What is a Beam in Architecture?

Worksheet

A beam is a rigid horizontal member that spans between two supports, resisting bending and shear forces to carry floor, roof or wall loads safely down to columns or walls.

Questions

1. What is the primary structural action a beam resists?

A) Bending and shear
B) Pure tension only
C) Torsion only
D) Buckling only

2. Which spanning system is most efficient for very long spans like a stadium roof?

A) Solid timber beam
B) Truss
C) Single brick lintel
D) Plain concrete slab

3. In a cantilever beam, where is the maximum bending stress located?

A) At the free end
B) At the mid-span
C) At the fixed support
D) Stress is zero everywhere

4. What generally happens to a solid beam's required depth as its span increases?

A) It stays constant
B) It decreases
C) It increases, often disproportionately
D) It becomes irrelevant

5. A timber floor beam must span 4 m between two load-bearing walls in a house. Which spanning solution fits best?

6. An architect needs a column-free exhibition hall 30 m wide. Why is a simple solid beam not practical?

7. A cantilevered balcony projects 2 m beyond its last support. What kind of beam action is at work?

8. Define: What is a beam?

9. Define: Simply supported vs cantilever beam?

10. Define: Why use a truss instead of a solid beam?

Answer Key

1. A) Bending and shear - Beams primarily resist bending moments and shear forces as loads act perpendicular to their length.

2. B) Truss - Trusses triangulate members to cover long spans with much less material than a solid beam.

3. C) At the fixed support - The fixed support resists the full overturning moment, so stress peaks there.

4. C) It increases, often disproportionately - Deeper beams are needed for longer spans, which is why very long spans favor trusses or arches instead.

5. Span = 4 m, a short residential span A single solid timber or engineered-lumber beam is efficient and economical here Trusses or steel girders would be over-engineered for this scale

6. Span = 30 m Beam depth needed for a solid beam would be roughly span/10 to span/15 2-3 m, far too heavy and costly A steel or timber truss (depth still large but far lighter per metre) or a long-span arch is the practical choice

7. One end is fixed to the structure, the other end is free - this is a cantilever beam Unlike a simply supported beam, maximum bending stress occurs at the fixed support, not mid-span The supporting beam must be anchored well back into the structure to balance the overturning moment

8. A horizontal structural member that spans between supports and carries loads by resisting bending and shear.

9. Simply supported rests on two supports with free ends; a cantilever is fixed at one end and free at the other.

10. Trusses triangulate members to span much farther using far less material than a solid beam of the same span.