# What is Thermal Bridging Mitigation?

Worksheet

Thermal bridging mitigation reduces heat loss through conductive paths (studs, slab edges, connections) that bypass insulation, typically with thermal breaks; the whole-assembly resistance can be estimated with the parallel path method R_eff = 1 / (fb/Rb + fc/Rc).

## Questions

1. A bridge has fb = 0.1, Rb = 0.5, and Rc = 3.0 mK/W. What is the approximate effective R-value?

A) 3.0 mK/W
B) 2.0 mK/W
C) 0.5 mK/W
D) 5.0 mK/W

2. What most commonly causes thermal bridging?

A) Window glazing alone
B) Conductive structural elements bypassing insulation
C) Paint color
D) Roof shape

3. What is a thermal break used for?

A) Increasing structural load capacity
B) Interrupting the conductive heat path at a connection
C) Reducing daylight
D) Waterproofing a roof

4. What effect does thermal bridging have on a wall's effective R-value?

A) Increases it
B) Has no effect
C) Decreases it
D) Doubles it

5. A balcony slab thermal bridge has a bridge area fraction of 0.08, a bridge path resistance of 0.4, and a clear-field resistance of 3.0 mK/W. Find the effective R-value.

6. A thermal break pad raises the bridge path resistance to 0.5 mK/W (fb still 0.08, Rc still 3.0). Find the new effective R-value.

7. A steel-stud wall has a 15% framing fraction (fb = 0.15), stud path resistance Rb = 0.15, and clear insulated cavity Rc = 3.5 mK/W. Find the whole-wall effective R-value.

8. Define: What is thermal bridging?

9. Define: Why is thermal bridging a problem?

10. Define: What is a thermal break?

## Answer Key

1. B) 2.0 mK/W - fb/Rb=0.2, (1-fb)/Rc=0.3, sum=0.5, R_eff=1/0.5=2.0 mK/W.

2. B) Conductive structural elements bypassing insulation - Conductive materials like steel or concrete create a shortcut for heat through the insulation layer.

3. B) Interrupting the conductive heat path at a connection - A thermal break inserts insulating material to interrupt conductive heat flow at a structural connection.

4. C) Decreases it - The high-conductivity path lowers the overall effective thermal resistance of the assembly.

5. fb/Rb = 0.08/0.4 = 0.2 (1fb)/Rc = 0.92/3.0 = 0.307 Sum = 0.507 R_eff = 1/0.507 = 1.974 mK/W

6. fb/Rb = 0.08/0.5 = 0.16 (1fb)/Rc = 0.92/3.0 = 0.307 Sum = 0.467 R_eff = 1/0.467 = 2.143 mK/W

7. fb/Rb = 0.15/0.15 = 1.0 (1fb)/Rc = 0.85/3.5 = 0.243 Sum = 1.243 R_eff = 1/1.243 = 0.805 mK/W

8. A path of higher heat conductivity through a building envelope that bypasses insulation - e.g., structural steel or a concrete slab edge.

9. It increases heat loss, lowers the effective R-value, and can cause cold spots, condensation, or mold.

10. An insulating material inserted into a structural connection to interrupt conductive heat flow.