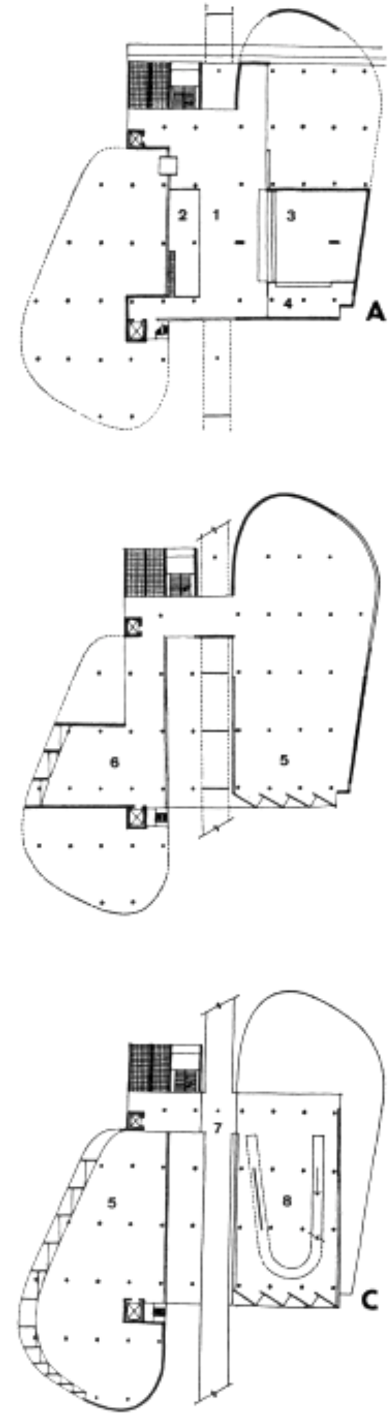
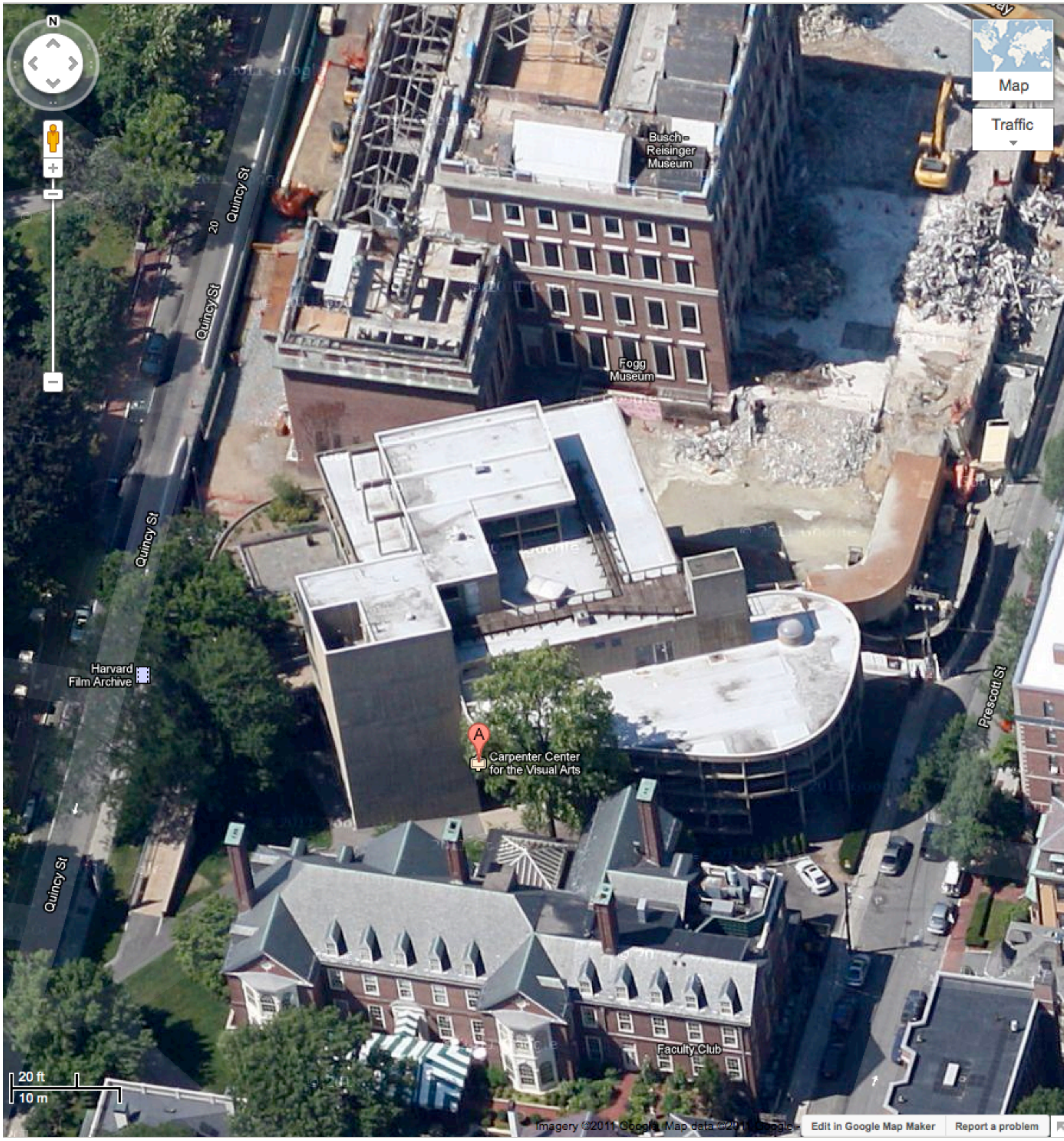
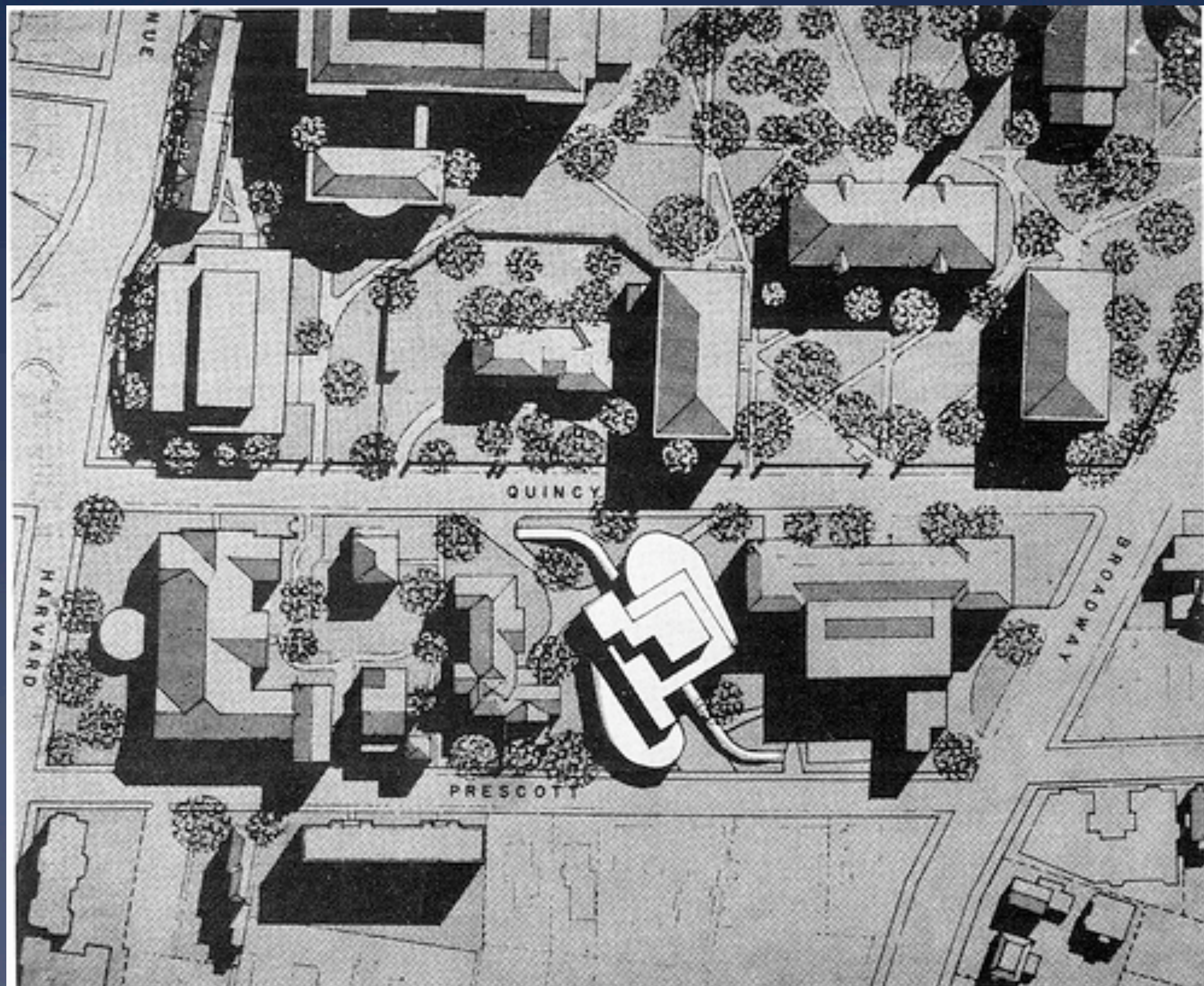
Carpenter Center, Harvard

Le Corbusier
1964





A building on a shortcut between Quincy and Prescott Streets



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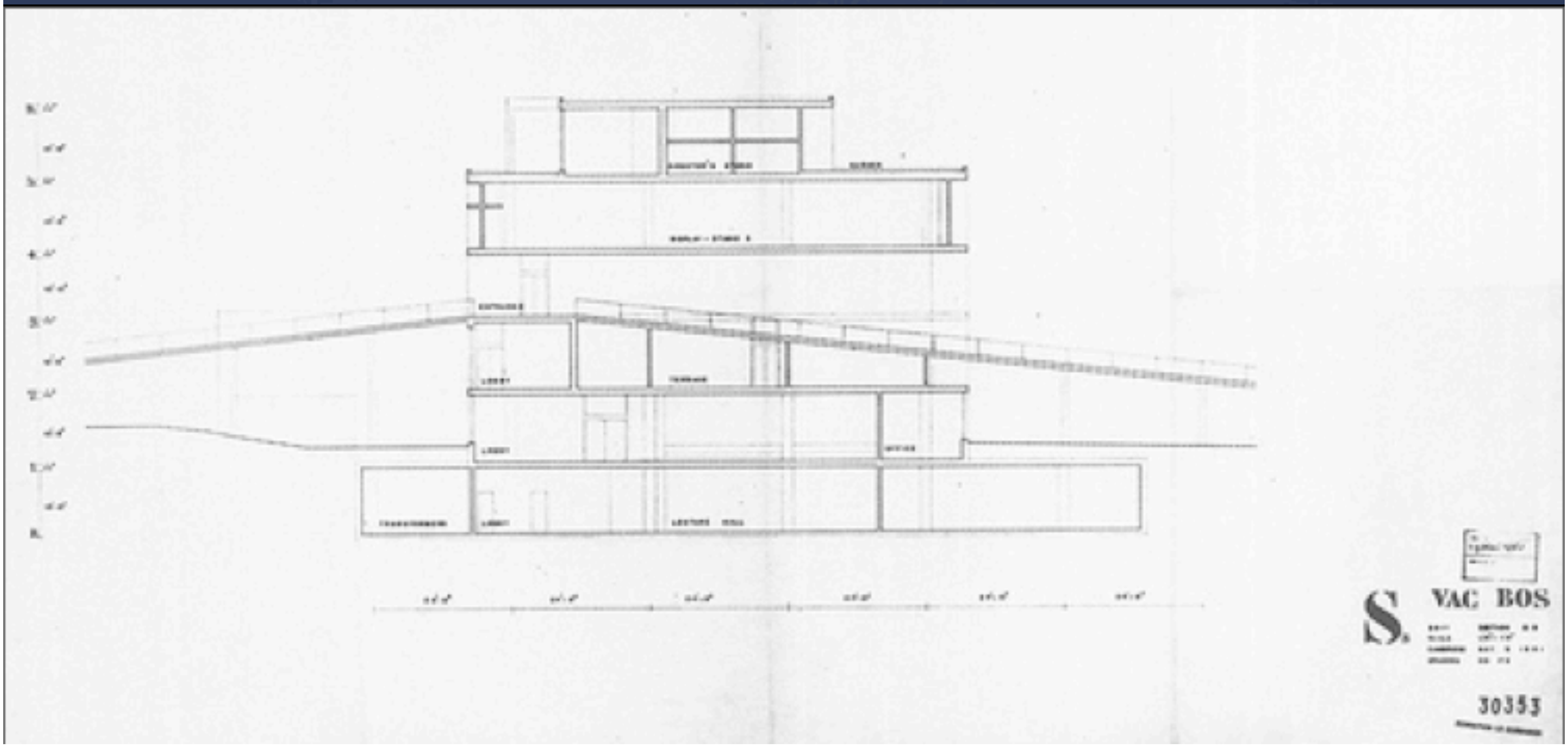
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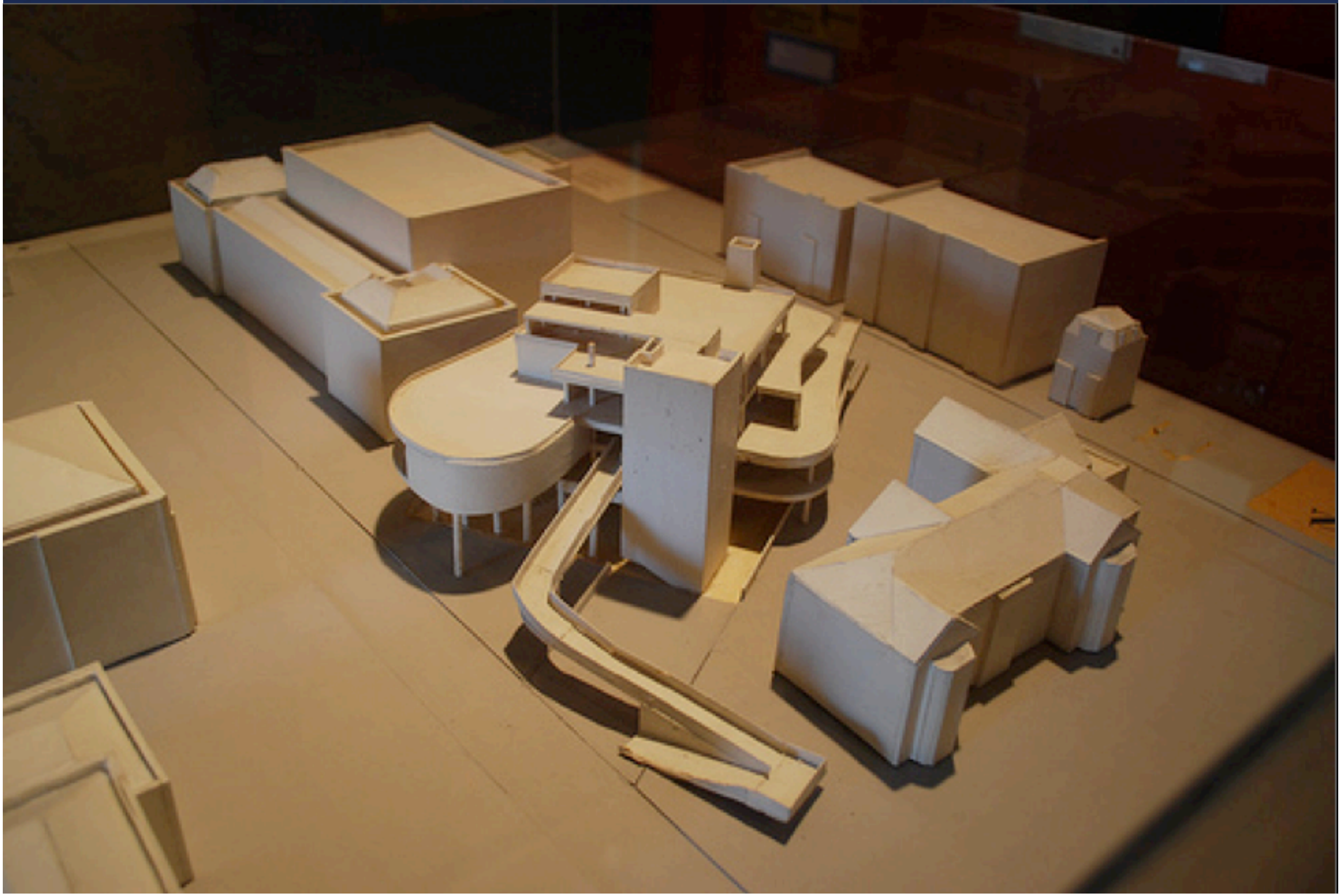


The Carpenter Center for Visual Arts

Located at Harvard University, the Carpenter Center is Le Corbusier's only project in the United States.

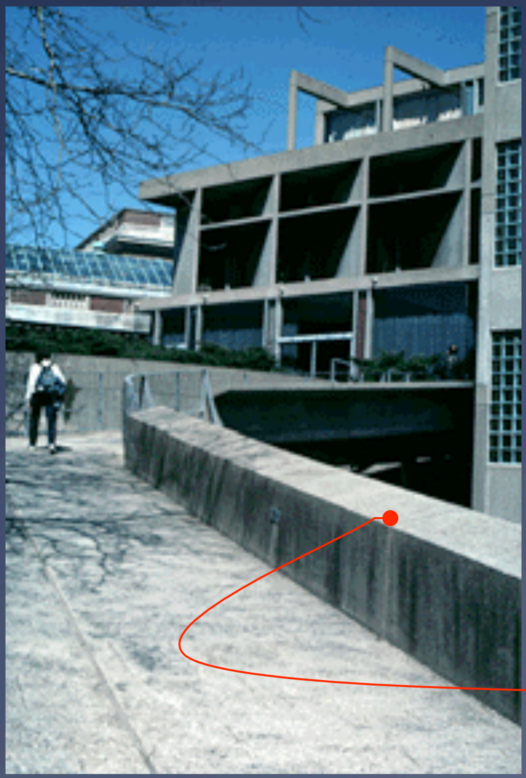
The firm of Jose Luis Sert was the local coordinating architect. Sert was Dean of the Harvard GSD at the time, and was influential in securing the commission for Corbu.

Corbu proposed that the project would have all of his elements of architecture included.

- Ramp
- Piloti
- Free plan
- Bris Solei
- Roof Garden

The ramp is both an access through the building to the neighborhood beyond Harvard and is the path to the front door

One answer to two problems



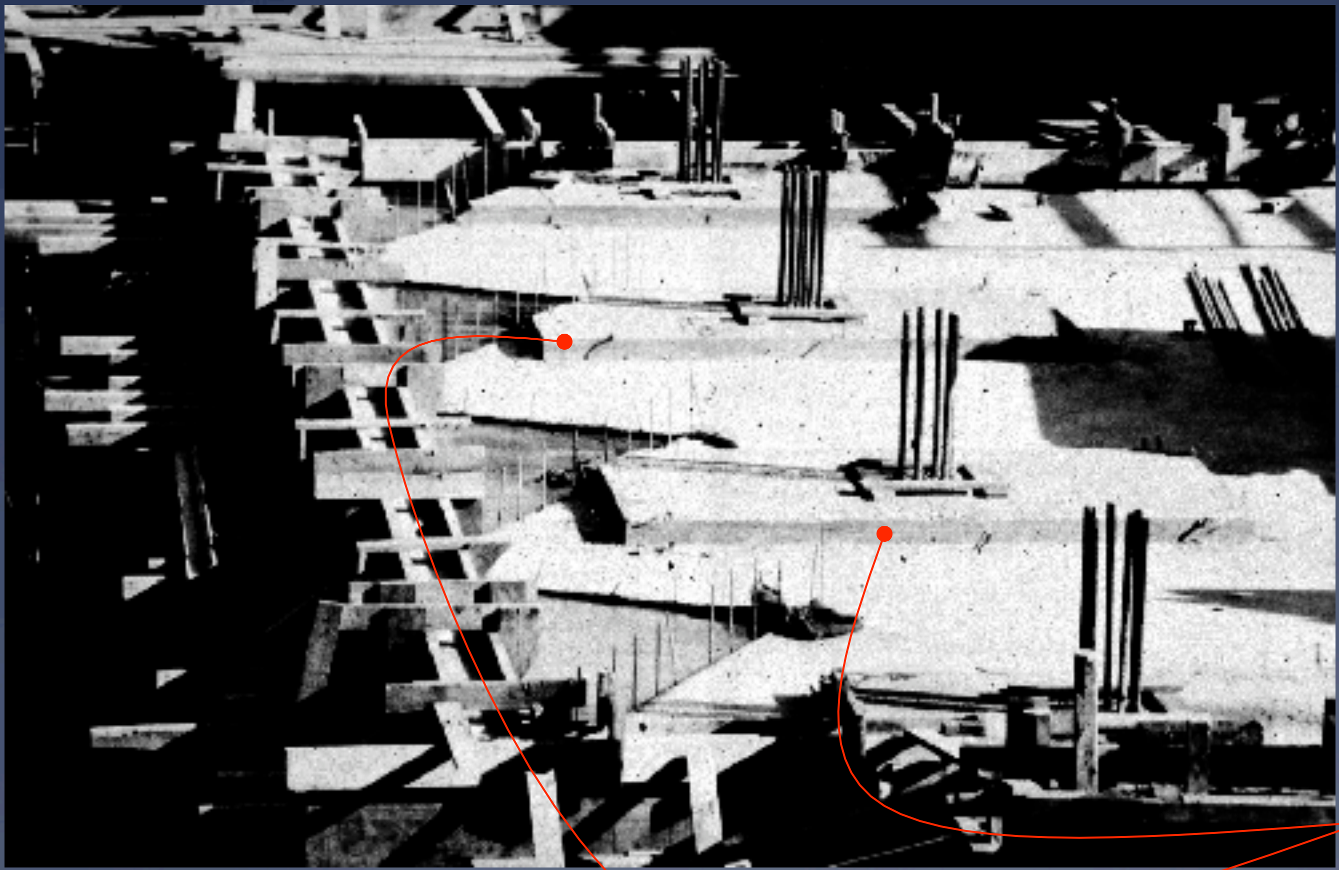
- Another concern Corbu had was the visual weight of the ramp.
- Engineers were planning to place a beam below the ramp to carry it from piloti to piloti.
- To address Corbu's concern that a beam below made the ramp seem to heavy, the engineers took advantage of the monolithic nature of concrete and put the beam above the slab to carry it… where it also acts as a guard rail!

Problem...

Slabs supported on piloti's challenged the structural engineers working with Sert.

The floor loads of the studio's above were too high for a simple flat plate… Shear forces indicated that drop panels would be necessary at each column head.

Corbu said no, nothing can interrupt the piloti meeting the slab.



This is where the magic of cast in place concrete comes in.

To resist shear at the piloti head, additonal material and steel is needed. This is usually added below the slab to form a shear head or drop panel.

Sert's engineers proposed placing the shear heads *above* the

Another problem...

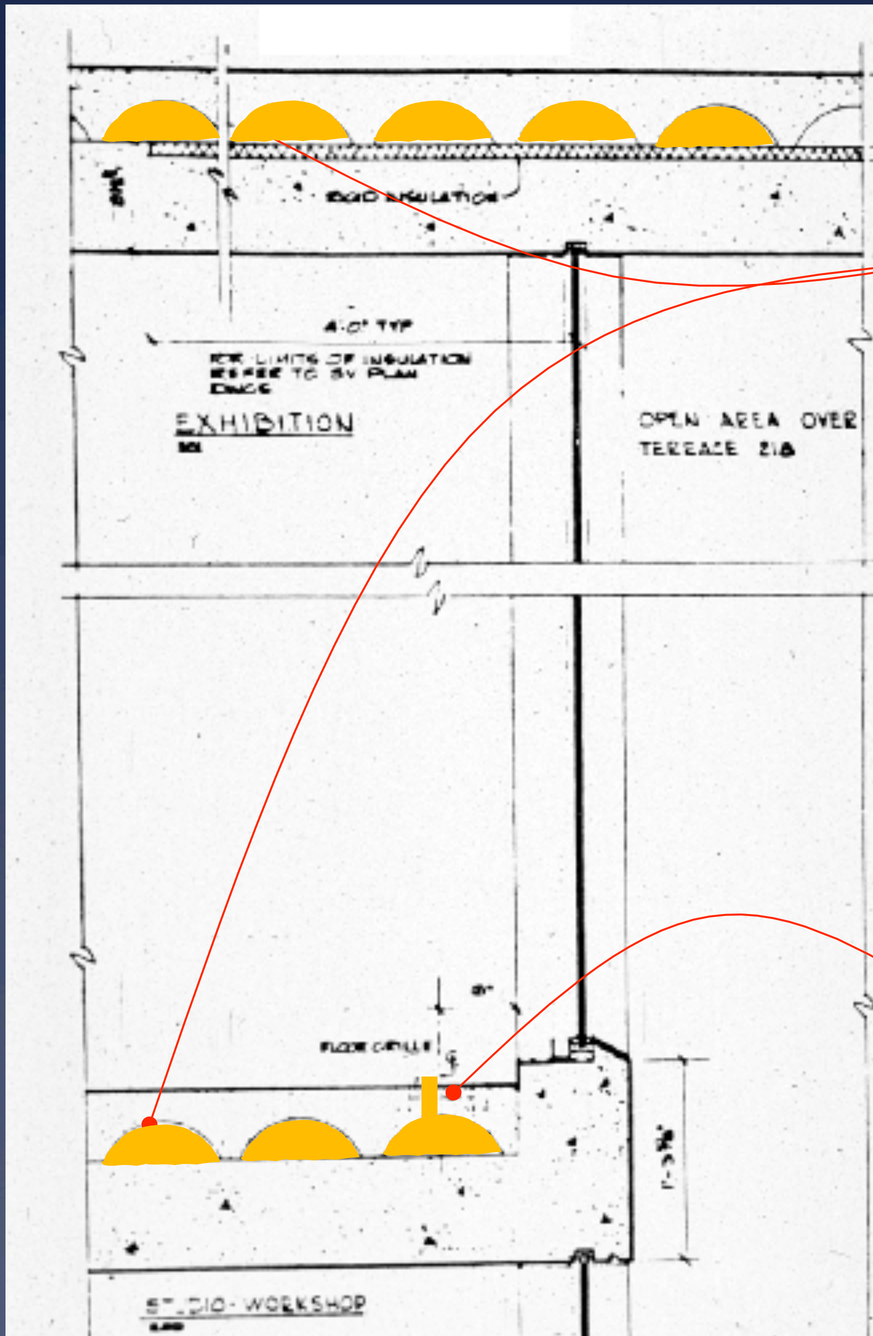
Usually shear heads never go above the slab because … ***people would trip on them!***

But Corbu's clarity of vision about the piloti and slab was also challenging the mechanical engineers…. He would accept ***no ductwork*** visible in the space!

Problem + Problem = solution!

The structural and mechanical engineers were in different firms, not in direct communication, they could only see their own problem…Corbu!

Sert's architects ***combined*** both problems and found the solution!



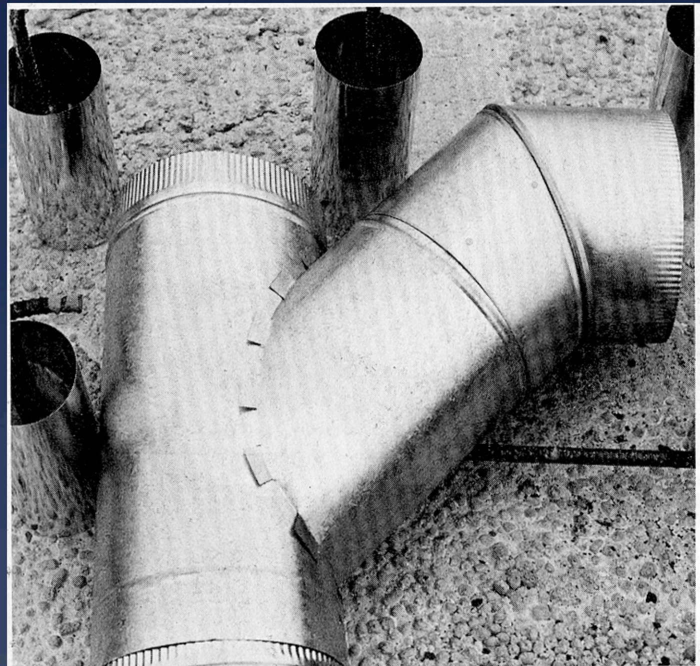
Air filled floors

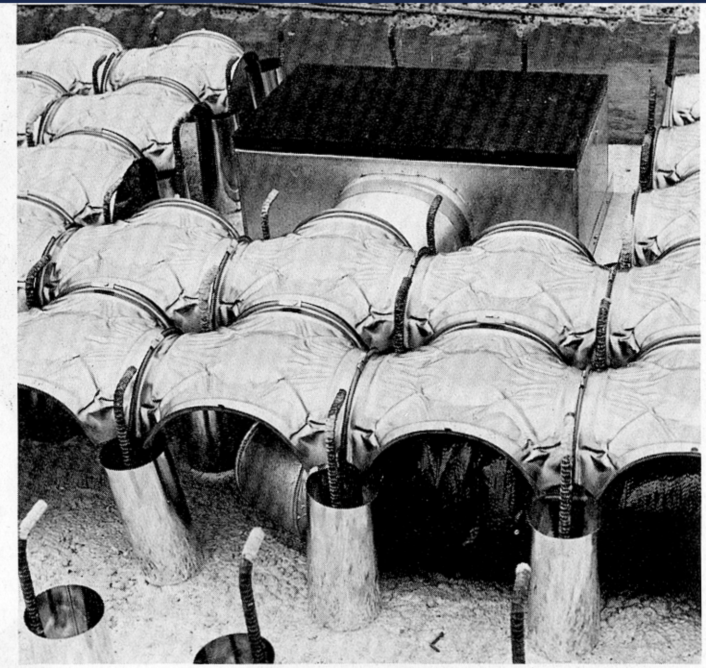
- Supply air would be carried through a network of small voids beneath a floor slab poured ***on top*** of the structural slab!

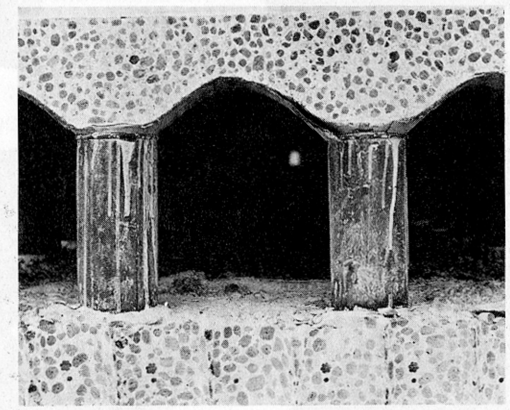
This ***Air Floor*** would cover up the shear heads so no tripping, no projections below the slab, no ducts…everybodies concerns are addressed.

The Air Floor product was '+' shaped plastic vaults set on the floor slab and connected to supply air ducts in the walls.

Where supply air was needed for in the room distribution, a slot was cut through the topping into the Air Floor to release supply air.



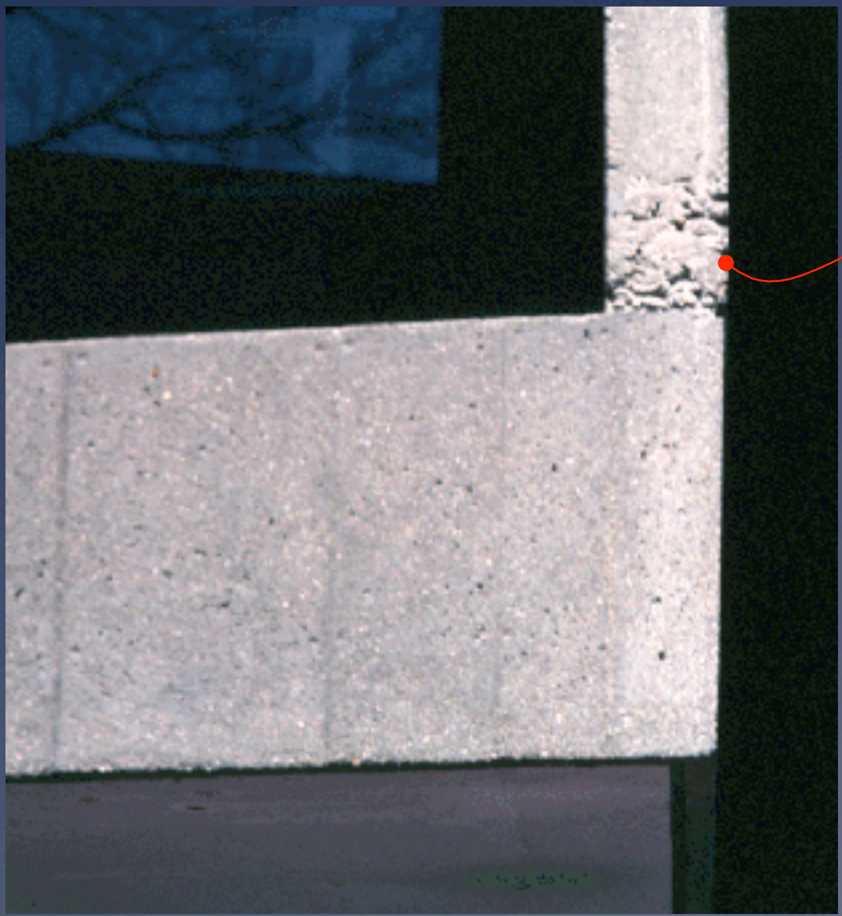




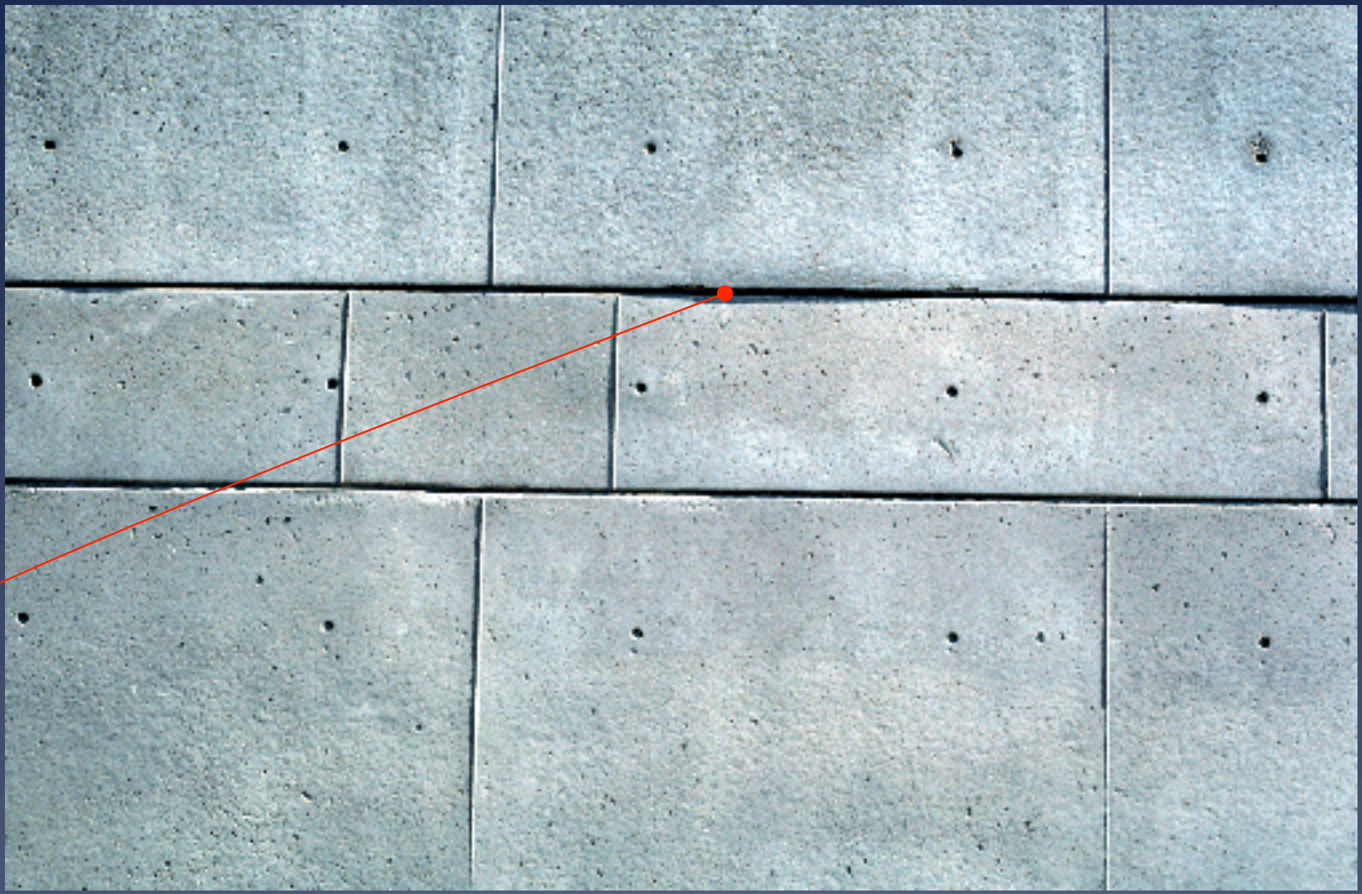
Hollow URBS floors enable ducts to extend in two directions. Ducts are laid on precast concrete bottom slab, arched forms are installed atop stub columns, and top slab is cast on them.

Traveling in Boston, Corbu thought a higher quality of concrete was possible here than in France. The details of the bris solei and ondulatories challenged the form builders, concrete placers to execute the very tall, very thin vertical elements.

- The quality of the finished project is very high, one of the best concrete buildings in the U.S.
- This due in a large part to the quality of the formwork, built by tradesman from the ship building industry in Boston!
- Who else could build wood structure precisely, without leaks around curves and detailed elements?

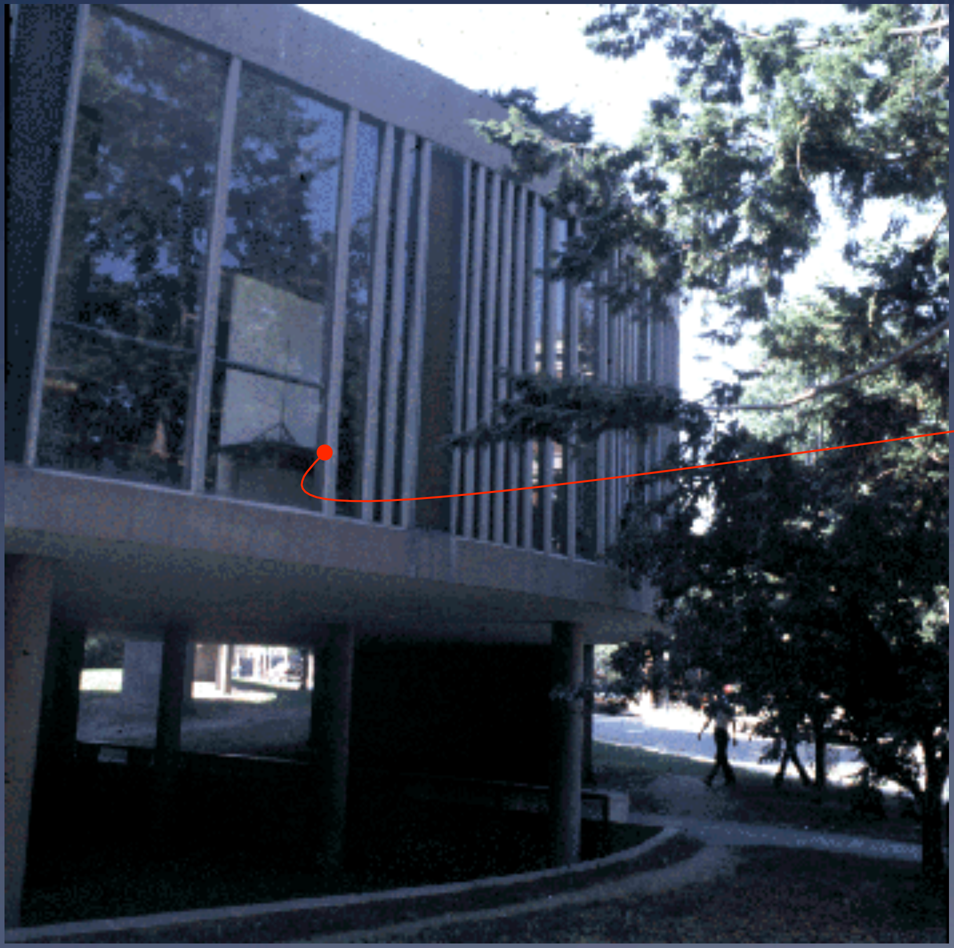


- Not many flaws exist on this project.
- One of the few, this honeycomb at the joint between a floor slab and a vertical face of the bris solei may have been caused by a form leak. Any form leak will allow water and cement paste out of the form, leaving a segregated mix area behind.



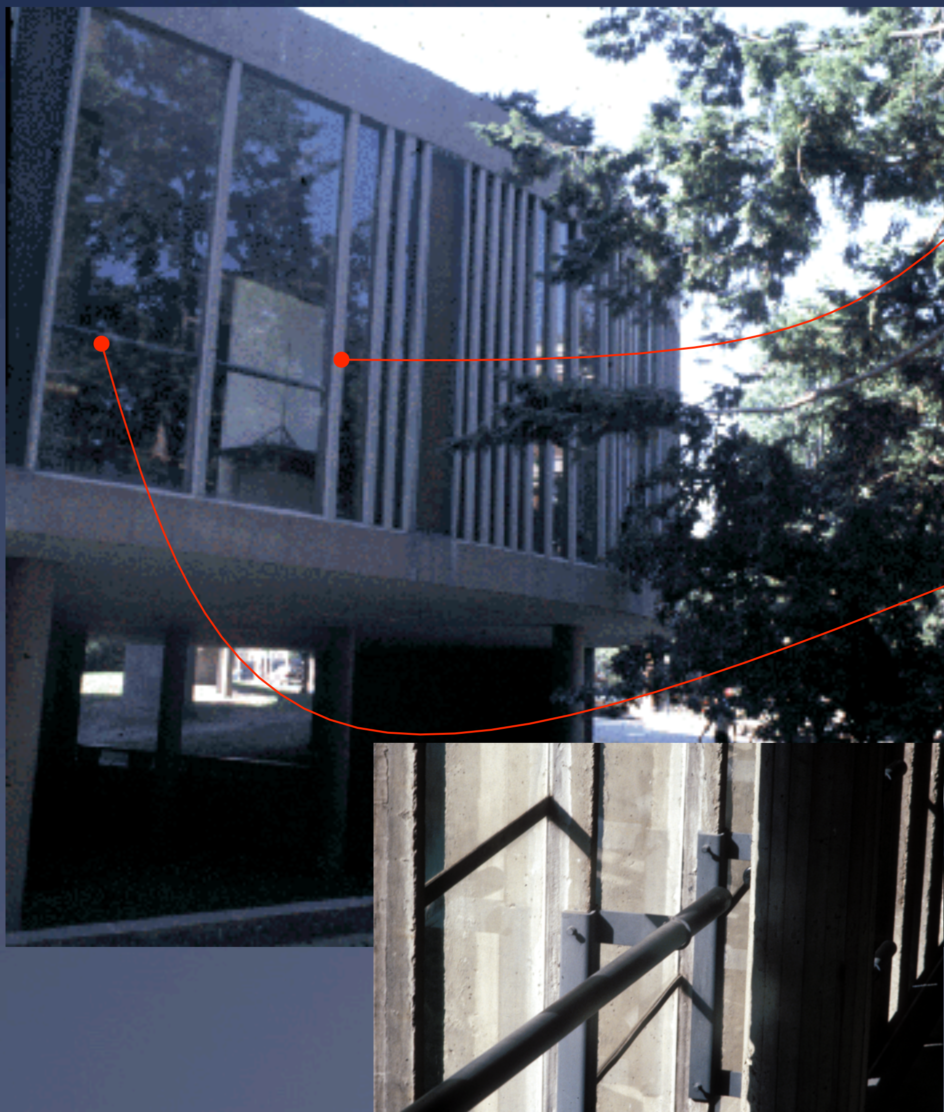
* Here, the wall forms deflected under the load of the concrete, and bowed out at the middle of each form. A little more bracing may have prevented this.

Concrete Mullions



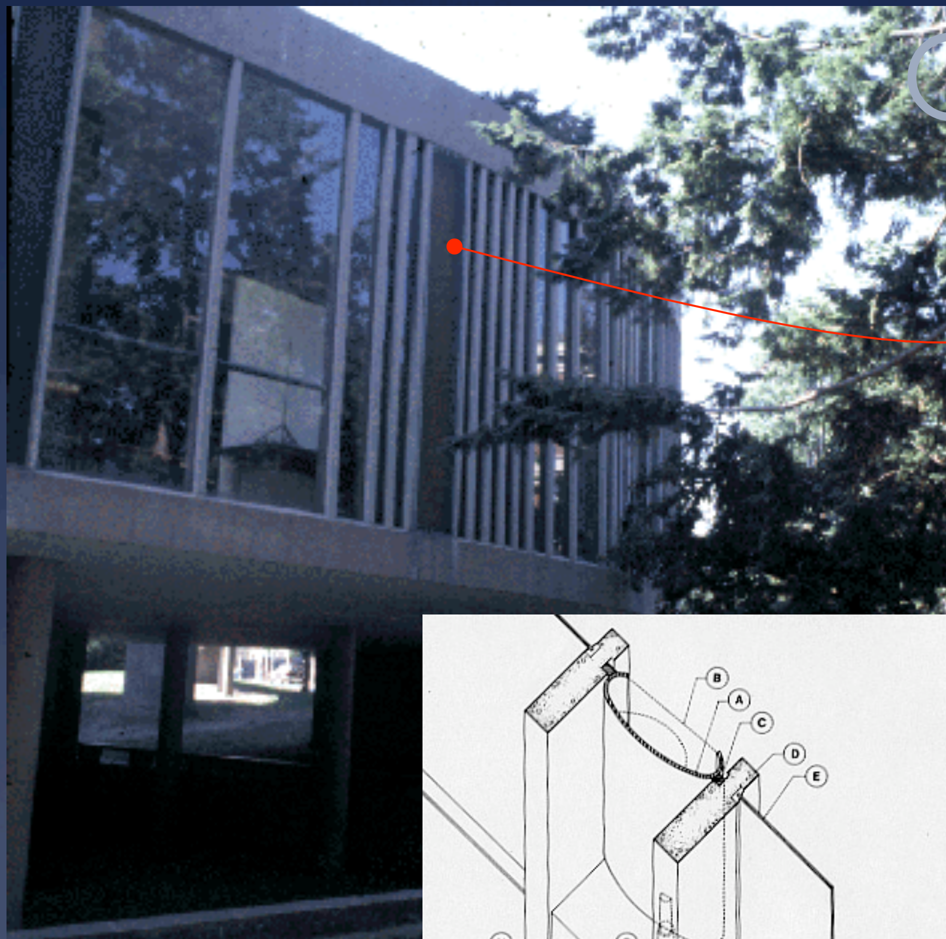
- Corbu used concrete to form the mullions between glazed panels around the curved portions of the plan.
- These ondulatories were precast and set in place as the glazing was installed.

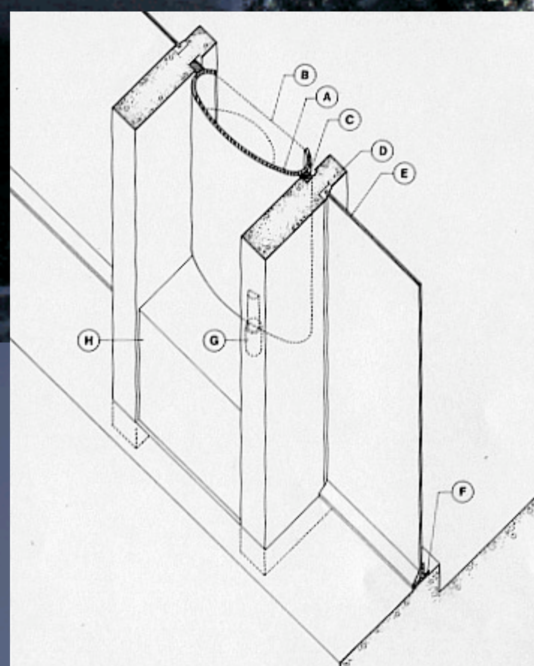
Structural handrails



* In many of Corbu's projects using these ondulatories, the concrete was too thin and began to deflect, breaking the glazing.
* Here, and in other projects, a steel rail has been added to both brace the ondulatories and act as a guard rail, keeping people from walking through the glass!

Ondulatories & Aereatures





The glazing between the ondulatories was not operable in most of LeCorbusier's projects. To provide for ventilation, Corbu designed pivoting opaque panels he called aereatures that could be opened to allow in air, keeping the glazing system a simple, inexpensive, fixed design.