SOLAR KITCHEN PROJECT AT AUROVILLE.
Architect: Suhasini Ayer-Guigan.

ENTRANCE TO THE DINING HALL
COLLECTIVE SOLAR KITCHEN

Auroville is an international town comprising of 4 main zones that would serve the needs of habitation, industry, culture and an international area and this is surrounded by a green belt that would be forests, farms and orchards. The town has a concept that is popularly know as the “Galaxy concept”. The centre of the town is a garden with three foci, which comprises of the “Matrimandir”, “the Amphitheater” and “the Banyan tree”. The services of the town would be strung along a boulevard known as the “Crown”, which would be accessible from all the 4 zones by the radials that start at the periphery and swing to the “Crown”. The crown itself would be comprised of the facilities that are inherent to the character of the zone. The “Solar Kitchen” is located on the “Crown” in the low-density section of the Residential Zone. This Project is meant to be a canteen where eventually people living in this area would eat there or get their meals delivered to the settlements where they live. Today it serves the needs of present population of Auroville. It is designed to serve 1000 meals three times a day. The kitchen and dining hall has been functioning since October '98 and the solar bowl component is functioning since late 2000.

The aim of the project was to build a demonstration project

- In the use of SOLAR THERMAL ENERGY in steam generation, which in the case of this project will be used for cooking meals 3 times a day for about 1000 people. (The detail explanation on this is found elsewhere in this document... solar bowl concentrator by Gilles, G, Sylvie. R and John. H)
- To support the organic farming sector of Auroville and the local villages by being the main purchaser for their products, which can be used for the meals prepared in the kitchen.
- To provide for the nutritional needs of the present community of Auroville (1700 inhabitants approx.) including the meals at the schools, work places and for special occasions.

The project comprises of 4 distinct sections.
The solar bowl and its technical rooms, the kitchen, storage and the preparation sections, the ancillary rooms like the laundry, gas bottles, electrical and generator rooms and finally the public part of the building which is the dining hall. On the first floor we have a Café and the internet/email facilities. (Refer to the attached ground floor plan).

As the project is more an industrial building in 70% of its functional space and only 30% is public access, it was a challenge to design a building where the flow of people be restricted to one end of the building even when they can see a long mass in front of their eyes. Also as the project is located on the “crown” where the development controls demanded a narrow linear plan which was in total contradiction to functional demands of the project the design challenge was considerable.
SOLAR BOWL WITH THE BOILER ARM IN THE FOCUS DURING ONE OF THE TEST RUNS
1. ENTRANCE
2. DINING HALL
3. PANTRY/DISH WASH
4. TOILETS
5. STEAM COOKING SECTION
6. PREPARATION
7. SERVICE ENTRY
8. BOILER ROOM & SOLAR BOWL MONITORING
9. COLD STORAGE
10. STORAGE
BUILDING TECHNOLOGY AND MATERIALS.

1. FOUNDATIONS: We decided to use a composite foundation technique, which comprises of three layers. The trenches were dug to varying depths depending on the load of the building. (0.75 mts depth for the storerooms to 1.25 Mts. depth for the kitchen part of the building) The first layer, which had a depth of about 20-25 CMS, was composed of sand and pebbles in a dry mix, which was compacted using a hand held rammer. The second layer is composed of blue metal of the size of 40-45 mm, which was mixed with stabilized earth mortar and compacted. The third layer is composed of granite blocks of the size of 300-350 mm in random rubble masonry in stabilized earth mortar up to ground level and above the ground level up to the plinth level the construction is in C.E.B. with a D.P.C. in 1:3 cement mortar with water proofing compound.

2. WALLS: All the pillars and wall are in C.E.B. (Compressed Earth Blocks) which are cement stabilized with 5% cement content and these were manufactured manually using the Aaram 3000 block maker. The building is made of load bearing masonry in C.E.B, including the 2 towers one of which is housing a water tank of 50 cum. The soil used was excavated on site and the resulting hole created is used for the waste-water recycling pond of the baffle reactor type. (Refer to the waste-water recycling paper by Tency. B elsewhere in this document)

3. LINTELS AND OVER-HANGS: The lintels are in cast in-situ R.C.C. using ferrocement pre-fabricated elements as lost shuttering which saves on the finishing plaster and eliminating the need for shuttering planks which are hard to come by in rural and semi-rural areas of India. The overhangs in the building are design incorporated in the lintel by recessing the openings therefor the lintels have a L profile where after the lintel level the wall moves outside to give rain and sun protection.

4. ROOF: There are several roofing systems used in the building. 1. The roof in the main kitchen area is made of long span (10 mts) ferrocement channels pre-fabricated on site and installed manually in place at 5.20 Mts. above ground level. This roof was load tested in real life situation to warehouse loading conditions. 2. The dining hall has doubly curved shell roofing where the shells are pre-fab ferrocement used as lost shuttering. 3. The storerooms and auxiliary areas have the normal ferrocement channels upto 6.50 span. Also in the kitchen and dining hall solar chimneys have been incorporated to enhance the natural ventilation.

5. WATER PROOFING: The waterproofing over the roofing channels is done on a insulation layer made of broken fired bricks mixed with lime, this is then treated with a fermented solution of jaggery and the nuts of Terminalia Chebula (Kaddukai) where this solution is poured over the brick jelly lime and beaten in with wooden mallets. Over this a screed of cement is done on which reject ceramic tiles are laid as a waterproofing layer.
PREFabricated SPIRAl StAIRCASE IN RCC LEADING THE COFFEE SHOP AND THE INTERNET SERVICE.
6. **STAIRCASES:** The main spiral staircase at the entrance is pre-fabricated R.C.C. which is designed to be assembled on site 4 steps at a time with concrete poured in the centre to create the main column. The internal staircases in the building for the internet office and access to the roof is also in pre-fabricated R.C.C. which are inserted into the walls during the time of construction.

7. **THE SOLAR BOWL** is built using pre-fabricated ferrocement elements, which are shaped, as sections of the sphere (like pieces of orange fruit segments) and these were assembled together in situ and grouted. The resulting structure is then plastered to achieve a smooth finish on which mirrors of float glass quality are stuck.

**SOLAR PASSIVE DESIGN COMPONENT**

Auroville falls under the classification of “Tropical dissymmetric sub-humid and/or warm humid”. The air temperature is moderately high, annual mean varies between $25^\circ$ C and $29.5 \, ^\circ$ C with a possible extreme on min. $16^\circ$ C and max. $45^\circ$ C. The relative humidity is about 80% and above leading to hot and sticky conditions. Also the wind speed is low and variable ranging from 3 to 5 meters/sec with the predominant direction being SE/E in the afternoons and evenings and NW/W in the night and early mornings. Rainfall is supposed to be regular as implied by the word tropical but as it is qualified by the word dissymmetric, here it is irregular and unequal. The winter monsoon (Oct-Nov) is NE/E and the summer monsoon (June-July) is W to SW. The solar radiation is predominantly diffuse due to cloud cover or water vapor with intense radiation on clear days causing painful sky glare.

The solar kitchen building is oriented with the long facades to North-South, which creates a wind incidence of 45 $^\circ$ to the prevailing wind direction causing a broader wind shadow resulting in a negative pressure, which creates higher indoor wind velocity. As again the development controls imposed on this location does not allow for solar and rain protection of the walls as dictated by the climatic conditions the windows are recessed and the resulting gap between the roof and walls have been used to create solar chimneys. If the hot air trapped between the roof and the lintel level would not be allowed to ventilate, would itself become the insulation cushion that would keep the heat in, therefore the solar chimneys are open between the lintel and the ceiling level. Solar vents function due to the differential temperatures within a given space causing an increase in the wind speed, which is essential for the comfort in hot humid climate. (See section)

**Project team:**
- Architecture: Suhasini Ayer-Guigan and Anita Gaur
- Solar energy: Dr. Sylvie Rousseau, Gilles Guigan, John Harper
- Solar energy advisor: Dr. C. L. Gupta.
TOP- VIEW OF THE SOUTH FAÇADE OF THE BUILDING DURING CONSTRUCTION.

LEFT- THE DINING HALL WHERE SOLAR VENTS ARE INCORPORATED ABOVE THE WINDOWS FOR AN INCREASED AIR VELOCITY.
SOLAR VENTS: DUE TO DIFFERENTIAL TEMPERATURE WITHIN A GIVEN SPACE, ONE CAN INCREASE THE WIND SPEED WHICH IS ESSENTIAL FOR COMFORT IN HOT AND HUMID CLIMATE.