

Egyptian Cold Passage



Overview

The horizontal passage of the Great Pyramid of Khufu at Giza, has expansion joints and a 0.30% slope over a distance of 32 meters because it was made for flash-evaporative cooling.

Key Takeaways

The so-called "Cold Passage" in the Great Pyramid of Khufu was designed to generate and store temperatures as low as -10°C (14°F) using flash-evaporative cooling.

Mechanism of the Cold Passage The horizontal passage of the Great Pyramid, often referred to as the "Cold Passage," was engineered to produce flash-evaporative cold. Pressurized liquid water, generated by a piston-like impactor in the inclined well, was transformed into a fog of microdroplets.

As these droplets evaporated, they created a rapid cooling effect, potentially lowering the temperature in the Queen's Chamber to 0°C (32°F) or even -10°C (14°F) depending on the overpressure generated by the central wooden Djed caisson in the Grand Gallery (Coursol, 2021–2025).

Temperature Storage and Use

The Queen's Chamber acted as a cold storage chamber, where a copper plate cold exchanger likely facilitated the cooling of chemical processes, such as the production of sodium carbonate and sodium bicarbonate, essential for mummification. Salt encrustation observed in the passage and chamber supports the presence of evaporative cooling, as modern evaporative coolers also experience similar salt deposits.



Ancient Egyptian Cooling Techniques

Beyond the pyramid, ancient Egyptians employed evaporative cooling in homes and structures. Techniques included hanging wet reeds or cloths in doorways and windows, using wind catchers (malqaf) to direct cool breezes into buildings, and constructing thick mudbrick walls that stabilized indoor temperatures. These methods allowed indoor temperatures to remain below 22°C (71.

6°F) year-round, demonstrating a sophisticated understanding of passive cooling and low temperature resistance in architecture.

Significance

The Cold Passage illustrates that ancient Egyptians not only understood evaporative cooling principles but also engineered large-scale systems capable of producing and maintaining sub-zero temperatures. This knowledge was applied both for practical purposes, such as chemical processing, and for comfort in residential and ceremonial structures. The combination of structural design, water management, and airflow control highlights their advanced engineering capabilities.

In summary, the Egyptian Cold Passage represents a remarkable example of ancient low-temperature engineering, using evaporative cooling to achieve and sustain temperatures far below ambient conditions, with applications ranging from chemical production to environmental control within monumental architecture.

Article Content

The Great Pyramid's evaporative cooling passage

The horizontal passage of the Great Pyramid of Khufu at Giza, has expansion joints and a 0.30% slope over a distance of 32 meters because it was made for flash-evaporative cooling.

How Did the Ancient Egyptians Cool Their Homes?

Every NYT Connections puzzle ever published is listed here, organised by date, with all four category groups and their sixteen words. The NYT only offers the current day's puzzle for free,

Winter Clothing in ancient Egypt

The ancient Egyptians tried to reduce the frost of cold and provide shade in several ways to feel thermal comfort. Thus, this raises many questions about how ancient Egyptians adapt to

Climate of Egypt

Despite the mild weather in the winter, the temperature at night decreases to be very cold at times, sometimes to at or below freezing, especially in the interior lands of Upper Egypt. The desert regions

Exploring Ancient Egyptian Architectural Cooling Techniques for

Ancient Egyptian architecture exhibits an innovative use of materials that contributed significantly to its effective cooling strategies. The Egyptians primarily utilized locally sourced limestone, mudbrick, and

NOVA Online/Pyramids/Khufu/Descending Passage/Low

The general public is not allowed down this small passage, but we have recreated the experience for you. One word of caution—this is not a place where claustrophobics should venture.

WEATHER AND CLIMATE OF ANCIENT EGYPT

Winter in Egypt is warm in most of the country, with high temperatures in the 70s F (20s C), and cool in the mountains and north, where the temperatures may fall below freezing at night.

How did the ancient Egyptians keep cool?

Designed in the form of towers connected to the building, its work lies in the exchange of heat between hot air and cold water running in special channels under the floor of buildings.

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How did the ancient Egyptians keep cool?

At this time of the year, air conditioners growl and electric fans redistribute the hot air in your apartment, which prompts the question: How did

Climate of Egypt

The cold prevailing northwesterly wind from Greece continuously blows over the northern coast without the interposition of an eventual mountain range and thus, greatly moderates temperatures

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Hence, this study investigates the influence of high temperatures on Egyptian granodiorite rock properties, given its widespread use as ornamental stones and aggregate material

Exploring Egyptian Techniques in Temperature Regulation in Ancient ...

Explore how ancient Egyptian techniques in temperature regulation utilize innovative architecture, water features, and natural ventilation for effective heating and cooling solutions.

Forever changes: Climate lessons from ancient Egypt

Studying climate history in ancient Egypt offers insight into what humans can do with often dramatic events like drought or temperature changes, the researchers said. Moral questions then

Natural ventilation, harnessed by New Kingdom Egyptian tomb

Fig. 5. Low velocity cold air draught profile for after Skistad (1994). With an average daily temperature differential of more than 20 °C (36 °F, Tutiempo, 2008) the natural ventilation would

Catalogue of Technical Solutions for Sustainable Cooling in Egypt

Medium temperature (MT): for chilled products such as dairy products, fruit, etc., typically operating in the temperature range between 0 °C and 8 °C. Low temperature (LT): for frozen products, such as fish,

Cryogenics | Low-Temperature Physics & Applications | Britannica

Cryogenics, production and application of low-temperature phenomena. The cryogenic temperature range has been defined as from $-150\text{ }^{\circ}\text{C}$ ($-238\text{ }^{\circ}\text{F}$) to absolute zero ($-273\text{ }^{\circ}\text{C}$ or $-460\text{ }^{\circ}\text{F}$), the

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