

RESPONSES TO CLIMATE AND CULTURE

Architecture Within the Landscape: case studies in rural place-making and environmental responsibility

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The notion of environmental quality (the interrelationship between place making and site landscape), in architectural design is not new. However, the recent popularity of environmental responsiveness in architecture most often stops with climatic or energy concerns helping only to establish or substantiate a surface aesthetic. Although these attempts are important, they fall short in terms of a true environmental response, for environmental quality is much more than "skin deep." At issue here is the fact that at best architecture is an intervention. Any attempt to turn that intervention into a positive force, and to make architecture a viable part of its landscape (one within its place), it must grow out of that landscape. By establishing this soulful relationship with place, architecture transcends merely being placed upon the landscape; it grows out of the landscape, is connected to the landscape, and is essential in helping to define place.

When a building truly responds to the issues, the directive forces, and the who, what, and where that encompass design and process, it becomes direction within its own setting. Both the Mitteness and Upp-Martin residences demonstrate the successful integration of programming, design, construction, and management necessary to adequately address a full range of environmental issues. The thoughts presented here center around a more grass roots approach to sustainability. Much in the same spirit as Harold Hay's "water bed roofed" house in Atascadero, California and other do-it-yourselfers of the Sixties and early Seventies, the venue I have turned to for the implementation of my ideas and concerns centers in the single-family housing sector (in Middle America). It is within this population that I feel some of the most wonderful opportunities exist. The mindset and attitudes of those willing to pursue the issues of placemaking, conservation, sustainability, and ultimately one with the landscape, is not only genuine, but results are expected.

This is a presentation of two case studies successful in addressing and subsequently integrating a full range of environmental issues into a completed architectural response. As the projects were initially shaped by social issues engrained in the programmatic statement specific to the Clients, "landscape," issues encompassing climate, context, and technology played dominant roles in the building designs. In addition, the economic, social, and cultural landscapes associated with the users, the buildings, the sites, and the surroundings became further factors giving both projects their "environmental," as well as architectural, depth.

These projects help to fulfill their owners' "American Dream" on a much higher level. Not only do they provide the "house in the suburbs" (although both residences were designed and built on rural acreages), the houses truly become expressive of who their owners are. In "personal" house design one must expand upon the traditional concept or definition of "function" in order to capture a personal environment expressive of the users, their needs, their habits, their expectations, and their desires in essence their past, their present, and their future. Clare Cooper Marcus provides a succinct description in *The House as Symbol of the Self* (1974), "The house both encloses space (the house interior) and excludes space (everything outside it). Thus it has two very important and different components: its interior and its façade. The house therefore nicely reflects how man sees himself, with both an intimate interior, or self as viewed from within and revealed only to those intimates who are invited inside, and a public exterior (the persona or mask, in Jungian terms) or the self that we choose to display to others."¹

The Climatic Landscape

Climatic response is probably the most single recognizable aspect associated with environmentally responsible architecture. In the two projects at hand, many of the climatic issues not only presented interesting challenges but contradictions as well. The climates themselves could only be described as spectacular. Minnesota has harsh winters filled with brilliant sunshine, ice crystal showers, unyielding winds, and nights that seem to start well before the days work is finished. Summers there are short-lived, at times uncomfortably hot or depressingly cool summer, filled with seemingly never-ending

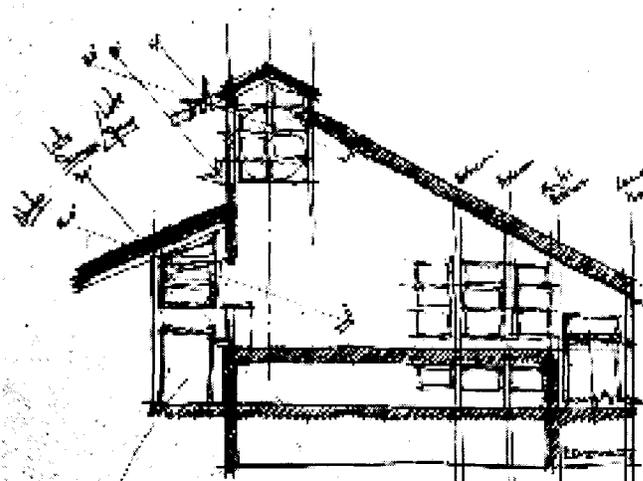
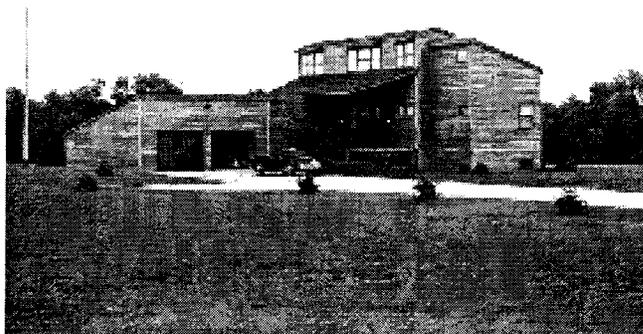
days, and capped by lingering twilight. Eastern Nebraska, on the other hand, is filled with sometimes unbearably hot and humid summers and winters that are at times unbelievably mild while at other times bitterly cold and snowy.

The Mitteness site is located on once open cropland. Winter winds posed a potentially enormous problem especially in light of the fact that the best, if not only, view was to the north, northwest. The site offered the potential for passive solar heating, from the side bordering on a county highway. Other climatic aspects to be considered were more of a regionally generic nature.

The issues became apparent although at times contradictory; views versus wind, solar gain versus viewing a highway, and solar gain for heating versus solar shading to avoid mechanical cooling. This last contradiction becomes apparent in those months of transition when in early spring needed solar gain could result in late summer gain, or visa versa when dealing with shading. Although solar movements are symmetrical over the course of the year, the earth's heating up and cooling down lags behind by about two months. With such contradictions the proper response becomes a challenge and the result becomes climatic responsibility.

The house was oriented 10 degrees west of due south, with the major axis running in the "east - west" direction. This enabled a maximum of heat gain during the winter months at a slightly later time of day, allowing the outside temperature to peak during "gain" times and the sun to increase in both altitude and strength, important for both heat gain from direct sunlight and brightness from reflected light. This particular orientation also enables each bedroom and the living room to receive direct light from the rising sun on December 21st. On this the shortest day of the seemingly endless Minnesota winter, the insides of the north walls in these same rooms are washed in sunlight from late morning to early afternoon.

Windows were obviously concentrated on the "south" facade to catch the winter sun, with eyebrows and a porch roof to eliminate solar gain in the summer months. Relatively large windows kept few in number capture the panoramic view to the north, northeast, and



Figs. 1 & 2. the Mitteness Residence, rural Traverse County, Minnesota; built in 1986

northwest, while providing cross-ventilation. Glare and gain from directly west and, to a lesser extent, east are avoided due to the basic orientation. Behind the south facade heat build-up is facilitated through the use of a 30+ foot high solar hall. This allows for the solar-gained heat to gather, naturally move upward, and through the use of a small circulating fan and ductwork, be channeled down the north wall (providing some radiant heat) into the basement mechanical room where it preheats the fresh-air intake.

The Upp-Martins chose an acreage complete with a pond in the southeast corner and natural wetlands along the entire northern third.

was laid out and structured very similar to the Mitteness House. Reducing the scale with a low starting long sloping north roof, helped to channel the cold north winds and blowing snow, while providing a high ceiling gallery for solar gain and chimney effect ventilation.

Other design responses were employed to ensure climatic compatibility. For the Mittenesses, six inch studs were used to provide larger insulating space, and perimeter foundation insulation helps to moderate ground temperatures in a climate with a 60" frost depth. The impact of winter winds is somewhat reduced by the long sloping roof line to the north while future development according to a landscaping/planting schedule should aid in assuring the building's climatic adaptability. Wall "R" values for the Upp-Martins should reach above 25, and the sleeping porch on the east side should provide a beautiful view of sunrise after a comfortable night's sleep.

The Contextual Landscape

The rural area of west central Minnesota, like many areas throughout the country's less populated regions, has not had to deal with architects or architecture since the earliest part of last century. At that time the small in size, but monumental in scale "downtown" was established in support of the newly constructed railroad station. Local construction before and since has been facilitated by individuals themselves or "builders" normally engaged in other activities or services to ensure an economic livelihood (e.g. most residential construction is performed by the local lumber yard and various subcontractors as little more than a side specialty).

Architecture is for all practical purposes a foreign term. The immediate context, therefore, was and is definitely not tolerant of the egotistical whimsy prevalent in the work of today's architectural stars. This was not a place to make a personal statement. Rather, a personalization of the client, the context, the issues at hand became the challenge. Aesthetic wrapping for the design generated a solution borrowing from the predominate visual icon - the strong, visual dominate grain elevator seemed a natural representation of both economic and cultural/social strength.

The resultant form facilitated the resolution of functional, climatic, and contextual issues extremely well. Whether one argues that the fit was purely accidental, the programmatic directives were flexible enough to fill any form, or that the form developed from the programmatic directives, the visual context playing a dominate role, it worked. The local gossip at the downtown cafe centered around the "grain elevator" the Mittenesses were building. I do contend that the fact that all of the pieces came together, all of the issues were successfully addressed, and the structure, especially from a distance, presents a very natural (local) landscape, is what architecture should be: calculated, well executed, visually familiar.

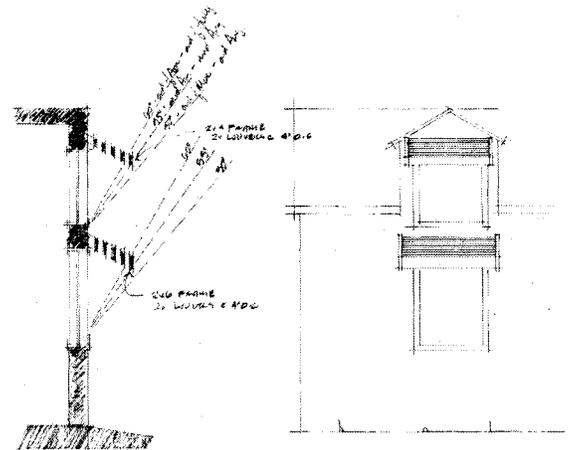
On the other hand, there are and have always been an ample number of practicing architects in the Lincoln, eastern Nebraska area. However, the state of present day practice in and around Lincoln has elevated itself to mediocre at best. For housing, enclosed space seems to be the (cost) driving factor, but the quality of that space is of little consequence. Personal expression is provided at additional, and often great, cost.

The Upp-Martin's sought more. The cultural/social wasteland that has become represented by the American suburban development was unacceptable. It is here that the collaborative effort between architect, client, site, and climate began. As Fran Upp puts it, "We are working with architect Nate Krug to design a passive solar home. Nate teaches Architecture at UNL and has a reputation for passive solar designs. We think he's done a great job incorporating all of our requirements into the house plan. The idea is to take full advantage of the South exposure for solar gain and also highlight the pond view to the East. We wanted a one story plan, a large home office/guest suite, and a three car garage so we'd have room for our tractor and farm equipment. A large pantry adjoining the kitchen is another important feature, as is a screened sleeping porch off the East end of the house. We also wanted the house to be extremely energy efficient, well ventilated, and built of materials that are low maintenance and environmentally friendly. In my time off this past year, I (Fran) have been educating myself in new building techniques

"programmatic fit" is implemented through minimal modifications incorporated into a design extruded from one of three simplistic plans. Changes in exterior and/or interior finishes, perhaps the addition of another bedroom or study, or some other easily accommodated change (usually for resale value) are made based on how much one wants to pay. The hurdle seems quite high as the local lumber yard owner / house builder was presented with plans that for all practical purposes could have been in some foreign language. The local concrete subcontractor wouldn't even touch the project. "Too many corners. Can't do it." And then from the builder, "Oh, and by the way, the largest piece of lumber we stock is 2 x 10."

The design was based on a four-foot module. For residential projects especially this has proven to be optimal in terms of both comfortable space and standard building materials. The switch from concrete to block foundations was easy to make. Only full or half blocks were needed and using a cement-based coating has kept the basement dry to date. Built-in flexibility and openness was achieved by combining the living and dining areas, resulting in clear spans far beyond the capability of 2 x 10"s. In fact, the double garage door opening presented a major structural "situation." Box beams became our "high tech" solution. In both of these cases adversity was turned into opportunity. The block actually saved money and materials and the beams help to add a sense of scale while providing natural conduits for lighting fixtures.

As construction progressed, problems were often turned into opportunities – in determining the final height of the solar-collecting clerestory and the shading "eyebrows" the amount of waste lumber was reduced to practically none; the extra depth the well had to go brought in water the perfect temperature for a ground-source heat pump; locating and hiding a rather large step-down transformer resulted in a perfect wood storage area; and so on. We were able to keep costs well within budget and technological innovation/flexibility coupled with proper climatic design has resulted in heating and cooling bills in the \$20 per month range. The local workers caught the spirit of the project early on, and in the final analysis they met the challenge presented to them. It is truly amazing what the human spirit is capable of achieving.



Figs. 3 & 4. the Upp-Martin Residence, rural Lancaster County, Nebraska, currently under construction.

The achievements of the human spirit are in the process of being realized in rural Lancaster County, Nebraska, as well. The Reward Wall System was finally decided upon as the major structural system for the Upp-Martins. Easy to work with, within their economic resources, and a promise of continued, long-term energy savings from the concrete-filled Styrofoam blocks easily adapted to the design intentions. The roof is somewhat conventionally framed, using scissor trusses where possible (allowing for a more three-dimensional spatial enclosure and insulating/venting space) and 2x framing for the interior partitions.

Where the Mitteness House employed a passive space heating strategy, the Upp-Martin house combines both passive and active systems. The majority of the house is a slab-on-grade providing thermal mass storage. The slabs are also moderated in temperature with the use of an integrated heating/cooling tube system. Space temperatures are moderated with the use of earth tubes running into the house from six perimeter locations. The small basement not only provides space for mechanical equipment and a storm shelter, but 32 batteries and an inverter are housed there. The Upp-Martins decided to provide for 50% of their electricity needs by wind generation. A commercially available wind generator on a 42' tilting pole will keep the batteries charged and helps to bring back the lost farm aesthetic – at one time most farms and ranches throughout the central Midwest employed wind power to pump water. A sewage lagoon will eventually provide compost for enriching surrounding soil and the roof design will allow future installation of photovoltaics if and when they become cost effective for the Upp-Martins.

In both cases, construction waste was practically eliminated and materials were used based on life-cycle costing rather than only first costs. Problems have come about to be sure and more are expected – in some instances we are “shooting in the dark.” However, the spirit is there and continues to drive the process turning adversity into opportunity. Construction goes on with smiles on faces and good feelings abound.

By establishing a soulful relationship with place, architecture transcends merely being placed upon the landscape. It grows out of the landscape, connects to the landscape, and is essential in helping to define place. This point is well established by these two projects. If architecture is to be a broad-based activity resulting in a synthesis of the social, political, artistic, economic, and technological concepts necessary to ensuring environmental quality, we must not only theorize about and research environmental quality needs, we must also learn from successful implementations. The Mitteness and Upp-Martin Residences are two such examples.

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