

# **SPECIFICATIONS FOR BLEACHING POWDER**

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# SPECIFICATIONS FOR BLEACHING POWDER

## GENERAL

### 1 Ambient Conditions

All materials shall be in every respect suitable for storage use and operation in the conditions of temperature and humidity appertaining in Sri Lanka.

The annual average temperature is 35 °C while the relative humidity varies generally from 70% during the day to 90% at night.

### 2 Suitability for Potable Water

Bleaching Powder will come into contact with potable water shall not constitute a toxic hazard, shall not support microbial growth,

### 3 Definitions

The definitions given in the relevant standards which are referred to in the specification shall apply for the terms used in this specification.

### 4 Inspection and Testing

The Manufacturer shall supply, furnish and prepare the necessary test samples of materials and supply the labour facilities and appliances for such testing as may be required to be carried out on his premises according to this specification. If there are no facilities at his own works for making the prescribed tests the Contractor shall bear the cost of carrying out the tests elsewhere.

The Engineer and nominated Inspection authority shall have full access to all parts of the plant that are concerned with the testing, furnishing or preparation of materials for the performance and testing of work under this Specification.

The Contractor shall furnish the Engineer with reasonable facilities and space (without charge) for the inspection, testing and obtaining of such information, as he desires regarding the character of material in use and the progress and manner of the work.

Further all materials shall be tested to the appropriate tests at the manufacturer's premises and shall be supported by a test certificate from the manufacturer.

The format for test certificate shall be in accordance with the format given in the schedule of particulars.

Engineer will appoint an inspection team comprising of 02 officers of NWSDB. The manufacturer should provide Laboratory facilities and other chemicals, supporting staff

and perform the test in presence of this inspection team. The certificate of acceptance of goods issued by the inspection team is compulsory to deliver materials from the manufacturer's plant.

Contractor is held responsibility for the assuring quality of the goods supplied by him until the final delivery point. Bleaching Powder is tested at the Employer's final delivery point by the employer and goods shall conform to the standard for the acceptance.

## **5 Marking**

All markings shall be legible and durable unless otherwise specified and shall be as specified in this specification.

## **6. Protection During Delivery**

The contractor shall provide protection to the approval of the Engineer, prior to the materials leaving the place of manufacture and shall maintain such protection until the items reach their destination in order to guard effectively against damage during transit and storage and the ingress of foreign matter inside the packages.

All details of the proposed method of providing such protection shall be submitted at the time of tendering.

The cost of providing protection shall be included in the unit prices bided in the Bills of Quantities.

## **7. Storing, Handling and Hauling of Materials.**

All materials shall be stored in an approved location and in such a manner as to preserve their quality and condition.

Storage shall be in accordance with the manufacturers recommendation and shall be stored in a dry place with a proper packing.

Materials and components shall be handled in such a manner as to avoid any damage or contamination and in accordance with all applicable recommendations of the manufacturers.

The contractor shall give instructions to the shipper on precautions to be taken in the handling of materials during loading, towage delivery and unloading and shall give particulars of these instructions to the purchaser.

## **8. Manufacturer's Certificate**

The Contractor shall supply to the Engineer a certificate stating that each item supplied has been subjected to the tests laid down herein and conforms in all respects to this Specification or such other Specification which has been submitted to and approved by the Engineer. In addition to this, contractor shall provide certificate for the conformity to the Standards (SLS 759: 1986) from the independent testing agencies mentioned in General condition of contract. Testing at Manufacturers factory by Employer will perform as specified.

## **9. Quality and Workmanship**

The Bidder shall provide ISO 9001 : 2015 Quality Management System requirement certificate for Quality Assurance for the goods manufacturing factory from an accredited agency for Bleaching Powder. Accredited Agency shall be a member of International Accredited Forum (IAF) and shall have the authority for the accreditation of mentioned goods in their scope of accreditation. Scope of the production shall be clearly specified in the certificate. Manufacturer shall maintain the validity of this certificate during the contract Period. If the supply is made from several factories, ISO 9001 : 2015 certificates for quality management system requirement shall be submitted for each factory.

## **10. Technical Specifications for Bleaching Powder**

### **10.1. General Requirements**

- 1.1 All materials to be supplied under this contract shall conform to Sri Lanka standard (SLS) 759: 1986 – Specification for chlorinated lime (Bleaching Powder) and Calcium Hypochlorite.
- 1.2 The material shall be white to slightly yellowish – white in appearance and shall be free from hard lumps and any visible impurities. It shall be dry and free – flowing.
- 1.3 The material shall be partly soluble in water and in 96 percent (V/V) solution of ethanol.
- 1.4 The materials shall evolve chlorine copiously on the additional of 2 mol/l solution of Hydrochloric Acid. When the material is shaken with water and filtered, the filtrate shall yield the two reactions prescribed in Appendix B of SLS 759 : 1986 which are characteristic of Calcium Salts and Chlorides.
- 1.5 Chlorinated Lime (Bleaching Powder) to be supplied shall be new and age from the date of Manufacturers shall be not more than 02 months when shipping.

## 10.2. Other Requirements

Chlorinated lime shall also conform to the relevant requirements, prescribed in Table 1 when tested according to the methods given Column (4) of the table.

**Table 1 – Requirement for Chlorinated Lime and Calcium Hydro chloride**

No. (1)	Characteristics (2)	Chlorinated Gr. 1 (3)	Method of Test (4)
i.	Available chlorine, percent by mass, min	35.0	as prescribed in SLS 759 : 1986
ii.	Loss of available chlorine on heating, on the basis of initial available chlorine percent by mass, max	6.6	-do-
iii.	Moisture, percent by mass, max	0.3	-do-
iv.	Particle size : a) Particles passing through 1.70 mm sieve, percent by mass, min.	} 99.5	-do-
v.	Bulk density, g/ml, min		0.8

## 10.3. Packing

The material shall be packed in air-tight High Density Polyethylene (HDPE) drums (45/50 Kg) with suitable inner-linings. The containers used shall be free from grease, dirt or any other foreign matter likely to cause decomposition of the material.

## 10.4. Marking

Each container shall be legibly & indelibly marked or labeled with the following :

- a) Name of the product :
- b) Grade (for chlorinated lime) :
- c) Name and address of the manufacturer and / or local distributor (including country of origin) :
- d) Trade mark, if any :
- e) Net mass of the contents, in Kilograms :

- f) The words “keep away from heat and moisture” :
- g) Date of manufacture & Date of expiry
- h) Batch or Code Number
- i) The words “National Water Supply & Drainage Board” or “NWSDB”
- j) Contract No

## **10.5. Sampling**

The method of drawing representative samples of material for ascertaining conformity to the requirements of this specification shall be as prescribed below :

### **10.5.1 Lot**

All the containers containing material belonging to one batch of manufacture or supply and ordered for inspection at one time shall constitute a lot.

### **10.5.2 General Requirements of Sampling**

10.5.2.1 Samples shall not be exposed to the atmosphere for a longer time than necessary and sampling shall be done as rapidly as possible.

10.5.2.2 to draw representative samples from the containers selected for sampling, an appropriate sampling instrument (galvanized iron sampling tube, scoop) shall be used.

10.5.2.3. The sampling instrument shall be clean and dry when used.

10.5.2.4. The samples shall be placed in clean, dry and air tight containers on which the material has no action.

10.5.2.5. Each sample container shall be sealed air tight after filling and marked with necessary details of sampling.

10.5.2.6. Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

10.5.2.7 The samples shall be stored in a cool and dry place.

### 10.5.3 Scale of Sampling

10.5.3.1 Samples shall be obtained from each lot for ascertaining its conformity to the requirements or this specification.

10.5.3.2 The number of containers to be selected from a lot <sup>Revised on 17-03-2016</sup> accordance with the Table 2.

Table 2 – Scale of Sampling

Number of containers in the lot	Number of containers to be selected
Up to 50	3
51 to 90	5
91 to 150	6
151 to 300	7
301 and above	8

10.5.3.3 The containers shall be selected at random. In order to ensure randomness of selection, tables of random number as given in SLS 428 shall be used.

### 10.5.4. Preparation of Sample

10.5.4.1 Equal quantities of materials shall be drawn from different parts of each container selected as in 5.3.2 using an appropriate sampling instrument to form a sample of not less than 100 g. The material obtained from each container shall constitute an individual sample to represent the container and shall be transferred to a separate sample container.

10.5.4.2 Equal quantities of material shall be drawn from different parts of each container selected as in 5.3.2 using an appropriate sampling instrument. The material so obtained shall be mixed to form a composite sample of not less than 300 g and transferred to a sample container.

### 10.5.5 Number of Tests

10.5.5.1 Each container selected as in 5.3.2 shall be examined for packaging and marking requirements.

10.5.5.2 The composite samples prepared as in 5.4.2 shall be tested for requirements;



- a) Available Chlorine,
- b) Loss of available chlorine on heating and
- c) Moisture
- d) Partical Size
- e) Bulk density

## 10.6. Method of Test

- 10.6.1 Tests for the requirements laid down in 1.4 and 2 shall be carried out as prescribed in SLS 759 : 1986.
- 10.6.2 During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

## APPENDIX B IDENTIFICATION OF CALCIUM SALTS AND CHLORIDES

### B.1 CALCIUM SALTS

Add a few drops of a solution of ammonium oxalate to the filtrate obtained as in **4.1.3**. Formation of a white precipitate which is only sparingly soluble in 6 mol/l solution of acetic acid but is soluble in hydrochloric acid, indicates the presence of calcium salts.

### B.2 CHLORIDES

Acidify 2 ml of the filtrate obtained as in **4.1.3** with 2 mol/l solution of nitric acid and add 0.4 ml of 0.25 mol/l solution of silver nitrate. Shake and allow to stand. Formation of a curdy white precipitate which yields the following reaction indicates the presence of chlorides.

Centrifuge and wash the precipitate with three quantities, each of 1 ml of water. Carry out this operation rapidly in subdued light, disregarding the fact that the supernatant solution may not become perfectly clear. Suspend the precipitate in 2 ml of water and add 1.5 ml of 10 mol/l solution of ammonia. The precipitate dissolves easily with the possible exception of a few large particles that dissolve slowly.

**APPENDIX C**  
**DETERMINATION OF AVAILABLE CHLORINE**

**C.1 REAGENTS**

**C.1.1** *Sodium arsenite*, 0.1 mol/l solution. Dissolve 4.948 g of arsenious oxide in 150 ml of warm water containing approximately 3 g of sodium hydroxide. Cool, neutralize the excess alkali with 25 per cent (V/V) solution of sulfuric acid using phenolphthalein as the indicator, until the solution is just decolourized. Add 300 ml of water containing about 25 g of sodium bicarbonate. If a pink colour develops, add a few drops of the dilute sulfuric acid to decolourize the solution. Transfer quantitatively to a 1-litre volumetric flask, dilute to volume and mix.

**C.1.2** *Starch solution*. Mix approximately 2 g of soluble starch with sufficient cold water to form a thin slurry. Add the slurry to approximately 1 litre of boiling water, add 1g of salicylic acid and boil until the solution is clear. Cool and store in a glass stoppered bottle.

**C.1.3** *Iodine, standard volumetric solution*,  $c(I_2) = 0.05$  mol/l. Mix  $12.70 \pm 0.05$  g of iodine with twice its mass of potassium iodide. Dissolve in a small quantity of water, filter into a 1-litre volumetric flask, dilute to the mark, and mix well. Pipette 50 ml of the sodium arsenite solution (**C.1.1**) into an Erlenmeyer flask, dilute with 100 ml of water, and add approximately 5 g of sodium bicarbonate. Add 5 ml of starch solution (**C.1.2**) and titrate with iodine solution from a burette until a permanent blue colour is obtained (see Note). Calculate the concentration of the iodine solution as follows:

$$\text{Concentration, in mol/l, of iodine solution} = \frac{5.0000}{V}$$

Where,

$$V = \text{volume, in ml, of iodine solution used.}$$

*NOTE - Iodine solution shall be added cautiously and drop wise near the endpoint.*

## C.2 PROCEDURE

Weigh, to the nearest 0.001 g, approximately 5 g of material and quantitatively transfer to a porcelain mortar. Add 30 ml to 40 ml of water, grind and mix until a smooth paste is obtained. Add more water, stir well, allow the insolubles to settle for a few seconds, and decant the supernatant liquid into a 1-litre volumetric flask. Add more water to the insolubles in to mortar, grind, mix and decant as before. Repeat the operation until all of the material has been transferred to the volumetric flask. Rinse the mortar and pestle and add the rinsings to the volumetric flask. Dilute to the mark with water. Mix thoroughly and without allowing the material to settle, pipette a 50-ml aliquot into a 250-ml Erlenmeyer flask containing 50 ml of water. From a burette pipette add 50 ml of sodium arsenite solution (C.1.1).

Add an excess of sodium bicarbonate (5 g to 10 g) and 5 ml of starch solution (C1.2). Titrate the excess sodium arsenite solution with iodine solution (C1.3) from burette until a permanent blue colour is obtained (see Note in C.1.3).

## C.3 CALCULATION

$$\text{Available chlorine, per cent by mass} = \frac{3.546(V_1c_1 - V_2c_2)}{m}$$

where,

- $V_1$  = volume, in ml, of sodium arsenite solution used;
- $V_2$  = volume, in ml, of iodine solution used;
- $c_1$  = concentration, in mol/l, of sodium arsenite solution;
- $c_2$  = concentration, in mol/l, of iodine solution; and
- $m$  = mass, in g, of sample in aliquot.

**APPENDIX D**  
**DETERMINATION OF LOSS AVAILABLE CHLORINE ON HEATING**

**D.1 APPARATUS**

**D.1.1** *Test tube*, dry, clean tube of length about 150 mm and an internal diameter of about 25 mm.

**D.1.2** *Air condenser*, consisting of a piece of glass tubing of length about 375 mm and an internal diameter of about 5 mm.

**D.1.3** *Oven*, maintained at  $100 \pm 2^\circ\text{C}$ .

**D.2 REAGENTS**

as in **C.1**.

**D.3 PROCEDURE**

Weigh, to the nearest 0.001 g, approximately 15 g of the sample into the test tube (**D.1.1**). Attach the air condenser (**D.1.2**) by means of a rubber stopper in such a way that the tube extends about 12 mm beyond the stopper in to the test tube. Incline the test tube at an angle of about  $15^\circ$  above the horizontal and rotate to loosen the material. Heat the apparatus for 2 hours in an oven (**D.1.3**) maintained at  $100 \pm 2^\circ\text{C}$ . Detach the air condenser, close the test tube with a solid rubber stopper and allow the test tube and its contents to cool to room temperature.

Thoroughly mix the contents of the test tube and determine the available chlorine content, as given in **C.2**.

**D.4 CALCULATION**

Loss of available chlorine, on the basis of

$$\text{initial available chlorine, per cent mass} = \frac{A-B}{A} \times 100$$

where,

- $A$  = per cent by mass, of initial available chlorine; and  
 $B$  = per cent by mass, of available chlorine after heating.

## APPENDIX E DETERMINATION OF MOISTURE

### E.1 PROCEDURE

Weigh, to the nearest 0.1 g, approximately 15 g of the sample in an open, dry weighing glass and place it for 24 hours in a vacuum desiccator (**Caution**, see Note) over fused anhydrous calcium chloride, under an absolute pressure of 30 mm to 40 mm of mercury. Weigh the sample again.

*NOTE - Place the desiccator within a protective enclosure.*

### E.2 CALCULATION

$$\text{Moisture content, per cent by mass} = \frac{m_1 - m_2}{m_1} \times 100$$

where,

- $m_1$  = mass, in g, of the sample before drying; and  
 $m_2$  = mass, in g, of the sample after drying.

## APPENDIX F DETERMINATION OF PARTICLE SIZE

### F.1 PROCEDURE

Weigh, to the nearest 0.1 g, approximately 50 g of the sample and place it on the relevant sieve conforming to **CS 124**. Shake the sieve till no more material passes through it and weigh the material passing through the sieve.

## F.2 CALCULATION

Material passing through the sieve,

$$\text{per cent by mass} = \frac{m_1}{m_0} \times 100$$

where,

$m_0$  = mass, in g, of the sample used; and

$m_1$  = mass, in g, of the sample passing through the sieve.

## APPENDIX G DETERMINATION OF BULK DENSITY

### G.1 APPARATUS

**G.1.1** *Test sieves*, of aperture sizes 1.40 mm and 1.70 mm conforming to **CS 124**.

**G.1.2** *Graduated cylinder*, of 100-ml capacity and from which the lip has been removed.

**G.1.3** Glass sleeve, of about 70 mm in length and closely fitting the graduated cylinder in **G.1.2**.

**G.1.4** *Ring stand*

**G.1.5** *Large rubber stopper*

### G.2 PROCEDURE

Weigh, to the nearest 0.1 g, approximately 40 g of the sample, previously passed either through a 1.40-mm sieve or 1.70-mm sieve (**G.1.1**) as the case may be (see S1. No. iv of Table 1) into a graduated cylinder (**G1.2**). Stopper the graduated cylinder and pass a glass sleeve (**G.1.3**) over it. Clamp the sleeve to a ring stand (**G1.4**). Place a large rubber stopper (**G1.5**) under the cylinder and adjust the sleeve so that the cylinder is 100 mm above the rubber stopper when the base of the cylinder touches the lower edge of the sleeve. Raise the cylinder until it

touches the sleeve, then release. Continue raising and dropping the cylinder until 100 cycles are completed. Read the volume of the sample.

### G.3 CALCULATION

$$\text{Bulk density, grams per milliliter} = \frac{m}{V}$$

where,

$$\begin{aligned} m &= \text{mass, in g, of the sample used; and} \\ V &= \text{volume, in ml, of the sample.} \end{aligned}$$

### 10.7. Criteria for Conformity

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied.

- 10.7.1 Each package examined as in 5.5.1 satisfies the relevant packaging and marking requirements.
- 10.7.2 Each individual sample tested as in 5.5.2 satisfies the relevant requirements.
- 10.7.3 The test results on the composite sample satisfy relevant requirements.

## 11. Deviation from Specification

### Preamble

The bidder is required to list all deviations of materials from the Specification including such information has already been given elsewhere in the Bidding Documents, the information shall be in sufficient detail to enable the Engineer to make a realistic assessment of the effect of such deviations on the performance or life of the materials to be supplied.

Deviation

Additional sheets should be attached as necessary