



SNS COLLEGE OF TECHNOLOGY



AN AUTONOMOUS INSTITUTION

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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

19GET102 – BASIC CIVIL AND MECHANICAL ENGINEERING

I YEAR / I SEMESTER

Unit 1 : Civil Engineering Materials and Surveying

Topic : Stones and Types



Stone as a Building Material

The main uses of stone as a building material are:

- As a principal material for foundation of civil engineering works, and for the construction of walls, arches, abutments and dams.
- In stone masonry in places where it is naturally available.
- As coarse aggregate in cement concrete (crushed form of rock).



Types of Building Stones and Uses

Based on Geology, stones or rocks are classified into three types:

1. *Igneous Rocks* - Basalt, Trap, Andesite, Rhyolite, Diorite, Granite.
2. *Sedimentary Rocks* - Lime stones, Dolomite and Sandstones.
3. *Metamorphic Rocks* - Gneiss, Quartzite, Marble, Slate.



Types of Building Stones and Uses

- Most of the prehistoric monuments are built with natural stones as they remain stable with time.
- Before the advent of concrete, stones were highly preferred for heavy engineering works like bridge piers, harbor walls, seaside walls, and for facing works.
- Stones for construction purposes are obtained by quarrying from solid massive rocks.
- The stones used for masonry construction should be hard, durable, tough, and should be free from weathered soft patches of material, cracks, and other defects that are responsible for the reduction of strength and durability.



Types of Building Stones and Uses

- Granite
- Basalt and Trap
- Limestone
- Sandstone
- Gneiss
- Marble
- Slate
- Quartzite
- Laterite



Granite



- It is a **deep-seated igneous rock**, which is hard, durable and available in various colours.
- It has a high value of crushing strength and is capable of bearing high weathering.
- **Granite is used for bridge components, retaining walls, stone columns, road metal, ballast for railways, foundation, stonework and for coarse aggregates in concrete.**
- These stones can also be cut into slabs and polished to be used as floor slabs and stone facing slabs.
- It is considerably hard and durable, and its compression strength ranges from 100MPa to 250MPa.
- It takes polish well, and the color varies from light gray to pink.
- The polished granite can be used as table tops, cladding for columns and walls.
- Granite is found in Maharashtra, Rajasthan, Uttar Pradesh, Madhya Pradesh, Punjab, Assam, Tamil Nadu, Karnataka and Kerala.



Granite





Granite





Basalt and Trap

- They are **originated from igneous rocks** in the absence of pressure by the rapid cooling of the magma.
- They have the same uses as granite.
- Basalt stone, which is also known as traps, is commonly used in road construction, as aggregate in concrete production, rubble masonry works for bridge piers, river walls, and dams.
- The compression strength of this stone type ranges from 200MPa to 350Mpa, and its weight is between 18KN/m³ and 29KN/m³.
- Basalt has good resistant to weather, impervious to moisture, very hard, and very difficult to dress in fine shapes.
- The color of basalt changes from dark gray to black.



Basalt and Trap





Limestone

- It is a **sedimentary rock** formed by remnants of seaweeds and living organisms consolidated and cemented together.
- It contains a high percentage of calcium carbonate.
- **Limestone is used for flooring, roofing, pavements and as a base material for cement.**
- However, dense, compact, and fine textured types which are free from cavities and cracks can be easily dressed and take a very fine polish.
- The use of limestones as facing stones should be avoided in areas where the air is polluted with industrial gases and also in coastal regions where saltish winds can attack them.
- It is found in Maharashtra, Andhra Pradesh, Punjab, Himachal Pradesh and Tamil Nadu.



Limestone





Sandstone

- This stone is another form of **sedimentary rock** formed by the action of mechanical sediments.
- It has a sandy structure which is low in strength and easy to dress.
- **They are used for ornamental works, paving and as road metal.**
- Sandstones in combination with silica cement are used in the construction of heavy structures.
- It is also employed in masonry works, dams, bridge piers, and river walls.
- The compressive strength ranges between 20MPa and 170MPa, and specific gravity varies from 1.85 to 2.7.
- It should be known that weathering sandstone makes it unsuitable for building construction.
- It is available in Madhya Pradesh, Rajasthan, Uttar Pradesh, Himachal Pradesh and Tamil Nadu.



Sandstone





Gneiss



- It can be recognized by its elongated platy minerals usually mixed with mica and used in the same way as granite.
- They can be used for **flooring, pavement and not for major purposes** because of its weakness.
- This type of stone is used for minor construction since the presence of deleterious substances in its constituents makes it undesirable for building construction.
- However, hard varieties of gneiss stone may be employed in construction works.
- The compression strength varies from 50MPa to 200MPa. It has fine to coarse grains, and its color may be light grey, pink, purple, greenish gray and dark grey.
- It is found in Karnataka, Andhra Pradesh, Tamil Nadu and Gujarat.



Gneiss





Marble

- It is a **metamorphic rock** which can be easily cut and carved into different shapes.
- It is used for **ornamental purposes, stone facing slabs, flooring, facing works etc.**
- It is used for facing and ornamental works in columns, flooring, and steps.
- The compressive strength of marble varies from 70MPa to 75MPa.
- Marble stones are quite strong, uniform in texture, least porous, and take an excellent polish.
- It can be easily cut and carved into different shapes.
- Marble is available in different colors like white and pink, found in Rajasthan, Gujarat and Andhra Pradesh.



Marble





Slate

- It is a **metamorphic rock** which can be split easily and available in black colour.
- It is used for **damp-proofing flooring and roofing**.
- Slate shows great variation in its building properties which depend on the thickness of the sheets and the color of the rock.
- It is used as roofing tiles, slabs, and pavements.
- It consists of quartz, mica, and clay minerals.
- The compression strength of slate changes from 100MPa to 200MPa, and its color can be dark gray, greenish gray, purple gray to black.
- The structure of slate is fine grained and its specific gravity is 2.6 to 2.7.



Slate





Quartzite

- It is a **metamorphic rock which is hard, brittle, crystalline and durable.**
- It is difficult to work with and used in the same way as granite but not recommended for ornamental works as it is brittle.
- It is used as building blocks, slabs, and as aggregate for concrete.
- The structure of quartzite is fine to coarse grain and mostly granular and banded, and mainly composed of feldspar and mica in small quantities.
- The crushing strength is between 50MPa to 300MPa. They are available in different colors like white, gray, yellowish.



Quartzite





Laterite

- It is **decomposed from igneous rocks**; occur in soft and hard varieties.
- It contains a high percentage of iron oxide and can be easily cut into blocks.
- The soft variety is used for walls after curing while the hard blocks are used for paving the pathways.
- Laterite is used as building stone, but its outer surface needs to be plastered.
- It contains a high percentage of iron oxide and can be easily cut into blocks.
- Laterite occurs in soft and hard varieties and the compressive strength of laterite is between 1.9MPa and 2.3 MPa, and its strength is increased with seasoning.
- Laterite color may be brownish, red, yellow, brown and grey.



Laterite





Uses of Building Stones

The stones used for various types of works are as follows:

- *Fine-grained granite and gneiss stones are used for **Heavy engineering works** such as building bridge piers, breakwaters, monuments, etc.*
- *Granite, quartzite and compact sandstones are used for **masonry works** in industrial areas exposed to smoke and fumes.*
- *Marble, granite and sandstone are used for facing work of buildings.*
- *Limestone and sandstone are used for **general building works**.*
- *Fine-grained granite, marble, and soft sandstone are used for Carvings and ornamental works.*
- *Compact limestone and sandstone are used for **Fire-resistant masonry**.*
- *Granite, quartzite stones are used in foundations of building in places with the **high groundwater level**.*
- *Marble, slate, sandstone and granite stones are used for floor pavings.*



Thank You!!