# M:OME Modern Sustainable Living in the Bridge Street Neighborhood

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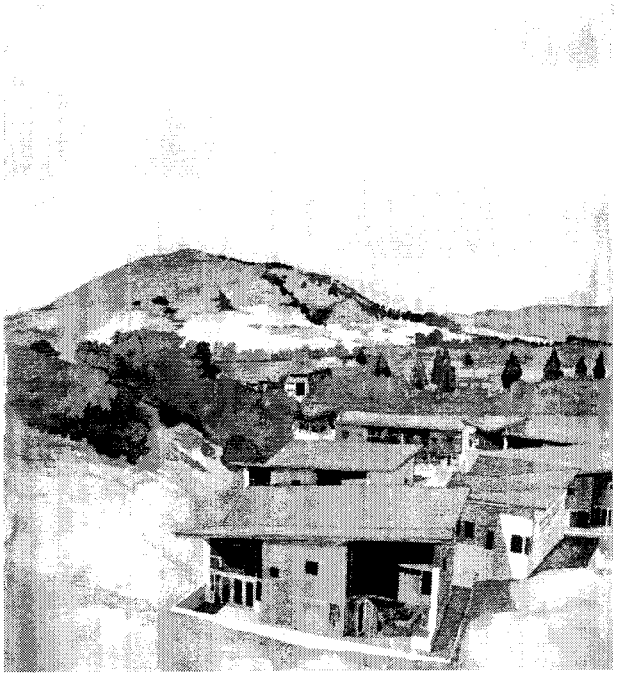

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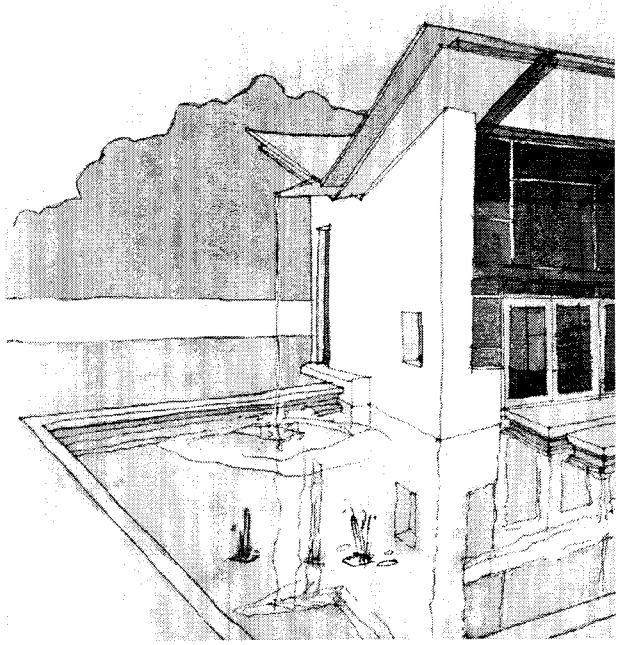

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> Buildings currently constitute the single largest energy consuming human creation, with the simple consequence that the sustainability of the built environment has a major impact on the global ecosystem."
>
> Catherine Slessor, Physics and Phenomenology, 2001[1]

**I.**

*The mission is simple: create modern affordable housing that belongs to its climate and region, sustains itself and its owners while supporting community and environment alike.*

As the architects of the M:OME/Bridge Street Neighborhood (BSN), a $6.5 million dollar housing development in the City of San Luis Obispo, we intend to bring environmentally friendly housing to a wider market. The team endeavors to make 50% of the 21 units affordable within moderate income Federal Affordable Housing Standards. In addition, the market rate homes would have one-bedroom units above the freestanding garage allowing the owners the option to have rental income to offset their mortgage costs. All of these housing options

bring an inherent diversity ensuring a rich, varied community.

The architects of M:OME/BSN have an attendant love of form, function, firmness, and efficiency...endeavoring to make work that is at once beautiful, structural, useful, and sustainable (meaning: both healthy + self-sufficient).

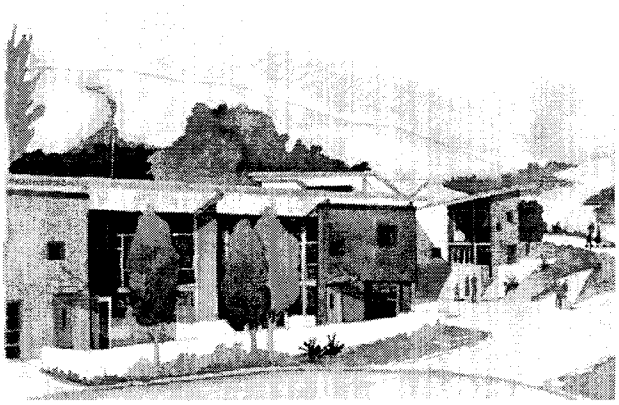
This approach carries over into the design of the neighborhood as well, creating a sense of place, and community, with a direct connection to nature.

> "It's developers who are willing to push new concepts like Bridge Street that ultimately move those ideas into the mainstream." Jennifer Seal, Rocky Mountain Institute[2]

The M:OME homes within the BSN are designed as a fine-tuned regional response to the latitude, climate and geography of central, coastal California; nevertheless, the design may be adapted for other climactic regions. It would simply need to be 'adjusted' to work with the sun angles, solar intensity, and microclimate conditions of the particular site. The architects believe that a house is a 'machine for living' such that it sustains itself by generating its own electricity, heat and hot water and has an integrated means for cooling in the summer months and rainwater collection in the springtime.

A house design must emanate from the specific characteristics of its site and the conditions of place. The modular or pre-manufactured home is another means for achieving affordability but at what cost? Do we really want affordability with a patent disregard for climate, site, geography, regional aesthetics and values? To eliminate all suspense, the architects of M:OME say "NO". M:OME wishes to bridge the gap between the extremes of modular homes and developer driven tract homes on the one hand and the custom designed houses by architects that are out of reach by most homeowners requiring affordability.

The M:OME is designed as a skin and bones system similar to the human body. The structural steel skeleton is exposed on the inside and the skin of the building wraps the exterior. The building skin functions as a malleable and protective layer that adapts to its environment. Consequently, the skin of



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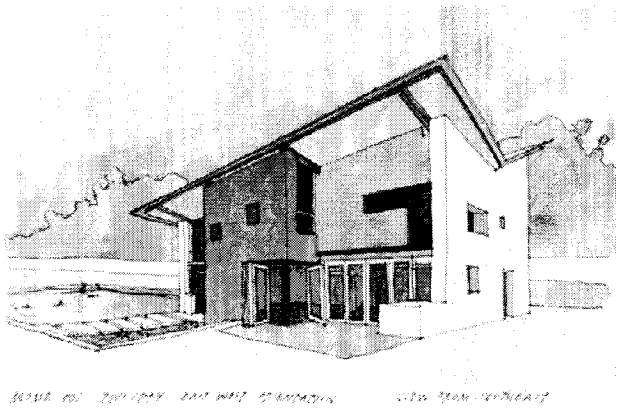
the West wall needs to look and behave fundamentally different than the skin of any other orientation. Similarly, the skins of the East, North and South walls must also respond to their respective orientations. Further, the microclimate of the region must enter into the design. The skin for our tropical M:OME in Hawaii, for example, reads differently than that of our mountain M:OME in the Rockies, or our desert M:OME in the Southwest.



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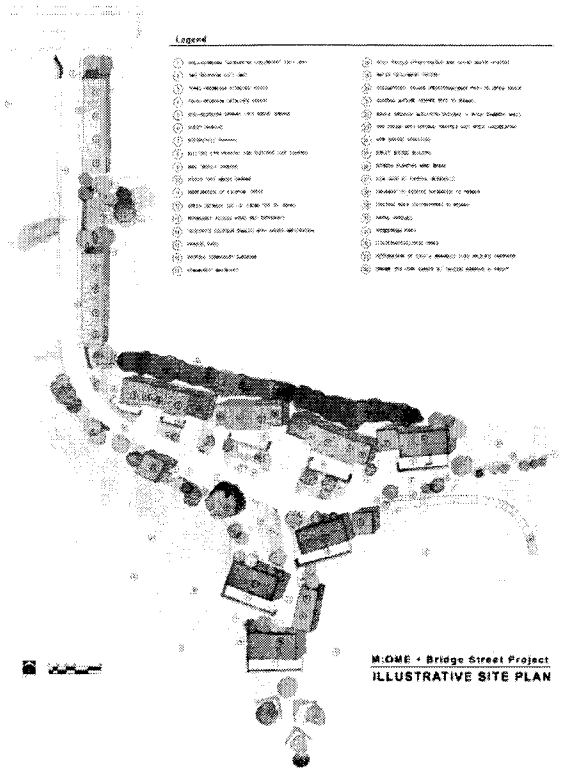
Within a single region a housing response can be similar, thus in our current design for the Bridge Street Neighborhood we make modifications to each home to balance light, view, heat gain and appropriate shading. This also gives the neighborhood a variation in color, form and material rather than defaulting to homogeneity and monotony.

## II. SITE DESIGN PHILOSOPHY

"Permaculture is the art and science that

applies patterns found in nature to the design and construction of human and natural environments. Only by applying such patterns and principles to the built environment can we truly achieve a sustainable living system. Permaculture principles are now being adapted to all systems and disciplines that human settlement requires. Architects, planners, farmers, economists, social scientists, as well as students, homeowners and backyard gardeners can utilize principles of Permaculture Design." *Larry Santoyo*[3]

*"All my life we have been at war with nature. I just pray that we lose that war. There are no winners in that war..."*
*Bill Mollison*[4]

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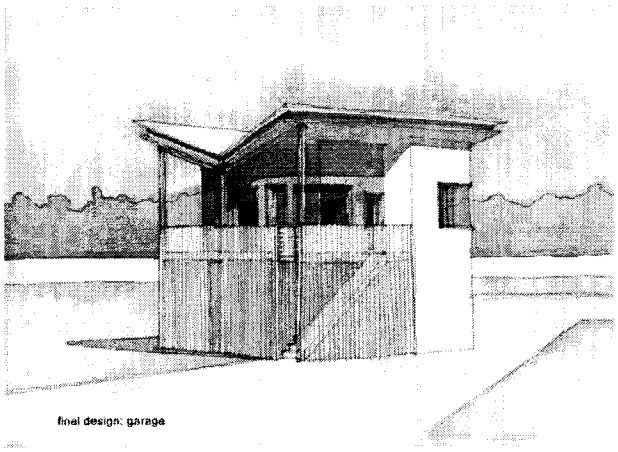


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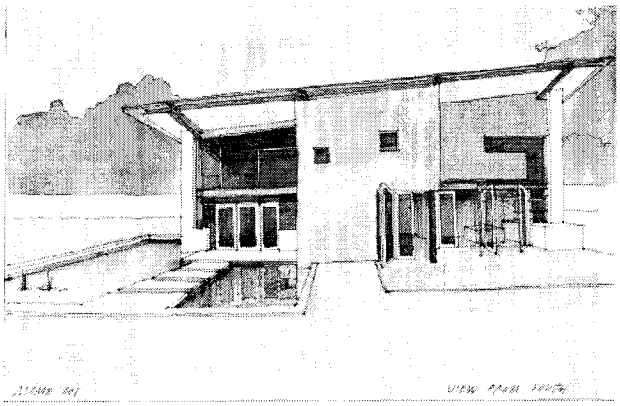

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The goal is to create a neighborhood based on the principles of permanent culture or 'permaculture', adopting an attitude of sensitivity to the site. The goal of the housing is to place it lightly on the land by respecting the existing vegetation and habitats. The M:OME definition of a successful design is a self-managed system, both with site and housing. The Bridge Street community of housing would be harmoniously integrated into the natural setting in a way that supports a healthy micro-community. The neighborhood is a size in which people are able to know and be known by others and where each member feels they are able to influence the community's direction. The variety of housing options provides inherent diversity of owners, both in lifestyle and income. The assortment of homes available would include one and two bedroom live/work spaces, three bedroom attached housing and four bedroom detached units with one bedroom

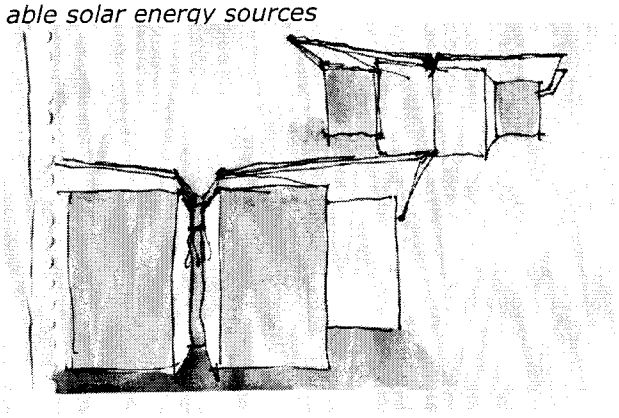
granny units: twenty-five units in all.

The Elements of a typical neighborhood would be present on the site:

- *Residence*
- *Potential Rental income or Granny Units*
- Food grown in common/private gardens
- *Leisure*
- *Social/community life*

Every building in the Bridge Street neighborhood would feature:

- *Natural / non-toxic materials for building*
- *Solar orientation for light and temperature control*
- *Maximum daylighting to minimize reliance on power*
- *Design and construction for longevity*
- *Permaculture and a whole systems approach in the building design, siting and landscaping*
- *Much of the house energy generated from renewable solar energy sources*



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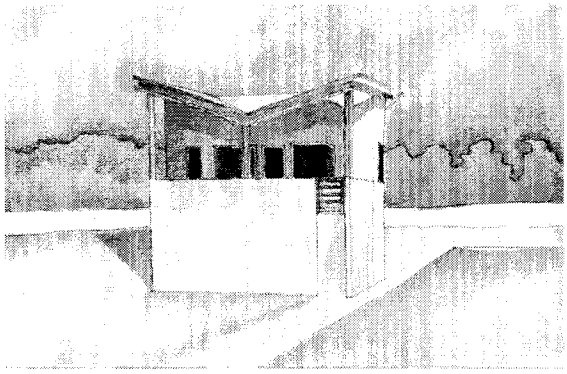
The houses will rest on landscaping resembling the original site and the surrounding hills. The housing placement forms a common area for a community orchard, gardens, mailboxes, shared electric



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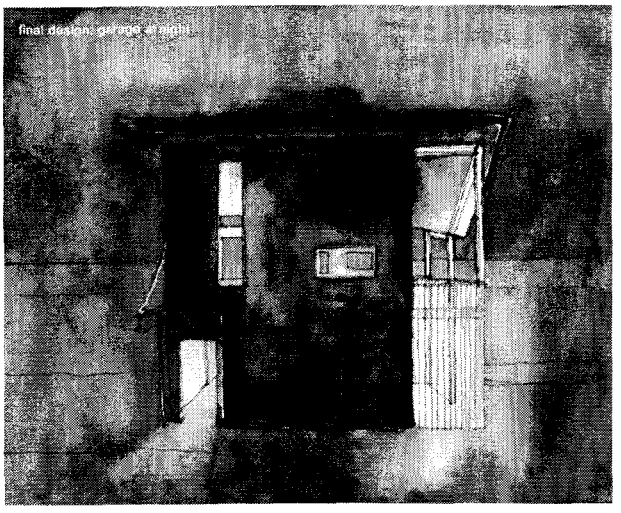
cars and bike benches that allows residents to interact. In addition, turf pavers and decomposed granite will be used on the vehicular surfaces to allow greater percolation into the water table, and greater sensitivity to the original feel of the site.

One of the most important issues for the site design of this parcel is the natural flow of water from the surrounding hills through the site. Our proposal is to plant an orchard in the northern catchment ravine to control erosion and capture some of the rainfall for irrigation as it comes down the hill. This addresses the permaculture principle of water catchment and soil fertility as high (in elevation) on the landscape as possible.

Because of the serpentine rock at a shallow level on the site, the water sheet flows through the site rather than percolating down. Vegetated contour swales would address this problem by acting to harvest seasonal sheet flow of rainfall, which would slowly infiltrate and recharge groundwater down slope, thus retaining moisture in the landscape much longer. This is called *'pattern application'* in permaculture. More than an aesthetic caprice, these contours will now direct water flow and nutrient dispersal with maximum efficiency via gravity. If needed, drip irrigation system will be laid on these level horizons where flow will not be interrupted by elevations, which would otherwise cause pooling.

Permaculture principles of *'edge effect'* are used in retaining the existing vegetation of brambles in the wildlife corridor (a dense blackberry thicket that forms a green corridor for wildlife to live, and a physical and visual boundary to the southern edge of the site). An edge is an interface between two mediums; in our case this would be the edge between the houses and the neighboring property



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to the north. Diversity, productivity and nutrients are enhanced at these edges.

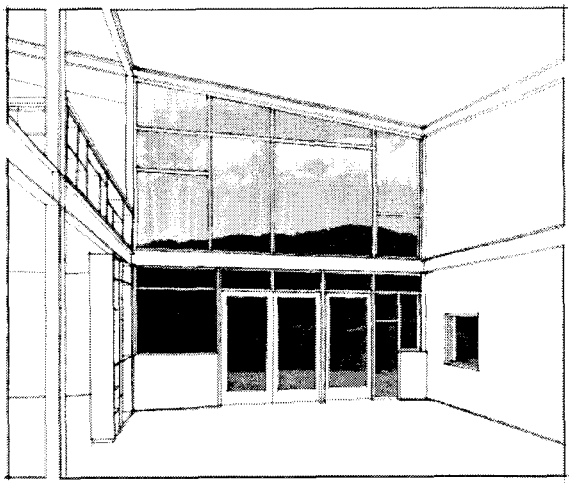
Plant Guilds are made up of a close association of species clustered around a central plant. This assembly acts in relation to the central plant to assist its health, aid in management, or buffer adverse environmental effects. An example would be apple trees with edible mint and nasturtium planted below to naturally prevent apple maggots.

The scale and economy of the Bridge Street Project could possibly allow the site to have shared use Neighborhood Electric Vehicles (NEVs) as a mode of transportation. Electric vehicles would be available on a per-trip basis for regional use by residents providing a built-in system for car-sharing, and a means to reduce vehicle emissions and noise pollution. In addition, covered bicycle parking is provided on several different areas of the site.

**III. BUILDING DESIGN PHILOSOPHY**

> "I sometimes dream of...a house whose inside is an open and manifest as a bird's nest...where to be a guest is to be presented with the freedom of the house, and not carefully excluded from seven-eights of it, shut up in a particular cell..."
>
> Henry David Thoreau[5]

Every architectural style in history has developed



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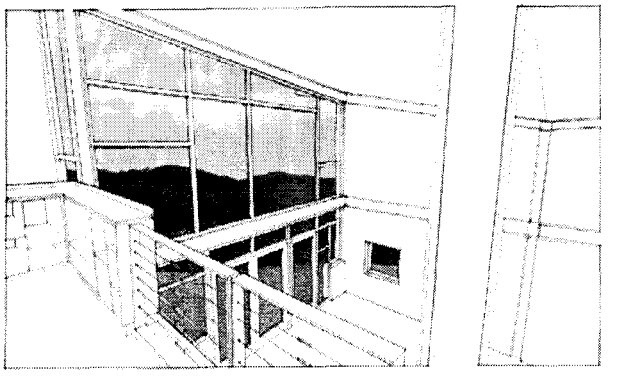
in response to the perceived needs of the day. The Bridge Street Project responds to the American need for a house that is warm, friendly, affordable and economical to operate; an efficient machine with integrated environmentally-friendly technologies. A new Victorian, Craftsman or Mission style home with photovoltaic panels, water catchment systems, solar water heaters, sunshade devices, would ap-



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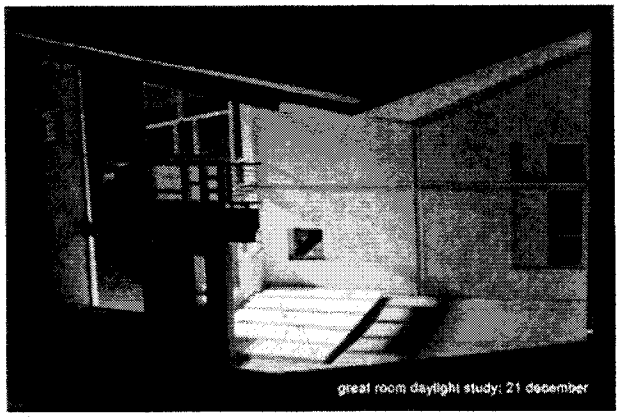
pear incongruent and anachronistic.

The inverted gable roof provides the water catchment system, an optimal photovoltaic roof angle, and a unique aesthetic while obscuring from vision the roof equipment. In addition, the roof form extending up and out opens views of surrounding ridgelines so prevalent on the Central coast and

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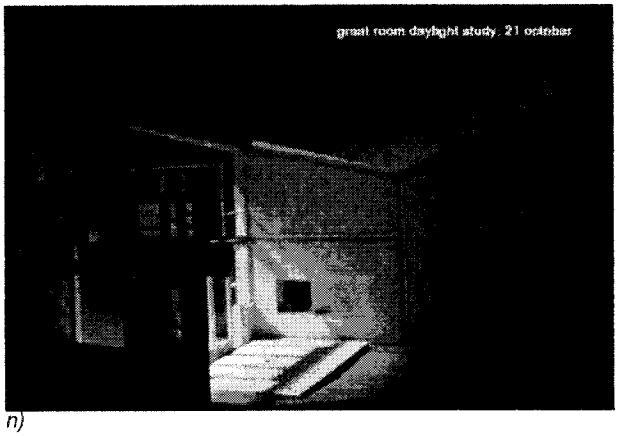


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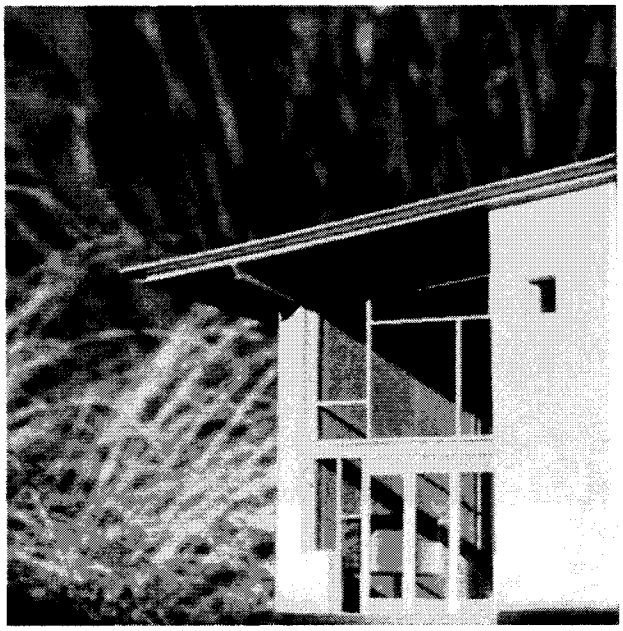
on this Bridge Street site in particular. It accentuates the notion of the indoor/outdoor relationship desirable in our climate, and it phenomenologically invites one to enter into the core of its interior, not to mention inviting the welcome winter sun.

The design team observed the solar shadow from the surrounding hills on the Winter Solstice (21 December), the shortest day of the year. All of the potential house sites were in full sun until 15:00 (3:00 pm), which is the exact time the team incorporated for the solar shadow of each neighboring residence on the site. In other words, the site placement would be such that no residence blocks the Winter Sun of her neighbor until three in the afternoon.

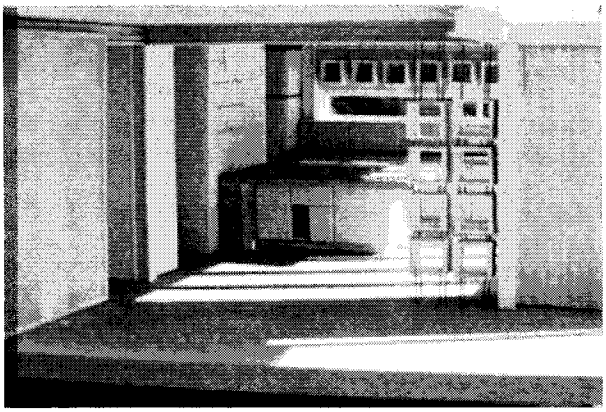
The project will be built using "Healthy House" materials that use non-toxic materials with little or no out-gassing and that are not destructive to the environment in their manufacturing process. Compromises may have to be made to ensure the affordability of the project overall. For example, we



will only use sustainably harvested bamboo flooring on the second floor. The first floor finish will remain as exposed "fly ash" concrete for thermal mass. Thermal mass walls retain passive solar gain on the interior. Straw bale walls may be replaced with environmentally friendly "Structural Insulated Panels" (SIPS). These panels have smooth, strong exterior surfaces of formaldehyde-free oriented strand board adhered to a non-toxic expanded polystyrene core. The oriented strand board is produced from a regenerable wood skin make up of second growth timber, typically 10-year-old poplar and aspen, rather than old growth lumber. Structural insulated panels are lightweight, strong and easy to assemble. The structural shell uses up to 60% less lumber and takes a third less labor to construct than a traditional stick framed structure. The SIP is energy efficient with an R-value of 40, can be recycled and is free of CFCs, HCFCs, HFCs and formaldehydes, with minimal air penetration and thermal bridging problems.

**V.**

In conclusion, M:OME/BSN intends to demonstrate that it is possible to build a community of houses that sets a higher standard than the convention that has been accepted in the past. If we can send humans into space to live, then surely we can live in more technologically progressive houses, which take advantage of scientific advances ready and available on the market? Surely, we can also learn from the



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past, from indigenous vernacular structures that respond naturally and positively to their climate. The team also wants to show that it is possible to build houses that are 'affordable', whereby the selling price is determined not by what the market will bear, but by the cost to design and build the structures. Going further, the project wants to exhibit that measures can be put in place to ensure modest gains in equity for the owners while preserving the affordability over the long haul.

The development process is long and complex, with many hurdles to leap over and many hoops to jump through, but it is the intention of the team to create a community in which people are enthusiastic to live.

The M:OME/BSN team would like to set a precedent and inspire the establishment of other communities such as this throughout our region. A group of people can come together, buy a piece land, hire an architect to guide them through the design, permits, codes and variances, and create their own version of a micro neighborhood. Hopefully, the Bridge Street Project will provide a model for this type of community.

Summary Features: Site Design

*Site restoration*

Wildlife corridor

Ravine erosion mitigation with upper orchard

Central community orchard and mailboxes

Retain existing brambles to establish a wildlife corridor on northern edge of site

*Reduce cut and fill with vegetated contour swales*

Allows water to move down slope through the site to the wildlife corridor and onto the creek

Reduced soil cutting reduces trips to landfill, reduces air pollution and reduces potential for site erosion

*Plant Guilds/Assemblies*

Site plantings form plant assemblies to naturally act as pesticides or soil amenders

Example: apple trees with edible mint and nasturtium planted below trees naturally prevent apple maggots. Plant guilds reflect native species as much as possible

*Reduced paving/reduced site runoff*

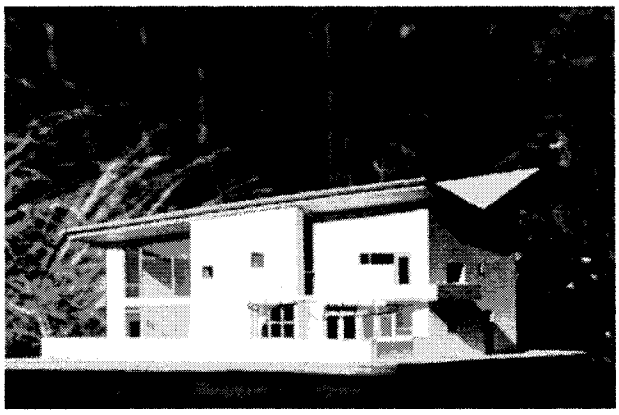
Use alternate paving materials for drives and roads to allow for site soil percolation

*Edible landscaping corridor and community gardens*

reduce trips to grocery store and encourage neighborhood participation

Water

Graywater dispersion on site and rainwater collection from roofs reduces amount of water consumed for irrigation



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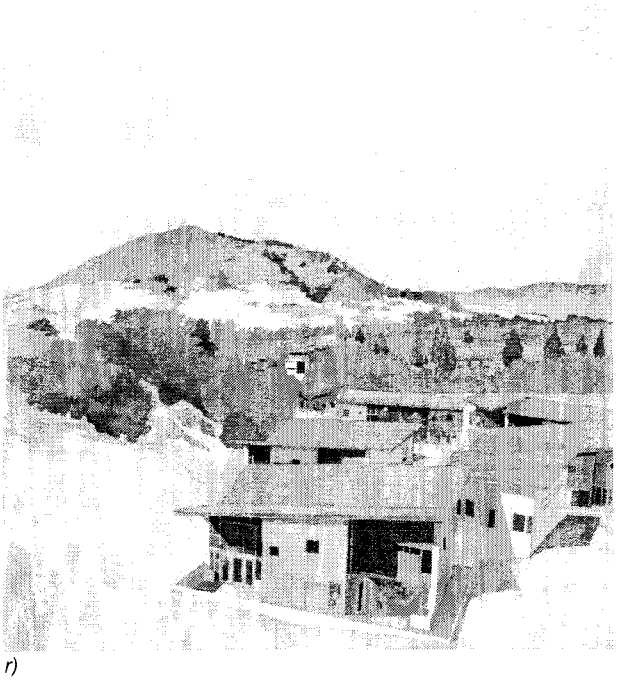

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**SUMMARY FEATURES: BUILDING DESIGN**

Plan layout responds to natural sun cycles

• Intimate interior spaces within an open, loft-like, modern floor plan

• Rooms needing morning sun are on the east

• Rooms most used in the afternoon are on the west

• Open family areas on south façade with Double height living room

• Outdoor kitchen and living rooms extend the livability of the house

Natural day lighting

• Reduces use of lights during the day

• Windows give light on two sides of each room[6] and soffits allow light to further penetrate interior

*Shading and Overhangs*

• Horizontal solar trellis on south side

• Vertical shading walls on west side

*Passive Summer Cooling.*

• Strategically located windows opened at night and closed during day means no air-conditioning bills

• Large roof overhang blocks summer sun

• Optional evaporative cooling basin on west takes advantage of NW breezes

• Thru-house ventilation incorporating both high and low windows to remove hot air via the Venturi effect

*Passive Solar Heating*

• Normal Building materials provide thermal mass (heat collector

• Window and building orientation allows winter sun to heat the house

• Thermal mass re-radiates absorbed heat to keep the house warm at night

*PV Roof panels*

• Grid-tied to PGE for access to additional power and approximately zero net utility bill

• 150 w panels generate enough electricity for average house (20 kw/day) Hot Water roof panels

• Preheat hot water for domestic use and for radiant in-floor heating

• Provide hot water for supplemental heat radiators in north rooms

*Cool roof*

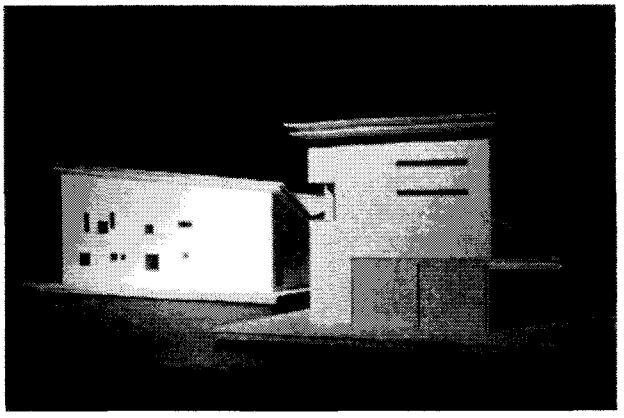
• Reflective standing seam metal roof reduces air temperatures surrounding building-heat island effect prevented

• Decreased costs on long term roofing maintenance and replacement

Greywater recycling and Rainwater collection from roof

• Puts water back into local water table and provides water for landscaping and gardens

• Reduces load on sewer



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Materials

•A 'healthy home' with minimized out-gassing or toxins from building materials

•Detail elements and finish materials are "timeless" and will age and mature gracefully.

*Neighborhood Context*

• Gatehouse lofts designed to reflect Bridge Street Building aesthetic

**• Scale of Housing and unit mix consistent with adjacent neighborhoods**

Energy Savings and waste reduction translates to dollars in the pockets of end-users

• passive solar heating and cooling technology

• photovoltaic electric panels

• reduced water usage via grey water and roof water catchment system

•compact fluorescent lighting,

• day lighting and light reflected off the upward canting interior ceiling is about five times that of a conventionally built home.

**SOURCES**

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2) Santoyo, Larry. Earthflow.com web site information

3) Mollison, Bill. A Permaculture Guide for a Sustainable Future Permaculture Resources Press, 1993

4) Farelly, E.M. Three Houses: Glenn Murcutt. Architecture in Detail Phaidon Press Limited, London,

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5) Lyons, Silas. The Tribune , San Luis Obispo, California. July 6, 2003, Front page , Quote by Jennifer Seals

of Rocky Mountain Institute describing the M:OME /Bridge Street Neighborhood

6) Alexander, Christopher, Ishikawa, Sara, Silverstein, Murray. A Pattern Language,

*Towns.Buildings.Constructions*, Oxford University Press, New York, 1977

**ILLUSTRATION NOTES:**

a) overall view of the bridge street neighborhood looking north with Cerro San Luis (Madonna Mountain) in the background-winter landscape. (watercolour by Tom di Santo)

b) view of water catchment system on the M:OME prototype M3 (watercolour by Tom di Santo)

c) view of the attached housing in the Bridge Street Neighborhood; looking east (watercolour by Tom di Santo)

d) southeast view of the detached housing in the Bridge Street Neighborhood (watercolour by Tom di Santo)

e) site plan of the Bridge Street Neighborhood (watercolour by Tom di Santo, digital draughting by Paul Locke)

f) south view of the detached housing in the Bridge Street Neighborhood (watercolour by Tom di Santo)

g) northwest view of the detached garage and studio above in the Bridge Street Neighborhood (watercolour by Tom di Santo)

h) process watercolour sketch of the attached housing in the Bridge Street Neighborhood (watercolour by Laura Joines-Novotny)

i) north view of the detached garage and studio above in the Bridge Street Neighborhood (watercolour by Laura Joines-Novotny)

j) west view of the detached garage and studio above at night in the Bridge Street Neighborhood (watercolour by Tom di Santo)

k) interior perspective of the great room looking out at the view in the detached house (digital work by Paul Locke;

analog work by Tom di Santo)

l) *interior perspective from the loft looking out at the view* in the detached house (digital work by Paul Locke; analog work by Tom di Santo)

m) partial model of the great room showing the quality of light on the 21st of December (model by TJ Esser and Laing Chung; photograph by Josef Kasperovich)

n) partial model of the great room showing the quality of light on the 21st of October (model by TJ Esser and Laing Chung; photograph by Josef Kasperovich)

o) partial model of the great room showing the exterior (model by TJ Esser and Laing Chung; photograph by Tom di Santo)

p) partial model of the kitchen showing the quality of light on the 21st of December (model by TJ Esser; photograph by Tom di Santo)

q) southeast exterior view of the detached housing model (model by TJ Esser; photograph by Tom di Santo)

r) overall view of the bridge street neighborhood looking north with Cerro San Luis (Madonna Mountain) in the background-summer landscape. (watercolour by Tom di Santo)

s) northwest exterior view of the detached housing and *garage models (models by TJ Esser; photograph by Josef* Kasperovich)