What is Mechanical Systems Integration?

Worksheet

Mechanical systems integration is the coordinated design of HVAC, plumbing and electrical systems within a building's architecture and structure, sized using tools like the flow rate formula Q = V A.

Questions

1. A duct carries air at 4 m/s through 0.5 m. What is the flow rate?

A) 2 m/s
B) 0.125 m/s
C) 4.5 m/s
D) 20 m/s

2. Mechanical systems integration mainly coordinates

A) Only paint colors
B) HVAC, plumbing and electrical with architecture and structure
C) Only furniture layout
D) Only landscaping

3. If flow rate Q is fixed and velocity V doubles, duct area A

A) Doubles
B) Stays the same
C) Halves
D) Quadruples

4. What tool commonly detects MEP-structure conflicts before construction?

A) Spreadsheet
B) BIM clash detection
C) Hand sketches
D) Site visit only

5. Air moves through a duct at 6 m/s through a cross-section of 0.25 m. Find the flow rate.

6. A room needs a flow rate of 2 m/s and the duct velocity is limited to 8 m/s. What duct area is required?

7. Compare two ducts delivering the same 3 m/s: one at 5 m/s, one at 10 m/s. Which needs a smaller duct?

8. Define: What is mechanical systems integration?

9. Define: What is the airflow formula?

10. Define: Why is BIM clash detection used?

Answer Key

1. A) 2 m/s - Q = V A = 4 0.5 = 2 m/s.

2. B) HVAC, plumbing and electrical with architecture and structure - It aligns MEP systems with the building's architectural and structural design.

3. C) Halves - A = Q/V, so doubling V halves A.

4. B) BIM clash detection - BIM software flags spatial clashes between systems before they're built.

5. Q = V A Q = 6 0.25 Q = 1.5 m/s

6. Q = V A A = Q/V A = 2/8 A = 0.25 m

7. Duct 1: A = Q/V = 3/5 = 0.6 m Duct 2: A = Q/V = 3/10 = 0.3 m Duct 2 (higher velocity) needs a smaller cross-section, but risks more noise and pressure loss

8. Coordinating HVAC, plumbing and electrical systems within a building's architecture and structure.

9. Q = V A - flow rate equals velocity times duct cross-sectional area.

10. To find and resolve conflicts between ducts, pipes, conduits and structural elements before construction.