SUSTAINABILITY AS A SELF-VALIDATING PROCESS; THE MENDES GUEST HOUSE - AN ARCHITECTURAL EXAMPLE

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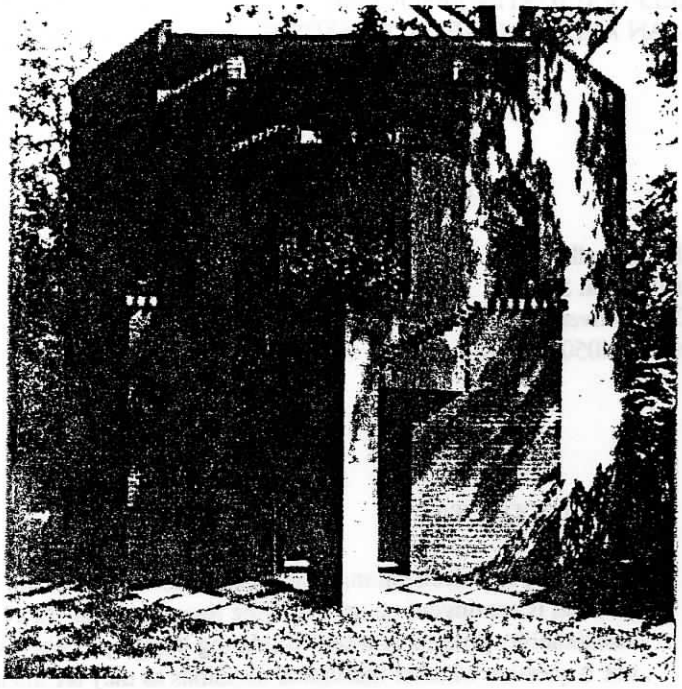
ABSTRACT

Most topics in Solar Energy and Sustainability are addressed within an analytical framework, but when we get to the subject of architecture or, in the case of ASES conferences, of Emerging Architecture we enter into another world. This is the world of design where presentations become much more descriptive and where we seem to be happy to abandon our technical/analytical framework in order to assess the overall, qualitative aspects of a particular building. Looking at slides of mass walls out of used tires and mud or beautiful buildings in which solar concerns are only a small part of the architects agenda may be a welcome relief from the endless viewing of graphs and tables. Still it tends to polarize our thinking to create two mutually exclusive realms: the technical realm of verifiable formulas and numbers and the aesthetic realm of value judgments and individual taste. This polarization tends to demean both realms and to marginalize the endeavors of solar energy and sustainability which can establish their legitimacy only from a fundamental union of both these realms.

This paper presents an architectural case study of the Mendes Guest House, which recently won a Kentucky Society of Architects Award for Excellence in Architectural Design. The study presents a decision making process which is not analytically based and whose essential qualities could not have been generated from such an analytically based decision making process. It is the sort of self-validating decision making process which is employed by mature designers. It is also the sort of process which, in effect, occurs in a natural ecosystem as well in any process, we would argue, aimed at generating and maintaining a sustainable human ecosystem.

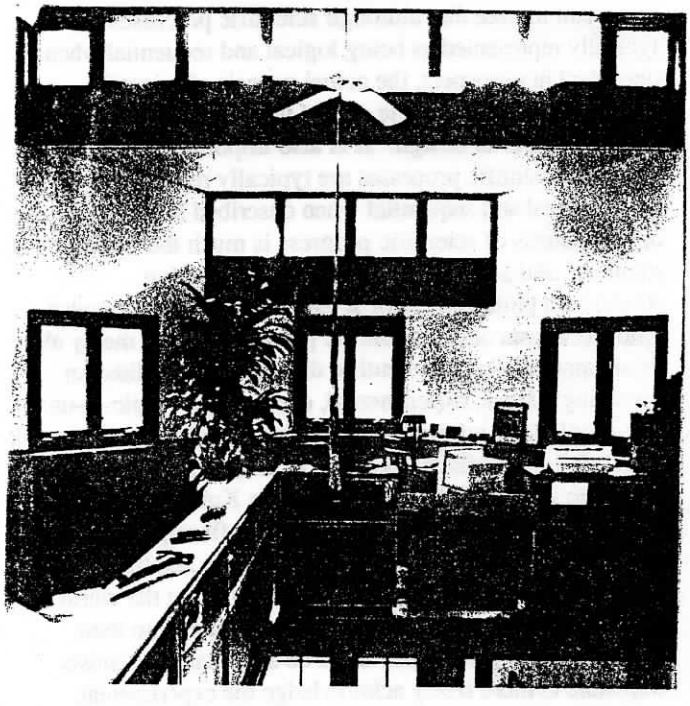
1. INTRODUCTION

In an analytical decision making process the validity of the solution is contingent on an error free linear process. In a sustainability process or a self-validating design process it is not a question whether individual decisions as they are made could be correct or incorrect. Rather because the process of synthesis continually turns in upon itself in a cyclical fashion, continually modifying earlier decisions, it is only finally the quality and viability of the whole which is able to self-validate the succession of earlier decisions. It is also important to note that although scientific processes are typically represented as being logical and sequential when described in retrospect, the actual genesis of scientific progress is much the same sort of iterative, trial and error process as it is in design. It is also important to note that although scientific processes are typically represented as being logical and sequential when described in retrospect, the actual genesis of scientific progress is much the same sort of iterative, trial and error process as it is in design. Revisionist philosophers of science like Abraham Kaplan who work from actual scientific practice depict a messy all-too-human process of scientific discovery and validation involving a loose, experimental, even ad hoc "logic-in-use" that is only later reformulated into a neat, tidy "reconstructed logic" that camouflages as much as it reveals about actual scientific praxis. Others, like Thomas Kuhn, point to the productive role of anomalies that do not fit reigning paradigms during periods of normal science and that eventually unseat old ways of theorizing about the world for new ones that incorporate existing anomalies into their theoretical scheme. It may even be said that if scientists were able to more freely acknowledge the experimental, synthetic nature of their endeavor, they would be more predisposed and better equipped to engage in the sort of collaborative, interdisciplinary science which the generation of sustainability models demands.

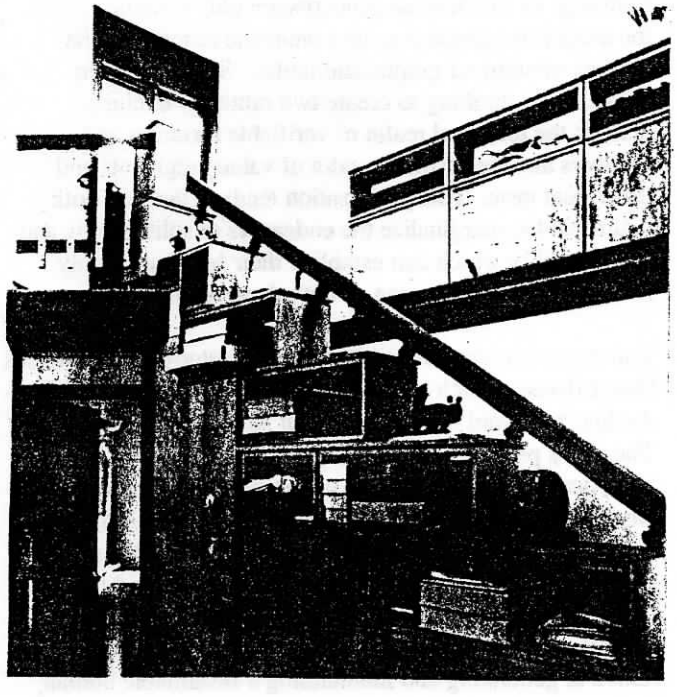


PHOTOGRAPH 1. VIEW FROM THE SOUTH

PHOTOGRAPH 2. BRICK CORBELING DETAILS



PHOTOGRAPH 3. INTERIOR VIEW TO THE SOUTH



PHOTOGRAPH 4. INTERIOR STAIR

2. THE MENDES GUEST HOUSE

Through this case study of a small, passively heated building, a decision making process is explained which unites technical methods and design methods as an example of a fundamental, but little understood characteristic of sustainability processes. The site of the Mendes Guest House is a very particular place offering many clues to the designer as to which sort of design considerations might be important to take into account. It is located on a long and narrow rectangular site in the back yard of an old (circa 1910) two story brick house in a beautiful old neighborhood of other two story brick houses in Lexington, Kentucky. An early decision was to work with brick masonry as a major material, both to respond to the dignity of the existing house and neighborhood as well as to use a material whose potential for heat mass storage would nicely compliment the intention of exploring passive solar applications to providing daylight and heat for the building. The decision to try to design with brick could neither be said to be right nor wrong at such an early stage in the design process, but like almost any early choice it is merely a potentially supportive tool for a larger process. The means of verifying this decision would have to await the outcome of a more extensive exploration which in fact would offer a number of surprises.

The site offered another interesting condition. Contrary to the layout of a great number of American cities, the street grid of Lexington is not laid out on a north south alignment, but rather it is almost at exactly 45 degrees off of north-south. This created two potentially conflicting conditions, which in design process terms is the same as saying that it created an opportunity for exploring and discovering a local order--that is an opportunity for synthesizing a unique local identity. In order to work with the existing house and the neighboring houses as well as with the narrowness of the site, the new building would seem best oriented parallel and perpendicular to the site lines. But in order to maximize solar gain for a passive solar application, solar fenestration would be best oriented at a 45 degree angle to the site lines.

3. THE DESIGN PROCESS

The clients, Guy and Page Mendes, needed a photography and painting studio that could double as a guest house with exhibition space and office space. But it also had to be very small. As the design evolved it became a two-story structure as an approximation of a cube, twenty-three feet on a side. To bring warmth giving sun into the studio, successive cuts were made on that 45 degree angle to the south corner of the cube stepping back into the cube three successive times and cutting successively longer diagonal windows into the cube.

The process of design involved building relationships upon relationship, eventually returning to the original relationships only to discover that they no longer fit, so that they had to be modified as the process wove around again and modified it again as a result of a widening net of determinants woven into the emerging fabric of the design. In this small project, then, the local order of brick had to be found as well as the order of the cube and the diagonal order of the sun, and each of these and many other orders had to be choreographed with one another so as to synthesize an order of the whole.

The order of brick was not easy to find. Today brick almost invariably means brick veneer, which is used as a surface or finish and is an entirely different treatment from the order of a load-bearing brick wall, as found in the original house and the rest of the neighborhood. It was decided to try to maintain the higher order of the double thickness of the load-bearing brick wall which could negotiate a more complex order with the other forces in the building design with an authority that a single layer of brick could not speak to. This led to a decision to complement the diagonals formed by the sun-oriented diagonal windows with additional brick walls on the ground level containing the building's entrance.

With the decision to work with brick bearing wall construction instead of a decorative veneer, we had the opportunity of seeking a three-dimensional order of brick as opposed to just a surface pattern of brick. With brick as structure we were able to consider how brick could span a window opening by developing a system of corbeling detail which could also speak to the way loads could be taken from a wall and lead to a column. By laying the bricks in Flemish bond instead of in simpler surface patterns, we created yet another level of complexity which would interact with other scales of brick articulation. The diagonally oriented sun windows gave rise to the diagonal brick walls and also created another opportunity for discovering the order of complexity. The stepping solar windows created stepped parapet walls. Such walls need some sort of cap to keep the water from seeping in from above. Walls may be capped with stone which is less porous than brick or with metal flashing on top of the wall or by using through-wall flashing several brick courses down which may be less noticeable. Each of these approaches would be aimed more at solving a waterproofing problem then at searching for a higher order in the realization of the wall. But by this time in the design process we had assembled enough "dancers" in our multiple attempts to build with brick and to work with the multiple geometric conditions of the site to be able to both solve the practical problems and choreograph the higher

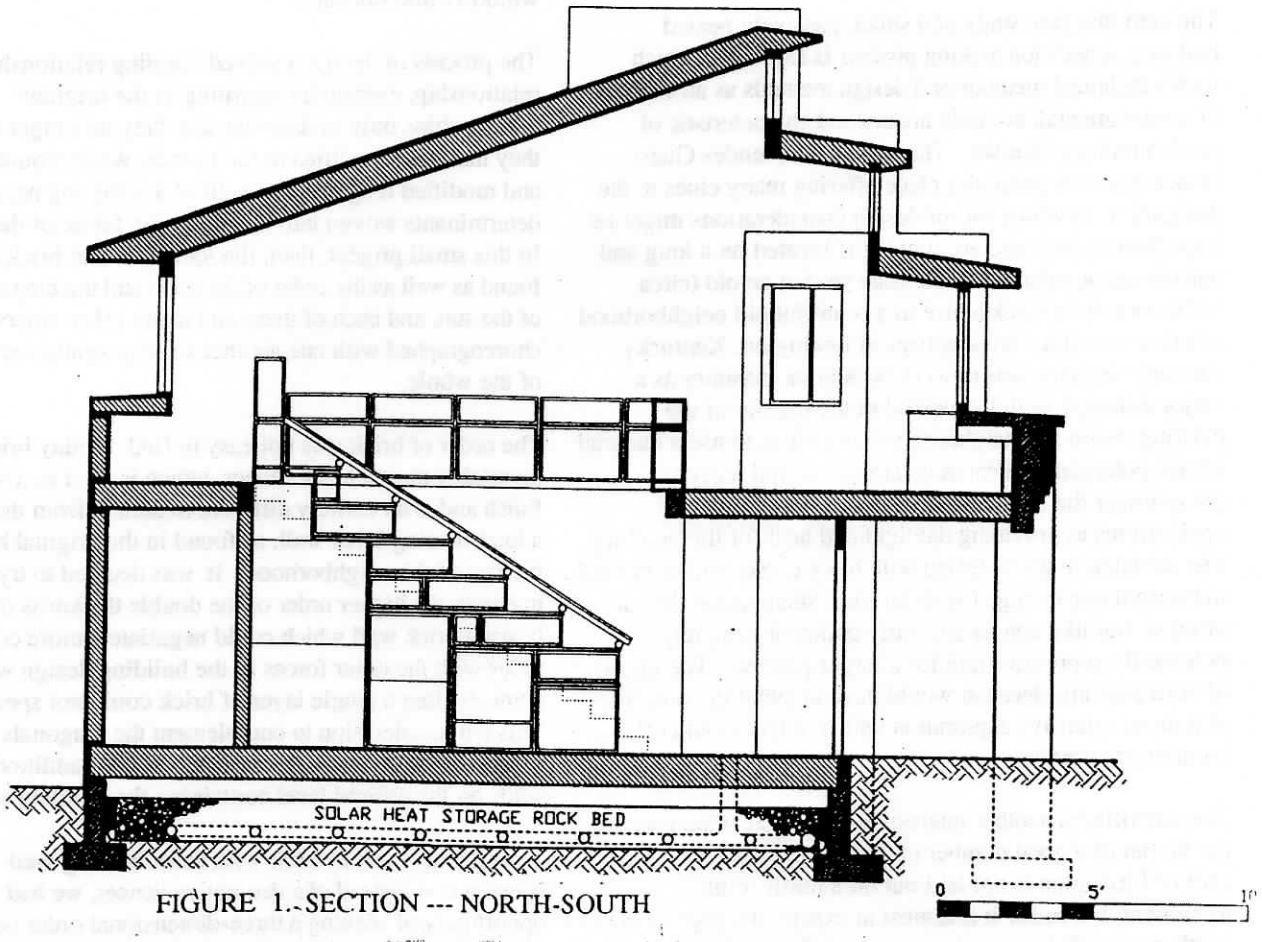


FIGURE 1. SECTION --- NORTH-SOUTH

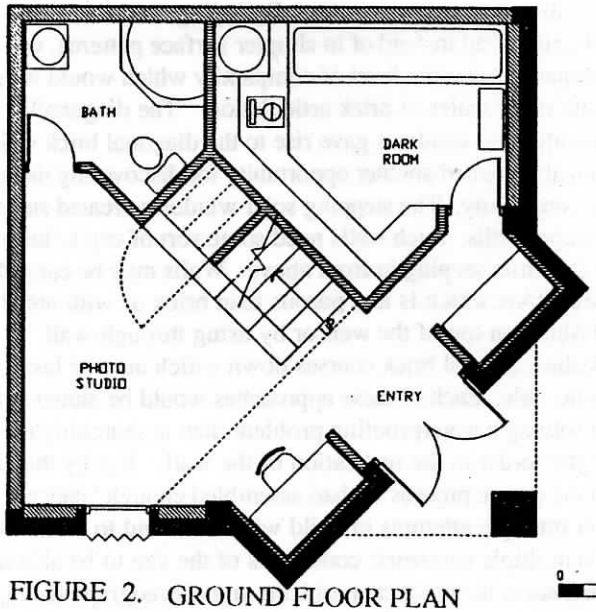


FIGURE 2. GROUND FLOOR PLAN

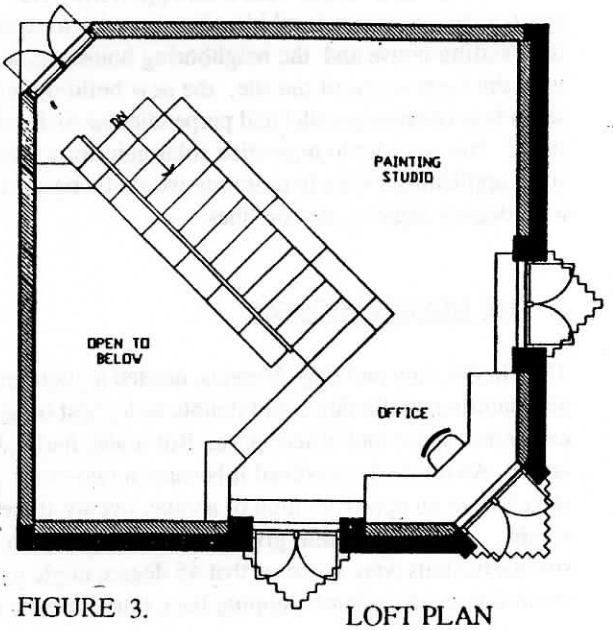


FIGURE 3. LOFT PLAN

order at the same time. With the new diagonal brick walls at the first floor entrance we now had brick coursing at both the right angle of the site and at 45 degrees to the site as influenced by the sun. We needed to put some sort of cap on the triangular roofs of these projecting triangular pieces. We discovered that we could continue the normal orientation of the coursing of the right angled walls over these triangular sections which would nicely cap the triangular section and at the same time result in a saw-tooth overhang which would nicely crown the walls and tie them in to the order of the right angled walls at the same time. The flashing to protect the wall from water would occur between the flat wall and the saw tooth overhang of the cap. This same saw-tooth cap detail could then be nicely used at the top of the wall at the parapet, this time capping the wall and referring back to both the caps on the projecting angled walls and the order of the the bricks below them. In addition we had the opportunity of turning the flat wall out on the 45 degree angle at each step up of the wall next to the solar windows. By turning the wall out we were also able to make it parallel to the solar windows which gave us the possibility of making a clean and complementary detail in what might otherwise be an awkward condition. These same negotiations between the brick material, the details and the geometries occurred in the "zipper" joints between brick meeting at a 135 degree angle and in the several details of the corbels.

But what of the original motive for using brick in the first place as a heat storage component? With eight inches of brick and another six inches of insulation and framing, this small building could hardly afford another four or eight inches of heat mass brick on the inside. Although the brick-cum-heat mass was one of the assumptions which initially propelled the idea forward in the first place, when we finally circled around to consider it again it no longer had a place in our designs. Perhaps it was just as well as there were other solar related problems which the interior brick wouldn't have solved. The design of the interior had a darkroom and a gallery space on the ground floor and a painting studio and office on the second level loft. With such a high ceiling a good deal of the accumulated heat would have risen to the highest point where it wouldn't have been of much use. A ceiling fan was planned, but this wouldn't have helped heat the darkroom. Instead we went to another system which we have used on other projects. We installed a simple rock-bed under the floor and with a small blower controlled by a thermostat we were able to draw air from the high point of the ceiling and blow it through a series of ducts, through the rock bed. This gave us a radiantly heated floor and good air circulation and heat distribution through the interior. The building works very well and the clients are very happy with it.

4. DESIGN AND SUSTAINABILITY

This is a small building generated by a simple design process. What is the relevance of this example and this process to the immensely more complex and as yet unrealized process of sustainability? It is our contention that the process just described has the sort of characteristics needed in a sustainability process and as such it is a microcosm of the type of process that we need to create to be able to negotiate a sustainable future. What are these characteristics which we have described? In the design of a building we find few imperatives. That is to say the building just described could have had many different solutions through a process which used any number of different materials, assumptions, shapes, etc. There was no equation to solve-- i.e. no problem to solve and no uniquely correct solution. There were a great number of potentially valid choices which could have been made at every level. In a small building with a single client and a single architect it is possible to imagine that a single acceptable building could be designed and built. It is far more difficult to imagine that in a pluralistic society with a great number of diverse and conflicting interests and an immense number of possible choices in many realms and at many scales that a process could be devised which would generate a set of mutually supportive and sustainable decisions, where any decision has the potential to be a good one in the appropriate context, but where no decision has any possibility of being good when tossed into a sea of individually determined choices.

In the above discussion we have seen how a good design can be generated through a process where the positive outcome is contingent on neither the validity of the original assumptions nor the validity of each of the individual decisions. Rather what has been typified is the sort of process which builds its validity as it builds the complexity of its relationships, by revisiting past assumptions and decisions again and again as the consequences of those assumptions are tested and built upon and changed. It is an organic process in that if it is valid it is so because it has found a life of its own-- it has created an inner consistency which supersedes any value one may attribute to any of its parts. It is an open, flexible process which can accommodate many sorts of decisions as long as those decisions can be made to contribute to an order building process. It is a balance seeking process where all manner of requirements, limits, ideas, and interests may be added to the mix provided the organization of the emerging construct may be brought toward balance. It is thus also a self-validating process which is just the sort of process that is necessary to both generate and manage a sustainable society.

When decisions are described where there are a large variety of choices available and no particular set of choices is an imperative one, those choices are typically called aesthetic decisions and when a decision is made on the basis of some built-in imperative the decision is often thought of as a functional decision. This designation often carries with it the implication of distinguishing between decorative decisions and essential decisions. This would be a big misunderstanding and a big mistake in relation to buildings and architecture. It will be a fatal misunderstanding and a fatal mistake if this becomes society's attitude toward sustainability. In a good design quality is projected through a network of relational decisions. By this definition and by the example cited, functional decisions and imperative choices are included in the overall design process, now understood as a process of synthesizing of the whole. In such a process there are no excluded factors -neither functional nor aesthetic and any factor (anywhere on a "functional-aesthetic" scale) may become a major vehicle for organizing a design. In the discussion of sustainability where a good deal more is at stake than in the design of an individual building, it becomes much more important to understand that the values and principles which are the generators of sustainability will be the vehicles which carry the design and management process with the quantitative factors playing a supportive role.

In this discussion it needs to be clear that some decisions are of differing quality and importance than others. Some decisions may be fixed from the beginning. Others may be specific (e.g., the choice of brick as the major exterior material). Some may be quite abstract yet may become an important organizational generator of the design (e.g., the rotated city grid). Some requirements or choices may have little influence on other decisions. The point is: while beginning with an overarching design initially, the design process, like actual scientific practice, quickly moves to a complex interplay of part and whole comprising the designer's "logic-in-use." This inherently messy process, when it goes right, yields an end-product that is the outcome of a self-validating process which is more empirical and pragmatic than any "reconstructed logic" enshrined in designers presentations. In so doing, it demonstrates anew the inextricable ties and creative tensions between truth and error, good and faulty design, the built environment and nature as plenum.

5. CONCLUSION

If sustainability is understood to be a local balance seeking process of informed choice, that process must be broad enough to include both quantitatively competent details and qualitatively guided values. The problem in attempting to negotiate sustainability from a quantitative base is that qualitative values don't compute. In order to insert them into a quantitative equation they must either be trivialized or translated into a medium into which they won't fit. But in any case a sustainability process can never be reduced to a set of equations, so that there is no purpose in trying to reduce the principles and values of sustainability to this limited analytical form. On the contrary a sustainability process can be quite comfortable in accommodating the equations which represent the functional tools that will be an integral part of the sustainability negotiation. If sustainability could be defined as a certain level of performance then analytical tools might be useful and sufficient, but sustainability has little to do with performance. Instead in sustainability as in design, quality is not the same as performance. Quality means the ongoing negotiation of relationships within a balance seeking framework.

5. ACKNOWLEDGMENTS

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