THE HVAC SYSTEM

The auditorium and recording studios would be mechanically ventilated using a split unit. A number of ideas were investigated using the atrium as a stack, in an effort to passively ventilate the steel section of the building. In the end, due to the deep spaces and the solid northern and western façades, cross ventilation was not possible. It was decided that only the atrium space could be passively ventilated. Air would be drawn in from the public space and extraction fans at roof level would be used at regular intervals to maintain air flow. The rest of the building would be mechanically ventilated. The plant room is situated on the roof. A hoist is placed on the Struben St side for installing the system and future maintenance.

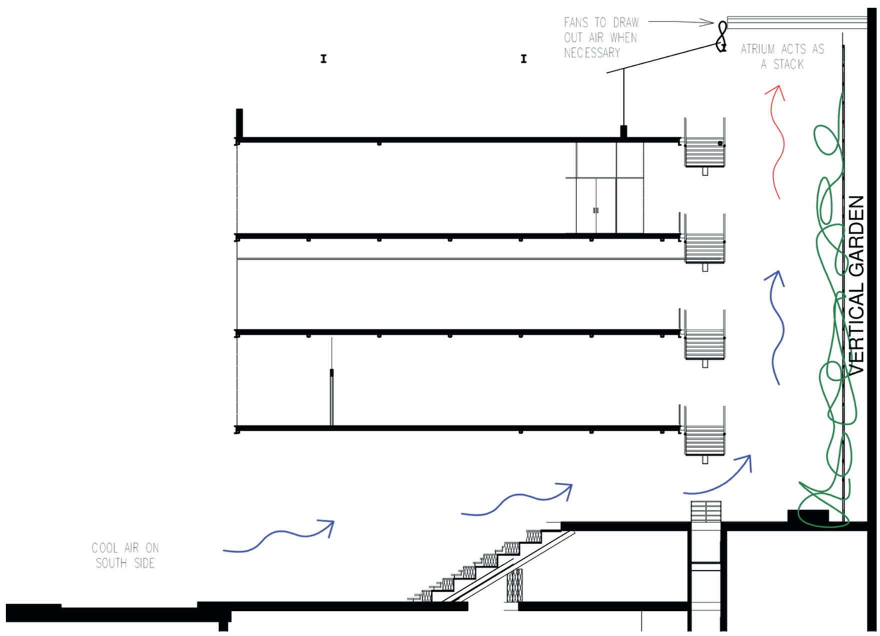

Fig. 81 Passively ventilated atrium

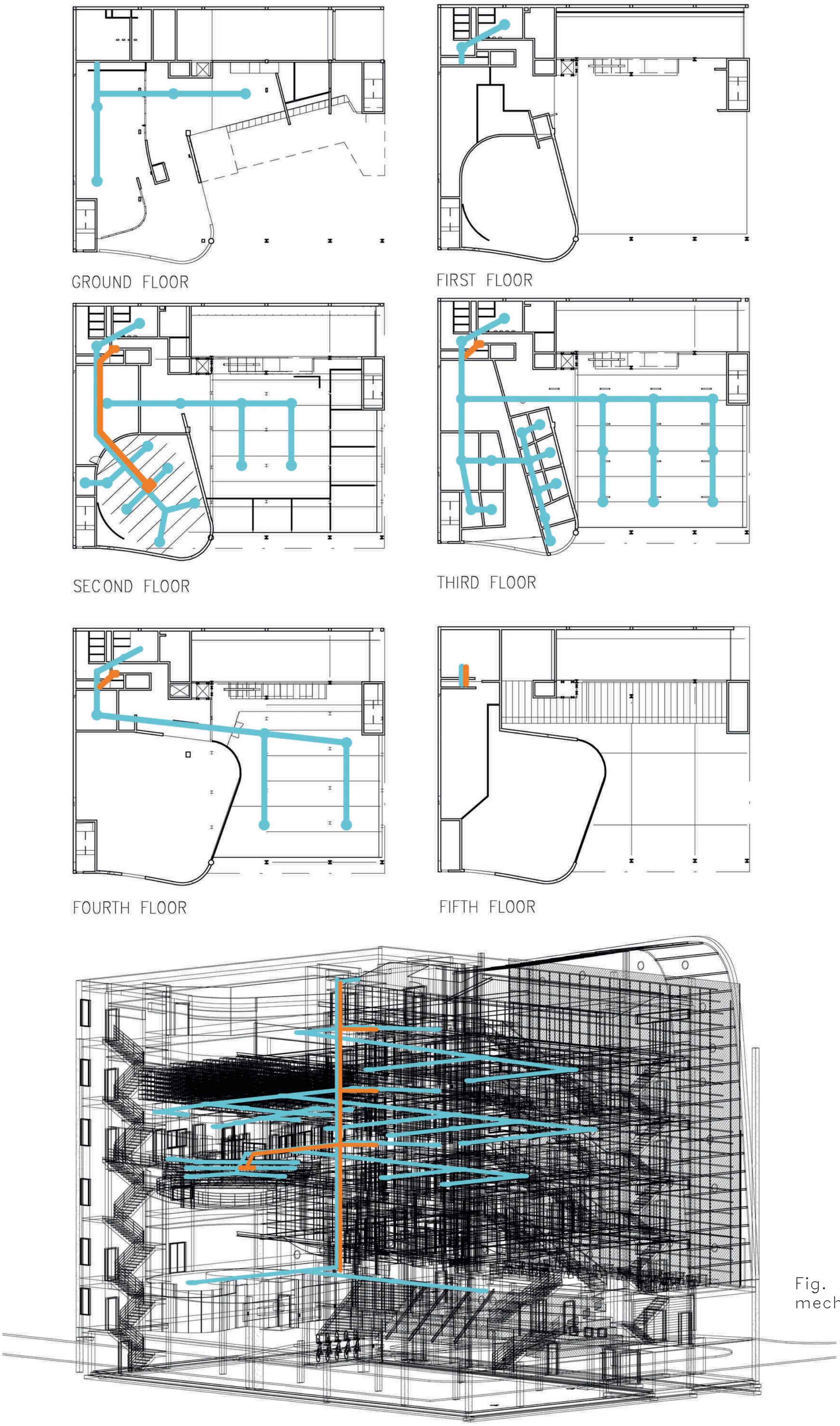

Fig. 82 Distribution of mechanical ventilation

STRUCTURAL ARGUMENT

The building is constructed using both concrete frame and steel frame structures.

The concrete frame section supports the private facilities which tend to have the heavier loads such as the auditorium, the recording studios and the archives. These programmes also all require special acoustic considerations and therefore a more solid form of construction has been chosen. The concrete structure expresses the fixed nature of the programmes in this section. The necessity of having the auditorium free of structure led to 600 deep coffer slabs being used to carry the loads and span the required distance.

The steel frame section contains relatively un-programmed space in that the programmes can be changed as necessary. These spaces therefore need to be open and flexible. The choice of a steel structure allows for large spans without heaviness and appears more temporary.

An H-section 305x305x97 will be a suitable size column to carry the load.

To keep the public stairway/seating free of structure 20,7m needs to be spanned

A deep rolled steel section could be used but the minimum depth of the beam would be 1,035m:

L/d = 15-->20
therefore d= 1035mm --> 1380mm

A truss would be a more efficient way to span this distance. By using a truss 4,08m deep, one floor of the building can fit in-between. A vierendeel girder would then be the most logical choice due to the fact that its members are either vertical or horizontal and therefore movement between them is less restricted than it would be if a rolled steel truss were to be used.

L/d for a vierendeel girder = 4-->12
L=20,7 required d = 4,08
20,7/4,08 = 5,07

5,07 lies on the conservative side of the span depth ratio for a vierendeel girder.

As Louis Kahn did in the Salk Institute, a girder will be placed on every second floor allowing the floors in between to be completely free of structure.

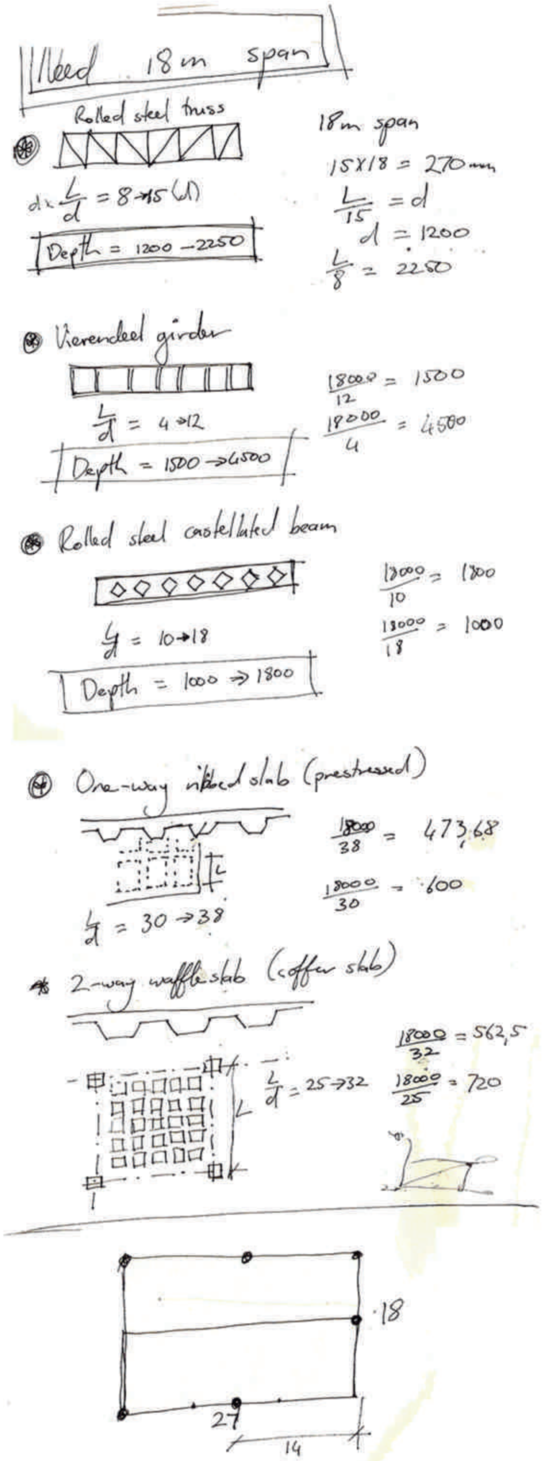

Fig. 83 Structural investigation

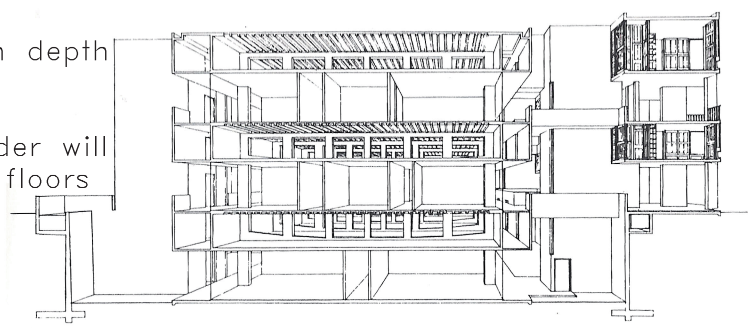

Fig. 84 Perspective showing structure of Salk Institute by Louis Kahn

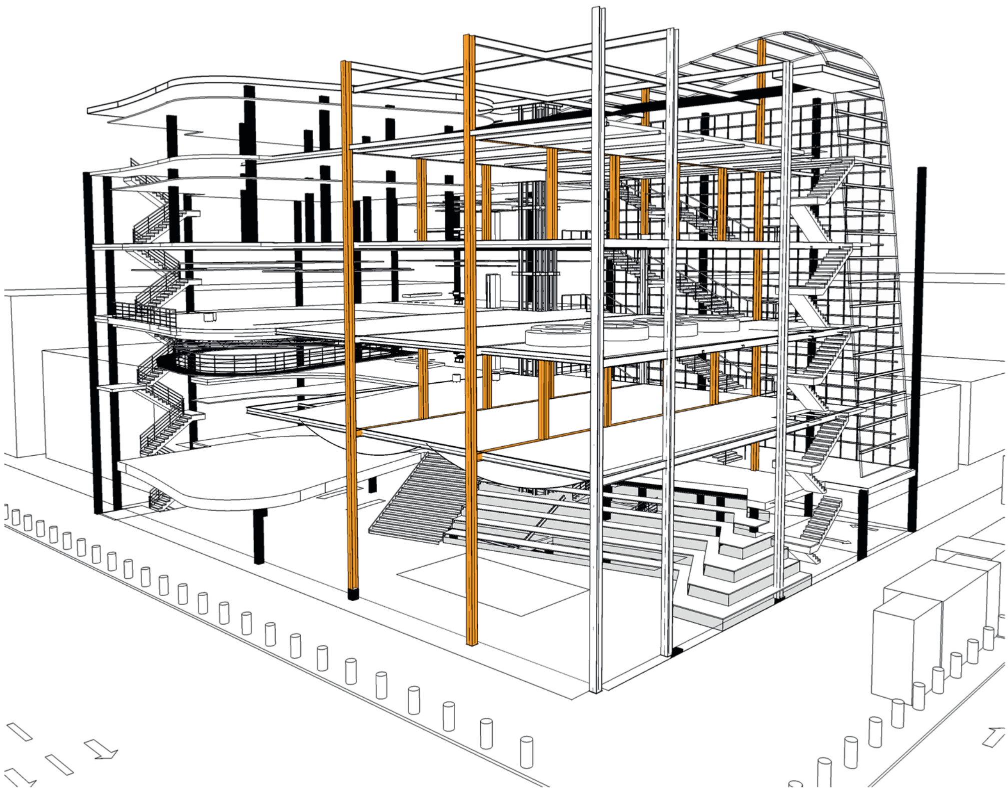

Fig. 85 Structure of Language Centre

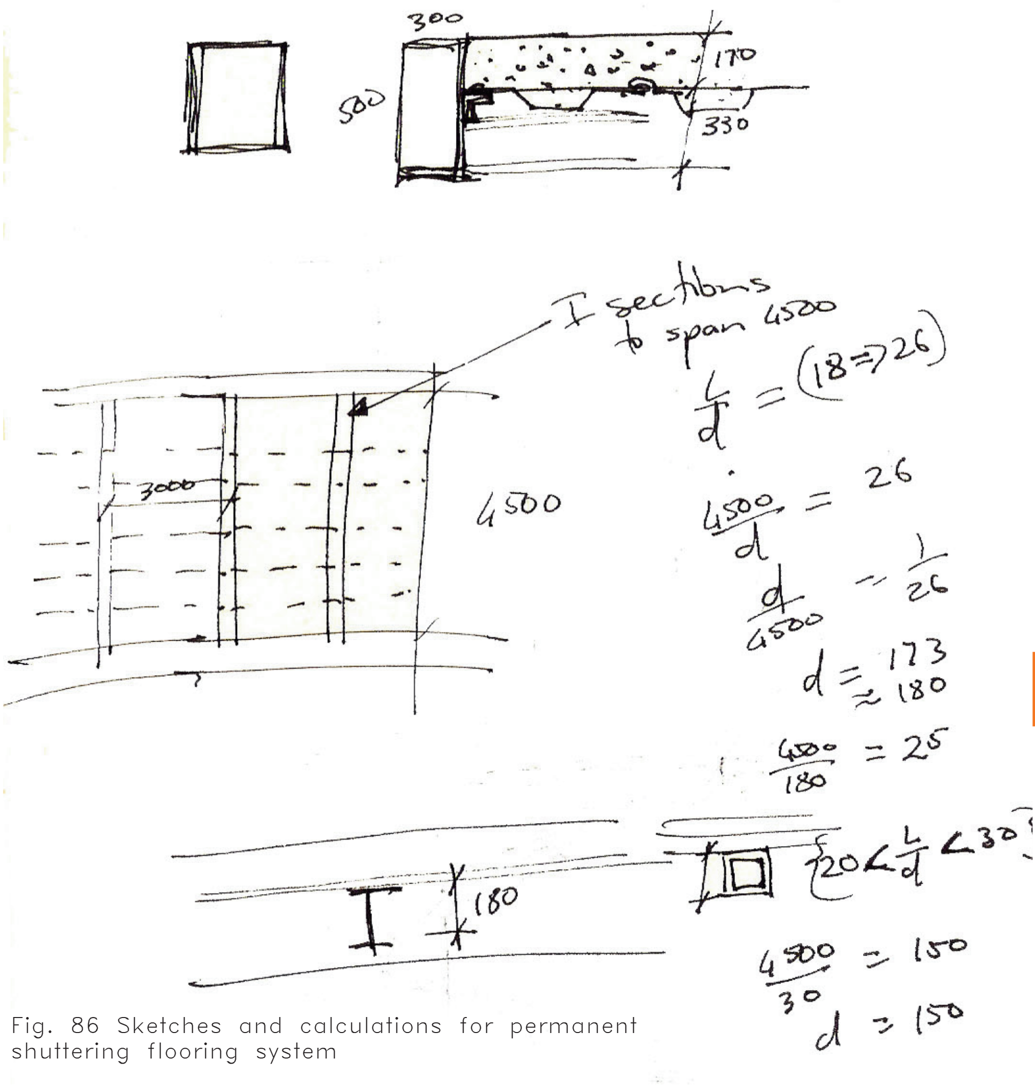

Fig. 86 Sketches and calculations for permanent shuttering flooring system

Bond dek permanent shuttering has been chosen as the floor structure between the steel trusses. The bond dek sheets are supported every 3m by 150x150mm steel square tubing welded to the structural supports. A floor thickness of 170mm will be sufficient to support the load over a 3m span.

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bond-dek

Allowable Load Tables

1,2 Thick

Composite Bond-Dek Slab (1,2 Thick)
Nominal uniformly distributed superimposed load (Ln) in kN/m² for simply supported conditions 25 MPa concrete

Span in metres

Depth of slab (mm)	Nominal dead load of slab (Dn)(kN/m²)	2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,25	4,50
140	2,56	10,00	8,75	7,80	6,80	6,00	5,34	4,80				
150	2,79	10,00	9,46	8,50	7,45	6,60	5,89	5,30				
160	3,03	10,00	10,00	9,29	8,16	7,29	6,45	5,79				
170	3,27	10,00	10,00	10,00	8,78	7,88	7,00	6,28				
180	3,50	10,00	10,00	10,00	9,48	8,48	7,54	6,78				
190	3,74	10,00	10,00	10,00	10,00	9,06	8,06	7,26	6,49	5,86		
200	3,97	10,00	10,00	10,00	10,00	10,00	8,76	7,76	6,94	6,26	5,66	5,16
210	4,21	10,00	10,00	10,00	10,00	10,00	9,33	8,24	7,36	6,64	5,99	5,44
220	4,44	10,00	10,00	10,00	10,00	10,00	9,69	8,74	7,81	7,04	6,33	5,74
230	4,68	10,00	10,00	10,00	10,00	10,00	10,00	9,13	8,19	7,43	6,72	6,13
240	4,91	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,63	7,83	7,07	6,42
250	5,15	10,00	10,00	10,00	10,00	10,00	10,00	10,00	9,09	8,22	7,41	6,72

Indicates maximum modified span/20.

Spans to the right of highlight (including highlighted areas) require propping during construction.

1,2 Thick Bond-Dek decking spans during construction (unpropped)
Allowing for a construction load of 1,5 kN/m² plus wet concrete

Slab depth (mm)	140	150	160	170	180	190	200	210	220	230	240	250
Unpropped span (m)	3,5	3,4	3,4	3,3	3,2	3,1	3,1	3,0	2,9	2,9	2,8	2,8

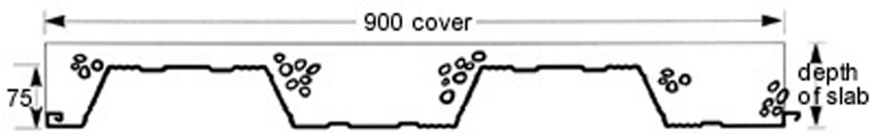

Fig. 87 Details and tables of Bond dek permanent shuttering flooring

BASEMENT

A basement is provided mainly to accommodate staff parking, refuse and storage. The site is relatively small and it is only possible to fit 23 parking bays in the basement. Because this is an urban building which encourages pedestrian movement and interaction with the city it was decided that even if only 23 cars can be accommodated it was better to have them under the building than on the street.
The possibility of having a second basement level was investigated but due to the large space required for the ramp to extend another level deeper compared to the number of additional parking places gained, this option would clearly not be feasible even if the ramp had parking spaces on it.