The Byland House: A Solar Monticello. Fayette, Missouri

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The design and construction of
the Byland house, commissioned
in 1977, took nearly three years
and landscaping remains to be
completed. Yet the house, now
occupied for several years, seems
to belong in the open countryside
near the central Missouri town of
Fayette.

The scheme refers to a search for
an elusive set of essential rela-
tionships between a building’s
function, form, image, and con-
text. These relationships, once an
intuitive part of architecture,
have been obscured in the ex-
perience of the modern move-
ment. The rejection of past forms
and associations and the reliance
on functional analysis for the
creation of a new architecture
has led to a proliferation of
novel, discrete, and often inac-
cessible solutions that have little
meaning other than shelter. ¹ At
the present time, when much of
modern architecture is undergo-
ing re-evaluation, the pattern of
disassociation of images from
their function and surroundings
seems to remain. The relaxation
of the prohibition against the past
has released a rush of new im-
ages, but not necessarily in
relation to function or context. A
latent feeling of superficiality
persists, suggesting style more
than substance.

Modernist design has been in-
fluenced by the program, as in
the dictate “form follows func-
tion,” and occasionally by the
physical context.² The most evi-
dent relationship to both program
and context is that of typology,
which was rejected by modernism
in the search for a new order,
where a type may simultaneously
express a function, be found
within a context, and suggest
cultural associations.³ The adap-
tation of a relevant typology can
thus result in a building form that
accommodates both program-
matic expectations and its sur-
roundings, with the inherit
elasticity found in inclusive con-
cepts. This suggests a super-
imposed relationship of function,
typology, and context simultane-
ously expressed.

The design for the Byland house
began with several trial and error
schematics of a familiar nature
which were soon discarded. Add-
ed to the program was a solar re-
quirement which, while in-
nocuous at first, soon became a
primary basis for the design. The
design took shape after a func-
tional/solar analysis, which, with
contextual references, suggested
a typology—the eighteenth cen-
tury villa—hence, a “Solar Mon-
ticello.” Once established, the
scheme underwent considerable
adjustments influenced by
technical requirements, the local
context, and—perhaps the most
difficult—a restricted budget. A
brief discussion of the program,
the Fayette context, and the
systems outlined above—func-
tional analysis, typology, and
contextual references—deline-
ates the evolution of the design.

The program stipulated by the
owners, a professional couple
with a teenage daughter, was very
complete. They wanted a one-
level, efficiently planned, passive
and active solar house that would
relate to its surroundings. They
had researched available active
systems and had selected the
Thomason “Solaris” as the most
cost effective. While not adverse
to gadgetry, they wanted to avoid
the typical high-tech image. The
house would display their antique
Missouri furniture collection and
be well organized into efficient
living and bedroom zones. Par-
ticular attention was given to
planning the kitchen, baths, and
other service areas. As the budget
was limited, materials had to be
locally available. The site in-
cluded four open acres sloping south
to a lake located several miles
town. I was familiar with the
Byland’s living patterns, as I had
visited them often in Fayette and
had designed their dental office
several years earlier.

The context for the Byland house
is an area along the Missouri
River known as “Little Dixie” that
retains a remarkable intact land-
scape of farms and small towns.
The area was settled in the early-
and mid-nineteenth century mostly
by southerners, who brought
with them a classically derived
architectural tradition nurtured
in Kentucky and other eastern
states (Figure 1). Fayette, a small
town of 3,000 people, is organiz-
ed around a court house square
whose nearly continuous com-
mercial facades form a “false
front” urban space behind which
are relatively informal, modest
neighborhoods of clapboard and
occasionally brick houses that
form a harmonious counterpoint
to the surrounding farm area
(Figure 2).

A functional analysis of the pro-
gram began with a critique of
typical solar designed houses
(Figure 3). In active designs, col-
lectors are usually placed over the south elevation, thereby blocking the relationship between interior and exterior, and preventing the opportunity for passive solar gain. In passive designs, the typical add-on greenhouse places an additional barrier between interior and exterior, is difficult to protect against heat loss, and is removed from the rear areas of the house. For the Byland house, it seemed practical to place the collectors at the north edge of the roof area in order to free the south elevation for passive collection, and to transform the greenhouse into an interior solarium. In this configuration, warmth gathered through the solarium can be transferred uniformly to the surrounding house.

The programmatic requirements for a one-level house suggested the organization of distinct living and bedroom zones on each side of a solarium/circulation zone. This diagram was then subdivided to form a nine square pattern, which, in turn, was transformed in shape to permit southern exposure to all the spaces along the east and west sides (Figure 4). Each of the nine plan segments represents a room with appropriate support spaces (Figure 5). Volumes are expressed in response to their relative importance and solar functions. For example, the solarium is two-stories high to permit maximum penetration of winter sun, and shed roofs facing south accommodate the solar collectors (Figures 6-7). In order to build a one-level house on the sloping site, it was necessary to create a flat area through cut and fill, which, due to topography, could be connected to the country road only at the northwest corner of the site.

The initial diagram for the house suggested Borromini’s cloister at San Carlo as a form for the solarium (Figures 8-9). The further development of the functional analysis led to the organization...
of the villa derived from Vaux-le-Vicomte, and one used by Jefferson at Monticello, where the large principal rooms form a linear central core (Figure 10). The polygonal projection of Monticello's drawing room and the salon of the French plan type also seemed an appropriate form for the solarium. While the early Fayette houses are much reduced in scale due to the conditions of the remote frontier, they share a basic element of this type—axial organization around a central hall. The characteristics of eighteenth century French villas, such as Champs, moreover, suggested a scheme already evident in the preceding functional analysis for the Byland program (Figure 11):

- emphasis on rational planning for domestic convenience, intimacy and comfort, often resulting in asymmetrical functional relationships within a symmetrical form;
- axial organization of the site plan to include sequentially an arrival courtyard, entry hall, salon, and private garden;
- octagonal or oval salon as the dominant space, with a direct relationship to the garden;
- expression of the plan, especially the salon, in the garden facades.

The second stage of the design development emerged from the adaptation of this plan type to the program. The transformation becomes evident in diagrams of the plan of Vaux-le-Vicomte where the central zone of entry and salon remain intact, but the wings are fragmented by the requirements of solar orientation of individual rooms (Figure 12). In the Byland house plan, the solarium and entry work perfectly in an organization similar to that of Champs, but the wings have evolved even further in response to specific functional requirements. As a consequence, the expression of the solarium on the south elevation refers more to later English and American houses than to either Monticello or Champs (Figures 13-15). Thus the adaptation of a typology produced a scheme comparable in function, but richer in other possibilities, than could have been achieved by a functional analysis alone.

Contextual references reflecting the dualities of classical and gothic, and European and American imageries found in Fayette represent a third system in the design. These are evident in the expression of the plan discussed above. The axial organization of the entry/solarium, expressed as stuccoed volumes, forms a core of the house around which locally derived clapboard sheds and...
flat roofed structures have been attached (Figure 16). The high courtyard facades formed by the backs of the solar collectors, with small windows, recall the American "false fronts" of local commercial buildings and create an implied enclosure around the gravel courtyard (Figure 17). Only the entry suggests the European sources of the solarium behind the facade. This duality is supported by the movement of light, as the sun touches the north facades only in spring and summer, while the spaces behind are filled with light the year around. From the south, the projecting solarium, recalling the brick bay windows of local houses and the octagonal bandshell on the court house square, suggests the idea of a ruined octagon to which later structures have been added.

The front entry, split by a column that symbolically supports the arched window above, is an image found in the upper windows of the Fayette court house (Figure 18). This element is also derived from Romanesque church portals and the facade of Pavillion IX at the University of Virginia (Figures 19-20). Thus the most authentic element in the house, a white tuscun column typical of those found in Fayette houses, is transformed into an unexpected role. The column also represents a vertical axis in solar geometry and is at the intersection of the north-south midday, and the east-west equinox, axis. To further express the equinox axis, a dark red moulding is set across the clapboard "false fronts" to accentuate their implied two-dimensionality.
With this development of images, the design reaches completion. Without the underlying order given by function and typology, this imagery would be only superficially applied without a necessary relationship to the function or substance of the house. And, conversely, the expression of function, or the program, also finds a relationship to the surrounding context.

Passive and solar concepts for the Byland house contribute, often in unexpected ways, to the quality of the interior environment. Each room is oriented south to a lake view. The solarium is the principal light source for the interior. The concept of an indirect light source is supported by the need to protect furnishings from direct exposure. The solarium is supported by an active collector system that provides space heating, domestic hot water, and assists in summer cooling. Summer cooling is achieved by a heatilator fireplace, ceiling and attic fans and by insulated (R-10) interior shutters, exterior sunshades, and well insulated walls (R-24) and ceilings (R-30) (Figure 21). The interior shutters function as apertures in the admission of light and in the control of heat gain and loss. Skylights and north facing clerestories provide daylighting and balance the intensity of south light.

In winter, the sun penetrates the full length of the solarium and fills the house with light (Figure 22). The solarium’s dark, polished concrete floor acts as a heat sink. In the evening or during cloudy days, the shutters can be closed to conserve energy. Low velocity air is distributed by an oversized duct system from the solar/rock storage directly below the solarium, which has a three to four day reserve capacity (Figures 23-24). Back up heating is provided by hot water fans in the duct supply from an oversized hot water heater and/or by the fireplace.

In summer, demountable redwood sunshades protect the south windows. Depending on the outside air temperature, the interior shutters form a second layer of protection. During a hot day, the skylights and clerestories provide sufficient daylighting to permit the windows to be shuttered, recalling the feeling of a traditional southern house. The most remarkable feature of the Thomason “Solaris” system is its assistance in cooling. In summer, when the collectors supply only the domestic hot water preheat tank, the water/rock storage is used as a storage for cooled air at night when the A/C compressor and coil (located in the return air chamber) operate to take advantage of lower outside temperatures. The system operates from 10 p.m. to 6 a.m. and permits A/C components to be sized at forty percent of normal capacity. During a recent heat wave, inside temperatures, protected by sunshades and shutters, were consistently maintained in the low 70s.

The Byland house has gained a favorable acceptance in the Fayette community—perhaps a most difficult test for any design. Depending on the viewer, the house is considered as traditional, solar, or modern. The owners find it not only functional and economical in energy consumption, but also fun to live in. Perhaps most significantly, the owners have become intrigued with the various references of the design, to which they have come to refer as the “genealogy” of their house.
NOTES

1. The interiors of modern hospitals, for example, are almost incomprehensible.