

What is Steel Frame Construction?

Worksheet

Steel frame construction is a building method where a rigid steel skeleton - columns, beams, and bracing - carries all structural loads while non-load-bearing walls simply enclose the space.

$$I = \frac{bh^3}{12}$$

Questions

1. What primarily carries the loads in a steel frame building?

- A) The exterior cladding
- B) The steel skeleton of columns and beams
- C) The interior drywall
- D) The roof tiles

2. In KL/r , what does 'r' represent?

- A) Member length
- B) Radius of gyration
- C) Yield strength
- D) Effective length factor

3. What does diagonal bracing resist?

- A) Vertical gravity loads only
- B) Lateral loads such as wind and seismic forces
- C) Thermal expansion only
- D) Nothing structural

4. Why does structural steel need fireproofing?

- A) Steel is flammable
- B) Steel rapidly loses strength at high temperatures
- C) Steel rusts in fire
- D) It doesn't need fireproofing

5. A steel column has $K = 1.0$, unbraced length $L = 4000$ mm, and radius of gyration $r = 40$ mm. Find its slenderness ratio.

6. A braced column has $K = 0.7$, $L = 3500$ mm, $r = 35$ mm. Find .

7. An unbraced cantilever column has $K = 2.0$, $L = 3000$ mm, $r = 30$ mm. Find and comment on buckling risk.

8. Define: What is the main advantage of steel frame construction?

9. Define: What is a slenderness ratio?

10. Define: What is bracing for in a steel frame?

Answer Key

1. B) The steel skeleton of columns and beams - The steel skeleton - columns, beams, and bracing - carries structural loads; walls just enclose space.
2. B) Radius of gyration - r is the radius of gyration, describing how the cross-section resists buckling.
3. B) Lateral loads such as wind and seismic forces - Bracing provides lateral stability against wind and earthquake forces.
4. B) Steel rapidly loses strength at high temperatures - Unprotected steel loses much of its strength within minutes of fire exposure.
5. $= KL/r = 1.0 \ 4000 / 40 = 100$
6. $= KL/r = 0.7 \ 3500 / 35 = 2450 / 35 = 70$
7. $= KL/r = 2.0 \ 3000 / 30 = 200 = 200$ is at the typical code limit for compression members - high buckling risk.
8. High strength-to-weight ratio allows longer spans, taller buildings, and faster erection than masonry or concrete.
9. $= KL/r$ - a measure of how prone a compression member is to buckling.
10. Diagonal bracing resists lateral loads like wind and seismic forces, keeping the frame stable.

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