1.00.00 GENERAL

This specification covers the requirements of manufacture, physical & chemical properties, inspection, testing and packing for supply of Calcium silicate preformed insulation suitable for service temperature upto 650 °C.

2.00.00 CODES & STANDARDS

2.01.01 The manufacture, physical & chemical properties, inspection and testing of Calcium silicate preformed insulation shall conform to the latest edition of the following standards.

2.01.02 IS:8154 Specification for preformed Calcium silicate insulation (for temperature upto 650°C).

2.01.03 IS:3346 Methods for determination of thermal conductivity of thermal insulation materials (two slab, guarded hot-plate method).

2.01.04 IS:9490 Method for determination of thermal conductivity of thermal insulation materials (water calorimeter method).

2.01.05 IS:5688 Methods of test for preformed block type and pipe-covering type thermal insulation.

2.01.06 IS:5724 Methods of test for thermal insulation cement.

2.01.07 IS:3144 Methods of test for mineral wool thermal insulation materials (for test for Chloride Content).

2.01.08 In case of any conflict between the above standards and this specification, the latter shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Purchaser’s Engineer shall be final and binding.

2.01.09 IS:7509 Thermal Insulating Cements-Specification.

3.00.00 MANUFACTURE

Preformed Calcium silicate insulation shall be made from reacted hydrous Calcium silicate reinforced with suitable inorganic fibres, and shall be formed into Pipe sections (two semi-cylinders), Curved segments (radiused & bevelled lags), Bevelled Lags and Flat blocks.

4.00.00 DIMENSIONS AND DIMENSIONAL TOLERANCES

4.01.00 The dimensions of the various forms of Calcium silicate insulation shall be as follows

4.01.01 PIPE SECTIONS

Length : 450, 500, 600 or 900 mm
Diameter (internal) : To fit standard pipes of external dia upto 219.1 mm
Thickness : 25, 40, 50, 60 or 75 mm

4.01.02 CURVED SEGMENTS (RADIUSED & BEVELLED LAGS)

Length : 450, 500, 600 or 900 MM
Diameter (internal) : To fit standard pipes of external dia above 219.1 mm and upto 610 mm.
Thickness : 25, 40, 50, 60 or 75 mm
4.01.03 **BEVELLED LAGS**
Length : 450, 500, 600 or 900 mm
Width  : 75 or 150 mm to fit standard pipes of external dia above 610 mm.
Thickness : 25, 40, 50, 60 or 75 mm.

4.01.04 **FLAT BLOCKS**
Length : 450, 500, 600 or 900 mm
Width  : 150, 300 or 600 mm
Thickness : 25, 40, 50, 60 or 75 mm

4.02.00 Flat blocks shall be free from warp. Mating faces shall be plane and edges shall be square to the surfaces and to one another.

4.03.00 Pipe sections and bevelled lags shall be concentric and free from warp. Mating faces shall be plane and ends shall correspond with a plane at right angles to the long axis.

4.04.00 Bevelled edges of curved segments (radiused & bevelled lags) shall correspond with the radii of the curved surface to be insulated.

4.05.00 The dimensional tolerance of preformed calcium silicate insulation shall be as follows. The method of measuring dimensions shall be as per IS:5688.

4.05.01 **FLAT BLOCKS AND BEVELLED LAGS**
Length : + 3 mm
Width  : ± 3 mm
Thickness : +3 mm and -1.5 mm

4.05.02 **PIPE SECTIONS AND CURVED SEGMENTS (RADIUSED & BEVELLED LAGS)**
Length : +3 mm
Diameter (inside) : + 5 mm and -0 mm
Thickness : +3 mm and -1.5 mm

5.00.00 **BULK DENSITY AND TOLERANCES ON DENSITY**
5.01.00 The bulk density of the preformed calcium silicate insulation shall be in the range of 200 to 280 kg/m³. The tolerance on manufacturer's declared nominal / specified density shall be +10% and -5%. The method of determining the bulk density shall be as prescribed in IS:5688.

6.00.00 **MATERIAL PROPERTIES**

6.01.00 **COMPRESSIVE STRENGTH**
The reduction in thickness under the following conditions shall not exceed 5% when tested as per the method given in IS:5688

a) Dry condition under a load of 415 kN/m²
b) Wet condition (after 18 hours immersion in water) under a load of 170 kN/m²
6.02.00 **THERMAL CONDUCTIVITY**

The thermal conductivity (k-value) of the calcium silicate insulation shall not exceed the values given below when determined in accordance with the method prescribed in IS:3346 or IS:9490, at a cold face temperature of not more than 80 °C (during testing).

<table>
<thead>
<tr>
<th>Mean Temp (°C)</th>
<th>Thermal conductivity (mW/cm°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0.61</td>
</tr>
<tr>
<td>150</td>
<td>0.67</td>
</tr>
<tr>
<td>200</td>
<td>0.74</td>
</tr>
<tr>
<td>250</td>
<td>0.80</td>
</tr>
<tr>
<td>300</td>
<td>0.87</td>
</tr>
</tbody>
</table>

6.03.00 **HEAT RESISTANCE**

When tested in accordance with IS:5724 under conditions of soaking heat for 24 hrs at the temperature of use i.e. 650 °C, the material shall be deemed suitable when the following requirements are met:

a) Linear shrinkage : 2% Max.
b) Compressive Strength : Max 5% reduction in thickness under a load of 345 KN/m²
c) Loss in weight : 12 % Max.

6.04.00 **FLEXURAL STRENGTH**

The flexural strength of the material shall not be less than 250 kN/m² when tested as per the method given in IS:5688.

6.05.00 **MOISTURE CONTENT**

The moisture content of the material shall not exceed 6.0% by weight when tested in accordance with the method prescribed in Annex - A of IS:8154.

6.06.00 **ALKALINITY**

When tested in accordance with the method prescribed in Annex - B of IS:8154, the pH value recorded shall be between 7.0 and 10.0.

6.07.00 **CHLORIDE CONTENT**

The material shall not contain leachable chloride in excess of 0.02% when tested as per IS:3144.

7.00.00 **PACKING AND MARKING**

7.01.00 Calcium silicate insulation shall be packed in Polythene all around and sealed to prevent moisture absorption during transit and storage, and further shall be packed in cardboard boxes & sealed and then stretch wrapped.

7.02.00 Insulation as well as the packages shall be serial numbered. Also, printed sheets indicating the nominal thickness, density and BHEL’s serial no. (given in bill of materials / insulation schedule) shall be placed inside the Polythene cover for proper identification.
7.03.00 Following details shall be legibly written on the packages with the help of stencils. Also, these details shall be typed on a sheet of paper and kept in a sealed polythene cover, inside the package.
   a) Project Name
   b) Purchase Order No.
   c) Sl. No. of package
   d) BHEL's Sl. no.
   e) Nominal thickness
   f) Pipe size for which it is suitable and Length
   g) Density
   h) Weight of the package.

8.00.00 INSPECTION AND TESTING
8.01.00 Calcium silicate insulation to be supplied under this specification shall be of tested quality. The manufacturer shall conduct all tests as called for in the specification and shall furnish the test certificates before the despatch of materials.
8.02.00 Sampling of calcium silicate testing shall be as per Appendix-C of IS:8154,

9.00.00 QUALITY ASSURANCE AND QUALITY PLAN
Calcium silicate insulation to be supplied, shall have assured quality and workmanship. Extent of Inspection & testing and BHEL’S witness hold points shall be as per Quality Plan enclosed herewith.

10.00.00 DATA AND INFORMATION TO BE SUBMITTED WITH THE BID.
Bidder shall submit the following data and information alongwith the bid without which the offer will be deemed incomplete.
10.01.00 Manufacturer’s descriptive literature and illustrative catalogues for the materials offered.
10.02.00 Quality plan duly signed with bidder’s seal.
10.03.00 Details of packing for various materials indicating the quantity, size, shape, dimensions etc. of the contents in each Package and type of packing.
10.04.00 A comprehensive write-up on the test to be conducted for thermal insulating materials, inspection methods, testing facilities and QA system adopted by the manufacturer.

11.00.00 DATA AND INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT
After the award of the contract, the following data and information to be submitted for review/approval of BHEL as per the distribution schedule.
11.01.00 Within 2 (two) weeks from the date of LOI, the following shall be submitted.
11.01.01 Bar chart indicating the completion dates of various activities i.e. placement of order for bought-out items, inspection & testing, packing & shipment etc.
11.02.00 Before the dispatch of the materials the following shall be furnished.
11.02.01 Material test certificates
11.02.02 Shop tests reports and certificates
11.02.03 Storage instructions
11.03.00 In addition to the above, monthly progress reports indicating the status / progress of various activities shall be furnished every month.