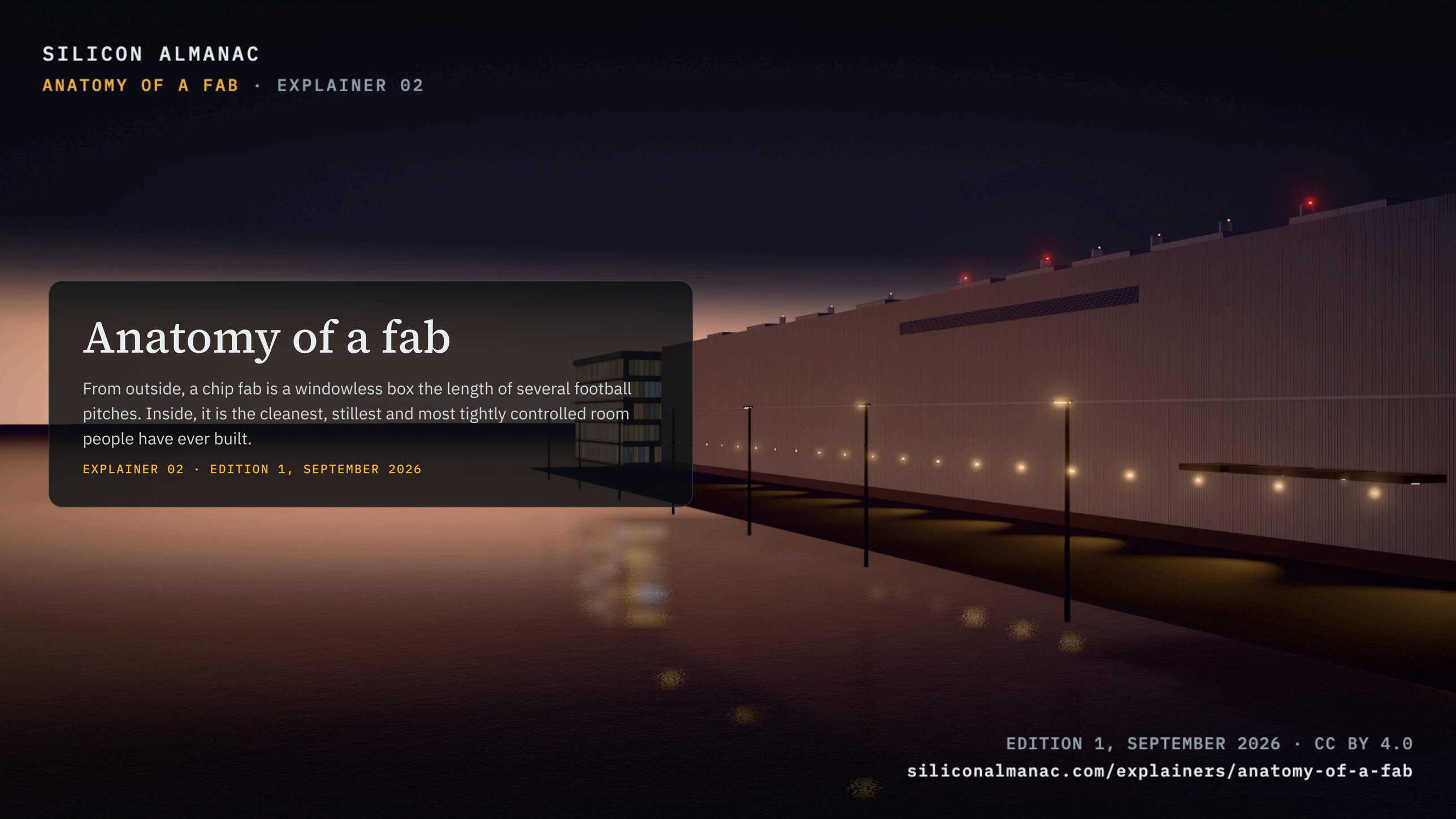
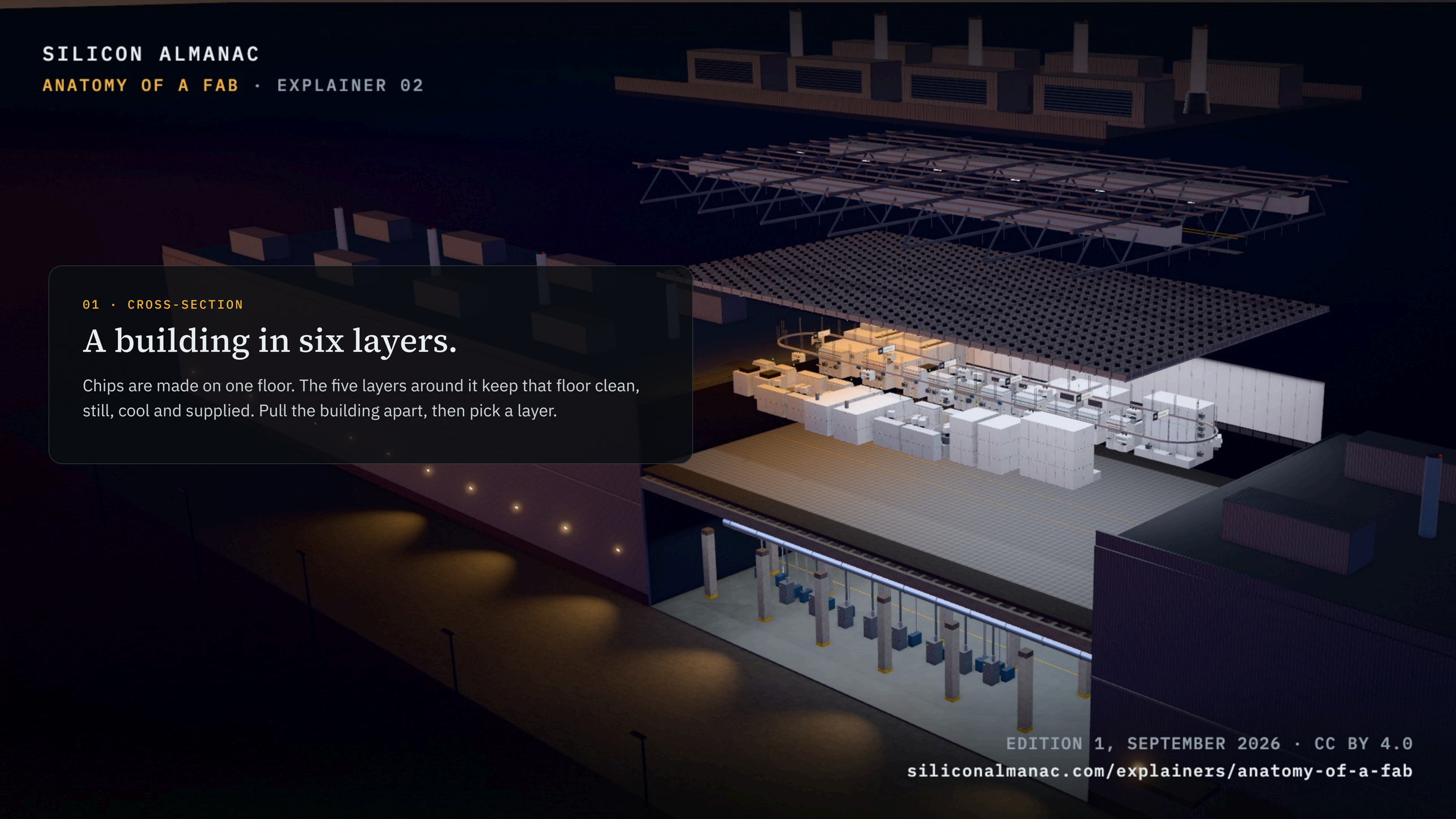
Anatomy of a fab

From outside, a chip fab is a windowless box the length of several football pitches. Inside, it is the cleanest, stillest and most tightly controlled room people have ever built.

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01 · CROSS-SECTION

A building in six layers.

Chips are made on one floor. The five layers around it keep that floor clean, still, cool and supplied. Pull the building apart, then pick a layer.

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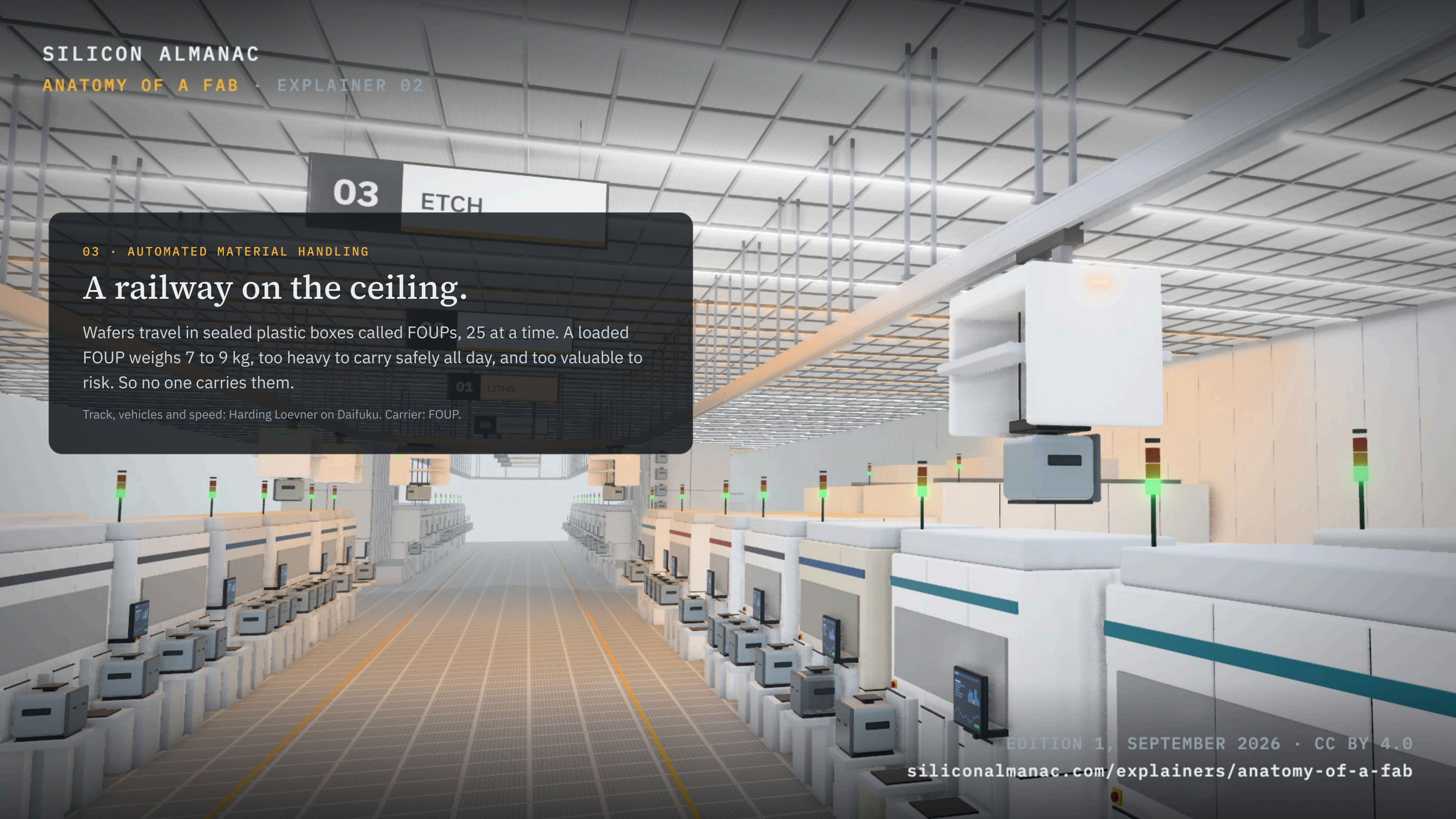
02 · AIRFLOW

Air that falls like rain.

The whole ceiling pushes filtered air straight down, at about 0.45 m/s, the speed US Federal Standard 209 recommended for rooms like this. It sweeps past the tools, through the perforated floor, up the side shafts and back through the filters. Anything a person or a tool sheds is carried down and away from the wafers.

Air speed: Journal of Building Engineering, 2025, citing Federal Standard 209. Temperature and humidity: CKY, Semiconductor fab HVAC design. Classes: Cleanroom.

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03 · AUTOMATED MATERIAL HANDLING

A railway on the ceiling.

Wafers travel in sealed plastic boxes called FOUPs, 25 at a time. A loaded FOUP weighs 7 to 9 kg, too heavy to carry safely all day, and too valuable to risk. So no one carries them.

Track, vehicles and speed: Harding Loevner on Daifuku. Carrier: FOUP.

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04 · THE ROUTE

Round and round, a thousand times.

A car factory is a line: parts enter one end and leave the other. A fab is a loop. The same lot comes back to lithography, etch, deposition and cleaning again and again, once for every layer of the chip.

Semiconductor Engineering: Battling fab cycle times

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05 · THE LEVEL BELOW

The machine under the machine.

What you see of a tool in the cleanroom is its clean end. Its pumps, gas supply, chemical feed and exhaust treatment sit one level down, in the subfab, plumbed up through the floor.

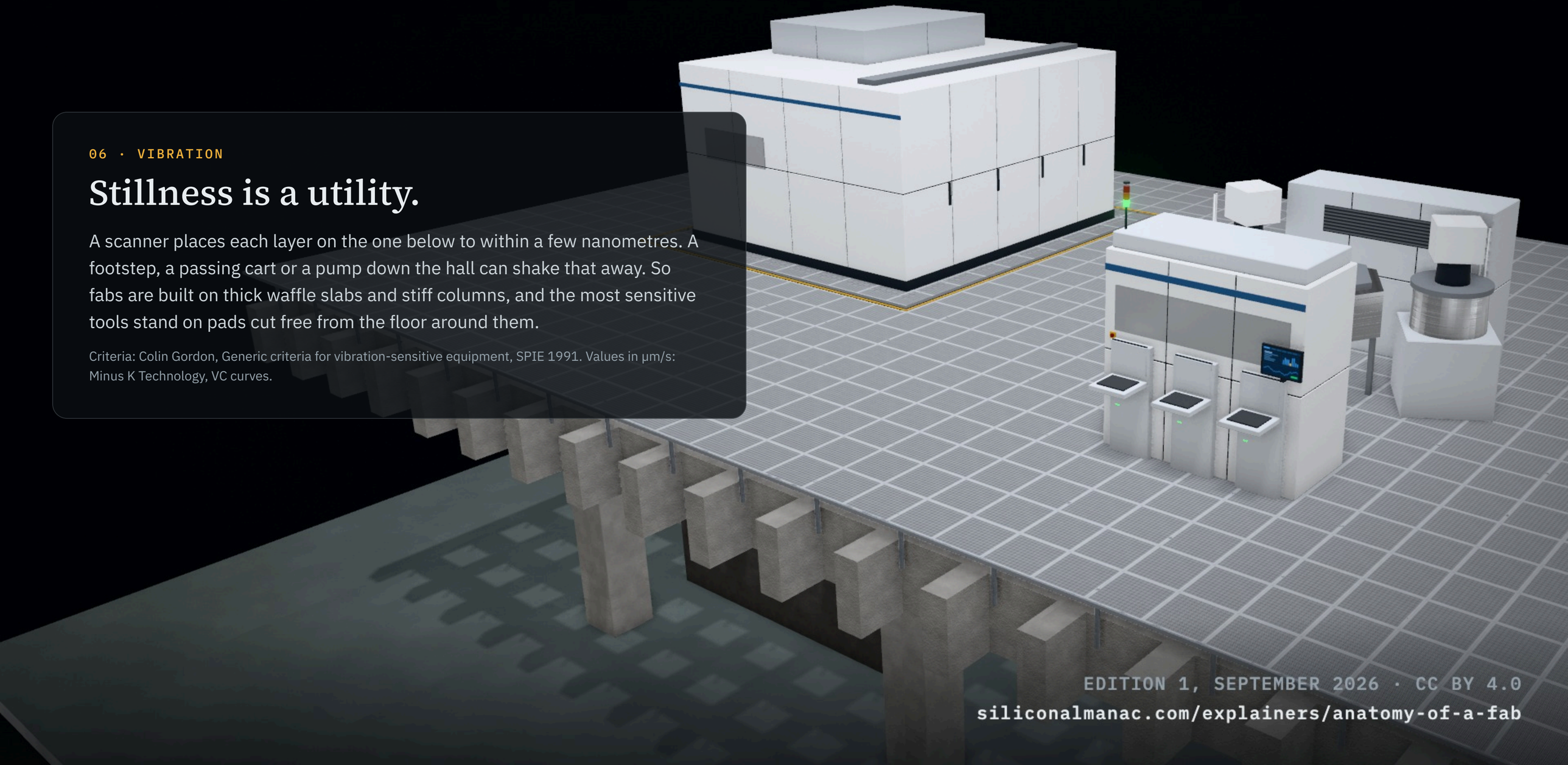
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06 · VIBRATION

Stillness is a utility.

A scanner places each layer on the one below to within a few nanometres. A footstep, a passing cart or a pump down the hall can shake that away. So fabs are built on thick waffle slabs and stiff columns, and the most sensitive tools stand on pads cut free from the floor around them.

Criteria: Colin Gordon, Generic criteria for vibration-sensitive equipment, SPIE 1991. Values in µm/s: Minus K Technology, VC curves.



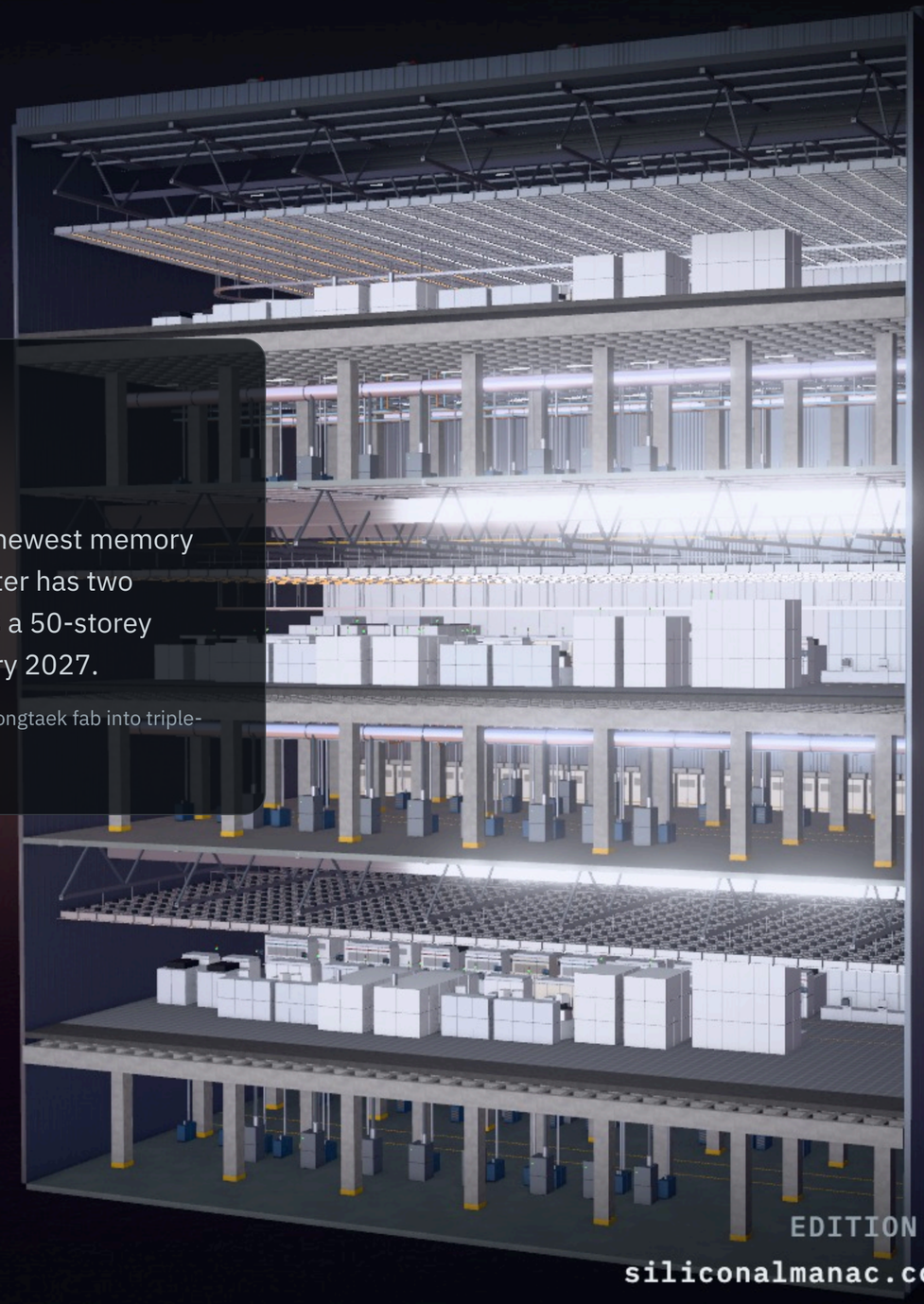
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07 · THE NEW SHAPE

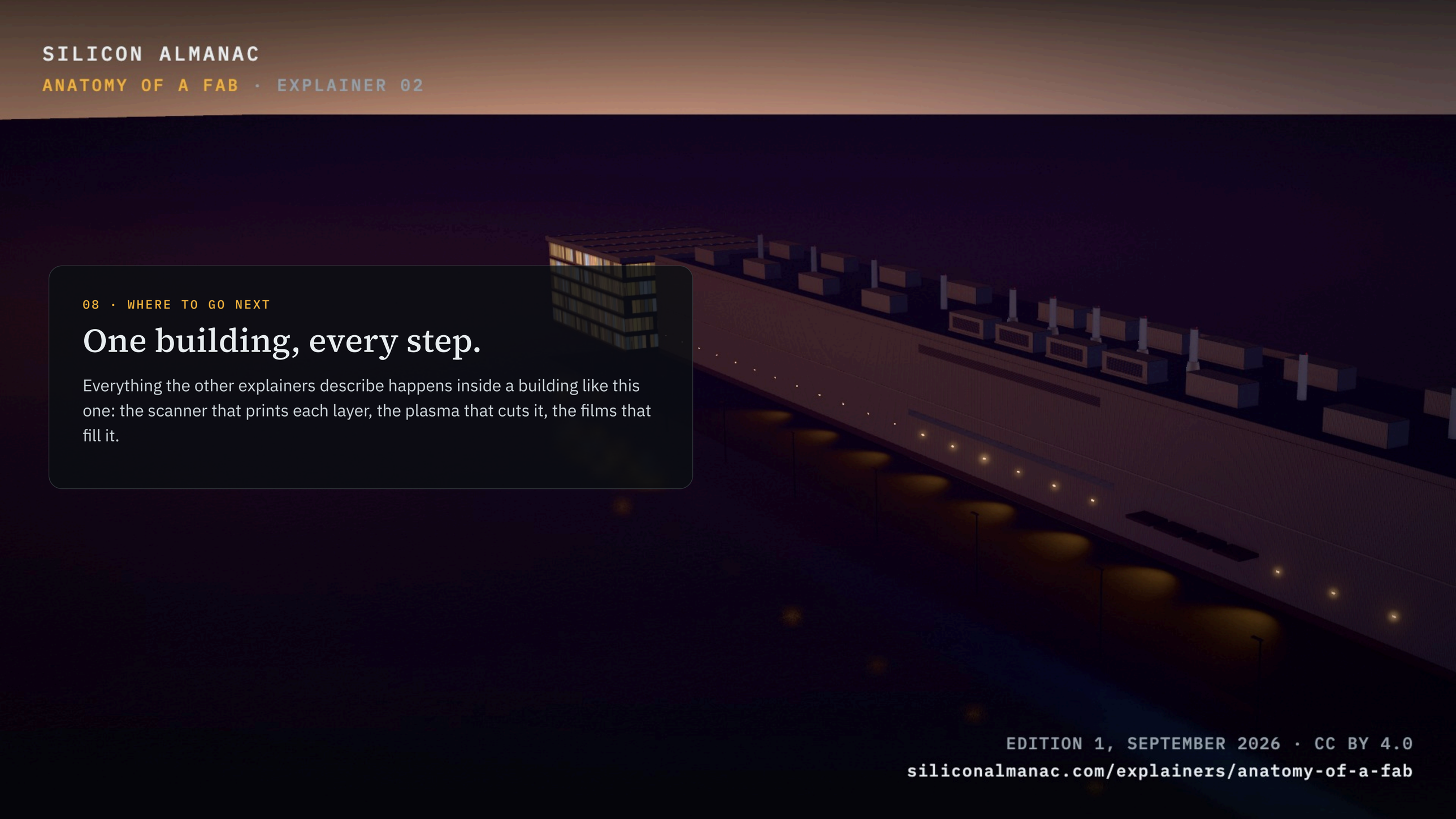
Cleanrooms, stacked.

Classic fabs have one cleanroom level over one subfab. The newest memory fabs stack them. SK hynix says the first fab of its Yongin cluster has two building shells holding six cleanrooms, in a building as tall as a 50-storey apartment block, with the first cleanroom opening in February 2027.

SK hynix: Yongin cluster facility investment. BusinessKorea: Samsung expands Pyeongtaek fab into triple-deck.



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08 · WHERE TO GO NEXT

One building, every step.

Everything the other explainers describe happens inside a building like this one: the scanner that prints each layer, the plasma that cuts it, the films that fill it.

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Sources

- SK hynix: Yongin cluster facility investment
- Semiconductor Engineering: Battling fab cycle times
- Harding Loevner on Daifuku's monorails
- BusinessKorea: Samsung expands Pyeongtaek fab into triple-deck (19 August 2026)
- Permana, Agharid and Wang: unidirectional airflow in a wafer-manufacturing cleanroom, Journal of Building Engineering (2025)
- CKY Refrigeration & Air Conditioning Engineering: Semiconductor fab HVAC design
- Colin Gordon: Generic criteria for vibration-sensitive equipment, SPIE (1991) · Minus K Technology: VC curves
- FOUP · Cleanroom

Every figure comes from a publisher named here. The buildings shown are generic, not any company's design. Figures are rounded. The model is built in code when the page loads: no photographs, no downloaded 3D files. It renders in real time with WebGL, at a quality chosen for your graphics chip. Motion is sped up for clarity.

Anatomy of a fab

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