A PART OF THE GENERATIVE CODE

The process starts with operations that fix positions, shapes and sizes of the main house volumes, the verandas, the secondary house volumes, and the gardens. Houses in Santa Rosa were often on steep sites, were nearly always two stories, with bedrooms above the main rooms, or, in some cases, below them when on sloping sites where principal access and entrance to the house came from the upper level. Each house has a major volume and a minor volume, and these volumes play a vital role in the process not only for the neighborhood, but also for the individual family, since houses are explicitly understood as playing a role in the formation of larger centers in the streets and neighborhood. (Note: the earlier part of the process, which allows people to create the neighborhood structure and its and streets, is shown in chapter 15).

I believe the Santa Rosa process creates a fair approximation of a living process. What is nice is that it can be used by many people, in a poor neighborhood as much as in a rich one. In this process emerging strong centers are formed explicitly at several levels: streets, street segments, house volumes, courtyards, gardens, verandas . . . and so on.

The following description is taken from the CES generative code handbook which was used by the seventy families.

HOUSE VOLUMES, LOTS, AND STREETS

Completion time: Thirty-five consecutive days. Participants on the site will include a representative of CES (the Center for Environmental Structure), a representative of Costruyamos (the Colombian self-help cooperative), all the families, at the rate of two per day, and one surveyor. The overall sequence of steps runs as follows:

Step 22: De• ne sequence of main street segments and secondary streets.
Step 23: First street segment: lay out lots in detail and locate house volumes, lot after lot.
Step 24: Start layout of • rst house lot of street segment by completing steps 24a to 24g.
Step 25: Continue layout of all houses contained within street segment, one after the other, by repeating steps 24a to 24g for each house.
Step 26: Embellish street segment.
Step 27: Survey lot boundaries after the completion of each street segment and prepare drawing.
Step 28: Continue detailed layout of all street segments, one after the other, by repeating steps 24, 25, 26 and 27.

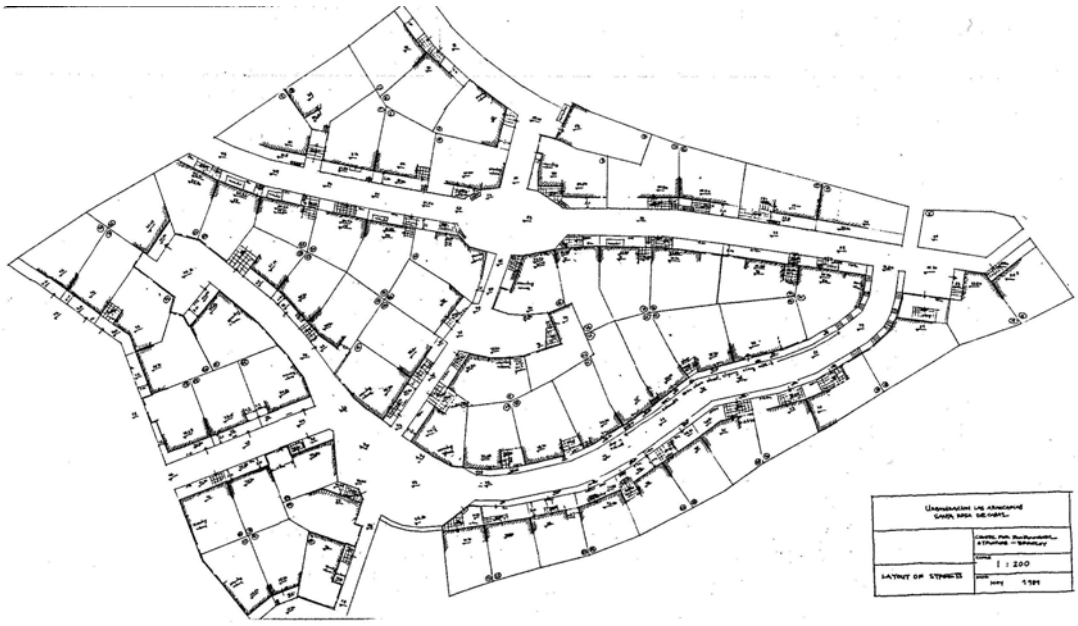
Step 22: De• ne sequence of main street segments and secondary streets.

By this stage of the larger process, the main street has already been laid out in the form of identifiable segments, and each secondary street, too, has been laid out to contain one or two segments (see chapter 15).

Now, define a sequence of street segments. Start with the main street segments: complete the main street centers and the main street connecting segments. Then, continue with the secondary streets, one after the other. Make a list of the street segments in the sequence they will be developed; specify how many houses each segment contains.

Step 23: First street segment: lay out lots and locate house volumes, lot after lot.

Start the detailed layout of the first street segment. It is to be completed incrementally,



Lotplan,showingtheseventylotslaidoutonthesite.Thisdrawingreflectstheresultsofworkontheneighborhoodlayoutandstreets,byCESstaffwithseventyfamilies.Itisadditionallydescribedinchapter9.

one house at a time, the CES rep working with the family.

The process of lot layout includes the first steps of house layout. For each house, the process must establish garden areas, house volumes, and verandas, giving position and size of these components. These must be located and defined for all houses of the street segment to create the good space of the street. The process also includes fine-tuning adjustments to the shape of lots.

CES and Costruyamos reps will organize and conduct this part of the layout process. Each day the detailed layout of *two* lots will be completed, one in the morning and one in the afternoon. Every family will be informed in advance of the exact day and time they will have to be on the site. It is important to arrange the schedule accurately so that the next family comes on the site after the previous family has completed its work. This allows each house to be laid out and designed in relation to the adjacent already-existing ones.

Step 24: Start layout of • rst house lot of street segment, by completing steps 24a to 24g.

Each lot will be laid out in seven steps:

Step 24a: De• ne the total house volume, and prepare the site.
Step 24b: Place main house volume adjacent and parallel to street, to help form street.
Step 24c: De• ne size, position and volume of the veranda.
Step 24d: De• ne secondary volumes.
Step 24e: De• ne garden area.
Step 24f: Adjust • nal lot boundaries.
Step 24g: Prepare volumetric house model and place it on the site model.

Now, start the detailed layout of the first house lot.

Step 24a: De• ne the total house volume and prepare the site.

Before coming to the site, the CES rep and family members have agreed on the maximum house volume this family house can have, expressed in 2 (square meters) of built space. This is derived from the loan maximum for each family (established by the bank, on the basis of each family's circumstances, and di erent for each family). A typical house may have 70m2. Among the seventy families in Santa Rosa, houses range in size from 35m2 to 108m2.

On site, the CES rep prepares the site as specified in the preliminary lot subdivision map, placing a yellow flag at each corner of the lot. The rep shows the family the stakes, and helps them to locate themselves and understand the site model (shown in photographs on this page and on page 337) so that family members get a clear picture of:

a. *Rough boundaries and extent of their lot.*
b. *Shape, size and character of adjacent streets so that the family will be in the position to take them into account, and respond to them in a positive way.*
c. *Existing situation on adjacent lots, including houses that have already been laid out.*

Also, the rep provides a stock of additional stakes, orange paint and string. Before starting, one thing is made clear to the family members. They are told that as nearly as possible the house volume (as they are now going to determine it) should run the full length of the lot frontage along the street. They are told, too, that once settled, volume must be maintained during all subsequent layout steps though side and back lot boundaries can be adjusted and slightly modified, so long as the total lot area they define is the same as the lot area given to them in the preliminary lot subdivision.

Step 24b: Place main house volume adjacent and parallel to street to help form the street.

The main volume of the house is always placed on the street so that it contributes physically to the formation of the public space of the street. It should respect what has already been laid out, and help to substantiate and improve it. The main volume may be either one or two story; families are encouraged to decide the height on the basis of what will best contribute to the shape of the street and feeling of the lot. For example, the wider parts of the main street may call for houses where two stories predominate; the narrower parts of the main street and secondary streets may call for houses in which there is more of a mixture of one-and two-story volumes.

The main volume should generally be long and thin, with its width chosen at some dimension between 3and 6meters. It has a simple shape (approximately rectangular) and should contains about 60% of the total house volume.

On main streets, the main volume should be placed to run the full length of the lot frontage, or along as much of it as seems feasible without stretching the house volume too thin. On side streets the main volume may not need to occupy the whole lot frontage length, thus allowing for a glimpse of the garden in the back.

Once its position is decided, drive orange stakes in the ground to identify its corners. The floor level of the main volume also has to be decided. While deciding it, families should

bear in mind that intensive site excavation is not feasible within cost limits, because it leads to expensive foundations. There are two main alternatives: either, raise the ground floor level of the volume to the highest point of the lot area it occupies, or, sink the ground floor level 0.5 to 0.6 meters maximum below the highest point of the area it occupies.

Choose to do whichever one helps the situation more, given the height of volume and its relative location on the slope of the lot. Finally, re-examine and check the height of the main volume in relation to the street width and the ground level where it sits.

Step 24c: De• ne size, position and volume of the veranda.

The veranda is the most important part of the Colombian house in Santa Rosa. Size calculations of the veranda should be based on the assumption that the construction price for the veranda is one-third that of the rest of the house. So, for example, a veranda of 30m^2 will count as 10m^2 of built space in the total of the three house volumes (main volume, secondary volume, and veranda).

The veranda is a large outdoor room: it functions as the heart of the house. Family gatherings and dining often take place on the veranda, when the weather allows for it. The veranda is at least 3–4meters wide and at least 4–6meters long. It is attached to the house volume; should be enclosed on two sides, either by the house volume or a wall; and is covered with a roof.

The veranda can either be on the first or on the second floor level of the house, depending on view and orientation (when on the second floor it should be placed to become part of the house volume, preferably the secondary house volume). For two-story main volumes that are on lots with pronounced slope, on the uphill side of the street it is preferable to place the veranda at the second floor level. With a pronounced slope on the downhill side of the street, or on a flat piece of land, the veranda may be either at the first story or the second story, whatever feels best.

To locate the veranda, • rst identify the best part of your lot, the one that has the best view and gets the breeze coming up the hill. Pin down the center of this space. Think of this as the place where the veranda — the center of your house — will be. Then, de• ne the volume of the veranda while carefully considering the following four points:

First, pay attention to its shape and size. Make it comfortable for everyday activities.

Second, place the veranda facing the view and open to the direction of the breeze.

Third, pay attention to the shape of the land directly in front of the veranda. This part should have a good shape as well and feel comfortable. It will be the part of the garden most intensely used, level, and most probably paved.

Fourth, make the veranda private, shielded from the street. On uphill houses, the veranda may extend into the second floor of the front volume to get maximum breeze and view. If downstairs, it has to be quite deep in order to feel private.

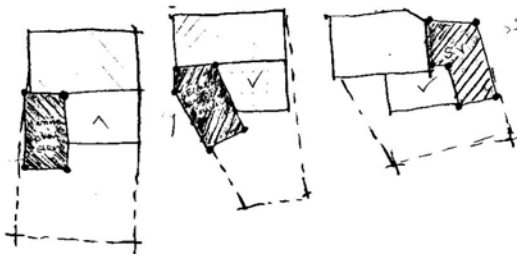
Drive orange stakes into the ground to define the corners of the veranda.

Step 24d: De• ne secondary volume.

The secondary volume of the house is usually attached to the main volume and is placed on the part of the lot left over after the placement of the main volume and the veranda. It should be in that place where you can least imagine having a garden or being outside. If themainvolumeof the house is one-story, then the secondary volume has to be one-story also (unless the slope of the lot allows for a two-story secondary volume that does not exceed the height of the one-story main volume). If the main volume is two-story, then the secondary volume may be either one-or two-story.

In houses where the veranda is on the second floor level, the secondary volume should extend under the veranda. Drive stakes to define the corners of the secondary volume.

The total built area of the three elements, which = The main volume (counted twice for two-story portion) + the secondary volume

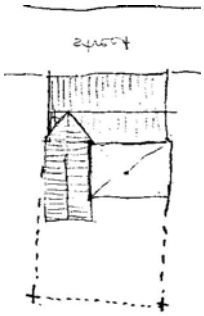


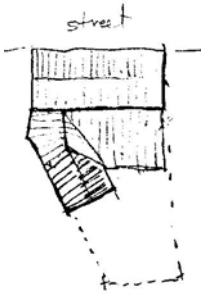
Step24dto24g:fixingthecornersofthesecondaryvolume;threecasesA,B,C,illustratedbelow:

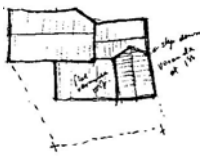
(counted twice for any two-story portion) + 0.33times the area of the veranda, must equal the total built area which is allowed by the bank.

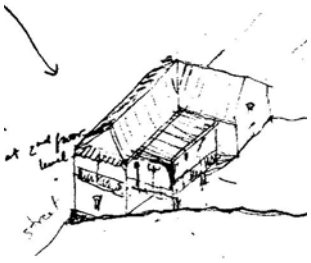
Step 24e: De• ne positive garden areas.

The garden should include two parts, (1)one part just below the veranda, which may be paved and onto which the activities of the veranda may spill out, and (2) another part, slightly further from the house, following the natural slope of the land, for vegetables and fruit trees. Make these garden areas feel comfortable and open and







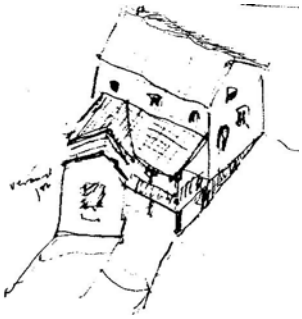


give them a positive shape; typically each should have roughly rectangular shape. Drive orange stakes at each corner of each of the positive garden areas.

Step 24f: Adjust • nal lot boundaries. Although the layout of house volumes and garden has been done within the perimeter of the lot boundaries originally marked on the subdivision plan, and marked in the field by the yellow stakes, the volumes and gardens, if positively

CaseA.

shaped, may have qualities which are better for the environment, and which do not perfectly match the original lot boundary lines. At this stage, the lot boundary lines are therefore settled finally, according to the work of staking out which has been done.



Take a piece of string and stretch it around the stakes at the outer perimeter of what you have just done — steps *24a* to *24e*. Examine the relationship between the new (orange) stakes and the old yellow stakes. Adjust the orange stakes and string, as needed, to conform to the

CaseB.

lot boundary, roughly, and to maintain the house volumes and positive garden areas. These orange stakes define the final boundaries of your lot. Make sure that the discrepancy between the yellow stakes and orange stakes are minor, and that the total area they define is within 2% of what has been initially assigned to your lot. This will guarantee negligible impact on the lot areas of neighbors' adjacent lots. Have the stakes surveyed to define the final lot boundaries.

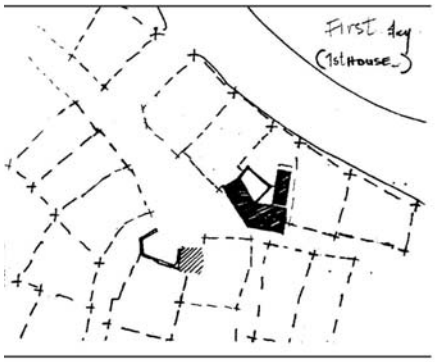
CaseC.

Step 24g: Prepare volumetric house model and place it on the site model.

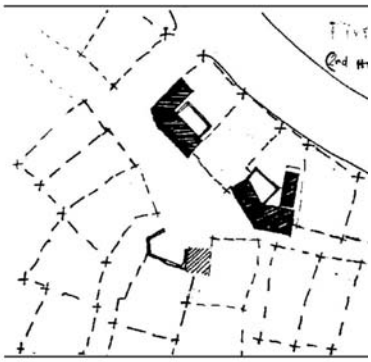
The CES rep should spend half an hour with the family deciding the volumetric configuration of the house. Two major things have to be decided:

a. Configuration of roofs. The house will usually have two or three roofs, depending on whether the veranda has its own roof or is contained under the roof of the main volume. The roofs of the main and secondary volumes are large gable roofs, extending considerably beyond the walls. The ridge of the roof is parallel to the length of the volume. If the veranda has its own roof,itwill eitherbeashedoraflat roof.

b. Relationship between volumes. The relationship between volumes and roofs has to be such as to create a harmonious whole. Transitions between volumes and roofs at di erent heights should be smooth.



Step 25: placing the first house



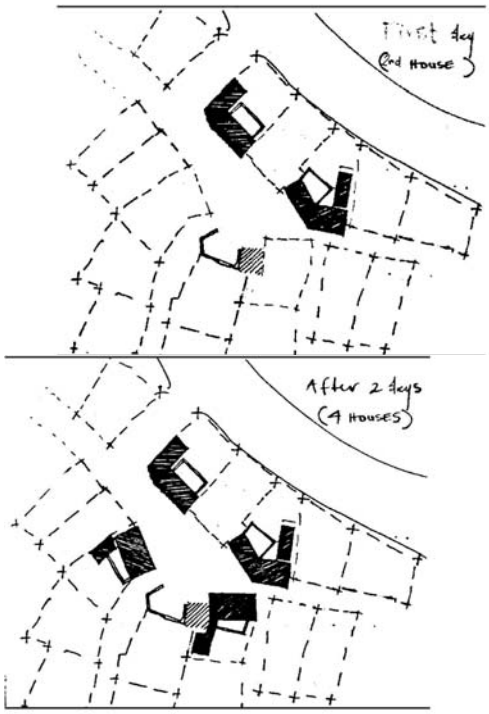
Step 25: placing the second house

Prepare a small wood and paper model of the house at 1:200scale. It should show volumes, relationships between volumes at di erent heights, shape of roofs. Glue it on the site model so that it can be used as a point of reference for families on adjacent house lots.

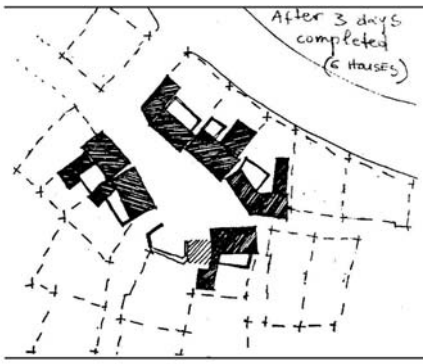
Step 25: Complete the layout of all houses contained within the street segment. Do the houses, one by one, with the different families, repeating steps *24a* to *24g*, again and again, until all houses of the street segment have been laid out.

The accompanying sequence of drawings shows the evolution of the lot-layout process along a street.

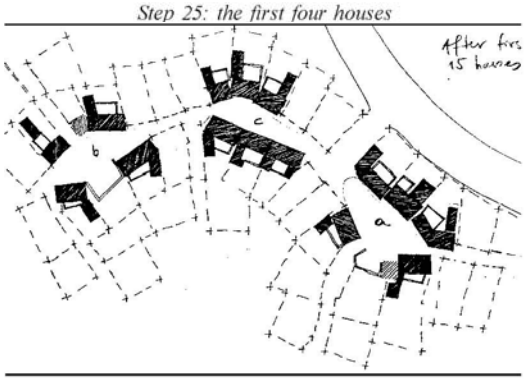
Step 26: *Embellish the street segment.*
At this point all the houses of the street segment have been laid out. Simultaneously, the street has taken its concrete shape, and it has been defined



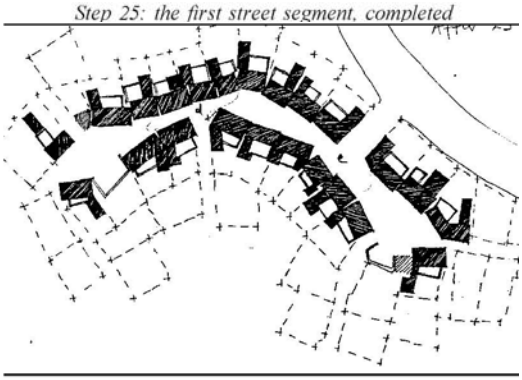
Step 25: the first four houses



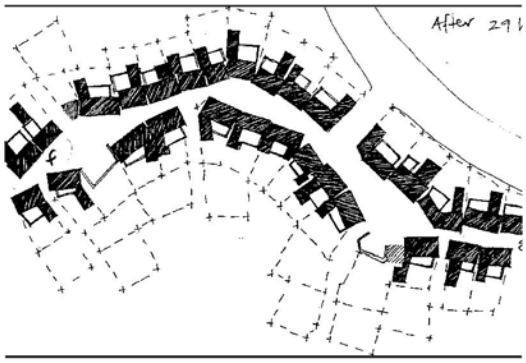
Step 25: the first street segment, completed



Step 28: first segment complete, and two more started



Step 28: three street segments complete



Step 28: most street segments complete

by the house volumes. Now the CES and Costruyamos reps, together with members of families who will live on this part of the street, must spend about an hour discussing the character of the street segment.

Each segment of a street should be regarded as contained open space, and should be brought to completion in the same way as houses will be, by concentrating on the space of the street as a positive space made of strong centers. In addition, minor centers — a tree, a low wall, a couple of benches, some steps, paving or a small fountain — will add to the liveliness and comfort of the street enormously. Spend some time considering the needs of the just completed street segment; think which ones of the above-mentioned items will contribute to this part of the street. It could be something really modest; a small touch to the street which will bring it to life.

Step 28: all street segments completed

Step 27: Survey lot boundaries after the com pletion of each street segment and prepare drawing.

Finally, it is time to survey each lot of the street segment, each one in relationship to the others. This task should be done by a professional surveyor who will have to record each house lot, with all its stakes as placed on the site, and the shape and boundaries of the street segment as a whole.

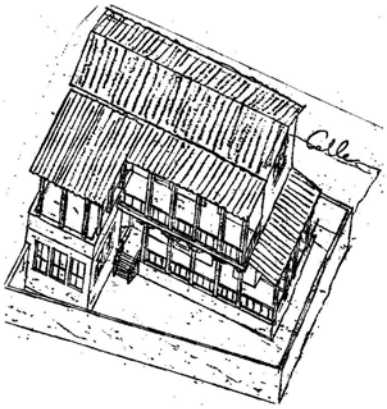
On the basis of this survey, the CES rep will prepare a final drawing that can be used for excavation and foundation work.

Step 28: Complete detailed layout of all street segments, one after the other, by repeating steps 24, 25, 26 and 27.

The above drawings show the evolution of such a layout process, in four stages:

Interior House Layout

At this point the volumetric configuration of each house and its location are on the site and on the site model. Each family knows the where the main volume, the veranda, the secondary volume and the garden of their house are located, and how large each part is.



TulioCobofamilyhouse,SantaRosadeCabal.KleonikiTsotropoulouwithfamilymembers,usingsequernceofrulesbyChristopherAlexander

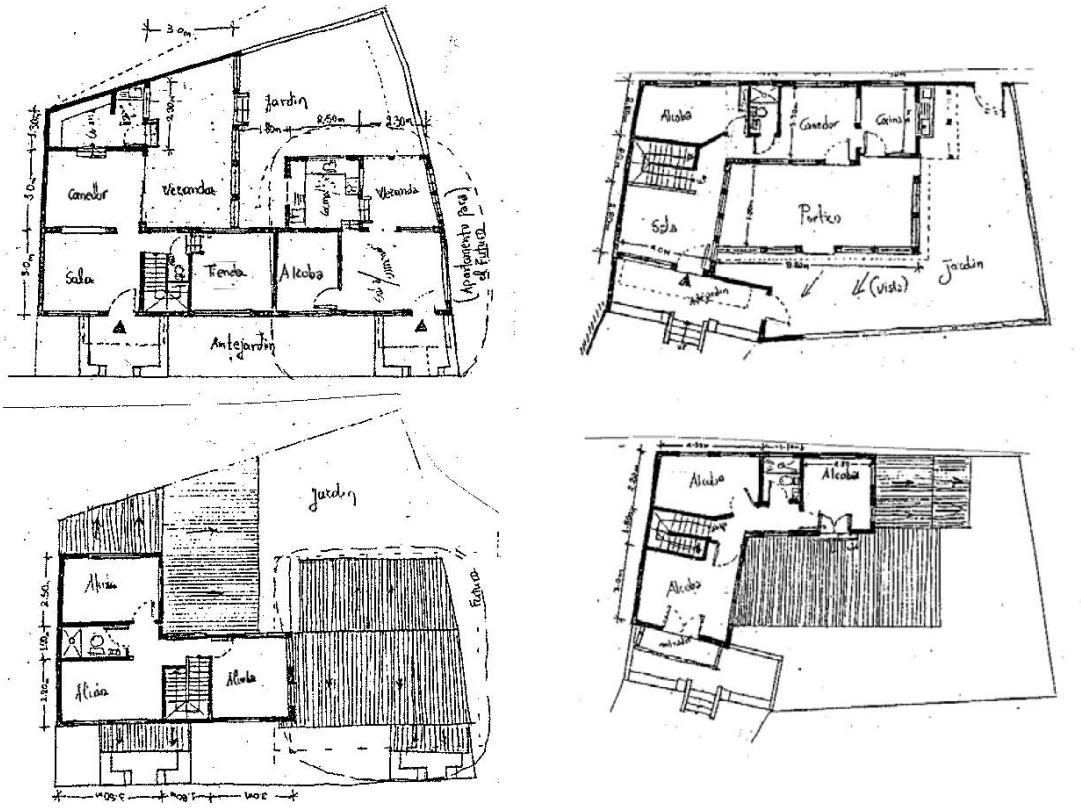
The next and final thing to accomplish is the interior layout of the house, on the basis of the volumetric arrangement decided during the previous steps.

Each family will spend half a day on the site together with CES rep to complete the interior layout of their house. They will complete the interior layout of their house on the basis of the following sequence:

Step 29: Locate the comedor (dining room) The main room of the house, the dining room, enhances the family character of the veranda. It is the largest room of the house, 20–30m^2,al-ways placed next to the veranda, and is wide open to the veranda.

Step 30: Fix entrance Choose position and make a front porch or landing to give transition from street to house. The front door then opens into a small entrance hall.

Step 31: Create mysterious path of entering There is a path from front door to veranda to garden. The path is not direct. The veranda cannot be seen from the front door. The path moves



Garciafamilyhouse,SantaRosadeCabal,KleonikiTsotropoulouwithfamilymembers,usingsequenceofrulesbyChristopherAlexander,1992

Hincapiefamilyhouse,SantaRosadeCabal,KleonikiTsotropoulou,withfamilymembers,usingsequenceofrulesbyChristopherAlexander,1992.

from dark towards light. The source of light is not revealed until you get there.

Step 32: ***Locate the kitchen*** The kitchen 10–15m^2 is on the same level as the dining room, but not necessarily adjacent to it.

Step 33: Locate the sala The sala, a formal room for receiving guests, has its door just inside the main entrance of the house. It is roughly square, about 10m^2,witha window looking onto the street, never onto the veranda or garden.

Step 34: Locate main staircase The main stair connects first and second floors and is located in the private part of the house, not visible from the main entrance. The stair case is always attached to the veranda and should be connected to the path that leads from entrance to veranda. The volume of the staircase is either a simple rectangular volume, or L-shaped for a dog-leg stair.

Step 35: De• ne minor passage Movement among the rooms of the house is loose, and happens in one of four principal ways: (a) through the veranda, (b) directly from room to room, (c) through the path connecting entrance to veranda, (d) by means of a minor passage open to outdoors (like a gallery) and upstairs.

Step 36: Locate bedrooms and bathroom Put bedrooms in any areas of the house volume not yet used up, mostly upstairs.

Step 37: Locate minor connecting stairs Small stairs are placed to connect front door with street, veranda with the garden, different levels within the house volumes.

Individual houses, individual apartments, workplaces, individual houses, gardens, rooms, when made living, are adapted to individual conditions and to individual people. They have a character that allows people's individuality to be lived through. Each place is unique, personal to the individuals, ''unique in all the world'' — and because of all that is a place which people can love.

This uniqueness of every part, like the uniqueness of leaves on a tree or roses on a rosebush, is a necessary part of a living order.

In any mass situation which requires repetition of houses, or repetition of apartments, or repetition of offices, it is good to bear the following in mind. Once generic patterns have been established, it is relatively easy to generate local individual variations in a genuine and practical way. You can do it by inventing processes, like those I have illustrated, which give each individual the power to create the configuration of their individual house or apartment. Such a process can easily be constructed so that silly mistakes will not occur, and so that the process virtually guarantees that each person will be able to make a coherent design.

In general, the geometry will be created by differentiation, not by addition or accretion, the parts given their dimensions by differentiating operations within the space of the land, or within the space of the room where the thing is being made. Dimensions are created in the attempt to fit each differentiation, positively and simply, into the spatial shell of the previous step in the unfolding.