FAQ – Frequently Asked Questions
about Constructing the Great Pyramid
through Multispiral Ramps

1. What is the purpose of this explanatory model?

The model is a re-engineering process.
It reconstructs the construction of the Great Pyramid using only

- geometry
- verified techniques of the Old Kingdom
- historical constraints

It avoids speculation entirely and follows a
single, consistent construction principle from start to finish.

2. Why is efficiency the key selection criterion?

The pyramid had to be completed within the allotted time of **20years**.
The pharaoh had to still be alive when its construction was finished.
This made efficiency a **non-negotiable requirement**.
Whenever multiple technical solutions are possible, the model selects the one that

- requires the least material
- minimizes labor
- reduces construction time
- fits the technological capabilities of the era

Efficiency becomes a **second source of information**, alongside archaeology.

3. Why are there no archaeological remains of ramps?

Because ramps were **temporary structures**. After completion, they were dismantled and the material was reused. The absence of ramp remains is therefore **expected**, not problematic.

The model provides an **archaeological falsification criterion** for increased concentrations of mud bricks in the joints of the outer rock layers.

4. Why not an internal ramp, as proposed by Houdin?

Because an internal ramp

- provides too little transport capacity
- becomes extremely narrow in the upper third
- cannot support parallel transport
- would extend the construction time far beyond 20 years

The model shows that the middle section alone required **at least 2.7 transport lanes** on average. Houdin's internal ramp offers only **one**.

5. Why use multispiral external ramps?

Because ramp volume grows **quadratically** with ramp width.
A single wide ramp is extremely inefficient.
Multiple narrow lanes

- require far less material
- can be recycled upward
- allow continuous parallel transport
- match the geometry of the stepped core

This makes multispiral ramps the **most efficient solution.**

6. How many blocks were used?

The pyramid consists of

- approx. **3 million standard blocks** (99 %)
- approx. **22,000 casing stones** (0.7 %)
- approx. **200 large granite blocks** (0.2 %)

The project is therefore primarily a **mass-transport challenge**, not a lifting challenge.

7. How many workers were involved?

- **10,000 permanent workers** year-round
- **+10,000 seasonal workers** during the Nile flood
- approx. **35 working hours per week**
- humane working conditions, not slavery

The site functioned like a **large, well-organized industrial operation**.

8. Why were sledges on wooden rollers used?

Because they

- reduce friction by a factor of 12
- eliminate the need for water carriers
- avoid slippery ramp surfaces
- shorten the construction time by about 30 %

For blocks up to 5 t, wooden rollers are the **optimal transport technology**.

9. How were the large granite blocks moved?

The huge blocks were not pulled up the outer ramps.
They only made up 0.2 %.
Instead, they were

- placed on the horizontal surface of the pyramid
- lifted upward using **zigzag lifting** (2° ramps)
- installed by 60% of the pyramid's height

This kept the mass-transport system uninterrupted.

10. How is the construction time calculated?

The time depends on

- number of blocks per level
- transport capacity per lane
- number of available lanes
- average annual number of workers

Using the middle level (Level 109) as a representative average yields:

- **18.34 years** for the stepped core
- **+1.6 years** for the casing
- **≈ 20 years total**

This matches historical accounts precisely.

11. Can the model be falsified?

Yes. It provides clear **falsification criteria**, such as

- ramp angle
- number of transport lanes
- transport throughput
- ramp volume
- worker productivity

If any of these values were proven impossible, the model would require revision.

12. Why is the model so robust?

Because it

- uses no speculative assumptions
- is fully deduced from constraints
- integrates all subsystems (ramps, transport, labor, time)
- matches historical sources
- reproduces the 20-year construction time
- is mathematically verifiable

It is not a “maybe” model — it is a
“this is what must have worked” model.

Images and further information can be found on the website
www.cheops-pyramid.net/en