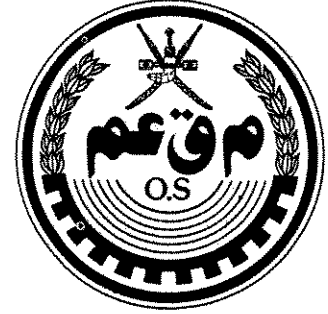


GULF STANDARD
No. 111/1989



OMANI STANDARD
No. 189/1989

**METHODS OF TEST
FOR DRINKING AND MINERAL
WATER - PART (1): SAMPLING**

Sultanate of Oman

**Standardization & Metrology Org.
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**METHODS OF TEST
FOR DRINKING AND MINERAL
WATER - PART (1): SAMPLING**

UDC 543.3

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METHODS OF TEST FOR DRINKING AND MINERAL WATER - PART (1): SAMPLING

1- SCOPE AND FIELD OF APPLICATION

This standard is concerned with sampling of bottled and unbottled drinking and mineral water.

2- REQUIREMENTS

When sampling drinking and mineral water the following shall be observed:

- 2.1 Necessary precautions shall be taken to protect the sample, their sources, the sampling instrument, and sample containers from any accidental contamination.
- 2.2 Samples shall be of sufficient volume to carry out the required tests and shall be taken frequently enough to permit accuracy of necessary tests.
- 2.3 Samples shall be collected, packed, transported and manipulated prior to analysis in a manner that safeguards them against change in constituents or properties to be examined.
- 2.4 Sample containers for chemical tests shall be made of chemically-resistant glass or plastic according to the required test and shall be totally clean and free from any extraneous surface dirt before use.
- 2.5 The closures of sample containers for chemical and physical examinations shall be of glass or plastic according to the required test, and shall be new and thoroughly washed.
- 2.6 For microbiological examinations, the sampling containers and stoppers shall be sterilized to protect samples from contamination until the tests are finished.
- 2.7 Samples shall be collected with great care to insure that they represent the source to be examined, and to avoid accidental contamination of the sample during collection.
- 2.8 Samples for bacteriological examination shall be collected first, to avoid the danger of contamination of the sampling point during collection of the other samples for other tests.
- 2.9 Where samples are being collected for microbiological examinations, the bottles shall not be filled to the end.

3- FREQUENCY OF SAMPLING

Intervals of sampling treated and untreated water and water of the distribution system shall be as follows:-

3.1 Microbiological tests

3.1.1 Treated natural water

— The bacteriological examination of chlorinated or otherwise disinfected water shall be carried out at least once a day at the outlet of each treatment point and before it enters the distribution system from each treatment point.

— A check on the concentration of the chemical disinfectant shall be carried out several times a day at various points throughout the distribution system, and not at the treatment point only.

— The results of these examinations shall be recorded as a permanent reference, and shall be supplemented at least twice a year by an inspection on the spot.

3.1.2 Untreated natural water

For samples of non-disinfected water entering the distribution system, the proposed maximum intervals between successive routine examinations shall be as shown in Table (1):-

Table No. (1)
Maximum intervals for sampling of untreated water

Population served	Maximum interval between two successive samples
Less than 2000	1 month
From 2000 to 50000	2 weeks
From 50000 to 100000	4 days
More than 100000	1 day

3.1.3 Water in distribution system:

3.1.3.1 Samples shall be taken from all the points at which water enters the distribution system.

3.1.3.2 Regardless of the water passing through the distribution system - whether subjected to disinfection or not -the proposed maximum intervals between successive sampling and the minimum number of samples to be examined each month, shall be as given in Table (2):-

3.1.3.3 The maximum intervals of collection the samples which showed in tables (1) and (2) shall be reduced or to be doubled in the case of epidemic or contaminant hazard.

3.2 Physical and chemical tests

3.2.1 The intervals of samples collection for physical and chemical tests shall be less than the intervals of samples collection for microbiological tests.

Table No. (2)
Maximum intervals for sampling from
distribution system water

Population served	Maximum interval between two successive samples	Minimum number of samples to be taken from whole distribution system each month
Less than 5000	1 month	1 sample per 5000
From 5000 to 100000	2 days	1 sample per 5000 population per month.
More than 100000	1 day	1 sample per 10000 population per month.

- 3.2.2 Tests for toxic elements shall be carried out at least one time each year, this period will be reduce when these elements are found in high levels in water sources, or in special cases as construction factories which there wastes contain toxic elements in water source area.
- 3.2.3 All water sources, which served large number of consumers shall be submit for complete chemical tests at least one time each month.
- 3.2.4 Periodically tests (colour, taste, odour, alkalinity, chlorides, ammonia and nitrite) shall be carried out one time each month for water source served 50,000 population or two times each year if the source served less numbers of population.

4- SAMPLING

- 4.1 Sampling for bacteriological tests:
- 4.1.1 Sampling containers:
 Bottles of at least 300 ml capacity, taking the following into consideration:
- 4.1.1.1 It shall be sterilized, provided with ground-glass stopper or metal screw cap, or any other cap made from a heat resistant material.
- 4.1.1.2 The stopper and neck of the bottle shall be protected by paper or by thin aluminium foils.
- 4.1.1.3 If the water contains traces of chlorine, chloramine or ozone, 0.1 ml of sodium thiosulphate 1.8% solution shall be added to sampling bottles, before sterilization, to neutralize these substances in the sample.
- 4.1.1.4 Sample bottle should be kept clean, closed until filled, it is not allowed to touch the stopper and neck of the bottle with anything when filling the sample, holding the bottle near its bottom, fill with sample without washing and close immediately.

- 4.1.2 Sampling procedure:
Water samples for bacteriological tests shall be taken as follows:
- 4.1.2.1 Tap water:
- The tap chosen shall supply water from a service pipe directly connected with the main, and not, for instance, one served from a roof cistern.
 - The outside and inside of the tap nozzle shall be carefully cleaned, then the tap is fully turned on and the water allowed to run to waste for 2 to 3 minutes. Then the tap turned off and the outer surface dried with a clean cloth, and the tap sterilized, either by a blow-lamp, gas torch or by igniting a piece of cotton wool soaked in a methyl alcohol and held close to the nozzle until the tap is unbearably hot to touch. Then the tap is turned on and water allowed to run to waste for a few seconds.
 - The sample bottle shall then be filled from a regular stream of water, avoiding splashing.
- 4.1.2.2 Reservoir water, stream water or spring water:
- The sample shall be representative of the water used for human consumption. It is therefore undesirable to take samples very close to the bank or too far from the point of draw off; and should not be taken from too great a depth, in a stream. Areas of stagnation should be avoided.
 - Hold the bottle near its bottom and plunge its neck downwards below the surface until it arrives to the required depth, the bottle shall then be opened, turned until the neck points slightly upwards, with the mouth facing the direction of the water current. If no current exists as in reservoirs, one should be artificially created by pushing the bottle horizontally forward, then the bottle is filled and immediately closed. If it is not possible to collect samples in this way, a weighted foot may be attached to the bottle, which can then be lowered into the water.
- 4.1.2.3 Water from a well fitted with a hand-pump:
The pump shall be operated continuously for 5 minutes. And the disinfection procedure as in item 4.1.2.1 shall be observed. Then several litres of water shall be pumped to waste, after which the sample shall be collect by allowing water to be pumped directly into the bottle which shall be immediately closed.
- 4.1.2.4 Water from a well fitted with a mechanical pump:
The sample shall be taken from a tap on the rising main or from a nearby tap, before the passage of water into the tank. The disinfection and the sampling procedure shall be carried out as in item 4.1.2.1.
- 4.1.2.5 Water from a well with no pump:
The sample shall be taken by means of a sampling bottle fitted with a weighted foot, and lowered below the surface of the water by means of the lowering device, then opened, and rapidly raised when full and then closed. In this case care should be taken to avoid contamination of the sample by the surface scum.
- 4.1.3 Transportation and storage of bacteriological test samples:

- 4.1.3.1 When the bacteriological test samples have been collected, they shall be sent to the laboratory without delay, it shall be kept in cold and dark place (4-10)°C until arrive to the laboratory accompanied with a report including all the relevant points mentioned in item (5). The samples shall be examined within one hour of their collection, if this is impossible, the interval between collecting the sample and its examination shall not exceed 24 hours in any case, provided that the sample is kept at a low temperature.
- 4.1.3.2 When it is impossible to examine the sample bacteriologically within 24 hours, a special method shall be prepared to carry out the examination at the site, by using the filter membrane method or by having a temporary laboratory at the site.
- 4.2 Sampling for biological tests:
- 4.2.1 Water samples for biological tests shall be taken from distribution system as follows:
- 4.2.1.1 Tap water:
- Samples are collected from tap by filtering a large volume of water through a membrane filter, after drying the membrane can be made transparent by immersion in oil, then microscopic examination is carried out instantly.
 - Or by filtering a large volume of water through a special filter attached to the tap and the deposit is then examined visually and by microscopically.
- 4.2.1.2 Mains' water:
For collecting samples from mains, a special nylon net or bag from cotton shall be attached to the outlet of a hydrant or a section of the main, using a high rate of water flow. The debris found in the bag or in the net is then examined, visually and microscopically.
- 4.2.1.3 Sampling from sources other than the distribution system:
Sampling of other sources shall proceed as mentioned in 4.1 (sampling for bacteriological tests), by using clean, neutral glass bottles of at least 2 litres capacity, with provide the sterilization of these bottles not necessary. Temperature shall be kept very neary from the original source temperature, and immediately sent the samples to lab for test.
- 4.2.2 After collection the sample shall be immediately examined, while the organisms are still alive. Fill the container partially to reduce the biological process for alive organisms and keep it in portable refrigerator and examine after 3 hours from collection. If the examination is delayed, the samples shall be preserved by adding a formalin solution of 2% to 5% concentration for examinations, and also logal solution may be added to search any alive organisms.
- 4.3 Sampling for radiological tests:
- 4.3.1 It is important to choose sampling points in the distribution system and at the sources of supply with care so that the sample is representative of the water to be examined, (because many radionuclides are readily adsorbed on surfaces and solid particles).
- 4.3.2 Samples shall be collected in polyethelene bottles to reduce adsorption on the walls of containers to a minimum, provided that the volume of sample is one litre at least.

- 4.3.3 Samples for radiological examinations shall be examined as soon as possible after collection.
- 4.4 Sampling for physical and chemical tests:
- 4.4.1 For physical and chemical tests samples shall be collected in chemically clean bottles of at least 2 litres capacity, made of neutral colourless glass, or plastic and fitted with ground-glass stoppers.
- 4.4.2 The bottle shall be rinsed out at least three times with the water to be sampled before it is filled, in the case of collection samples for metals determination, samples containers shall be rinsed with hydrochloric acid (1:1), then washed thoroughly before collection of the samples with distilled water free from ions.
- 4.5 Samples shall be transported to the laboratory without delay, and shall be kept cool during transportation. The chemical analysis shall be started as soon as possible and in any case shall not exceed the time determined for each element by 72 hours maximum.

5- SAMPLE SIZE

- 5.1 Bottled drinking and mineral water.
- 5.1.1 Select at random, from the lot, a number of carton equal to the sample size according to Table (3).

Table No. (3)
Sample Size for the Lot of Bottled Water

Lot Size (carton)	Sample Size (carton)
4,800 or less	6
4,801 - 24,000	13
24,001 - 48,000	21
48,001 - 84,000	29
84,001 - 144,000	48
144,001 - 240,000	84
More than - 240,000	126

- 5.1.2 One container, which shall be totally the representative sample for physical and chemical tests, shall be taken at random from each carton and sealed. A similar sealed sample shall be kept with the lot's owner, for reference if needed.
- 5.1.3 Eight containers shall be taken at random from the selected cartons in item 5.1.2 for carrying out the microbiological tests and sealed.
- 5.1.4 Unbottled water
Sample size, containers type and kind of test which carried out on the unbottled water shall be determined according to Table (4).

Table No. (4)
Minimum Sample Size of Unbottled Water

Required test	Minimum sample size (ml.)	Container	Notes
Taste	500	Glass	
Colour	500	Glass or plastic	
Odour	500	Glass	
Turbidity	500	Glass or plastic	
Total dissolved solids	100	"	
pH	25	"	
Electrical conductivity	100	"	
Total hardness	100	"	
Ozone	100	Glass	
Residual chlorine	500	Glass or plastic	
Grease and oil	1000	Glass	
Acidity	100	Glass or plastic	Borosilicate glass
Alkalinity	200	"	
Carbon dioxide	100	"	
Cyanide	500	"	
Fluoride	300	Plastic	
Chromium	300	Glass or plastic	
Mercury	500	"	
Nitrate	100	"	
Nitrite	100	"	
Phenols	500	"	
Phosphate	100	Glass	
Sulphate	100	Glass or plastic	
Arsenic	100	"	
Chloride	50	"	

6- SAMPLE INFORMATION

Samples sent to the laboratory, shall be accompanied with a report containing the following information:

- 6.1 Name and address of authority requesting the examination.
- 6.2 Name and address of the person who draw the sample.
- 6.3 Date and time of collecting the sample.
- 6.4 Reasons for examination and whether it is a routine examination or otherwise.
- 6.5 Source of water (well, spring, stream, public supply system cistern ... etc.).
- 6.6 Exact place from which the sample is taken (whether it is from a tap, and whether the tap is directly connected to the main or is connected to a cistern).

- 6.7 The method of purification and sterilization used, if any (give details of dose of chemicals, point of treatment, quantity treated ... etc.).
- 6.8 Temperature of sample when drawn.
- 6.9 Weather conditions at the time of sample collection.
- 6.10 If the sample is taken from a well the following additional information shall be mentioned:
- 6.10.1 Depth of well, and level of water from ground surface.
- 6.10.2 Whether the well is covered or uncovered, and type, and construction of cover if any.
- 6.10.3 Whether, the well is newly constructed and if there are any recent alterations which might affect the condition of water.
- 6.10.4 Type of construction and type of protective material circulating the well.
- 6.10.5 Proximity of drains, cesspools or other possible sources of pollution, and their position with respect to the well.
- 6.10.6 Whether the well is fitted with a pump; if so (manual or mechanical).
- 6.11 If the sample is taken from a spring, it shall be stated whether the sample is directly from the spring or from a collecting chamber.
- 6.12 If the sample is taken from a stream or wadi the following additional information shall be mentioned:
- 6.12.1 The depth at which the sample is taken.
- 6.12.2 The place from which the sample is taken (middle or side).
- 6.12.3 Level of water (above or below the average).
- 6.12.4 Weather conditions at the time of sampling, and wheather floods or heavy rains have lately occurred.
- 6.12.5 Proximity of any possible source of pollution and its position with respect to the spring or wadi.