भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
BUREAU OF INDIAN STANDARDS
(Ministry of Consumer Affairs, Food & Public Distribution, Govt. of India

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प्रारंभिक मसौदा

हमारा संदर्भ : सीईडी 06/टी-6 **30 सितम्बर 2024**
तकनीकी समिति : पत्थर विषय समिति, सीईडी - 06
प्राप्तकर्ता :

क) सिविल इंजीनियरी विभाग परिषद्, सीईडीसी के सभी सदस्य
ख) सीईडी 06 के सभी सदस्य
ग) रूचि रखने वाले अन्य निकाय

प्रिय महोदय/महोदया,

निम्नलिखित भारतीय मानक का मसौदा संलग्न हैं:

प्रलेख संख्या	शीर्षक
सीईडी 06 (26663)P	**प्राकृतिक निर्माण पत्थरों की पहचान की विधि** (IS 1123 का *दूसरा पुनरीक्षण*) ICS No. 91.100.15

कृपया इस मसौदे की जाँच करें और इसमें और सुधार के संबंध में अपनी सम्मतियाँ साझा करें।

सम्मतियाँ भेजने की अंतिम तिथि: 21/10/2024

टिप्पणियाँ, यदि कोई हों, बीआईएस ई-गवर्नेंस पोर्टल https://www.services.bis.gov.in/php/BIS_2.0/WCDraft/comment_pdraft.php के माध्यम से ऑनलाइन भेजी जा सकती हैं।

वैकल्पिक रूप से, टिप्पणियाँ संलग्न प्रारूप में भी दर्ज की जा सकती हैं और ced06@bis.gov.in या divya.s@bis.gov.in पर ईमेल की जा सकती हैं।

आपको अपनी टिप्पणियाँ सबमिट करने के लिए लॉग इन करने की आवश्यकता हो सकती है, कृपया लॉग इन करने के लिए अपने मोबाइल नंबर (बीआईएस को प्रदान किया गया) और ओटीपी प्रावधान का उपयोग करें।

यदि कोई सम्मति प्राप्त नहीं होती है अथवा सम्मति में केवल भाषा संबंधी त्रुटि हुई तो हम मान लेंगे कि प्रारंभिक मसौदे के लिए आपका अनुमोदन प्राप्त हुआ है। यदि सम्मति तकनीकी प्रकृति की हुई तो उसे विषय समिति के अध्यक्ष के परामर्श से आवश्यक कार्रवाई के लिए विषय समिति के सामने रखा जाएगा।

धन्यवाद।

भवदीय
ह/-
(दिव्या एस.)
सदस्य सचिव सीईडी 06
वैज्ञानिक 'डी'(सिविल इंजीनियरिंग)
ई-मेल: **divya.s@bis.gov.in**

संलग्न: उपरलिखित

भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
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PRELIMINARY DRAFT

Our Reference: CED 06/T-6 **30 September 2024**

Technical Committee: Stone Sectional Committee, CED 06

Addressed To:

a) All Members of Civil Engineering Division Council, CEDC
b) All Members of CED 06
c) All others interested

Dear Sir/Madam,

Please find enclosed the following document:

Doc No.	*Title*
CED 06 (26663)P	**Method of Identification of Natural Building Stones** [*Second Revision* of IS 1123] ICS No. 91.100.15

Kindly examine the attached draft and forward your comments for further improvement.

Last Date for comments: 21 October 2024

Comments if any, may be sent online through the BIS e-governance portal at https://www.services.bis.gov.in/php/BIS_2.0/WCDraft/comment_pdraft.php.

Alternatively, comments may also be recorded in the enclosed format and emailed at ced06@bis.gov.in or at divya.s@bis.gov.in.

You may be required to login to submit your comments, kindly use your mobile number (provided to BIS) and the OTP provision to login.

In case no comments are received, or comments received are of editorial nature, kindly permit us to presume your approval for the above document. However, in case comments of technical nature are received, then in consultation with the Chairperson, CED 06 the comments may be put up to the Sectional Committee for necessary action.

Thanking you,

Sd/-
(**Divya S.**)
Member Secretary CED 06
Scientist 'D' (Civil Engineering)
E-mail: **divya.s@bis.gov.in**

Encl: As above

FORMAT FOR SENDING COMMENTS ON THE DOCUMENT

[Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/ table/figure, etc, be stated on a fresh row. Information/comments should include reasons for comments, technical references and suggestions for modified wordings of the clause. **Comments through https://www.services.bis.gov.in/php/BIS_2.0/WCDraft/comment_pdraft.php shall be appreciated**.]

Doc. No.: CED 06(26663)P **BIS Letter Ref**: CED 06/T-6

Title: Method of Identification of Natural Building Stones
[*Second Revision* of IS 1123]

Last date of comments: **21 October 2024**

Name of the Commentator/ Organization: _____

Sl No.	Clause/ Para/ Table/ Figure No. commented	Comments/ Modified Wordings	Justification of Proposed Change
1.			
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NOTE- Kindly insert more rows as necessary for each clause/table, etc

FORWORD

(*Formal clause will be added later*)

Building stones are available in large quantity in various parts of the country and to select and utilize them for their satisfactory performance it is necessary to know the various strength properties determined according to the standard procedure. The strength of the rocks depends on its minerals constituents which form the basis of classification and identification of rocks and thus before ascertaining the strength properties it is also necessary to identify the types of rock. This standard had therefore been formulated to cover standard methods for identification of natural building stones. This standard was first published in 1957 which covered the aspects of petrographical examination of building stones. While revising the standard its scope is limited to only identification of natural building stones which is in fact needed by the various research laboratories of tones using departments.]

The major modifications in this standard are:

a) The terminology of different types of natural stones have been incorporated, and
b) The table for characteristics of building stones have been updated.

This standard contributes to the United Nations Sustainable Development Goal 9 ‘Industry, innovation and infrastructure’; Sustainable Development Goal 11 ‘Sustainable Cities and Communities’ towards strengthening the efforts to protect and safeguard the world’s cultural and natural heritage; and Goal 12 ‘Ensure sustainable consumption and production patterns’ towards substantial reduction of waste generation through prevention, reduction, recycling and reuse.

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 : 2022 ‘Rules for rounding off numerical values (second revision)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Preliminary Draft Indian Standard

METHOD OF IDENTIFICATION OF NATURAL BUILDING STONES

(*Second Revision of IS 1123*)

1 SCOPE

1.1 This standard lays down the procedure for identification of some of common types of natural building stones.

1.2 The natural building stones are found in all types of rocks *viz*. Sedimentary, Metamorphic and igneous rocks.

2 TERMINOLOGY

2.1 Common Sedimentary Rocks

Common sedimentary rocks include sandstone, siltstone and shale. These rocks often start as sediments carried in rivers and deposited in lakes and oceans. Tuffaceous rocks contain volcanic ash whereas limestone is essentially formed as a chemical/ bio-chemical precipitate.

2.2 Dimension Stone

Dimension stone can be defined as naturally occurring rocks of igneous, metamorphic or sedimentary rocks which are quarried specifically as blocks or slabs which meets specifications as to size, shape, colour, grain size, texture, patterns and surface finish of the stone are general requirements, durability, strength, and the ability of the stone to take polish are other important selection criteria.

2.3 Igneous rocks

Igneous rocks (from the Latin word *ignis* meaning fire) form, when hot, molten rock crystallizes and solidifies. This melt usually originates deep within the Earth (near active plate boundaries as well as hot spots) and then rises toward the surface. Igneous rocks are divided into two groups, intrusive or extrusive, depending upon where the molten rock solidifies. Intrusive Igneous Rock or plutonic igneous rock forms when magma is trapped inside the Earth. Some of the magma may feed volcanoes on the Earth's surface, but most remains trapped below, where it cools very slowly over many thousands or millions of years until it solidify. Slow cooling means the individual mineral grains have a very long time to grow, so they grow to a relatively large size. Intrusive rocks have a coarse grained texture. Extrusive Igneous Rocks or volcanic igneous rock is produced when magma comes up and cools above (or very near) the Earth's surface. These are the rocks that form at erupting volcanoes and oozing fissures. The magma, called lava when molten rock erupts on the surface, cools and solidifies almost instantly

when it is exposed to the relatively cool temperature of the atmosphere. Quick cooling means that mineral crystals don't have much time to grow, so these rocks have a very fine-grained or even glassy texture. Hot gas bubbles are often trapped in the quenched lava, forming a bubbly, vesicular texture. The common Intrusive Igneous rocks are Granite, Granodiorite, Dolerite, Diorite and Gabbro and common Extrusive igneous rocks are Rhyolite, Andesite, Dacite, Phonolite and Basalt.

2.4 Granite

Although geologically Granites are usually coarse grained acidic igneous rocks, commercially Granites include igneous and metamorphic rocks of igneous origin, which are blockable, can be sawed in slabs, having attractive colors, texture and lustre. It is found in variable colours & patterns which are developed due to distinct mineral constituents and impurities. The texture varies from glassy to crypto-crystalline to fine grained rocks (when extrusive igneous rocks are termed Granite) to coarse grained and porphyritic type. The colour varies from pure white to off white, shades of pale yellow, grey, green, pink, purple, brown, shades of grey and black etc. The common rocks traded as commercial granites are Granite, Granodiorite, Dolerite, Diorite, Gabbro, Charnockite, Rhyolite, Andesite, Phonolite, Basalt etc.

2.5 Metamorphic rocks

Metamorphic rocks started out as some other type of rock, but have been substantially changed from their original igneous, sedimentary, or earlier metamorphic form. Metamorphic rocks form when rocks are subjected to high heat, high pressure, hot mineral-rich fluids or, more commonly, some combination of these factors. Conditions like these are found deep within the Earth or where tectonic plates meet. Common Metamorphic Rocks include Phyllite, Mica-schist, Granite gneiss, Quartzite and Marble
Metamorphic rocks can be foliated (like granite gneiss and biotite schist) or non-foliated (like Quartzite and Marble). Foliations are parallel arrangements of certain mineral grains that give rocks a striped/layered appearance.

2.6 Sedimentary rocks

Sedimentary rocks are formed through sedimentary process, which involves erosion and physical disintegration or fragmentation of pieces from a pre-exisiting rock, transportation, and deposition of those fragments (coarser as well as finer) as sediments in air/ water/ ice medium and finally their cementation and lithification. They can also be formed as secretions or fragmentary deposit of once-living organisms apart from chemical precipitation (deposits) in a basin/ depression.
Sedimentary rocks often have distinctive layering known as bedding (primary layer of deposition) where sedimentation process is involved.

3 SELECTION OF SAMPLE

3.1 Representative sample shall be selected to determine the characteristic of stone. The samples shall be from the fresh rock and not weathered/friable.

3.2 The sample shall be selected by the purchaser or his authorized representative from the quarried stone or taken from the natural rock, as described in 2.2.1 and 2.2.2 and shall be of adequate size to permit the preparation of the requisite number of test pieces.

3.2.1 *Stones from Ledges or Quarries* — The ledge or quarry face of the stone shall be inspected to determine any variation in different strata. Differences in colour, texture and structure shall be observed. Adequate quantity of samples from each strata that appears to vary in colour, texture and structure of quarry shall be required to perform various test shall be obtained. Pieces that have been damaged by blasting, driving wedges, heating, etc, shall not be included in the sample.

3.2.2 *Rocks and Stones*— A detailed inspection of the rocks and stones over the area where the supply is to be obtained shall be made. The different kinds of rock/stone and their condition at various quarry sites shall be recorded. Separate samples for each class of rock/stone that would be considered for use in construction as indicated by visual inspection shall be selected.

NOTE —The term 'boulder' is also commonly used in the mining industry for extracted irregularly shaped rocks.

4 PROCEDURE

4.1 The sample shall be examined macroscopically for its colour, structure, texture and mineral constituents and recorded.

4.2 The type of rocks shall be identified according to characteristics given in Table 1. In case of doubt, guidance can be obtained from engineering properties of the rock given in Table 1.

5 REPORTING

5.1 Date of sample taken, identification of sample and the type of stone shall be reported.

TABLE 1 CHARACTERISTICS OF BUILDING STONES

(Clause 3.2)

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
Class: Igneous Rocks													
1.	**Granite**	White to pale light grey, greenish and pink.	Crystalline, fine to coarse grained, massive sometimes sheeted and banded; joints common.	Essentially quartz and feldspar with mica, amphiboles and tourmaline iron oxide as accessories.	Used primarily for dimensional stone, landscaping cobbles and for bridge piers, river walls, dams and related structures, pavements, kerbs, pedestal, tomb stone monumental buildings, carving institutional and commercial buildings, table top, coarse and fine aggregate, etc. Polished granite looks more elegant than marble with a very long lasting luster.	Granite occur throughout the country. Most granites are traversed bv joints and fractures. Granites may be graded by their colour, texture, structure and compressive strength.	2.63-2.73	98-245	13-29	7-25	0.4-4	43.9-87.9	19613-58840
2.	**Granodiorite**	Light grey , pink, off-white, light greenish	Crystalline, fine to coarse grained; massive; banded joints common.	Essential minerals are quartz and plagioclase feldspar with accessories like biotite and hornblende.	Same use as granites.	Less abundant in occurrence as compared to granite.	2.8-3.0	-	-	-	0.50	-	-

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
3.	**Syenite**	Light coloured to dark green, grey and bluish grey.	Crystalline, medium to coarse grained; massive; joints common.	Essential minerals are alkali feldspar sometimes with nepheline, (nepheline syenite), sodalite. Common accessories are hornblende, biotite and augite.	Same use as granites.	Syenites are less abundant than granites.	2.60-2.80	34-49	-	-	1.38-1.54	-	5884-7845
4.	**Diorite**	Grey to dark grey to grayish black	Crystalline, medium to coarse grained; massive; cooling joints common.	Essential minerals are plagioclase feldspar and dark minerals like amphiboles, pyroxenes, etc.	Same use as granites.	Found in a number of places in India.	2.8-3.0	177-294	-	15-29	0.25	-	6865-9807
5.	**Gabbro**	Dark grey to greenish to black.	Crystalline, medium to coarse grained; banded jointed.	Consists of calcium-feldspar and pyroxene (augite); accessories may be olivine, biotite, hornblende and rarely quartz.	May be used where available for bridge piers, river walls dam and related structures; it may also be used for pavements, kerbs and in buildings (same as granite).	It's high strength value, makes it suitable for heavy structures.	2.90-3.2	177-294	-	15-29	0.1-0.2	-	687-1079
6.	**Basalt (Decean Trap)**	Dark grey to greenish black to brownish to black.	Fine grained, dense and compact and also at times vesicular with flow bands. Often occurring in	Olivine, Plagioclase feldspar and pyroxene with or without interstitial glass: Vesicles filled by quartz, cryptocrystalline silica such as agate, chalcedony,	Used primarily for bridge piers, river walls, dams and related structures, in masonry works and is used also for pavements, kerbs, monumental buildings; etc.	Basalts occur as "trap" rocks all along the West Coast and upto Central India, and in Rajmahal. It is cut into slabs and blocks. Fractures, joints decrease its	2.0-3.0	147-294	20-59	10-29	0.1-1.0	14.86-18.92	588-981

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
			columns and prismatic structures. Fractures and joints are common	jasper showing variegated colour banding calcite and zeolite.		importance.							
7.	**Dolerite**	Dark grey, greenish to brownish black	Crystalline, medium to coarse grained; fractures and joints common.	Consists of plagioclase feldspar and pyroxene; olivine, hornblende and biotite are common accessories.	Same as Gabbro.	Its high strength values makes it suitable for heavy structures. Very high quality aggregate material.	3.0-3.05	196-343	23-59	15-34	0.1-0.5	-	785-1079
8.	**Rhyolite**	White to light grey, pink and greyish black; black when extremely glassy (obsidian and pitchstone).	Glassy to cryptocrysta-lline with few embedded crystals of quartz and feldspars; flow-bands and fractures quite common.	A volcanic equivalent of granite.	Though not used on large scale; rhyolite is rarely block able and used in buildings, paving blocks, ornamental and decorative works, etc and is excellent aggregate material.	Rhyolites are less abundant than granites. The rock may be characterised by cracks and fractures which render the blocks unsuitable for the purpose of building stone.	2.40-2.60	134	-	-	4-6	-	-
9.	**Trachyte**	Grey to greenish, brownish to bluish grey.	Glassy, aphanitic; flowbands and fractures common.	A volcanic equivalent of syenite.	-Do-	Less abundant.	2.60-2.85	80	-	-	-	19.5	**-**
10.	**Andesite**	Dark grey to black.	Glassy, aphanitic.	A volcanic rock with plagioclase feldspar and one or more minerals like biotite pyroxene and	-Do-	It is not abundant in India. May possess cooling cracks, joints and fractures	2.20-2.60	127-245	-	-	0.10-11	-	**-**

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
				hornblende.		which may render it unsuitable as a dimensional stone.							
Class: Sedimentary Rocks													
1.	**Sandstone**	Depends on the colour of matrix and cement; shows variegated colors generally white, grey, red, pink, buff, brown, yellow and even dark grey.	Stratified (bedded) fine to coarse grained; sedimentary structures such as cross-bedding flute-cast and sole-markings, etc, common.	Consists mainly of quartz with feldspar and dark minerals in a siliceous, calcareous, argillaceous and ferruginous cement.	Used for dimensional and decorative purpose, besides used as masonry work for dams, bridge piers, river walls, buildings, pavements, kerbs, monumental stones, carving etc.	Famous building stone, ornamental stone. Sometimes weathering of the rock renders it unsuitable as building stone. Sometimes Kaolinisation of feldspars and leaching effect of matrix and cement make the rock porous. It is desirable to use sandstone with silica cement for heavy structures if necessary.	1.85-2.7	20-167	7-39	4-25	3-25	1.6-29.0	49-785
2.	**Dimensional Limestone and dolomite**	White, grey, pink, red, blue, buff brown, green yellow, black, etc. (Colour due to impurities in the form of silicates and carbonates	Bedded, granular; fine to coarse grained saccharide	Consists essentially of calcite (calcium carbonate)/ dolomite mineral / magnesium carbonate.	Used as dimensional stone besides used as slabs and tiles in any type of construction. Large size blocks of Miliolite limestone (Porbandar stone) used as ornamental and building stone.	Limestone is found to occur throughout India. It should be devoid of any argillaceous band, softer vein, cracks.	2.14-2.8 (limestone) 2.5-2.8 (dolomite)	29-245 (limestone) and (dolomite)	10-49	5-25	5-20	1.3-24.1	98-785

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
		or trace elements).											
3.	**Laterite**	Brownish red, yellow, brown, grey and mottled colours.	Porous, oolitic and pisolitic with cavities; at times bedded.	A mixture of hydrated oxides of iron and aluminium frequently with magnesium dioxide, titanium oxide.	Generally used as blocks in the construction of institutional buildings.	Freshly quarried laterite is soft and porous, but when exposed to atmospheric conditions it hardens and makes a very tough material. When used in walls it should be plastered from outside.	1.85	1.86-2.26	-	-	-	-	-
Class: Metamorphic Rocks													
1.	**Charnnockite**	Light grey to dark grey to grayish black.	Fine to coarse grained, massive banded and sometimes foliated.	Consists of quartz, feldspar, hypersthene and garnet. Sometimes called hypersthene granite.	Same use as granites.	Found in Karnataka, Telangana, Andhra Pradesh and Occurs in association with Khondalites in the Eastern Ghats. Its strength is similar to granites and may be put to similar uses as granite.	2.7-3.0	50-186	-	-	-	-	779-975
2.	**Gneisses**	Light grey, pink, purple, greenish grey and dark grey and grayish black.	Fine to coarse grained; alternative dark and white bands (gneissic	Composed of quartz, feldspar, biotite, hornblendes, etc.	Not commonly used because of deleterious constitutes, but may be used in minor constructions if easily available.	Varying composition of bands are likely to give low strength of the rocks. Widely found in India.	2.5-3.0	49-196	-	3-20	0.3-1.5	-	197-481

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
			structure).		Hard gneises may be used for construction of buildings. Now gneisses are used as dimensional and decorative stone and also as riprap stone.								
3.	**Quartzite**	White, grey, yellowish, buff (colour is dependent on the impurities).	Fine to coarse grained often granular and banded.	Quartz is the chief constituent with feldspars and mica in small amounts.	Used as blocks and slabs for building stone and aggregate material. Now also used as dimensional and decorative stone.	Widely available in India.	2.35-2.63	147-294	20-59	10-29	0.2-0.6	-	9.12
4.	**Marble**	White, rose, pink, red, green, yellow, black, etc. (Impurities impart different shades).	Fine to coarse grained, massive crystalline and granular.	Mainly calcite and dolomite or mixture of the two with some other impurities, e.g. wollastonite and serpentine as bands and veins.	Used as blocks, slabs and tiles in monuments, temples, commercial buildings. Marbles are as ornamental stones.	Rajasthan, Madhya Pradesh and Gujarat are major producing states in India.	2.6-2.9	50-245	14-29	7-20	0.10-0.60	6.7-41.7	-
5.	**Khondalite**	Light grey to brown and light pink.	Medium to fine grained; often banded or schistose.	Composed of quartz feldspar, garnet and sillimanite, with biotite and muscovite.	Khondalite is widely used for building stones in commercial and institutional buildings in the form of blocks and slabs. In ancient tiles it was used in monuments and temples. Khondalite may contain softer schistose bands and are found to weather easily on exposure to atmospheric	It is easily available all along the Eastern Ghats.	2.36-2.51	2	-	-	-	-	-

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
					conditions.								
6.	**Slate**	Dark grey, black, greenish grey, purple grey, etc.	Fine grained, slaty cleavage, fissile along planes of original bedding.	Composed of quartz, mica and clay minerals.	Used as slabs and roofing tiles in the construction of buildings, pavements, etc. Also used as decorative stone. Easily cut into slabs, of desired dimensions. It may contain softer bands	. Slate is found in many parts of the country.	2.6-2.84	49-196	17-59	7-20	0.1-1.0	-	-
7.	**Phyllite**	Grey, greenish, buff, reddish. Rock characterized by shinning silky lusture (phyllitic shean).	Fine grained, often characterized by foliation, cleavage and	Composed of micas, quartz, garnet, and clay minerals and iron oxide.	Used as slabs roofing tiles for minor construction works and also carving statues in temples. Now also used as dimensional stone. The rock is fissile in nature. Harder phyllites are used commonly where their occurrence is abundant.	Abundantly found in the country.	2.6-2.90	78-245	-	21-80	-	-	**-**
8.	**Schists**	Grey to black, brown, purple, greenish grey, silver, copper etc.	Fine to coarse grained, schistose.	Consists of quartz, feldspar, biotite, muscovite, chlorite, hornblende, garnet, etc.	Not generally used, because of its low strength, but if easily available may be used for minor construction. Also used for roofing. There are different types of schists, quartz-muscovite quartz-sericite schists, hornblend schists, etc. Also used as dimensional and decorative stone. However, this rock is fissile in	Abundantly found in the country.	2.31-3.04	39-93	17-59	8-61	-	-	177-333

S. No.	Type	Physical Properties			Users	Availability	Average Engineering Properties (See Note)						
		Colour	Texture & Structure	Mineralogical Composition			Specific Gravity	Compressive Strength	Shear Strength	Tensile Strength	Porosity	Resistance to Abrasion	Modulus of Elasticity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
								N/mm²	N/mm²	N/mm²	Percent	Percent	N/mm²
					nature and so harder phyllites are used commonly where their occurrence is abundant.								