

## Sampling Protocol for Commissioning Test of Fresh Water Plumbing System

### 1. General

- 1.1 This sampling protocol is applicable for collection of water samples at water sampling tap and connection point for commissioning of newly installed or replaced inside services for fresh water supply in occupied or unoccupied buildings.
- 1.2 Site supervisors/testing laboratories shall take necessary measures and maintain relevant records to ensure that the water samples are:
- taken by a competent person with proper training supported by relevant training records on the sampling procedures and handling of the water samples.
  - representativeness of the water quality of the new plumbing system at the time of sampling
  - free from contamination during the course of sampling, sample storage and transportation.
- 1.3 Sample Bottles
- 1.3.1 Sample for Metal Tests: Sample bottles shall be made of PE, PP, FEP, PE-HD or PTFE<sup>1</sup>, with a capacity of 1-litre each. Sample bottles and caps shall be: (i) thoroughly cleaned with a phosphate-free detergent solution; (ii) thoroughly rinsed with deionised water; (iii) soaked in dilute nitric acid (~10% volume dilution of concentrated HNO<sub>3</sub>) or dilute hydrochloric acid (~25% volume dilution of concentrated HCl) for 24 hours; (iv) rinsed with deionised water several times, and (v) dried and kept tightly capped in storage.
- 1.3.2 Sample for Chemical and Physical Tests: Sample bottles shall be made of plastics or glass except soda glass with a capacity of 500mL. The bottles shall be prepared in accordance with the ISO 5667-3.
- 1.3.3 Sample for Bacteriological Tests: Sample bottles shall be glass or plastics with a capacity of 250mL and the recommendations for sample bottles given in ISO 19458 shall be followed. The bottles shall be prepared in accordance with the ISO 19458. Sufficient amount of sodium thiosulfate (7.1 mg of sodium thiosulfate (pentahydrate) can neutralise 1 mg of residual chlorine) shall be added into the sample bottle to remove the residual disinfectant present in the water sample.

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<sup>1</sup> FEP: perfluoro(ethylene-propylene) plastic; PE: polyethylene; PP polypropylene; PE-HD: high density polyethylene; PTFE: polytetrafluoroethylene

- 1.4 Water samples shall not be taken at the following drinking water tap or sampling tap:
- Leaking tap;
  - Drinking water tap installed with an inline water filter or a point-of-use filter with no bypass switch;
  - Insufficient space below the tap to accommodate the sampling bottle;
  - Environment with high risk of contamination such as close to works site or dusty environment or dirty water tap.
- 1.5 All information and observation regarding the sampling location shall be recorded, in particular, when a tap at a sampling location is considered not representative and rejected due to conditions mentioned in Clause 1.4 above.
- 1.6 Never rinse sample bottle prior to sample collection.
- 2. Collection of Water Sample from fresh water plumbing system (excluding fresh water flushing and fire service supply)**
- 2.1 Collection of Water Samples for Heterotrophic Plate Count (HPC) Test at Water tap/Connection Point.
- 2.1.1 For fresh water inside service in unoccupied buildings, before flushing, remove and cleanse the strainer. Flush the temporary sampling pipe/tap (for connection point) or water tap for at least 2 minutes. Close the sampling pipe/tap or water tap and reinstall the strainer after flushing. Disinfect the sampling pipe/tap or water tap in accordance with ISO 19458. Open the sampling pipe/tap or water tap and flush briefly<sup>2</sup> with a view to collecting a representative sample from the plumbing system for commissioning test. Place a sterile sample bottle under the sampling pipe/tap or water tap and take 250-mL sample for testing of HPC. For fresh water inside service in occupied buildings, after collecting the water sample for testing of HPC as above, the strainer is removed and cleansed again, followed by 3 minutes flushing at the sampling pipe/tap or water tap. Then the strainer is reinstalled to the water tap before commencing the 30 minutes stagnation period as stated in clause 2.2.1.
- 2.2 Collection of Water Samples for metal, chemical, physical and *E. coli* tests after water stagnation.

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<sup>2</sup> Flush briefly only to overcome influence of disinfection of the tap or to remove non-representative volume of sample trapped inside temporary sampling pipe and tap which is not part of the new plumbing system.

- 2.2.1 Always collect the water sample for metal testing first after the stagnation period (For fresh water inside service in unoccupied buildings, the stagnation period is minimum 6 hours. For fresh water inside service in occupied buildings, the stagnation period is minimum 30 minutes) followed by collection of water samples for analysis of chemical, physical parameters and *E. coli*. The start time of stagnation and the collection time of stagnation samples shall be recorded.
- 2.2.2 Sample Collection at Water Tap
- 2.2.2.1 At the end of the required stagnation period, place a 1-L sample bottle for metal testing under the tap. Collect 1-litre of water with the tap opened as much as possible without spillage. Never rinse the sample bottle before sample collection.
- 2.2.2.2 Immediately after collection of 1-L of water sample, place a 500mL sample bottle for chemical and physical testing under the tap and collect 500mL of water. Close the tap after sample collection.
- 2.2.2.3 Disinfect the tap in accordance with ISO 19458. Open the tap and flush briefly<sup>2</sup> with a view to collecting a representative sample from the new plumbing system for commissioning test. Place a sterile sample bottle under the tap and take 250-mL sample for testing of *E. coli*.
- 2.2.3 Sample Collection at Connection Point
- 2.2.3.1 For sample collected from temporary sampling pipe/tap, at the end of the required stagnation period, open the sampling pipe/tap and flush briefly<sup>2</sup> with a view to collecting a representative sample from the plumbing system for commissioning test. Place a 1-L sample bottle for metal testing under the sampling pipe/tap immediately after the brief flushing. Collect 1-L of water without spillage. Never rinse the sample bottle before collection.
- 2.2.3.2 Follow clauses 2.2.2.2 and 2.2.2.3 to collect water samples for chemical, physical and *E. coli* testing.
- 2A. Collection of Water Sample from fresh water flushing and fire service supply**
- 2A.1 Collection of Water Samples for Physical, Chemical and Bacteriological Tests at Connection Point

- 2A.1.1 Flush the temporary sampling pipe/tap for connection point for at least 2 minutes. Place a 500 mL sampling bottle for physical and chemical tests under the sampling pipe/tap and collect 500 mL of water. Close the sampling pipe/tap after sample collection.
- 2A.1.2 Disinfect the sampling pipe/tap in accordance with ISO 19458. Open the sampling pipe/tap and flush briefly<sup>3</sup> with a view to collecting a representative sample from the new plumbing system for commissioning test. Place a sterile sample bottle under the sampling pipe/tap and take 250 mL sample for bacteriological tests (i.e. *E. coli* and HPC)

### **3. Sample Labelling and Transfer**

- 3.1 All sample bottles shall be properly labelled immediately after sample collection to avoid inadvertent mislabelling and sample mix-up. Pack each water sample bottle in a plastic bag and store them in a cold box for transportation. Deliver the samples to an accredited laboratory for analysis as soon as possible after completion of the sampling. Care shall be taken to avoid sample contamination during sample collection, handling, storage and transportation.

### **4. Retesting Arrangement**

- 4.1 The retesting arrangement in Table 1 shall be followed when any result(s) of parameter(s) fail(s) to comply with the acceptance criteria in Table 2.

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<sup>3</sup> Flush briefly only to overcome influence of disinfection of the tap or to remove non-representative volume of sample trapped inside temporary sampling pipe and tap which is not part of the new plumbing system.

Table 1: Retesting Arrangement

Parameters	Scenarios		
	Metal parameters	fail	pass
Physical and Chemical parameters	pass or fail	fail	pass
Bacteriological parameters ( <i>E. coli</i> and Heterotrophic Plate Count (HPC))	pass or fail	pass	fail
<b>Parameters to be retested</b>	all parameters	all parameters other than metal	

Table 2: Acceptance Criteria

Parameter	Acceptance Criteria
<i>Chemical and Physical</i>	
Turbidity	≤ 3.0 NTU
Colour	≤ 5 Hazen Unit
pH at 25°C	≥ 6.5 and ≤ 9.2
Free Residual Chlorine	> 0 mg/L and ≤ 1.5 mg/L
Conductivity at 25°C	≤ 300 μS/cm
<i>Metals</i>	
Lead	≤ 10μg/L
Chromium	≤ 50μg/L
Nickel	≤ 70μg/L
Cadmium	≤ 3μg/L
Copper	≤ 2000μg/L
Antimony	≤ 20μg/L
<i>Bacteriological</i>	
HPC	≤ 20 cfu/mL
<i>E. coli</i>	0 cfu/100mL

## 5 References:

- 5.1 ISO 5667-3:2012 “Water Quality -Sampling Part 3: Preservation and handling of water samples”
- 5.2 ISO 19458:2006 “Water Quality – Sampling for microbiological analysis”