Filler Slab at its initial working process.

Building an Architecture of Low-Impact Materials

The 3R Pavilion

The pavilion not only addresses the issue of the increasing environmental footprint of buildings, but through its use of the 3Rs- Reduce, Reuse and Recycle- it becomes a model and a demonstration of low-impact, sustainable construction.

Text: *Sahiba Gulati*
Images and Drawings: *courtesy PVDRS*

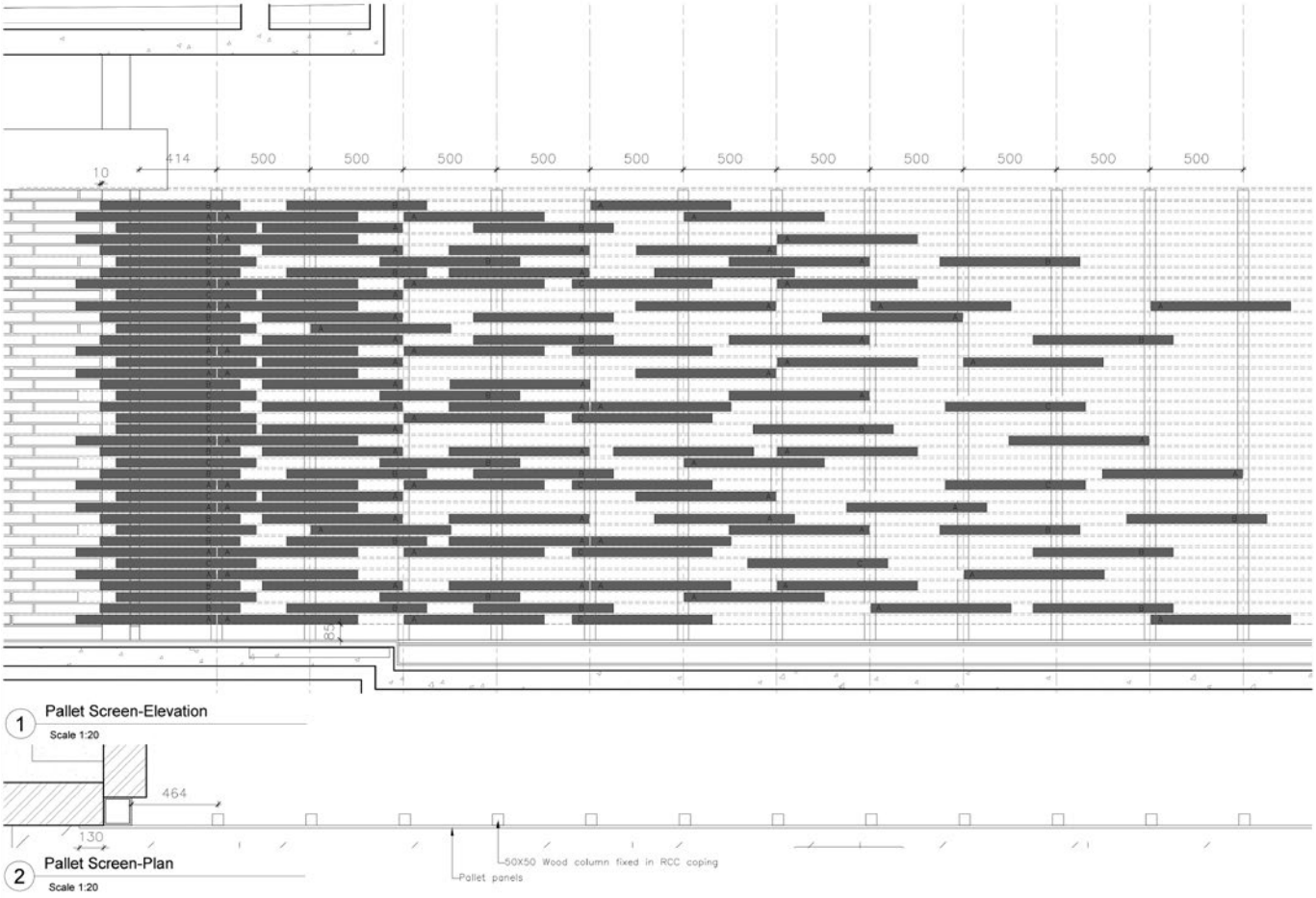
Reduce, Reuse and Recycle - using a combination of these three concepts, Keyur Vadodaria and Megha Patel-Vadodaria of PVDRS are constructing the '3R Pavilion' as an annexe to a residence in Ahmedabad.

Included in the brief were a multi-purpose room, outdoor seating adjacent to the swimming pool, along with a desire of the client to not use conventional building materials. PVDRS used this opportunity to negate all material and construction processes from the project that embody high energy.

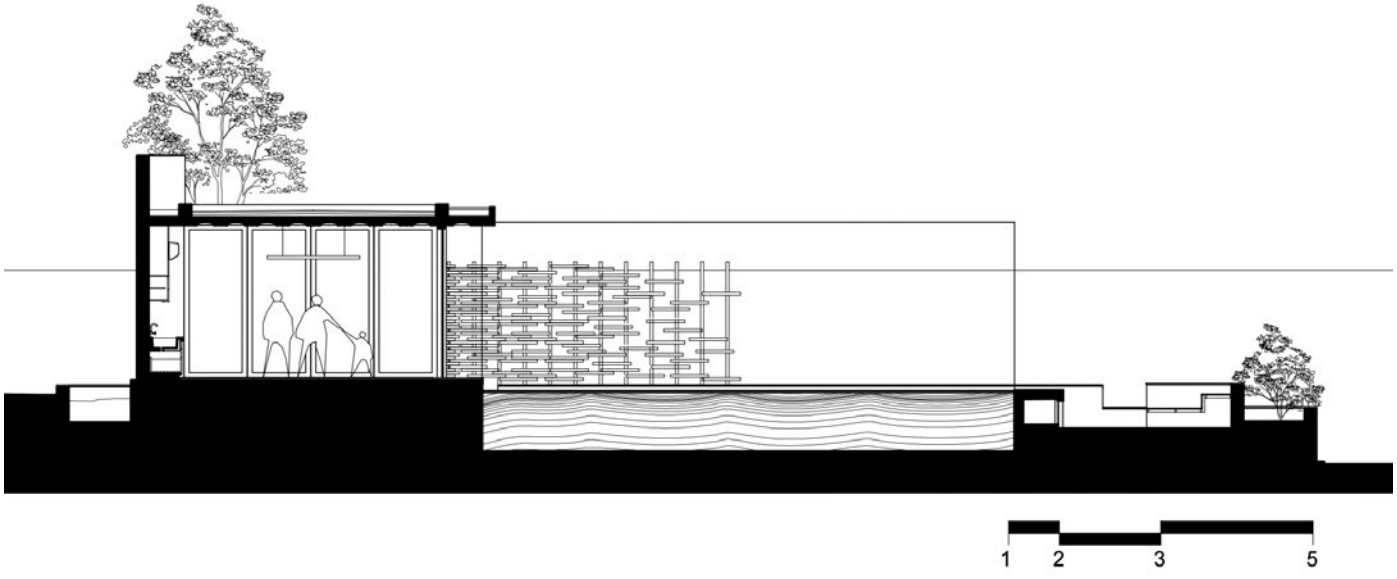
Process intensive, non-recyclable materials that consume enormous amounts of energy due to extraction, processing, manufacturing and delivery were factored out. As 20 per cent of the building's embodied energy can be accounted for by materials, using low-impact materials would bring down the environmental footprint.

The spatial quality of the space and the tectonics of low-impact materials were intentionally explored to maximise their potential for the project. What came about is a pavilion that would be a model of sustainable construction.

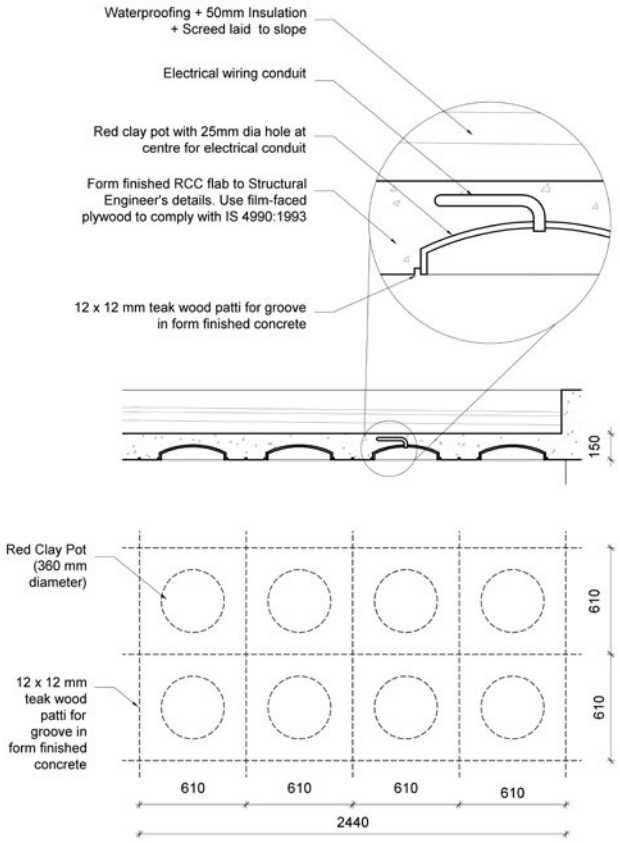
↑ *The slab in its interior views.*

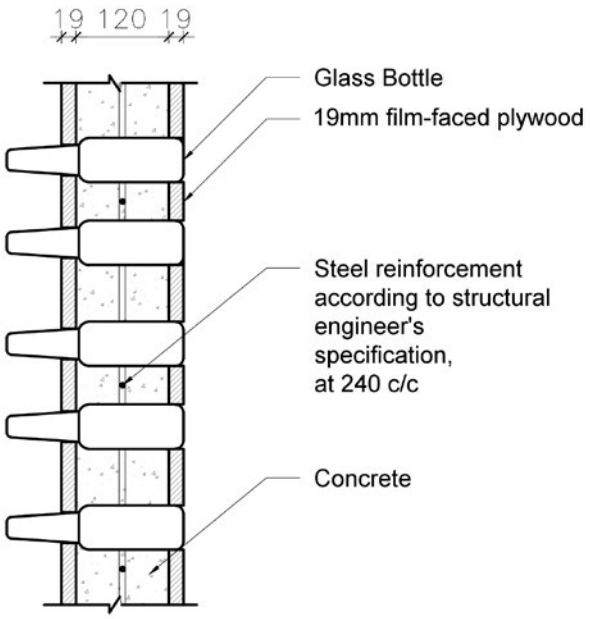


↑*Pallet Wall Details*

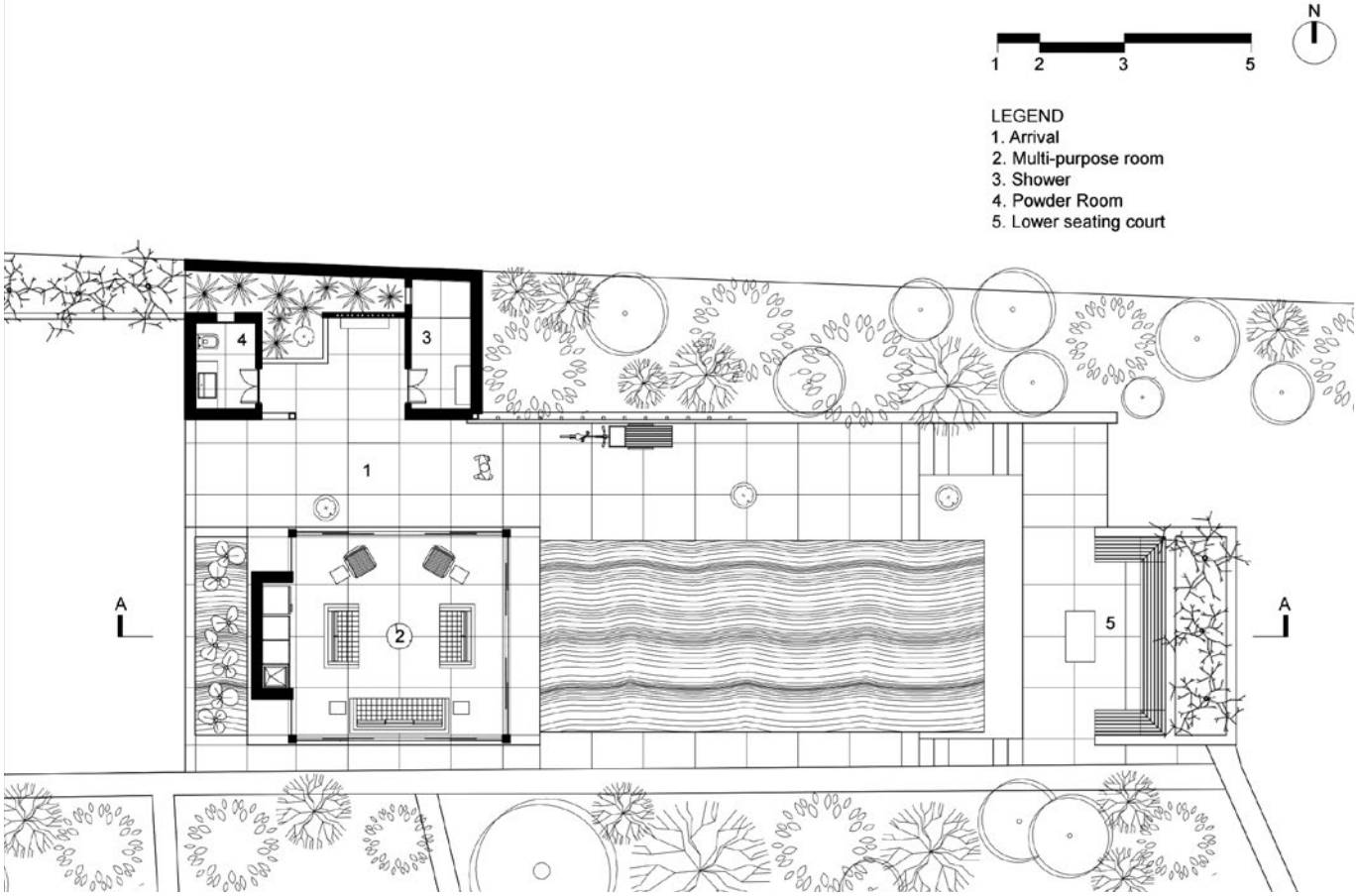


↑*SECTION*





↑ *FILLER SLAB AND WALL DETAILS*



↑ *PLAN*

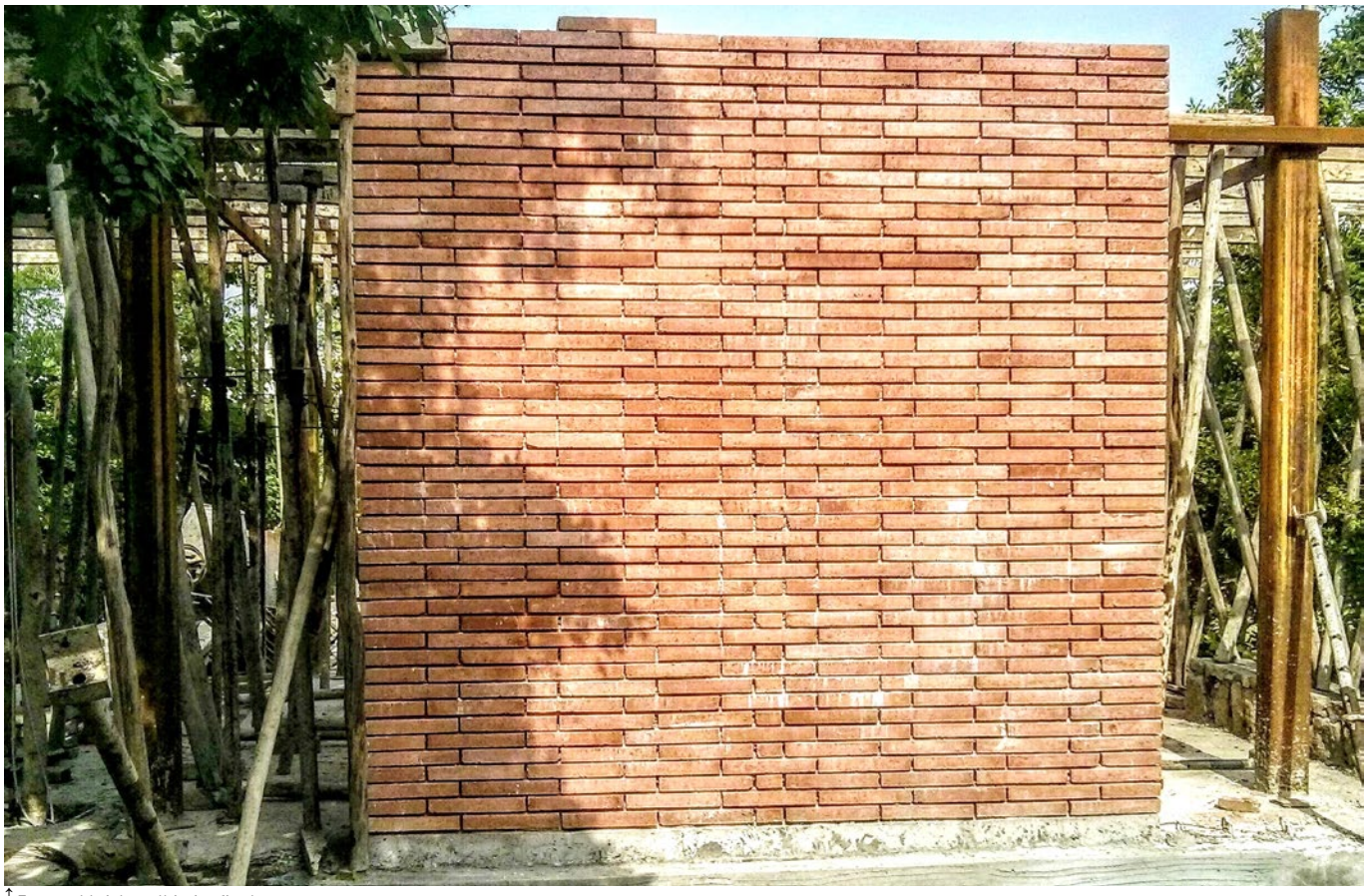
↑ *Filler wall in elevation.*

↑ *Construction details of Filler Wall.*

The roof of the structure is a Filler slab, a technology introduced by Laurie Baker. Concrete is a material that is good in compression, and in an RCC slab it is used in the tension zone as well to act as a cover for reinforcement. The additional dead load of this concrete increases the load of the slab and the amount of reinforcement used. In filler slab, when the concrete in the tension zone is replaced with low-cost, low-impact filler material, it can reduce the steel used by upto 40 per cent and concrete upto 30 per cent. Both concrete and steel have high embodied energy.

The positive of this project is that each technology used has been moulded to achieve optimum results. Earthen pots were to be used as filler material. To achieve a seamless finish between the form-finished concrete and the pots, the size and shape of the pots were specified to the local potter and several iterations made. A grid was made for the slab using teak wood *pattis* for squares, and recycled rubber for rings for the pots. The grid helped the masons to precisely place each earthen pot. The rings ensured that the pots didn't accidentally move when the concrete was poured. The rings would also help achieve a clean finish between the concrete surface and the earthen pot. 25mm diameter holes have been drilled in the centre of specific pots for electric wiring outlets. Ingeniously enough, the ceiling grid dimensions were also derived in such a manner that the waste of shuttering ply was minimised.

For the walls, the architects did not go for conventional kiln-fired bricks, as they are baked at temperatures of up to 1300 degree celsius. Instead, unfired sun-dried bricks comprising of *surkhi* (waste brick powder) and lime have been used. This also enabled them to reduce



↑ *Exposed brick wall in its final stage.*

the mortar joints as these bricks are larger than their conventional counterparts. The mortar used comprises of lime with ceramic waste that was obtained from a nearby ceramic tile manufacturing factory.

The load bearing walls were to be made of concrete. Here, beer bottles have been laid within the wall. The bottles were sourced from a nearby hotel. Using a CNC-cut shuttering formwork, the beer bottles are laid in a grid expressed through grooves obtained by using 12 x 12m teak wood strips. An interesting screen has been constructed along the edge of the pool. It turns out that the wooden pallets used here are actually being reused. Originally they were used for transportation of glazing and insulation material for this project.

Stone from the nearest quarry was not an option for flooring as it was 200 km away from site and would have shot up the embodied energy of the pavilion. Many options were explored before the architects finally settled on cast on site terrazzo flooring. The recycled stone used here was procured from local stone suppliers of Ahmedabad. A grid of brass strip is being laid such that it reduces the risk of cracks in the floor and aligns with the ceiling grid. Solid wood doors, windows and ironmongery reclaimed from demolition of derelict old houses of Ahmedabad were restored and are being reused with minimal alteration and refurbishment.

"When I conceived this building, I could see that materiality would become the basis of its architecture. The design and construction detailing explored the tectonic and sensorial qualities of low impact materials, craftsmanship and construction techniques. When completed, the pavilion itself would become a demonstration of sustainable construction," says Keyur Vadodaria. With rigorous attention to each and every detail, a large impact has been made on reducing the environmental footprint, without compromising on the spatial quality. ■

FACT FILE:

Project	:	The 3R Pavilion
Location	:	Ahmedabad
Architect	:	Patel-Vadodaria Design Research Studio (PVDRS)
Design team	:	Keyur Vadodaria and Megha Patel-Vadodaria
Project Area	:	1500 sft
Structural Engineer	:	P-Cube Consultants
Civil contractors	:	Amrutbhai
Carpentry contractors	:	Madanlal
Initiation of Project	:	May 2015