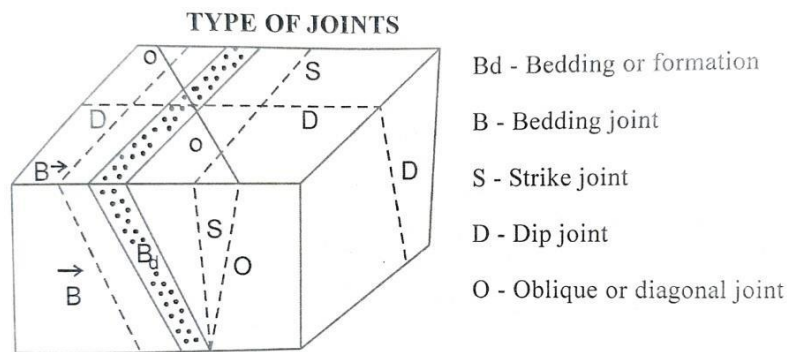


### 3.4 JOINTS

The regular or irregular cracks, developed in rocks, due to tensional or Compressional forces acting within the crust, with no relative displacement between the affected rock blocks are called joints.

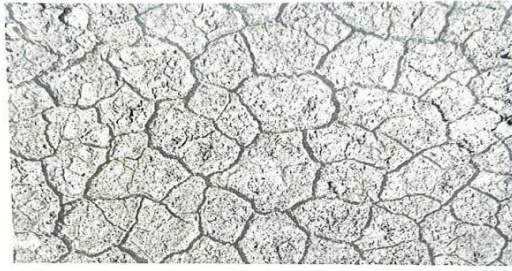
#### Types of joints:

1. **Primary joints:** The joints developed in igneous rocks, due to cooling and contraction of magma mass is known as primary joints.
2. **Master joints:** A very large joint, which can be traced over an extensive area, is called a master joint.



3. **Dip joint:** A dip joint necessarily strikes parallel to the direction of dip of the beds forming the country.
4. **Strike joints:** A strike joint strikes parallel to the strike of the country rocks.
5. **Oblique or diagonal joint:** An oblique or diagonal joint strike neither parallel to the strike of the country rock nor parallel to its dip direction .i.e., its strike direction lies in between the dip and strike.
6. **Joint system:** Two or more joint sets together constitute a joint system.
7. **Columnar joints:** Columnar joints are developed, due to tensional forces, in lava flows. They are developed due to intersection of two or more vertical joint sets within the affected rock mass.

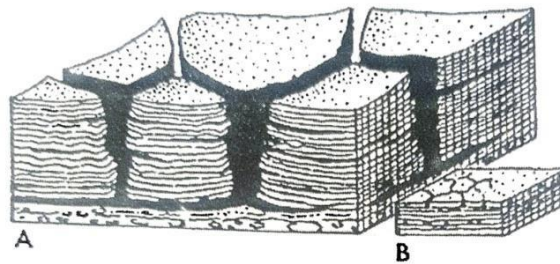
COLUMNAR JOINTS - PLAN



8. **Conjugate joint system:** Whenever two interesting joint sets (whether vertical or inclined) are oriented at right angles to each other, they are said to form a conjugate joint system.
9. **Sheet jointing:** A number of closely spaced parallel joints which are horizontal in attitude are called sheet joints.



SHEET JOINTS IN ROCKS



10. **Mural joints:** When three sets of joints (2 vertical and 1 horizontal) are developed with equal spacing between them, they split up the rock masses into cubical blocks. Such a jointing pattern is called mural jointing. They are well developed in granites.

**Engineering importance:**

As far as **water supply projects** are concerned, regions of jointed strata are considered to be suitable for groundwater exploration, because jointed zones will serve as aquifers.

In case of **dam & reservoir project**, the foundation should be made on a sound massive bed rock.

On the other hand, if the rock strata are heavily jointed, there will be significant leakage of stored water in the reservoir of dam.

For **tunnel projects**, the rocks should be free from joints.

If the roof or walls of a tunnel are highly jointed, there will be seepage of water into the tunnel. Lining of tunnels may be required in such cases.

In hilly terrains, jointed rocks cause instability of slopes, leading to landsliding. Many landslides and slope failure are due to the jointed nature of rocks.

In all the above cases, a treatment is required, called “grouting”, to improve the strength of the rocks.

