

STONES

Building stones are obtained from rocks occurring in nature and are classified in three ways:

1. Geological classification
2. Physical classification
3. Chemical classification



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STONES

1. Geological classification of rocks

- **Igneous rocks** (granite, basalt & trap) cooling of magma
- **Sedimentary rocks** – deposition of products of weathering by action of natural forces like rain, wind, glacier etc
(laterite, sandstone, limestone, shale)
- **Metamorphic rocks** change in character (slate, quartzite, marble)

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STONES

2. CHEMICAL CLASSIFICATION OF ROCKS

- Siliceous rocks:
 - Silica is predominant, hard and durable, not easily affected by weathering agencies
 - Presence of weak minerals make it easily disintegrated
 - Eg: granite, quartzite etc..
- Argillaceous rocks:
 - Clay is predominant, Soft, dense and compact, durable but brittle Eg: slate, laterite etc..
- Calcareous rocks:
 - Calcium carbonate is predominant.
 - Eg: limestone, marble etc.

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3. PHYSICAL CLASSIFICATION OF ROCKS

- Stratified rocks:
 - These rocks have planes of cleavage or stratification and can be easily split up along these planes. Sedimentary rocks
- Un-stratified rocks:
 - No planes of stratification, cannot be easily split up, structure may be crystalline granular or compact granular Igneous rocks of volcanic agencies and sedimentary rocks formed by movement of earth
- Foliated rocks:
 - Have a tendency to split up in definite direction only
 - Rocks which have foliations(planar fabric) in the direction of pressure applied on it.
 - Metamorphic rocks

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Stratified rocks Unstratified rocks



Foliated rocks

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QUALITIES OF GOOD BUILDING STONES

- Should have a minimum compressive strength of 100 N/mm²
- Should have sufficient hardness.
- Should have high resistance to wear and tear.
- Specific gravity should be greater than 2.7.
- Should have high impact value (toughness index should be greater than 13).
- Water absorption after 24 hours should be less than 0.6.
- Should have a suitable texture for carving and dressing and a crystalline structure and good appearance.
- Should be durable (igneous and metamorphic rocks are more durable than sedimentary rocks).
- Should have good resistance against weathering agencies.

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USES OF STONES

- For foundations, walls, columns, arches, lintels, roofs, floors etc.
- For facing work of masonry
- As coarse aggregate in concrete
- As ballast in railways
- As aggregates in road construction
- As floors, piers, abutments, retaining walls in bridges
- For light houses
- For dams

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Tests on Stones

- Acid test- Kept in HCl (1%) for 7 days, maintain its sharp edges and surface free from powder –for weathering quality due to presence of CaCO₃
- Attrition test – wear of stone – resistance against grinding under traffic - Deval's attrition testing machine. % wear is found
- Crushing test as in brick
- Hardness test – Dorry's testing machine

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- Acid test
- Attrition < 3%
- Crushing strength >100 N/mm²
- Water absorption 0.6
- Impact >17 for roadworks ; 14-17 moderate
- Hardness 13-19 moderate

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Attrition test – wear and tear

- Devl's attrition testing machine
- 50 N, 60mm size broken stone are filled in both the cylinders of dia 200mm and ht 340mm
- Rotated at 30rpm for 5 hrs
- Wt taken
- % wear calculated
- ≤ 3%

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Crushing strength test

- CTM
- 40mmx40mmx40mm size stones
- Placed in water for 72 hrs
- Tested in saturated condition
- As in brick, load applied, note the breaking load
- Strength = load / area
- >100 N/mm²

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Hardness – for disintegration

- Dorry's Testing machine
- Cylindrical Samples of dia 25mm and ht 25mm
- Placed in machine and pressed with a pressure of 12.5N
- Annular disc is rotated at 28 rpm
- After 1000 revolutions, take out and weighed
- Hardness coefficient = $20 - (\text{loss in wt}/3)$
- >17 for roadworks
- 14-17 → medium hard

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Impact test – toughness index

- Cylinders of dia 25mm and ht 25mm
- Placed on the CI anvil of machine
- A steel hammer of Wt 20N is allowed to fall vertically over the specimen
- 1st fall @ 1cm ht, 2nd fall @ 2cm ht.....
- Note the blow at which the specimen breaks
- If it breaks at nth blow, then nis the toughness index
- 13-19 → moderately tough

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COMMON BUILDING STONES AND ITS USES

1. Granite

- It is an igneous rock
- Hard and durable
- Has excellent building properties like:
 - high strength
 - low abrasion value -resistance to wear and tear
 - good resistance to frost and other weathering agencies.
- Used for facing work, walls, bridge piers, columns, steps etc..
- It is also used where weight and durability is essential.



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COMMON BUILDING STONES AND ITS USES

2. LATERITE

- It is a sedimentary rock.
- Has to be seasoned to gain hardness.
- Compressive strength is only 1.8 to 3.2 N/mm².
- Uses: for masonry works.



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COMMON BUILDING STONES AND ITS USES

3. LIMESTONE

- A type of Sedimentary rock composed of calcium carbonate.
- Not useful as building stones.
- Uses: as aggregate for construction of floors, steps, walls, etc.
- Also used in the manufacture of cement.



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COMMON BUILDING STONES AND ITS USES

4. Sand stone

- Sedimentary rocks composed of quartz.
- Occurs in many colours.
- Most suitable and durable type is the one which comes in light colours with homogeneous texture.
- Uses: used for steps, flooring, facing works etc.



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COMMON BUILDING STONES AND ITS USES

5. Marble

- Metamorphic rocks formed from limestone under high temperature.
- Available in different colours and textures.
- Uses: used both as ornamental stone and as a construction material.
- Extensively used for flooring.



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COMMON BUILDING STONES AND ITS USES

6. Gneiss

- Metamorphic rocks similar to parent rock granite.
- Sometimes it may contain mica which makes it useless as a building stone.
- Uses: used for paving works.



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