Types of Support

There are three main types of support used in engineering and construction: roller, hinged and fixed. Roller support allows for movement in one direction and is typically used in situations where there is a need for a structure to be able to expand or contract, such as a bridge. The roller support can rotate around a central axis and support loads from any direction.

A hinged support, also known as a pin joint, allows for movement in any direction and is often used in structures requiring flexibility, such as doors or gates. The hinged support allows for rotation around a central point, similar to a hinge on a door. Fixed support, also known as pinned support, is important for the GATE exam. It does not allow for any movement and provides a stable base for a structure. It is often used when a structure needs to be held in places, such as a building foundation or a beam supporting a bridge. The fixed support can resist all vertical, horizontal, and rotational loads.

Roller Support

Roller support is a type of support used in construction and engineering to support a structure or object. It consists of a cylinder or roller designed to rotate around a central axis, allowing the supported object to move or rotate freely. Roller supports are typically used when it is necessary to allow for movement or rotation of the supported object, such as in the construction of bridges, cranes, and other types of machinery.

Roller supports are often used with other types, such as fixed or sliding supports, to provide a stable and secure foundation for a structure. They are particularly useful in situations where the supported object is subject to lateral loads, as they allow the object to move or rotate in response to these forces, reducing the stress on the structure. Roller supports are also used in various other applications, including conveyor belts, rolling mills, and material handling systems. They can be generated in determinate and indeterminate structures. They are typically made of materials such as steel or other high-strength metals and are designed to withstand the loads and stresses associated with their intended use.

Roller Support Examples

Roller supports to allow the movement of a structure or object along a fixed path. Examples of roller supports include conveyor belts, sliding doors, and roller coasters. Here are a few more examples of how roller supports are used:

1. **Bridges:** Roller supports are commonly used in the construction of bridges to allow for movement or rotation of the bridge deck in response to applied loads. The roller supports allow the bridge to move or rotate slightly, reducing the stress on the structure and increasing its stability.

2. **Cranes:** Roller supports are also used in constructing cranes to allow for the rotation of the boom and other parts of the crane. The roller supports allow the crane to rotate and move freely while providing a stable and secure foundation for the structure.
3. **Conveyor belts:** Roller supports are used in conveyor belts to support and guide the movement of the belt. The roller supports allow the belt to move smoothly and continuously while providing a stable foundation for the belt and the materials being conveyed.
4. **Rolling mills:** Roller supports are used in rolling mills to support and guide the movement of the rolls. The roller supports allow the rolls to rotate and move freely while providing a stable foundation for the rolls and the materials being processed.
5. **Material handling systems:** Roller supports are used in material handling systems to support and guide the movement of materials. The roller supports allow the materials to move smoothly and continuously while providing a stable foundation for the materials and the handling equipment.

Hinged Support

A hinged support, also known as a pin joint or hinge, is a type of support used in construction and engineering to allow for the rotational movement of a structure or object around a fixed axis. It consists of two connected parts joined by a pivot or hinge, allowing one part to rotate relative to the other. Hinged supports are commonly used in various applications, including doors, gates, and movable structures. They are also used in constructing bridges, cranes, and other types of machinery to allow for rotational movement or adjustment.

Hinged supports are typically used when it is necessary to allow for rotational movement of a structure or object, but not necessarily translation (movement in a straight line). They are often used with other types of supports, such as roller or fixed supports, to provide a stable and secure foundation for a structure. Hinged supports are typically made of materials such as steel or other high-strength metals and are designed to withstand the loads and stresses associated with their intended use. They are also commonly used to construct joints in robotics and other mechanical systems.

Hinged Support Examples

Hinged supports, also known as pivot points or pin joints, allow for rotational movement around a fixed point. Hinged support includes hinges on doors, folding tables, and the human elbow joint. Here are a few examples of how hinged supports, also known as pin joints or hinges, are used:

1. **Doors:** Hinged supports are commonly used to construct doors to allow for rotational movement around the hinges. The hinges allow the door to swing open and close while providing a stable and secure connection between the door and frame.
2. **Gates:** Hinged supports are also used to construct gates to allow for rotational movement around the hinges. The hinges allow the gate to swing open and close while providing a stable and secure connection between the gate and the gate posts.

3. **Bridges:** Hinged supports are used in the construction of certain types of bridges, such as swing and bascule bridges, to allow for rotational movement of the bridge deck. The hinges allow the bridge deck to rotate around a fixed axis, allowing the bridge to open and close to allow the passage of boats or other vessels.
4. **Cranes:** Hinged supports are used in constructing cranes to allow for rotational movement of the boom and other crane parts. The hinges allow the crane to rotate and move freely while providing a stable and secure foundation for the structure.
5. **Machinery:** Hinged supports are also used to construct various types of machinery, such as presses and other manufacturing equipment, to allow for rotational movement and adjust the machinery. The hinges allow the machinery to rotate and move freely while providing a stable and secure foundation.

Fixed Support

Fixed support, also known as a pinned support or fixed joint, is a type of support used in construction and engineering to prevent the movement of a structure or object along a particular axis. It consists of a connection between two parts of a structure that allows for rotational movement around the connection but prevents translation (movement in a straight line) along the axis. Fixed supports are commonly used in various applications, including the construction of bridges, buildings, and other structures. They are also used in the construction of machinery and other types of equipment to provide a stable and secure foundation.

Fixed supports are typically used when it is necessary to prevent the movement of a structure or object along a particular axis while still allowing for rotational movement around the axis. They are often used with other types of supports, such as roller or hinged supports, to provide a stable and secure foundation for a structure. Fixed supports are typically made of materials such as steel or other high-strength metals and are designed to withstand the loads and stresses associated with their intended use. They are also commonly used to construct joints in robotics and other mechanical systems.

Fixed Support Reactions

Fixed supports are points of a structure that do not allow movement or rotation. The support reactions at fixed support can be calculated using the principles of statics and the structure's known loads and support reactions. The sum of all forces and moments at fixed support must equal zero for the structure to be in equilibrium. Here are a few examples of how fixed supports, also known as pinned supports or fixed joints, are used:

1. **Bridges:** Fixed supports are commonly used in the construction of bridges to prevent movement of the bridge deck along a particular axis while still allowing for rotational movement around the support. The fixed supports provide a stable and secure connection between the bridge deck and the bridge piers, preventing the bridge from collapsing under the applied loads.

2. **Buildings:** Fixed supports are also used in the construction of buildings to prevent movement of the structure along a particular axis while still allowing for rotational movement around the support. The fixed supports provide a stable and secure foundation for the building, preventing it from collapsing under the applied loads.
3. **Machinery:** Fixed supports are used in the construction of various types of machinery, such as presses and other manufacturing equipment, to prevent movement of the machinery along a particular axis while still allowing for rotational movement around the support. The fixed supports provide a stable and secure foundation for the machinery, allowing it to operate smoothly and reliably.
4. **Robotics:** Fixed supports are also used in the construction of joints in robotics and other mechanical systems to prevent joint movement along a particular axis while still allowing for rotational movement around the support. The fixed supports provide a stable and secure connection between the components of the system, allowing it to operate smoothly and reliably.

Roller Support Reactions

Roller support is a type of support used in construction and engineering to support a structure or object. It consists of a cylinder or roller designed to rotate around a central axis, allowing the supported object to move or rotate freely. When a structure or object is supported by roller support, the support reacts to the loads applied to the structure or object in a specific way. The reaction forces at roller support depend on the type of loads applied to the structure or object and the position of the roller support relative to the loads. Generally, roller support will react to applied loads with vertical and horizontal forces and a moment (rotational force).

The support exerts the vertical reaction force at roller support in the direction perpendicular to the ground. It is equal in magnitude and opposite in direction to the vertical component of the applied loads. The horizontal reaction force at roller support is the force exerted by the support in the direction parallel to the ground. It is equal in magnitude and opposite in direction to the horizontal component of the applied loads. The moment at roller support is the rotational force exerted by the support. It is equal in magnitude and opposite in direction to the moment caused by the applied loads. The moment at roller support depends on the position of the loads relative to the support and the magnitude of the loads. To determine the reaction forces at roller support, it is necessary to analyze the loads applied to the structure or object and the position of the support relative to the loads. This can be done using various methods, such as free-body diagrams and structural analysis techniques.

Applications of Different Types of Support

Different types of supports, such as roller supports, fixed supports, and hinged supports, are used in various applications to support structures and objects and allow for movement or rotation as needed. Here are some examples of how these different types of supports are used:

- **Roller supports:** Roller supports are used in various applications where it is necessary to allow for the movement or rotation of a structure or object. Examples include bridges, cranes, conveyor belts, rolling mills, and material handling systems. Roller supports to allow the structure or object to move or rotate freely while providing a stable and secure foundation.
- **Fixed supports:** Fixed supports are used in various applications where it is necessary to prevent the movement of a structure or object along a particular axis while still allowing for rotational movement around the support. Examples include bridges, buildings, fixed beams, and various types of machinery. Fixed supports provide a stable and secure connection between the structure or object and the support, preventing the structure or object from collapsing under applied loads.