SPECIFICATIONS FOR HYDRATED LIME

SPECIFICATION INCLUDED IN THE CONTRACT DOCUMENT SUPERSEDES THE PERTICULAR CONTENT IN THE SLS 682:1984

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GENERAL

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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 30 °C while the relative humidity varies generally from 70% during the day to 90% at night.

2 Suitability for Potable Water

Hydrated Lime will come into contact with potable water shall not constitute a toxic hazard, shall not support microbial growth and shall be suitable for human consumption.

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 Agency 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 one Engineer and one Chemist 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. Hydrated Lime is tested at the Employer's final delivery point by the Engineer 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 tendered 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 682:1984) suitable for human consumption from the independent testing agencies mentioned in General condition of contract. Testing at Manufacturers factory by the Engineer will perform as specified.

9. Quality and Workmanship

Hydrated Lime which are intended to supply shall be manufactured in compliance with the ISO 9001: 2008/2015 quality management system standards. Quality management system certification should be from an organization which is a member of International Accreditation Forum and shall have accredited to issue such certification and the manufacturer shall have this certification valid during the supply and delivery of the materials. Document any evidence regarding accreditation together with the scope of certification should be provided.

TECHNICAL SPECIFICATION FOR HYDRATED LIME

1.0 GENERAL

Hydrated Lime shall be in the form of a fine white powder which is free from lumps and hard caking. It shall be substantially free from foreign mater and core and shall conform to SLS 682 : 1984 standard together with calcium Hydroxide content specified in the clause 3 hereof.

Hydrated Lime shall be food grade.

Note : Core is that fraction of limestone which has resisted dissociation the kiln. It results from incomplete calcinations or under burning.

2.0 PARTICLE SIZE

2.1 Not less than 99.5 percent by mass of the material shall pass through a 600 μm sieve and not less than 98.5 percent by mass shall pas through a 75 – μm sieve when tested as prescribed in Appendix B of SLS 682 : 1984.

3.0 CALCIUM HYDROXIDE CONTENT

3.1 The material shall contain not less than 90 percent by mass of calcium hydroxide when tested as prescribed in Appendix C of SLS 682 : 1984.

4.0 BASICITY FACTOR

4.1 Basicity factor of the material shall be not less than 0.72 when tested as prescribed in Appendix D of SLS 682 : 1984.

Note : The basicity factor of a lime or limestone product is a measure of available alkalinity. It represents the grams of calcium oxide equivalent per gram of lime or limestone product used for comparing the relative neutralizing values.

5.0 PACKAGING

Hydrated Lime shall be packed in 25 Kg. quantities in paper (or Suitable) bags having two polythene inner liner as per the standard SLS 682 : 1984 and shall be free from dirt, any foreign matters likely cause decomposition of the material.

5.1 Marking.

Each package shall be legibly and indelibly marked with the following information.

(a) Name of the product

(b) Name and Address of the manufacturer

(c) Trade mark, if any

(d) Net mass of the Contents, in Kilograms :

(e) The words “keep away from heat and moisture” :

(f) Date of manufacture & Date of expiry.

(g) Batch or code Number

(h) The words “National Water Supply and Drainage Board” or NWSDB”

(i) Contract No.

6.0 SAMPLING

6.1 Lot

In any consignment all the packages containing the same quantity of Hydrated Lime of one batch of manufacture or supply shall constitute a lot.

6.2 General Requirements of sampling

6.2.1 in drawing, handling and preparation of sample the following precautions shall be observed :

6.2.1.1 Sampling and preparation of sample shall be conducted as expeditiously as possible in order to avoid undue exposure of the material to the air.

6.2.1.2 Samples shall not be taken from broken packages.

6.2.1.3 Sampling instrument shall be clean and dry when used.

6.2.1.4 Samples shall be placed in clean, dry and air-tight glass or other suitable containers.

6.2.1.5 The material being sampled, the sampling instruments and the containers for samples shall be protected from adventitious contamination.

6.2.1.6 The sample containers shall be air-tight after filling and marked with necessary details of sampling.

6.2.1.7 Samples shall be stored in the shade.

6.3 Sampling Instruments

A sampling tube having a core diameter of not less than 25 mm shall be used.

6.4 Scale of Sampling

6.4.1 Each lot shall be tested separately for ascertaining its Revised on 16-03-2016
requirements of this specification.

6.4.2 The number of packages to be selected from a lot shall be in accordance with

Table 1.

Table 1 – Scale of Sampling

Number of Packages in the lot	Number of Packages to be selected
Up to 08	02
09 to 27	03
28 to 64	04
65 to 100	05
101 to 300	06
301 to 500	07
501 to 800	08
801 to 1300	09
1301 to above	10

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

6.5 Preparation of Sample

6.5.1 A representative sample of material shall be obtained form each package selected as in 6.4.2 in accordance with method given in 6.5.2.

6.5.2 The sampling tube shall be inserted into a package being sampled so that it will take a core material from substantially the entire length of the package.

6.5.3 The material obtained from each package shall be thoroughly mixed and reduced by coning and quartering to obtain a test sample of not less than 150g.

6.6 Number of Tests

6.6.1 Each package selected as in 6.4.2 shall be examined for packing and marking requirements. (This may be done at the place of sampling)

6.6.2 The sample prepared as in 6.5.3 shall be tested for requirements specified in 1.0, 2.0,3.0 and 4.0 of this specification.

7.0 METHOD OF TEST

The materials shall be tested by the appropriate methods prescribed in Appendix B to D of SLS 682 : 1984 which in given below. If manufacturer uses different test method, those test methods shall be submitted verify whether those test methods shall comply with the that of SL 682 : 1984.

APPENDIX B

DETERMINATION OF PARTICLE SIZE

B.1 APPARATUS

B.1.1 *Test sieves,* with nominal aperture 600- µm 75- µm conforming to CS 124.

B.2 PROCEDURE

B.2.1 Weigh about 100g of the sample of hydrated lime to the nearest 0.1g and place on a 600-µm sieve, which is nested above a 75-µm sieve. Wash the material through the sieves by means of a stream of water from a faucet. Use a piece of rubber tubing attached to the water faucet for the washing. The velocity of the water may be increased by pressing the tubing, but shall not cause any splashing of the sample over the sides of the sieve. Continue the washing until the water coming through the sieve is clear, but no case should the washing be continued for more than 30 minutes. Take care not to let water accumulate on the 75- µm sieve, as the openings will be clogged and the operation cannot be completed in 30 minutes. Dry the residues on both sieves in an atmosphere free from carbon dioxide at a temperature between 100 ºC and 120 ºC, and weigh. Continue the drying and weighings operation until the deference between to successive weighings is not more than 0.01 g.

B.3 CALCULATION

B.3.1 Calculate the percentage residue retained on each sieves, based on the original mass of the sample. The mass of the material retained on the 600-µm sieve shall be added to the mass of the material on the 75-µm sieve to obtain the mass of the material retained on the 75-µm sieve.

APPENDIX C

DETERMINATION OF CALCIUM HYDROXIDE CONTENT

Two methods have been prescribed for the determination of calcium hydroxide content. For routine analysis, the iodine method prescribed in C.1 may be used but in case of dispute, the sugar method prescribed in C.2 shall be used.

C.1 IODINE METHOD (ROUTINE METHOD)

C.1.1 Reagents

C.1.1.1 *Sodium thiosulfate*, standard volumetric solution

c ($Na_2S_2O_3$) =0.05 mol/l, freshly standardized against standard iodine solution.

C.1.1.2 *Iodine*, standard volumetric solution c (I_2) =0.05 mol/1, freshly standardized against standard sodium thiosulfate solution.

C.1.1.3 *Starch indicator solution*, triturate 5 g of starch and 0.01 g mercuric iodide with 30 ml of cold water and pour it slowly with stirring, into one litre of boiling water. Boil for three minutes. Allow the solution to cool and decant the supernatant clear liquid.

C.1.2 Procedure

C.1.2.1 Take 0.1 g to 0.2 g of the material, weighed to the nearest 0.001 g in a glass - stoppered conical flask and add about 80 ml of boiling water. Shake it for 30 minutes till hydration is complete. Cool the solution and add a known excess of iodine solution (C.1.1.2), say 75 ml, and stir occasionally until the lime has gone into solution.

Any insoluble silica present is easily distinguished from the milky - appearance of lime. The solution after excess addition of iodine should be of the same colour as a solution of 10 ml of iodine in 100 ml of water, that is, deep red. Allow about 10 minutes for complete reaction of lime with iodine. The excess of iodine is titrated

against sodium thiosulfate solution (C.1.1.1) using the starch solution (C.1.1.3) as indicator.

C.1.3 Calculation

Calcium hydroxide content,
Per cent by mass $= \frac{7.4(75c_1 - \frac{Vc_2}{2})}{m} \times 100$

Where,

V = Volume, in ml, of sodium thiosulfate solution (C.1.1.1) ;

c_1 = Concentration of the iodine solution (C.1.1.2), in mol/1.

c_2 = Concentration of the sodium thiosulfate solution, in mol/1; and

m = mass, in g, of the material taken for the test.

C.2 SUGAR METHOD (REFERENCE METHOD)

C.2.1 Reagents

C.2.1.1 *Rectified spirit*, conforming to SLS 351

C.2.1.2 *Hydrochloric acid*, standard volumetric solution c (HC1) = 0.1 mol/1

C.2.1.3 *Sodium hydroxide*, standard volumetric solution c (NaOH) = 0.1 mol/1

C.2.1.4 *Sugar solution*, approximately 15 per cent sucrose (m/V) in carbon dioxide - free water.

C2.1.5 *Phenolphthalein indicator solution,* dissolve 0.5 g of phenolphthalein in 100 ml of rectified spirit.

C.2.2 Procedure

C.2.2.1 Weigh to the nearest 0.001 g about 1 g of the finely powdered material into a 500 ml volumetric flask and wet it with the minimum amount of rectified spirit (C.2.1.1). Shake with about 400 ml of sugar solution (C.2.1.4) for 3 hours mechanically. Dilute to volume. Filter through a coarse, dry filter paper (Whatman No. 40 of its equivalent) into a dry flask. Discard the first 25 ml of the filtrate. Pipette out 50 ml from the

filtrate into another flask to which 50 ml of hydrochloric acid (C.2.1.2) is added and titrate with sodium hydroxide solution (C.2.1.3) using phenolphthalein (C.2.1.5) as indicator.

C.2.2.2 Run a blank using 50 ml of sugar solution and 50 ml of hydrochloric acid.

C.2.3 Calculation

Calcium hydroxide content,

Per cent by mass $= \frac{37.04\,(V_1 - V_2)c}{m}$ **x 100**

Where,

V_1 = Volume, in ml, of sodium hydroxide solution (C.2.1.3) used in blank;

V_2 = Volume, in ml, of sodium hydroxide solution used with the material;

c = Concentration of the sodium hydroxide solution in mol/1; and

m = mass, in g, of the material taken for the test.

APPENDIX D

DETERMINATION OF BASICITY FACTION

D.1 REAGENTS

D.1.1 *Sulfuric acid,* standard volumetric solution, c(H_2SO_4) = 0.250 mol/1.

D.1.2 *Potassium hydroxide,* standard volumetric solution, c(KOH) = 0.500 mol/1.

D.2 PROCEDURE

D.2.1 Weigh to the nearest 0.001 g about 1 g of the sample which has been ground to pass a 150-µm sieve (conforming to CS 124) and transfer to a 500-ml erlenmeyer flask containing about 20 ml of cold water. Add from a burette 100 ml of sulfuric acid (D.1.1) and stopper with a two-hole rubber stopper. Place the flask on a hot plate and boil for 15 minutes. (Glass beads may be added to prevent bumping). Remove the

flask from the hot plate and cool in water. Add several drops of phenolphthalein indicator solution and titrate the excess acid with potassium hydroxide solution (D.1.2).

D.3 CALCULATION

Calculate the basicity factor as follows:

$$\text{Basicity factor} = \frac{V_1 c_1 - V_2 c_2}{m} \times 0.028$$

Where,

V_1 = Volume, in ml, of sulfuric acid solution (D.1.1) required for titration of the sample:

V_2 = Volume, in ml, of potassium hydroxide solution (D.1.2) required for titration of the excess:

C_1 = Concentration of the sulfuric acid solution in mol/1:

C_2 = Concentration of the potassium hydroxide solution in mol/1: and

m = Mass, in g, of sample.

8.0 CONFORMITY TO STANDARD

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

8.1.1 Each package examined as in 6.6.1 satisfies the relevant packages and marking requirements.

8.1.2 The sample tested as in 6.6.2 satisfy the relevant requirements.

9.0 AGE FROM THE DATE OF MANUFACTURING

Hydrated lime to be supplied shall be new and age from the date of manufacturing shall be not mare than 02(two) months when supplying.