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मानक

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IS 1849-1-2 (1991): Design and installation of vertical mixed feed type lime kiln guide, Part 1: For limestone, Section 2: RCC type shaft [CED 4: Building Limes and Gypsum Products]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS 1849 (Part 1/Sec 2) : 1991

भारतीय मानक

ऊर्ध्व मिश्रित भरण किस्म की भट्टियों के डिजाईन और
संस्थापक मार्गदर्शिका

भाग 1 चूना पत्थर के लिए

अनुभाग 2 प्रबलित सीमेंट कंक्रीट टाइप शाफ्ट

Indian Standard

**DESIGN AND INSTALLATION OF VERTICAL
MIXED FEED LIME KILN — GUIDE**

PART 1 FOR LIMESTONE

Section 2 Reinforced Cement Concrete Type Shaft

UDC 666·9·041 (026)

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

September 1991

Price Group 2

Building Limes and Lime Products Sectional Committee, CED 4

FOREWORD

This Indian Standard (Part 1/Section 2) was adopted by the Bureau of Indian Standards, after the draft finalized by the Building Limes and Lime Products Sectional Committee had been approved by the Civil Engineering Division Council.

For refinement and standardization of the technique of manufacture of building limes, which are mostly produced in small scale industries, it was felt that guidelines for the design of lime kiln based on studies carried out by the Central Building Research Institute, Roorkee; Khadi and Village Industries Commission, Bombay and Gujarat Engineering Research Institute, Vadodara could be formulated so that it will be helpful in setting up kilns for the manufacture of building lime in the villages and small scale industries. For efficient design of kiln a number of factors, such as chemical composition of limestone, type of the fuel and output required are considered. This standard gives general guidance for the design and installation of lime kiln in which the charge is fed from top and lime is drawn from the bottom of the shaft through discharge opening. This standard (Part 1/Section 2) has been prepared based on studies conducted by Gujarat Engineering Research Institute, Vadodara and covers the general principles of design and construction of vertical mixed feed reinforced cement concrete shaft type kiln for manufacture of lime from limestone. For the present, requirements are being covered up to a capacity of 10 tonnes per day.

This standard has been prepared in two parts, Part 1 covers design and installation of kilns for the manufacture of lime from limestone and Part 2 covers design and installation of kilns for the manufacture of lime from limeshell.

Part 1 of this standard is in two sections, Section 1 covering the masonry type shaft and Section 2 covering the reinforced cement concrete type shaft.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

AMENDMENT NO. 1 JULY 2011
TO
IS 1849 (PART 1/SEC 2) : 1991 DESIGN AND INSTALLATION OF VERTICAL
MIXED
FEED LIME KILN — GUIDE

PART 1 FOR LIMESTONE

Section 2 Reinforced Cement Concrete Type Shaft

(Page 1 clause 2.1) — Substitute the following second and third entries for the existing:

'IS No.

Title

195 : 2005 Fireclay mortar for laying fireclay refractory bricks — Specification (*fourth revision*)

456 : 2000 Plain and reinforced concrete — Code of practice (*fourth revision*)'

(Page 1, clause 5.1, line 4) — Substitute 'M 20 (*see* IS 456 : 2000)' for 'M 15 (*see* IS 456 : 1978)'.

(Page 1, clause 5.2, line 4) — Substitute 'M 20 (*see* IS 456 : 2000)' for 'M 15 (*see* IS 456 : 1978)'.

(Page 3, clause 5.3.2.1, line 3) — Substitute 'IS 456 : 2000' for 'IS 456 : 1978'.

(Page 3, clause 5.3.2.1, line 10) — Substitute 'IS 195 : 2005' for 'IS 195 : 1963'.

(CED 4)

Reprography Unit, BIS, New Delhi, India

Indian Standard

DESIGN AND INSTALLATION OF VERTICAL MIXED FEED LIME KILN — GUIDE

PART 1 FOR LIMESTONE

Section 2 Reinforced Cement Concrete Type Shaft

1 SCOPE

1.1 This standard (Part 1/Section 2) covers details for the design and installation of vertical mixed feed reinforced cement concrete shaft type kilns for manufacture of lime from limestone upto a capacity 10 tonnes per day.

2 REFERENCES

2.1 The Indian Standards given below are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
6 : 1983	Moderate heat duty fireclay refractories, group 'A' (<i>fourth revision</i>)
195 : 1963	Fireclay mortar for laying fireclay refractory bricks (<i>second revision</i>)
456 : 1978	Code of practice for plain and reinforced concrete (<i>third revision</i>)
6508 : 1988	Glossary of terms relating to building lime (<i>first revision</i>)

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 6508 : 1988 shall apply.

4 SIZE OF KILN

4.1 The size of the kiln shall be mainly decided by the output required from it which will in turn depend upon the type of fuel and chemical composition of limestone.

4.2 The typical details and dimensions of a 10 TPD kiln are given in Fig. 1 for guidance.

NOTE — The dimensions given in Fig. 1 were adopted by Gujarat Engineering Research Institute (GERI), Vadodara. Quality of limestone and fuel used by GERI during experimental burning were as under:

a) *Limestone*

CaCO₃ — 87 percent
Specific gravity — 2.6
Size — 75 to 100 mm

b) *Coal*

Fixed carbon — 55 percent
Calorific value — 6 200 KCal/kg
Size — 30 to 50 mm

5 INSTALLATION

5.0 A vertical mixed feed reinforced cement concrete shaft kiln shall consist of the following:

- a) Foundation,
- b) Base,
- c) Super structure:
 - i) Discharge place, and
 - ii) The shaft of the kiln, and
- d) Charging device.

5.1 Foundation of the Kiln

A suitable reinforced cement concrete foundation shall be provided depending on the nature of the soil and expected loads. Concrete weaker than grade M 15 (*see* IS 456 : 1978) shall not be used.

5.2 Base of the Kiln

The base of the kiln shall be made of reinforced cement concrete which shall be suitably designed to rest the shell. Concrete weaker than grade M 15 (*see* IS 456 : 1978) shall not be used.

5.3 Superstructure

5.3.1 Discharge Place

Discharge openings of suitable size shall be provided diametrically opposite and shall be fitted with metal doors of flood gate type with counter weight balancing for facility of easy operation.

The fire bricks shall be laid in arch above opening. For protection against wear, steel lining may be provided from the floor of the shaft upto 1 m above top of the fire brick arch.

5.3.2 Shaft of the Kiln

The shaft shall be circular and shall have constant diameter from top to bottom. The shaft of the kiln shall consist of:

- a) Lining,
- b) Insulation,
- c) Outer wall or the shell, and
- d) Inspection steps.

5.3.2.1 The outer wall or the shell shall be designed and constructed in M 20 grade concrete (see IS 456 : 1978) with hoop and vertical reinforcement. The coarse aggregate shall comprise of crushed metal made up of one single type of rock so as to have concrete of uniform thermal property. Shell shall be cast in stages of not more than 1 metre. The fire bricks (see IS 6 : 1983) shall then be laid to the same height with fire clay mortar (see IS 195 : 1963) using thin joints and pointing shall be done with refractory cement.

A wash of refractory cement shall be applied only on the inside face. The plaster of diatomaceous earth shall be applied to the outer side of the fire brick lining after the lining is laid. The gap between the inner face of shell and the diatomaceous earth shall then be filled with 'no-fines' concrete with brick bat or coarse aggregate in the proportion of 8 parts of aggregate to 1 part of cement. A cage of 10 mm rod shall be laid on the outer surface of the fire brick lining duly anchored with dowel bars from shell at 1 m interval vertically and circumferentially. The dowel bars shall be coated with diatomaceous earth for protection.

5.3.2.2 A 15 cm thick cement concrete coping with a drip moulding and sloping outside shall be laid at the top of the kiln.

5.3.2.3 *Poke holes*

Poke holes shall be provided around the periphery of the kiln throughout the height. The poke holes of 100 mm diameter should generally be placed at intervals of 1.5 m along the height and 3 m along the circumference. The holes shall be duly fitted with refractory pipes extending 30 mm beyond the shell and provided with refractory plugs.

5.3.2.4 *Inspection steps*

Inspection steps made of 15 mm diameter bars shall be provided to have access to the poke holes.

5.4 *Charging*

Any charging device which is found to be convenient shall be adopted.

5.5 *Temperature Control*

Thermocouples fitted with pyrometer shall be inserted through poke holes for measurement of temperature in the various zones of the kiln.

5.6 *Forced Draft*

Air blower of suitable capacity shall be provided to provide forced draft into the kiln.

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