

How a Cool Roof Works

Explain a physical process, connect evidence, and qualify its limits.

CCSS.ELA-Literacy.W.11-12.2 "Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB In paragraph 1, underline the two sentences beginning 'A cool roof' and 'A cooler roof'. In paragraph 2, mark the reported research finding R and the proposed comparison P. Circle two conditions in paragraph 3 that limit what a school can conclude about its own roof.

From Sunlight to Building Heat

- ① A roof's surface affects how much solar energy a building absorbs. Dark surfaces generally absorb more sunlight than highly reflective surfaces. A cool roof uses materials with high solar reflectance; many also release absorbed heat efficiently as thermal radiation. A cooler roof surface can reduce heat flowing into the building and lower the need for air conditioning. Surface temperature, indoor temperature and energy use are related, but they are different measurements. Insulation and building systems also influence what happens inside.
- ② Berkeley Lab researchers monitored cool-roof installations on six California buildings at three sites and reported lower daily peak roof surface temperatures after installation. They also estimated cooling-electricity savings from monitoring data. These findings support the connection between roof properties and building performance, but do not give an automatic prediction for every school. As an illustrative study design, a school could compare similar roof sections while recording sunlight, surface temperature and indoor conditions. That is a proposed comparison, not a report of results already collected at the school.

- ③ An explanation must also connect benefits to conditions. Climate, insulation, shade, roof type and cooling equipment affect the value of a reflective surface. Reflecting sunlight can reduce helpful solar warming during cold weather, so an annual evaluation should include heating as well as cooling. Dirt and weathering can change reflectance over time. Comparing roof options with improved insulation requires local information about the building and its use. The process explains why a cool roof may help; local measurements are needed to estimate the size and cost of that benefit.

2 ANSWER WITH EVIDENCE _____ Use the passage

- ① Explain the chain connecting greater solar reflectance to a possible reduction in cooling energy.

- ② Which part of paragraph 2 describes reported findings, and which describes a proposed comparison? Why does the distinction matter?

- ③ Why would roof surface temperature alone be insufficient to estimate a school's annual energy savings?

3 YOUR TURN

Your own words

Write a 160-200-word informative explanation for the school facilities committee. Explain how roof reflectance can affect building heat, connect the reported research to that process, and distinguish the proposed school comparison from completed evidence. Analyze at least two conditions that could change local results. Organize the ideas so each builds on the previous one, then conclude with what local measurements would clarify.

Write a connected explanation

Use several paragraphs: explain the mechanism, connect the evidence, then analyze limits and useful measurements. Define technical terms through context. Explain relationships rather than listing facts. Keep reported results separate from the proposed comparison; avoid promises of a specific energy saving. Write 160-200 words, excluding any title.

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PART 1 • READ AND MARK

In paragraph 1, underline the two sentences beginning 'A cool roof' and 'A cooler roof'. In paragraph 2, mark the reported research finding R and the proposed comparison P. Circle two conditions in paragraph 3 that limit what a school can conclude about its own roof. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Explain the chain connecting greater solar reflectance to a possible reduction in cooling energy.	Greater reflectance means less sunlight is absorbed, which can lower roof surface temperature and heat flow into the building, reducing the need for air conditioning.
2	Which part of paragraph 2 describes reported findings, and which describes a proposed comparison? Why does the distinction matter?	The six-building Berkeley Lab monitoring describes reported findings. The school comparison is a proposed design with no results yet; students must not present an illustrative plan as measured evidence.
3	Why would roof surface temperature alone be insufficient to estimate a school's annual energy savings?	Indoor conditions and energy use are different measurements. Insulation, equipment and climate matter, and winter heating effects must be considered alongside cooling.

PART 3 · YOUR TURN (SAMPLE ANSWER)

Informative explanation: A cool roof changes the first step in a building's heat gain: absorption of sunlight. Greater solar reflectance sends more incoming sunlight away from the surface. With less energy absorbed, the roof can stay cooler and transfer less heat into the building. This can reduce air-conditioning demand, although a surface temperature is not itself an energy-use measurement.

Berkeley Lab's monitoring of six California buildings connects that mechanism with observed lower peak roof temperatures and estimated cooling-electricity savings after installation. These reported findings differ from the suggested school comparison, which is only a study design. Similar roof sections could help researchers reduce some differences, but the school has not yet collected those results.

Local conditions determine how much benefit is possible. Strong insulation may already limit heat entering through the roof, while climate affects both summer cooling and winter heating needs. Dirt can also change reflectance over time. Measuring roof and indoor temperatures alongside annual heating and cooling energy would clarify the relationship. Those records, interpreted with building conditions, would help the committee compare roof changes with insulation improvements.

TEACHER ASSESSMENT NOTES

Require an accurate process chain, connected interpretation of the reported findings, a clear distinction between evidence and the proposed comparison, analysis of at least two local conditions and a meaningful conclusion. The model explains rather than merely advocates. Background: U.S. DOE, Guidelines for Selecting Cool Roofs, <https://www.energy.gov/sites/prod/files/2013/10/f3/coolroofguide.pdf>. Reported monitoring: Akbari et al., Monitoring the energy-use effects of cool roofs on California commercial buildings, <https://doi.org/10.1016/j.enbuild.2004.11.013>. The school comparison is illustrative and has no reported data; no local savings percentage is established.