUIREMENTS 13
5.4 MICROBIOLOGICAL REQUIREMENTS 13

6. BOTTLES AND OTHER CONTAINERS **14**

6.1 CONTAINER TYPES AND CONDITION 14
6.2 WASHING OF CONTAINERS 14
6.3 FILLING, SEALING AND INSPECTION OF BOTTLES 14

7. PACKING AND LABELING OF CONTAINERS **15**

7.1 PACKING 15
7.2 LABELING 15
7.2.1 Composition and carbonation of the product *15*
7.2.2 Cautionary notices *16*
7.2.3 Additional labeling requirements *16*
7.2.4 Optional labeling *16*
7.2.5 Labeling prohibitions *17*

8. TRANSPORTATION AND STORAGE **17**

REFERENCES **18**

ANNEX A: NOTES TO PURCHASERS 22

ANNEX B: QUALITY VERIFICATION OF PACKAGED WATER 22

B.1 QUALITY VERIFICATION 22
B.2 SAMPLING AND COMPLIANCE WITH THIS GUIDELINE 22

ANNEX C: BOREHOLE SAMPLING PROCEDURE 24

C.1 WATER LEVEL MEASUREMENT 24
C.2 PURGING THE BOREHOLE 25

DEFINITIONS

Acceptable:	Acceptable to the authority administering this guideline, or to the parties concluding the purchase contract, as relevant.
Batch:	Quantity of water that is processed during a specified period of production in a single packaging plant.
Bottle:	Container that is made of glass, plastics material, tin plate or other suitable material, and that (in each case) is capable of being sealed with a closure.
Bottling cycle:	Period of bottling that produces a batch (see "batch")
Carbonated water:	Water that, after possible treatment in accordance with 6.1, has been made effervescent by the addition of carbon dioxide (see 6.3), also referred to as "sparkling" water.
Defective:	Container or its contents that does not comply in one or more respects with the relevant requirements of the guideline.
Diuretic:	Substance that causes an increase in excretion of urine from the body, thereby reducing the amount of water in the body.
Flavoured water:	Product that has had flavouring added to the water to give a particular taste
Lot:	Product of the same description and from the same batch, in packages of the same size and type, from the same manufacturer, and submitted at any one time for inspection and testing.
Mineral content:	Concentration of mineral salts, trace elements and other inorganic constituents present, normally expressed in milligrams per litre.
Mineral water:	Water containing not less than 250 mg/L total dissolved solids (TDS), coming from subterranean water source. Mineral water shall be distinguished from other types of water by its constant level and relative proportions of minerals and trace elements at the point of emergence from the source, due account being taken of the cycles of natural fluctuations. No minerals may be added to this water.
Natural:	Water that has not had its physical, chemical or microbial composition altered from that of its source, except by treatment permitted in this guideline.
Non-carbonated water:	Water that does not contain free carbon dioxide or other gases in excess of the amount necessary to keep dissolved the hydrogen bicarbonate salts that are present in the water, also referred to as "still" water.
Prepared water:	Water that has had its physical, chemical or microbiological composition altered from that of its source.
Product:	Water that complies with the requirements given in SANS 241, or equivalent Namibian Standard
Source:	Point at which the untreated water is extracted from subterranean water-bearing strata.

Sparkling water:	(See “carbonated water”)
Spring water:	Water derived from a subterranean source from which water flows naturally to the surface of the earth (as opposed to being pumped to the surface).
Still water:	(See “non-carbonated water”)
Substances:	Chemical additives such as colourants, flavourings, minerals, preservatives, sugars and sweeteners that have been added to the water and that are permitted by the regulations under the current Foodstuffs, Cosmetics and Disinfectants Act.
Vermin:	Animals such as insects and rodents that could lead to possible contamination of products.

OVERALL CLASSIFICATION OF BOTTLED WATER

Only the following description shall be used on labels:

CLASSIFICATION	MAJOR REQUIREMENTS
NATURAL WATER	• Only if source is a spring, well or borehole; • No treatment process allowed that modifies mineral content; • No chlorination allowed for disinfection; • Only UV and/or ozonation allowed for disinfection; • Collected product to be bottled/packaged within 48 h.
MINERAL WATER	• Natural mineral content not less than 250 mg/l TDS; • All other requirements as for Natural Water.
PROCESSED WATER	• Any source that can be converted to a potable water but does not include reclaimed water; • Any treatment processes allowed that may alter mineral and physiological content of source water; • No chlorination allowed for disinfection; • Only UV and/or ozonation allowed for disinfection; • May be carbonated.
FLAVOURED WATER	• Any water with flavouring added; • All other requirements as for Processed Water.
“Still” or “Non-Carbonated”	• No CO_2 has been added; • Can be used in conjunction with any of the above expressions for a specific water.
“Sparkling” or “Carbonated”	• When CO_2 has been added; • Must be used in conjunction with any of the above expressions for a specific water.

1. SCOPE

This guideline specifies the description, treatment, testing, bottling, packaging and labeling of both natural and prepared water. The guideline forms part of the drinking water regulation of the Water Act and will thus be regulated by the Department of Water Affairs and Forestry. The standard was adapted from the South African Standard for Bottled Natural Water, SANS 1657.

In Namibia natural water resources are very scarce and many communities do not have direct access to flowing municipal tap water. Even in areas where tap water is readily available, the quality thereof is often not high enough for the public to accept it as their primary source of potable water. Therefore, there is a high demand for packaged water with a known and consistent quality. The water may be offered as packaged non-carbonated ("still") water or as packaged carbonated ("sparkling") water, with or without permitted substances. All of the above may also be offered as unflavored or flavored water. The choice whether to carbonate and/or flavor the water ultimately depends on the producer according to observed consumer demand of the product. During the production or bottling process, extreme care must be taken to ensure that no waste products are allowed to be discharged in a way that may contaminate the bottled water source.

2. MANUFACTURING AND OPERATIONAL REQUIREMENTS

2.1 Factory and processing area

2.1.1 General

All the statutory requirements of the Food Stuffs, Disinfectants and Cosmetics Act, Public Health Act, Labour Act, Water Act and Local Authority Act, all as currently applicable in Namibia, shall be complied with.

Sections 2.1 to 2.5 give the requirements with which the factory, the equipment and the water used in preparation of the product shall comply.

2.1.2 Factory construction, layout and conditions

Factories used for the bottling water shall comply with the General Regulations Government Notice 121 of 1969 in terms of the Public Health Act. Should these be revised at any time, the most recent revision will be applicable.

2.2 Water (other than the product)

Factory facilities used for the treatment, distribution and storage of water shall be adequately protected against contamination. Water used at the factory shall be potable water and free from substances that could be detrimental to the quality of the product. Potable water shall comply with the requirements of the proposed Namibian Water Quality Standards and Guidelines.

2.3 Hygienic operating requirements

The factory and grounds shall be kept in a clean and hygienic state at all times and no operation that may be detrimental to the product quality during manufacturing, processing or treatment shall be permitted. Processing and storage areas shall be kept free of moulds, dust, dirt, flaking paint and other loose or extraneous material.

The plant and its equipment shall at all times be kept in a hygienic state and shall be cleaned and disinfected as is necessary to ensure product quality. At each change of operations the entire processing system, including all equipment and utensils, shall be cleaned and rinsed with potable water that complies with 2.2. At least once weekly, or more if necessary, the entire system shall be cleaned, rinsed and properly disinfected. Steam used for cleaning purposes shall not contain any substances that could contaminate the product.

Floors, walls and drainage channels shall be kept clean and hygienic at all times by cleaning them at the end of each day's operations and as often as is necessary during the working day.

Waste, litter and overflow shall be disposed of regularly and in an efficient and hygienic manner to avoid accumulation. All refuse facilities, processing areas and storage areas shall be kept free of rodents and pests. Pesticides shall at no time come into contact with containers or the product and shall not be used while processing is in operation. Equipment, work surfaces and utensils shall be kept free of pesticide residues. Pesticides shall comply with the requirements of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act currently applicable in Namibia and shall only be handled by properly trained and authorized personnel or under strict supervision of such persons. No animals, including birds, shall be permitted in any part of the factory.

2.4 Employees

2.4.1 Health

- Employees shall pass a medical examination prior to commencement of employment and shall undergo an annual medical examination;
- Any person that suffers from, or is a carrier of, any communicable disease (especially *Salmonella* or *Shigella* organisms), or who shows symptoms, or is suffering from, gastroenteritis or an enterobacterial infection, or who is suffering from any condition causing discharge of loose skin, pus or serum from any part of the body shall be prohibited from working in any part of the factory where the product is prepared, processed, handled or transported;
- Any person that suffers from, or is a suspected or known carrier of, any disease that can be transmitted through food or has any infected wounds, sores or any illness, shall be prohibited from working in any part of the factory in which there is a possibility that the person could contaminate the product. Persons with cuts or open wounds shall discontinue working until the injury has healed or been treated to such an extent that contamination is no longer possible;
- The authority administering this guideline shall have access to all medical certificates submitted by candidates for inspection purposes;

2.4.2 Protective clothing

Employees and visitors entering a processing area shall wear clean protective clothing and clean washable caps to cover their hair. Waterproof clothing shall be made of a plastics material or similar acceptable material. Overalls shall entirely cover the wearer's personal

clothing. Protective footwear shall be worn in preparation and processing areas. Protective clothing of any kind shall not be a possible source for contamination of the product.

2.4.3 Personal hygiene

Employees working in a processing area shall wash their hands at regular intervals as well as after each absence from that area. Jewelry, wristwatches, nail lacquer or varnish, chewing gum and tobacco shall not be permitted in the preparation, processing, packaging and storage areas.

3. SOURCE REQUIREMENTS (NATURAL WATER)

Only where water that is used as the base for the product is abstracted from a natural spring, well or borehole and then immediately bottled, is the final product referred to as “Natural Water”. This section deals only with the requirements for obtaining source water for natural water bottling.

3.1 Abstraction area

Strict precautionary measures shall be taken to prevent contamination of springs, wells or boreholes used for abstraction of the product. Any activities excluding the collection of the product or servicing of the equipment required for this collection process, shall be prohibited in the abstraction area and no animals or unauthorized persons shall have access to the area. Equipment used for the collection of product shall be made from materials that are corrosion-resistant and do not affect the original qualities of the product in any way. The source abstraction area must be sufficiently protected to prevent any adverse environmental impact or source water contamination. The abstraction point should be enclosed and water should only be extracted from this enclosure.

Any storage or waste tanks, canalization, drainage or used-water lines in the protected abstraction area shall be designed, constructed, protected and maintained in such a way as to ensure that no contamination of the abstraction area can occur.

Collected product shall not be stored for longer than 48 hours and shall receive no chlorine treatment. Ultraviolet (UV) light treatment and/or Ozonation (see 5.1) for disinfection is allowed, before packaging can commence.

If it is found during production that the product is contaminated, all operations shall be discontinued until the cause of the contamination is identified and eliminated.

Product shall be abstracted in a manner that conforms to hydro-geological conditions in such a way that extraneous water or pollutants cannot enter the abstraction system.

3.2 Source

The producer shall obtain a certificate from a professional hydro-geologist and provide it to the authority administering this standard. This certificate shall:

- Give the precise location of the source, showing its altitude on a map with a scale no smaller than 1 : 25000 and no larger than 1 : 1000;
- Give the hydrogeology of the source, including a detailed geological description of the surrounding terrain;

- Certify that the source is not in danger of contamination by sewerage, farming operations, waste disposal, industrial activities and/or any other human or animal activities;
- Describe the equipment used for water abstraction;
- Give the natural flow rate of the spring along with its seasonal variation. The maximum discharge rate of the source shall also be given.

Should testing of the untreated product (see 3.1.3) reveal that the source has been contaminated, a professional hydro-geologist shall be commissioned to survey the area surrounding the source to determine the cause of the contamination. Production shall be discontinued until such cause has been eliminated.

4. UNTREATED WATER REQUIREMENTS

Water that is used as base for the product, whether sourced naturally or obtained elsewhere shall be tested for constituents listed in Tables 1 and 2, at the frequency stated.

Table 1 – Limits for specific substances

Substance	Limits	Test Method	Frequency of Testing
Copper	0.5 mg/L	SANS 5203 (SABS SM 203)	Initially and annually
Manganese	0.05 mg/L	SANS 5209 (SABS SM 209)	Initially and annually
Arsenic	0.05 mg/L	SANS 5200 (SABS SM 200)	Initially and annually
Barium	0.5 mg/L	APHA method 3500-Ba	Initially and annually
Bromate	10 µg/L	ASTM D6581 - 08	Initially and annually
Bromide	0.5 mg/L	ASTM D1246 - 10	Initially and annually
Cadmium	0.01 mg/L	SANS 5201 (SABS SM 201)	Initially and annually
Chromium	0.01 mg/L	SANS 6054 (SABS SM 1054)	Initially and annually
Lead	0.05 mg/L	SANS 5208 (SABS SM 208)	Initially and annually
Zinc	1.0 mg/L	SANS 5214 (SABS SM 214)	Initially and annually
Mercury	0.001 mg/L	SANS 6059 (SABS SM 1059)	Initially and annually
Selenium	0.01 mg/L	SANS 6058 (SABS SM 1058)	Initially and annually
Iron	0.1 mg/L	SANS 5207 (SABS SM 207)	Initially and quarterly
Aluminium	0.15 mg/L	SANS 6169 (SABS SM 1169)	Initially and annually
Fluoride	1.0 mg/L as F	SANS 163-1/ISO 10304-1 (SABS ISO 10304-1) or SANS 5205 (SABS SM 205)	Initially and annually
Nitrate & Nitrite	3 mg/L (total) as N	SANS 163-1/ISO 10304-1 (SABS ISO 10304-1)	Initially and annually
Sulfide	0.1 mg/L as H_2S	SANS 6056 (SABS SM 1056)	Initially and annually
DOC	3 mg/L as O_2 absorbed	SANS 5220 (SABS SM 220)	Initially and annually
Radioactivity (gross alpha activity)	0.5 Bq/L	ISO-9696 (ISO, 1991b) or APHA co-precipitation technique (APHA, 1998)	Initially and annually
Radioactivity (gross beta activity)	1.0 Bq/L	ISO-9695 (ISO, 1991a) or APHA co-precipitation technique (APHA, 1998)	Initially and annually

NOTE Alternative test methods that deliver equal or better results may be substituted for those listed above

Table 2 – Physical and macro constituents

Quality	Limits (if applicable)	Test Method	Frequency of Testing
Colour	20 mg/L Pt	SANS 5198 (SABS SM 198)	Daily
Turbidity	1 NTU	SANS 5197 (SABS SM 197)	Daily
Electrical conductivity	150 mS/m	SANS 6057 (SABS SM 1057)	Daily
Total dissolved solids	1 000 mg/l	SANS 5213 (SABS SM 213)	Initially and quarterly
Calcium	150 mg/Las Ca	SANS 6265 (SABS SM 265)	Initially and quarterly
Magnesium	70 mg/L as Mg	SANS 6265 (SABS SM 265)	Initially and quarterly
Sodium	100 mg/L	SANS 6050 (SABS SM 1050)	Initially and quarterly
Potassium	50 mg/L	APHA method 3500-K/D	Initially and quarterly
Chloride	200 mg/L	SANS 163-1/ISO 10304-1 (SABS ISO10304-1)	Initially and quarterly
Sulfate	200 mg/L	SANS 163-1/ISO 10304-1 (SABS ISO10304-1)	Initially and quarterly
Alkalinity	-	APHA method 2320	Initially and quarterly
Bicarbonate	-	Calculated using APHA method 4500-CO2/D and the results obtained for pH value and alkalinity	Initially and quarterly

For bottling of water where the untreated water is received from a source of potable water other than a spring, well or borehole (for example from a municipal supply), the manufacturer shall be required to perform the tests in Tables 1 and 2 initially and at least once every week thereafter.

- When tested in accordance with SANS 5221 (SABS SM221), untreated product samples shall comply with the following:
  1. 100 mL shall not contain any coliform bacteria
  2. 100 mL shall not contain any faecal coliform bacteria
  3. 1 mL shall contain fewer than 100 organisms per total heterotrophic plate count (HPC)

- A 100 mL sample of untreated water tested in accordance with SANS 6461/ISO 6461 shall contain no viable *Clostridium* spores

- Samples shall be kept at 4 °C ± 3 °C and tested microbiologically within 24 hours of sampling. Parasites shall be absent in 10 L of the untreated product when tested using the following method:

  Filter 10 L of the water sample through a 1.2 µm filter membrane. Remove the filter and place it in 100 mL sterile water for 10 min. Resuspend the filtered material/residue, then concentrate by centrifuging at 2100 r.p.m. for 6 min. Examine the pellet collected at 400 times magnification under phase contrast microscopy for the presence of parasites.

  (NOTE As algae can be confused with certain protozoan cysts such as *Cryptosporidium* and *Giardia*, it is advisable to use an immunofluorescent stain and a fluorescing microscope to distinguish between these organisms.)

- If the source water contains bromite in concentrations exceeding 10 µg/L the treatment process may not include an ozonation step. Use of ozonation in such cases would result in the production of carcinogenic bromate. Ozonation may thus only be used if the source water does not contain bromite exceeding the above concentration.

- If the initial or subsequent surveys (see 4.2) reveals any possible contamination of the source, the untreated product shall be tested with the methods and for the contaminants shown in table 3, as follows:

Table 3 - Contaminants

Contaminant	Amount permissible	Test Method
Phenolic compounds	< 5 µg/L	SANS 5211 (SABS SM 211)
Trihalomethanes (total)	< 50 µg/L	
Organochlorine pesticides and PCBs	Not detectable*	APHA method 6630(b)
Organophosphate pesticides	Not detectable*	AOAC method 991.07
Cyanide	< 0.01 mg/L as CN	SANS 5204 (SABS SM 204)
Nitrite	< 0.1 mg/L as N	SANS 6777/ISO 6777 (SABS ISO 6777) or SANS 163-1/ISO 10301-1 (SABS ISO 10304-1)
* Not detectable using the method specified NOTE Alternative test methods that deliver equal or better results may be substituted for those listed above		

5. PRODUCT REQUIREMENTS

Only descriptions as per Table 4 shall be used on labels to identify a specific water:

Table 4. Classification of different bottled waters

CLASSIFICATION	MAJOR REQUIREMENTS
NATURAL WATER	• Only if source is a spring, well or borehole; • No treatment process allowed that modifies mineral content; • No chlorination allowed for disinfection; • Only UV and/or ozonation allowed for disinfection; • Collected product to be bottled/packaged within 48 h.
MINERAL WATER	• Natural mineral content not less than 250 mg/l TDS; • All other requirements as for Natural Water.
PROCESSED WATER	• Any source that can be converted to a potable water but does not include reclaimed water; • Any treatment processes allowed that may alter mineral and physiological content of source water; • No chlorination allowed for disinfection; • Only UV and/or ozonation allowed for disinfection; • May be carbonated;
FLAVOURED WATER	• Any water with flavouring added; • All other requirements as for Processed Water.
"Still" or "Non-Carbonated"	• No CO_2 has been added; • Can be used in conjunction with any of the above expressions for a specific water.
"Sparkling" or "Carbonated"	• When CO_2 has been added; • Must be used in conjunction with any of the above expressions for a specific water.

5.1 Permissible treatment

5.1.1 Natural water

- Permissible treatments include:
    - Separation from unstable constituents by filtration or decantation, or both. If necessary the process can be accelerated by previous aeration;
    - Pre-filtration using a coarse filter and filtration using a fine filter of 0.4 µm or less;
    - Ultraviolet (UV) light or Ozonation treatment for disinfection;

      (NOTE: Care should be taken in the selection of the ultraviolet light source to ensure that all bacteria are effectively killed. If bacteria are only damaged and not killed the water might initially test sterile; however, the bacteria might repair their cell structure at a later stage.)

- The removal of CO_2 from the water, as well as the addition of CO_2, either directly, or after an initial removal stage;

The above-mentioned treatments shall only be permitted on the condition that the mineral content of the product is not modified in the essential constituents giving the product its properties. The product shall not be subjected to any treatment other than the treatments permitted above. In particular no chemicals (of whatever nature) will be added.

- Natural water product shall not be transported in bulk containers for any process before bottling;
- The bottling plant shall be directly connected to the source with a suitable pipeline that will not alter the product composition or contaminate the product in any way. The distance between the source and the bottling plant shall not exceed 1 km, unless the authority administering this guideline is satisfied that the product will not be adversely affected.

5.1.2 Water other than natural water

Single, or combinations of appropriate and safe physical, chemical and antimicrobial treatments are permissible.

5.2 Chemical and physical tests

When tested in accordance with the methods shown in Table 1, the product in its packaged state, shall not contain more of the substances as shown. The product shall be tested for physical and macro constituents as given in Table 2.

5.3 General requirements

- The product shall have a pleasant, characteristic and palatable flavor, which shall be in accordance with any claim referring to flavor made or implied on the label. No off-odors and off-flavors shall be present;
- The net volume of the product shall comply with the regulations under the Trade Metrology Act currently applicable in Namibia;
- Dust, fiber particles, surface film or scum, sediment and other foreign matter shall not be present and the product shall comply with the test for turbidity under normal storage conditions;
- Carbonation shall be in accordance with the claimed product type stipulated on the label. CO_2 and other gases shall be of acceptable food grade;

5.4 Microbiological requirements

- When tested in accordance with SANS 5221 (SABS SM 221), product water samples shall comply with the following:
  1. 100 mL shall not contain any coliform bacteria;
  2. 100 mL shall not contain any faecal coliform bacteria;
  3. After packaging, 1 mL shall contain not more than 100 organisms per total heterotrophic plate count (HPC), sampled within 12 hours of packaging, when

incubated at 22 °C for 72 hours. Thereafter, the total viable colony count shall not increase more than is normal for bacterial content increase from the water as it was at the source;

- When tested in accordance with SANS 5221 (SABS SM 221), but using malt extract sugar instead of plate count agar, and incubating at 25 °C for 5 days, moulds shall be absent;

6. BOTTLES AND OTHER CONTAINERS

6.1 Container types and condition

The product shall be sealed in suitable containers, for example bottles or sachets, which will not contaminate or change the flavor or odor of the product. In addition to glass containers, only polyethylene terephthalate (PET) plastic containers shall be permitted. Containers shall be delivered to the filling plant in sealed packaging to prevent contamination. Annex A gives the requirements to be specified in contracts and tender invitations.

All bottles shall be clean and free of any defects at the time of filling and closures shall be clean and sterile at the time of sealing. Crown caps shall be fitted with a solid cork or composition cork disc or with an acceptable plastics disc. Containers designated for filling with product shall be used solely for this purpose and not for materials storage or any other purpose.

6.2 Washing of containers

A suitable automatic process shall clean returnable and, where necessary, new bottles immediately before filling of product commences. The cleaning process shall, as a minimum, consist of the following:

- Pre-rinse or pre-soak;
- Brushing, soaking, jetting with an effective cleaning solution at a sufficiently high temperature and a sufficiently long time to ensure thorough cleaning;
- Thorough rinsing with potable water to remove any residual cleaning solution;

New bottles that do not require treatment shall be rinsed with treated product or with potable water that complies with 2.2. Rinsed bottles shall be rinsed with an alcoholic solution of phenolphthalein to establish whether cleaning has been effective. The indicator shall not turn red.

6.3 Filling, sealing and inspection of bottles

Filling of containers with product using automatic or manual equipment shall at all times occur under strict hygienic conditions, with containers being sealed immediately after filling. All equipment used during the filling process shall be kept clean and open bottle ends shall not be touched by hand, in order to prevent any possible product contamination.

Continuous inspection of washed, unfilled and filled bottles shall be performed either by automated electronic equipment or by trained personnel (sighters). Sighters shall have good eye sight, work short shifts not exceeding 30 minutes and shall undergo annual eye tests.

7. PACKING AND LABELING OF CONTAINERS

7.1 Packing

The final product shall be packed, as required (see Annex A), in sealed containers that are suitable for preventing deterioration and contamination of the product. The requirements of the Trade Metrology Act currently applicable in Namibia shall be complied with.

7.2 Labeling

The requirements of the Trade Metrology Act currently applicable in Namibia, and of the Foodstuffs, Cosmetics and Disinfectants Act currently applicable in Namibia, shall be complied with.

Labels on bottles shall be clean, securely fastened and only applied by the manufacturer or his authorized agent. The name of the product shall be a true description of the product concerned.

The label shall clearly indicate into which of the following categories the bottled water falls:

- Mineral water;
- Natural Water;
- Processed Water;
- Carbonated Water;
- Flavored Water.

For non-carbonated water the expression “still” may also be added.

For carbonated water the expression “sparkling” may also be added.

7.2.1 Composition and carbonation of the product

In case of a mineral water, the label shall state the total dissolved solids (TDS) content of the product:

high: TDS ≥ 1000mg/L;

medium: 500 mg/L < TDS < 1 000 mg/L;

low: 250 mg/L ≤ TDS ≤ 500 mg/L;

The composition of the product shall be clearly indicated on the label with concentrations in units of milligrams per litre (mg/L). These concentrations shall be accurate to within 10% of actual measured values recorded during random sampling. As a minimum, the following constituents shall be listed in the order below:

Date of Manufacture

Best Before Date

TDS

Calcium as Ca

Magnesium as Mg

Sodium	as Na
Potassium	as K
Chloride	as Cl
Nitrate	as N
Fluoride	as F
Sulfate	as SO_4
pH	
HTPC < 100	
Date of Analysis	

The label shall also indicate whether the product is natural ["still"], carbonated ["sparkling"], or slightly carbonated as a means of preservation. The "Best Before Date" should be 2 months from the date of bottling.

7.2.2 Cautionary notices

- **Diuretic effect:** If the product contains more than 1000 mg/L of total dissolved solids or more than 600 mg/L of HCO_3 (490 mg/L HCO_3 as $CaCO_3$), the label shall state that excessive consumption (which shall be defined) could have a diuretic effect.
- **Laxative effect:** If the product has a sulfate content (excluding sodium sulfate) exceeding 600 mg/L, the label shall state that the product could have a laxative effect.
- **Fitness for infants:** If the product contains more than 100 mg/L of sodium, more than 200 mg/L of sulfate or more than 6 mg/L of nitrate (as N), the label shall state that the product is not suitable for the preparation of food for infants.

7.2.3 Additional labeling requirements

The net contents shall be stated on the label in metric units (SI units). In addition, the name of the source and the name and physical address of the exploiter shall be stated. Each product container shall be permanently marked to identify the production factory, lot and date of manufacture. If packaged natural water has been submitted to treatment according to 5.1.1, the main treatment process(es) shall be stated on the label.

7.2.4 Optional labeling

The following optional labels may be included:

- The term "Bottled in Namibia" may appear on the product only if the product is from a Namibian source and has been packaged in accordance with the requirements of this guideline;
- A trade name;
- The terms given in table 4 may be stated on the label, provided that the conditions specified are adhered to:

Table 4 – Optional labeling

Property	Limits	Test method
"Alkaline"	HCO_3 > 500 mg/L, expressed as $CaCO_3$	APHA method 2320
"Acidulous"	Free CO_2 > 250 mg/L	APHA method 4500-CO_2/D
"Saline"	NaCl > 1000mg/L	SANS 5202 (SABS SM 202) and SANS 6050 (SABS SM 1050)
"Contains iron"	Fe > 1 mg/L	SANS 5207 (SABS SM 207)
"Contains iodine"	I > 1 mg/L	APHA method 4500-I

7.2.5 Labeling prohibitions

- No claims of medicinal or beneficial effects (preventative, alleviative or curative) shall be made about the properties of the product;
- No names of locality, village or place may form part of the trade name unless it refers to the product collected at the location designated by that trade name;
- No pictures or statements about the nature, origin, composition and properties of the product that could confuse or mislead the public shall be made;

8. TRANSPORTATION AND STORAGE

Transportation of the final product shall occur under conditions that protect the product against contamination, deterioration, damage, rough handling, exposure to direct sunlight and temperatures above 30 °C.

REFERENCES

WHO (2008) *Guidelines for Drinking-water Quality,* 3rd ed. Vol. 1. *Recommendations*. Geneva, World Health Organisation.

Test Methods:

The test methods listed below are intentionally shown without publication dates to prevent inaccuracies should any of the methods be revised after publication of this standard. The latest version of a test method should always be used. Where the Namibian Standards Institute (NSI) has developed a Namibian standard, such a standard should be used in place of the corresponding Non-Namibian standard.

AOAC method 991.07, *Organic phosphorus pesticide residues* (Official methods of the Association of Official Analytic Chemists (AOAC): 16th edition, Volume 1).

APHA (1998) *Standard methods for the examination of water and wastewater*, 20th ed. Washington, DC, American Public Health Association.

APHA method 2320, *Alkalinity*.

APHA method 3500-Ba, *Water B Barium content.*

APHA method 3500-K/D, *Water B Potassium content*.

APHA method 4500-CO_2/D, *Carbon dioxide.*

APHA method 4500-I, *Iodine.*

APHA method 6630(b), *Organochlorine pesticides.*

ASTM D6581 - 08, *Standard Test Methods for Bromate, Bromide, Chlorate, and Chlorite in Drinking Water by Suppressed Ion Chromatography*.

ISO (1991a) Water quality - *Measurement of gross beta activity in non-saline water - Thick source method*. Geneva, International Organisation for Standardization (International Standard 9695).

ISO (1991b) Water quality - *Measurement of gross alpha activity in non-saline water - Thick source method*. Geneva, International Organisation for Standardization (International Standard 9696).

SANS 163-1/ISO 10304-1 (SABS 10304-1), *Water quality – Determination of dissolved fluoride, chloride, nitrite, orthophosphate, bromide, nitrate and sulfate ions, using liquid chromatography of ions – Part 1: Method for water with low contamination.*

SANS 241 (SABS 241), *Drinking water.*

SANS 1657 (SABS 1657), *Bottled natural water*.

SANS 1862 (SABS 1682), *Packaged water other than natural mineral water*.

SANS 5011 (SABS SM 11), *Water – pH value.*

SANS 5197 (SABS SM 197), *Turbidity in water.*

SANS 5198 (SABS SM 198), *Colour of water.*

SANS 5200 (SABS SM 200), *Arsenic content of water.*

SANS 5201 (SABS SM 201), *Water – Cadmium content.*

SANS 5202 (SABS SM 202), Chloride *content of water.*

SANS 5203 (SABS SM 203), *Water – Copper content*

SANS 5204 (SABS SM 204), *Cyanide content of water.*

.

SANS 5205 (SABS SM 205), *Water – Fluoride content.*

SANS 5207 (SABS SM 207), *Water – Iron content.*

SANS 5208 (SABS SM 208), *Water – Lead content.*

SANS 5209 (SABS SM 209), *Water – Manganese content.*

SANS 5211 (SABS SM 211), *Water quality – Determination of phenol index – 4-Aminoantipyrine spectrometric methods after distillation.*

SANS 5213 (SABS SM 213), *Water – Dissolved solids content.*

SANS 5214 (SABS SM 214), *Water – Zinc content.*

SANS 5220 (SABS SM 220), *Water – Oxygen absorption.*

SANS 5221 (SABS SM 221), *Bacteriological quality of water.*

SANS 6050 (SABS SM 1050), *Water – Sodium content.*

SANS 6054 (SABS SM 1054), *Water – Chromium content.*

SANS 6056 (SABS SM 1056), *Sulphide content of water.*

SANS 6057 (SABS SM 1057), *Electrical conductivity of water.*

SANS 6058 (SABS SM 1058), *Selenium content of water.*

SANS 6059 (SABS SM 1059), *Mercury content of water.*

SANS 6169 (SABS SM 1169), *Water – Aluminium content.*

SANS 6265 (SABS SM 1265), *Calcium and Magnesium content – Atomic absorption spectrometric method.*

SANS 6461-1/ISO 6461-1, *Water quality – Detection and enumeration of the spore of sulfite-reducing anaerobes (clostridia) – Part 1: Method of enrichment in a liquid medium.*

SANS 6461-2/ISO 6461-2, *Water quality – Detection and enumeration of the spore of sulfite-reducing anaerobes (clostridia) – Part 2: Method by membrane filtration.*

SANS 6777/ISO 6777 (SABS ISO 6777), *Water quality – Determination of nitrite – Molecular absorption spectrometric method.*

Acts:

Water Resources Management Act, 2004 (Act No. 24 of 2004), or subsequent revision;

Water Act, 1956 (Act 54 of 1956), or subsequent revision;

Public Health Act, 1919 (Act of 1919), or subsequent revision;

Local Authority Act, 1992 (Act 1 of 1992), or subsequent revision;

Labour Act 2007, (Act 11 of 2007), or subsequent revision;

Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947), or subsequent Namibian revision;

Trade Metrology Act, 1973 (act 77 of 1973), or subsequent Namibian revision;

Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972), or subsequent Namibian revision;

Annex A: Notes to Purchasers

The following requirements shall be specified in tender invitations, order and contract:

- The type of product required (see 7.1);
- The type of container in which the product is to be packed (see 6.1);

Annex B: Quality verification of packaged water

B.1 Quality verification

- If the purchaser requires ongoing verification of the product, attention should also be given to the manufacturer's quality system in addition to final product evaluation. In this connection it should be noted that SANS 9001/ISO 9001 (SABS ISO 9001) covers the provision of an integrated quality system.
- If no information about quality control or testing of a lot is available, the sampling plan given in B.2.1 can be followed if a purchaser wishes to test and inspect samples of the final product to establish whether a lot of product complies with this guideline.

B.2 Sampling and compliance with this guideline

The following sampling procedure shall be followed to determine whether a lot, submitted for inspection and testing, complies with the requirements of this guideline. The results of sample testing shall be deemed to be representative of the whole lot.

- **Sample for physical examination and for inspection of containers:**
    - Take, at random, the number of containers shown in column two of table B.1;
- **Sample for chemical analysis:**
    - Take, at random, the number of containers that will deliver the volume given in column three of table B.1;
- **Sample for microbiological examination:**
    - Take, at random, one container during each stage of the packaging cycle (beginning, middle, end of packaging cycle);

The lot shall be deemed to comply with the requirements of this guideline if no defects are found in any of the tests and inspections mentioned in above in B.2.

Table B.1 – Sampling procedure

1	2	3	4
Lot size (containers)	**Sample size for physical examination (containers)**	**Sample volume for chemical analysis (L)**	**Sample size for microbiological examination* (containers)**
0 – 5 000	3	3	3
5 001 – 12 500	6	3	3
12 501 – 25 000	9	3	3
25 001 – 50 000	16	3	3
50 001 upwards	30	3	3
• For examination for parasites, 10 L of product is required.			

Annex C: Borehole Sampling Procedure

C.1 WATER LEVEL MEASUREMENT

When arriving at a borehole or well to collect a water sample, the first measurement that must be taken is the rest water level and the second is the depth of the borehole. The lip of the borehole casing is to be used as the datum for these measurements.

Reasons why the water level and depth of the borehole must be measured:

- If the borehole open-depth measuring device cannot go down the borehole the pump will also not go down.
- If the borehole has been sampled previously the depth measurement will indicate whether borehole collapse or silting has occurred.
- The volume of water that must be purged be calculated so that a representative sample can be collected (see formula).
- Accurate water levels are essential for calculating groundwater flow directions and seasonal changes of the aquifer.

C1.1 WATER LEVEL MEASURING EQUIPMENT

The preferred equipment is the OTT, SPOHR or similar approved.

For open-depth measurement it is preferred to use a large diameter (smaller than the borehole diameter), perforated bottom device to ensure accuracy.

C.1.2 FIELD PROCEDURE

- Lower the end down the borehole until the needle deflects, the buzzer or light goes on and raise it until it stops deflecting or going off. This is the water level and must be measured and recorded accurately.
- Measure the water level depth using the top of the casing edge (mbsu).
- Re-check the water level and record.
- Lower the weight until the bottom of the borehole is felt and record the depth keeping the tape (fibre

  glass preferred) tensed.

C.2 PURGING THE BOREHOLE

C2.1 INTRODUCTION

A borehole must first be purged to remove stagnant water from the borehole so that the groundwater sample subsequently collected is representative of the *in situ* groundwater. Stagnation modifies groundwater chemistry to the extent that samples may be totally unrepresentative of the formation water. Stagnant water will be affected by a number of processes:

- Leaching or adsorption of certain constituents from or onto borehole casing or screen.
- Reaction of steel casing with hydrogen ions resulting in increasing pH and decreasing Eh.
- Depletion of heavy metal species precipitated by sulphide (produced by the action of sulphate reducing bacteria commonly found in the stored water)
- Precipitation or dissolution of certain metals due to changes in the concentration of certain dissolved gases such as oxygen and carbon dioxide.
- Addition of foreign materials through the top of the borehole.
- Loss of VOC's.
- Changes of redox potential due to contact with the atmosphere.
- Changes of microbial population as contact with the atmosphere changes the anaerobic environment to aerobic. This will result in subsequent changes in pH and redox conditions and chemistry of the water.

Purging of the borehole in practice involves the removal of sufficient water so that the field chemistry parameters (pH, Temp, EC, and Eh) are stable. For most cases, this involves the removal of three times the volume of the standing water in the borehole. As soon as pH and EC are stable for the duration of the purging of one borehole volume, start sampling.

C2.2 FIELD PROCEDURE

- Measure the water level using the approved method and dipper
- Measure the borehole depth using the suggested method
- Thus height of water column = borehole depth – depth to water-level
- Calculate the standing volume of water in litres by using the following formula.

Volume of Standing water = π x (radius of borehole)^2 in metres x Height of water column x 1000 in metres

- Install pump with inlet one meter from the borehole bottom for all boreholes as a standard procedure.
- Set up EC, pH, Temp and Eh meter
- Start pumping (throttle if necessary)

- Measure pumping rate in L/sec
- Using the calculated well volume, calculate the pumping time needed to remove THREE volumes
- Take continuous readings of EC, pH, Temp and Eh
- If the field chemistry stabilized before three volumes are pumped use the time for three volumes as the purge time at that pumping rate
- If EC, pH, Temp and Eh have not stabilized, continue pumping until it stabilizes. This will be the purge time at that pumping rate
- Record all the above information into the logbook so that succeeding sampling runs can follow this established routine
- Once the borehole has been purged, with the pump still pumping, lower the pump a short distance, 0,5 m, and collect the water sample if the yield is high enough to allow this procedure. This is done so that contamination from the stagnant water which is above the pump inlet does not occur.
- Collect the required groundwater samples by removing the cap of sample bottle without contaminating the inner surface of cap and neck of sample bottles with hands.
- Fill all preserved and sterilized bottles without rinsing and replace cap immediately.
- Samples for heavy metal analysis shall be pressure filtered on site (filtration unit and 0.45 micron filter to be provided by Scientific Services Division)
- If the site is a hazardous waste site make arrangements to safely dispose of the purged water which may or may not contain toxic substances.

C2.3 LOW YIELDING BOREHOLES

Some boreholes to be sampled are low yielding and go dry when purging. Leave the borehole to recover for at least one hour or until the recovering water level is at least 1m above the pump. When returning obtain as many measurements as possible for the water that is there as this is representative groundwater. Bladder pumps are very useful as the pumping rate can be adjusted to very low volumes. Low yielding boreholes pumped at high rates will give erroneous results for parameters affected by exposure to air, especially Eh. Suction of air during sampling is not allowed.

C2.4 TURBID WATER

If the borehole water becomes turbid or silty, reduce the pumping rate to see whether turbidity reduces.

C2.5 PURGING EQUIPMENT

Submersible pumps and bladder pumps are suitable. Airlift pumps, bailers, grab samplers and syringe samplers are not suitable.

C2.6 REFERENCES

Gillham,RW; Robin, MJL; Barker, JF; and Cherry, JA. 1983. Groundwater monitoring and sample bias. Department of Earth Sciences, University of Waterloo, Waterloo, Ontario.

Gillham,RW; Robin, MJL; Barker, JF; and Cherry, JA. 1985. Field evaluation of well flushing procedures. Department of Earth Sciences, University of Waterloo, Waterloo, Ontario.

Robin, MJL and Gillham, RW. 1987. Field evaluation of well purging procedures. Groundwater monitoring review, NWWA, Ontario.

Panko,AW; and Barth, P. 1988. Chemical stability prior to groundwater sampling: A review of current well purging methods. Groundwater contamination: Field Methods, ASTM STP 963, AG Collins and AI Johnson.

Weaver, JMC. 1992. Groundwater sampling: A comprehensive guide for sampling methods. WRC project No 339, TT 54/92.

Wood, WW. 1981. Guidelines for collection and field analysis of groundwater samples for selected unstable constituents. Techniques for water resources investigation, Chapter D2, US Geological Survey.

BOREHOLE DATA LOG SHEET

GROUNDWATER POLLUTION MONITORING SHEET NO.

BOREHOLE NUMBER: WW	
ADDITIONAL NUMBER:	
BOREHOLE LOCATION:	
STICK-UP HEIGHT (mm)	
CASING DIAMETER (mm) ID	
MEASURED OPEN DEPTH (mbsu):	
MEASURED REST WATER LEVEL (mbsu) BEFORE PURGING	
PURGING METHOD	
PURGING RATE (sec/20l)(m3/h)	
RECOVERING WATER LEVEL (mbsu) BEFORE SAMPLING	
PUMPING DATE:	
PUMPING RATE (sec/20l)(m3/h)	
PUMPING TIME: Start:	
Stop:	
TIME PUMPED (min)	
TIME SAMPLE TAKEN:	
SAMPLING METHOD:	
WATER QUALITY:	

	TEMPERATURE (Celsius)	
	CONDUCTIVITY (mS/m)	
	DISSOLVED OXYGEN (mg/l)	
	pH	
	REDOX POTENTIAL (Eh)	
	COLOUR (visual)	
	ODOUR	
	TURBIDITY (visual)	

GENERAL REMARKS:	