

tity of materials, and quantity of work constant, only a few of the bricklayers we interviewed were interested.

A fourth thing was that the larger bricklaying companies, oriented in their thinking towards high-pressure time/money operations, showed us work which was clearly not in keeping with the need for every portion of brickwork to evolve, or for the right and most living thing to be attained. These bricklayers and their compa-

nies might be called the wage slaves of corporate high-pressure operations. We could not ask them to help us.

Phil Pye, who finally did the work, was a humble, silent man: aggressive when he felt unfairly treated, but honest, cooperative, and willing to work with us. From the beginning, there was an inherent reasonableness in his attitude, and a sense of excitement to do something valuable.



12 / SETTING UP A DESIGN/MANAGEMENT/CONSTRUCTION ORGANIZATION FOR A \$16 MILLION BUILDING

What is needed to build such a building? What kind of approach to designing, managing, crafting, a very large building will keep it humane, and make it genuinely beautiful?

Let us imagine a new kind of design/construction/management process for a building of £10 million (\$16 million), which allows the building to be conceived, designed, and built so that it comes to life. For the sake of argument, assume that, all in all, some two hundred men and women will be working on the building. How are they to work together? How can each of them put something of themselves into the building? And how can they together, as suggested in Book 2, chapter 14, put their deep feeling into the building, so that it comes to life as one whole?

Success will depend very much on the management structure, the human organization. Repeated use of the fundamental process requires freer adaptation and creation of centers. Such adaptation can only work if the process allows each center to be freely determined within the whole, according to the needs and demands of the whole. Yet, of course, the whole must become a single entity, coherent, not a tower of Babel

where each craftsman does what he wants. Not only that, but the craftspeople's free participation and contribution to an emerging whole must be allowed during the earliest stages of design and during heavy construction, when big issues are decided as much as during later stages of design, and during finishing.

Most often, large-volume 20th-century organization of construction work created efficiency by assigning rule-based tasks to categories, and imposing these categories, regardless of the reality which occurs. Instead, to carry out the living process successfully in a larger project, it needs acceptance, from the beginning, that design, engineering, cost control, construction, direct management of subcontractors and communication between architect and craftspeople directly, will all be encouraged and supported *as part of a single multifaceted operation of interacting processes.*

This kind of management structure did exist fully in the West Dean Visitor's Centre, in the San Jose building, and in the Eishin campus. Contracts expressing this arrangement were in place from the first days of the project. In the Mary Rose Museum, preparations were under way for such a contract.

To grasp the nature of such a new construction management process, let us imagine 50,000



The Parliament Building Assembly Hall, Sri Lanka. I do not know it for a fact, but I strongly believe that this building was designed and built by processes very close to the ones that I describe in these four books. Geoffrey Barwa, architect, 1982.

decisions being made during the course of building the Museum or other large public building. The decisions and actions were to evolve over a three-year period, from the time the project is first conceived to the time the Museum was first to be occupied. The total process would require about 50 decisions per day, daily, for 1,000 days.

To be consistent with the living process, and specifically also with the continual repetition of the fundamental process as the living process was carried out, all these decisions have to work in an atmosphere of concern for living, flexible detail, carried out within a vision of an emerging whole — and this conception must be shared by the two hundred men and women doing the work, and by the managing architect and the top construction managers and engineers who are supervising and carrying out the work.

To get all that, the process is to be managed, from the beginning to completion, by an

architect-manager — head of a team of architects-construction-engineers — capable of running a large-scale construction job.

While the initial plan and volume are being worked out, the structural scheme of the building simultaneously makes its appearance. Major public spaces in the building, and smaller social spaces, appear early on the scene.

The neighborhood of the building and the space around the building are going to be improved by the insertion of the building. The building will support the wholeness of the neighborhood, repair it, heal it.

Then a structure appears: a subtle and beautiful kind of repetition, with some syncopation to make spaces positive, and one in which individual columns and beams are able to take their own form. To achieve this syncopated grid, even at the earliest stage of work, computer studies of finite element analysis will accompany the work-

ing through of the building. Engineers are cooperating from the outset, not coming in afterwards.

The money allocated to the structure has to be conceived, from the beginning, in such a way that it makes best use of the available budget. To get this, the building is first and foremost designed *as a system of expenditures*. From the outset, and every day, financial calculations help to shape the building, as much as design, since this is the way the building evolves successfully *as a whole*. Indeed, the design first appears, not on the drawing board, but as a cost plan which gave us a picture of budget allocations, each item chosen so that each one makes its maximum contribution to the feeling and experience of the whole.

Consideration of construction management is already involved, from the very earliest stage of work in the initial cost plan. Amounts set aside for different parts of the building are not estimates, but often preliminary bids from selected subcontractors. Thus, even while the building is in the earliest stages of design, allocations of money are based on real experience and real discussion.

The materials to be used in the design then evolve in relation to the budget and in relation to real, defined subcontractors.

Construction workers are organized in a decentralized fashion, so that each construction worker has some freedom to contribute to the formation of the whole. Of course, what is done in any one part of the structure has to work within the budget, and it has to be consistent with the larger plan; nevertheless, there is freedom, locally, within the building, to make each room and part unique, and for each team of construction workers to give the process something that they love and enjoy.

Generic structural considerations are settled early on so that the foundations and major structural skeleton are fixed and safe. Minor structural matters are solved, dynamically, during construction; engineers work with the project as it goes forward, and their insurance allows them to make calculations and modifications, while

the building proceeds. Insurance is therefore differently contracted, because it allows construction and design to be intermingled.

The human organization of the job is different from today's construction contract in a number of ways. The job as a whole is performed under a management contract with a fixed budget. A general contract management team is paid a management fee which is fixed in advance. There is no profit beyond the fee. Expenditure of all money beyond this fee is visible to the client, and the builder has the responsibility to deliver the best possible building with the available fixed sum.

Human organization of the work is handled by different craft-based subcontractors. All work is assigned as variable within the job of fitting to existing design, but based on fixed parameters of quantity. Subcontractors and craftsmen are expected to provide variation and quality within the fixed quantity.

Drawings made in advance only show the means of construction, and the approximate form of results, not the detailed plans or execution. Small details of space, materials, ornament, and color are in the hands of the users, craftspeople, and the architect/builder.

At every level of decision, and in each time period, users of the building — both executives of the project and the general public — are involved, with the understanding that their wishes can be consulted and will be incorporated in an ongoing rhythm throughout construction. Additional cost to the building is not permitted as an outcome of user involvement, nor time delays.

In some parts of the building, users lay out their individual space, sometimes even whole floors, with the help of computer programs that give people the ability to form layouts that are organic and suited to their immediate needs.

Financing of construction is arranged so that not all the money is spent at the outset. A definite sum is set aside for annual modification and repair, for the first ten years, so that the building can be fine-tuned after construction.

Compensatory savings are made so that the building, as first built, sometimes appears a little more rudimentary than usual.

Structural members are likely to be more massive than is typical, and are used to contain services, storage, and other space-eating elements. Ornament is highly visible in parts of the building; splashes of color and design are visible in subtle quantities to touch the whole with subtle feeling.

All the architect-managers are personally involved in the making of at least some of the ornaments and details. And at least half of the

construction workers on the job have enough responsibility, and freedom, so that their individual mark is left on the building — in the form of initials, or stamped marks, or signature. The shared motive, maintained throughout, and communicated to all who worked on the building, is that the public space which the building creates, is going to be considered as important in the process as the building itself. As the building matures, this space, too, is helped to flower, creating areas for the benefit of the ordinary wishes and desires of ordinary people, and for the nourishment of their feeling.



12 / CONCLUSION
 GEOMETRIC FEATURES WHICH FOLLOW FROM THE USE
 OF LIVING PROCESS IN THE MAKING
 OF LARGE BUILDINGS

In a large building generated by such a living process, certain recognizable features will recur. Individual rooms, components, and structural spaces, workplaces, individual houses, gardens, rooms, will be adapted to individual conditions and to individual people. They are places where people's individuality can be experienced, lived through. Each place — even in such a big building — is unique, personal to the individuals, "unique in all the world."

That means we must have the engineering and construction skills to do it. For the biggest buildings, the subcontractors, who will I think one day be artists themselves, need to be given freedom to create living structure in the crafts for which they are responsible. So, at the same time we architects control the process, we must learn not to control it fully. I believe the life of the finished result will come in a kind of process not invented yet, from a new way of making, building, and managing, which allows living structure to emerge from the cooperation of hundreds of subcontractors' and artists' creative efforts, under a coordinating "feeling" which binds them together.

I will see how far I can go in characterizing this kind of unfolded structure in big buildings, geometrically.