La Casa de Paja

La Casa de Paja, or The House of Straw, is designed in the Spanish Colonial Style. Our intent was to create a home that would be enjoyable to live in, easily built with volunteer labor, sustainable, energy efficient, and that would be faithful to the California tradition of indoor/outdoor living.

Straw Bale construction has a 100-year history in the U.S., and the inherent thickness of the building material is a perfect match for the Spanish Colonial style which was originally based on adobe brick construction. The use of straw as a building material satisfies Habitat for Humanity's desire to use materials that are "green" and easy to use. Straw bale buildings are commonly raised by untrained members of the community, straw provides high thermal and acoustical insulation, is locally available, is an agricultural waste product put to good use, and is energy efficient – all factors which help reduce the homeowners' carbon footprint.

The three gardens (front, side courtyard, and rear) are designed to serve as three outdoor rooms, rather than as undefined leftover spaces. These bonus rooms are created without having to build walls, they provide shading and cooling, and they feature native and edible plants. The front garden is laid out like a formal Spanish garden with rosemary hedges, native salvias, drought tolerant trees in the median (Palo Verde and Mesquite), a producing olive, tall yuccas and ocotillos in front of the bedroom window for security, potted cacti, citruses and herbs. The rear garden, with a fountain against the garage wall for evaporative cooling, has an open play area, raised vegetable and herb beds, a citrus hedge to provide shade from the late afternoon sun, and a pomegranate and a fig tree for fruits and shading. The side courtyard is an outdoor living space with a direct connection to the living, dining and family rooms. It features a manually retractable fabric awning for summer shading, a fountain, potted plants and permeable paving. The courtyard and the rear garden are both visible from the kitchen, so that parents can supervise their children while working in the kitchen. The fountains in the front yard, courtyard, and rear yard, provide aesthetic delight, water for birds, and evaporative cooling.

The interior spaces are divided into public and private zones. Public spaces face south, and are defined with archways, rather than solid walls, keeping them visually connected. Private spaces are on the north side of the house. Daylight is maximized with windows and French doors, and with Solatubes in the rooms that only have windows on one side. South-facing glazing is maximized for passive solar heat gain throughout the core of house, which saves on energy costs and helps the environment. Integral color concrete floors with radiant heating are used throughout the house as the finished floor.

Straw bales are less expensive than lumber and serve both as the structural wall material and as insulation, (no need to buy and install fiberglass or other insulation). The use of FSC certified wood doors and windows is environmentally responsible, and the SIPS panels eliminate the need for flat ceiling framing, and reduce the required framing skills and cost of the roof. With its high ceilings, (10'-0" in the living room and 9'-0" everywhere else), and thick straw bale walls, the house will feel spacious and substantial. Water harvesting and edible landscaping create both an aesthetic and an economical exterior environment. The house is also designed with long term cost savings in mind. Energy modeling shows that the house will be comfortable with no or very little heating and cooling – thanks to the thick walls, the house could easily be heated by just lighting a fire in the fireplace, baking some bread or pizza in the oven, or bringing the dog in for the night.

KITCHEN GARDEN

SIPS STRUCTURAL PANELS WITH TERRA COTTA CLAY TILE ROOF

SOLATUBES

100'

60'-3

d.g. or gravel path

pomegranate

10

10

11

citrus hedge to shade West sun

Play Area

15'-0" REQ. R.Y.

19'-9"

broken concrete paving

50'

fig

10' MIN.

10'-0" MIN.

fountain

broken concrete paving

COURTYARD

STORAGE

GARAGE OR CARPORT

18'-0"

CARPORT

15'-0"

42'-3"

FOUNT. TO HELP AERATE CISTERN

CABLES FOR SUNSHADE

18'-0"

8'-8"

10'-8"

10'-0"

DRIVEWAY (broken concrete, slope to cistern)

slope for level change

20'-0 20'-0" . F.Y.

11'-4 1/2"

5'-0"

5'-0"

olive

BENCH

33'-6 1/2"

d.g. or gravel path

FOUNT. TO HELP AERATE CISTERN

SIDEWALK

PARKWAY

STREET

Palo Verde (Cercidium Floridum)

Mesquite

100'

70'-0" (IF 75' HERE NO MODIFICATION REQ.)

4'-0" OVERHANG REQUIRES MODIFICATION

30'-0" FOR ZERO CLEARANCE YARDS

FLAT ROOF WITH CLAY TILE ON PARAPET. FUTURE SOLAR PANELS

SOLID WALL FOR FIRE PROTECTION WHEN YARD <5'

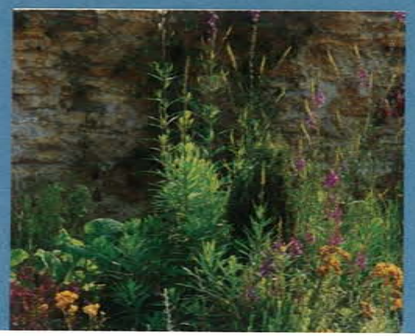
FLAT ROOF OVER OPEN BEAMS. FUTURE SOLAR PANELS

PLANTING STRIP

N

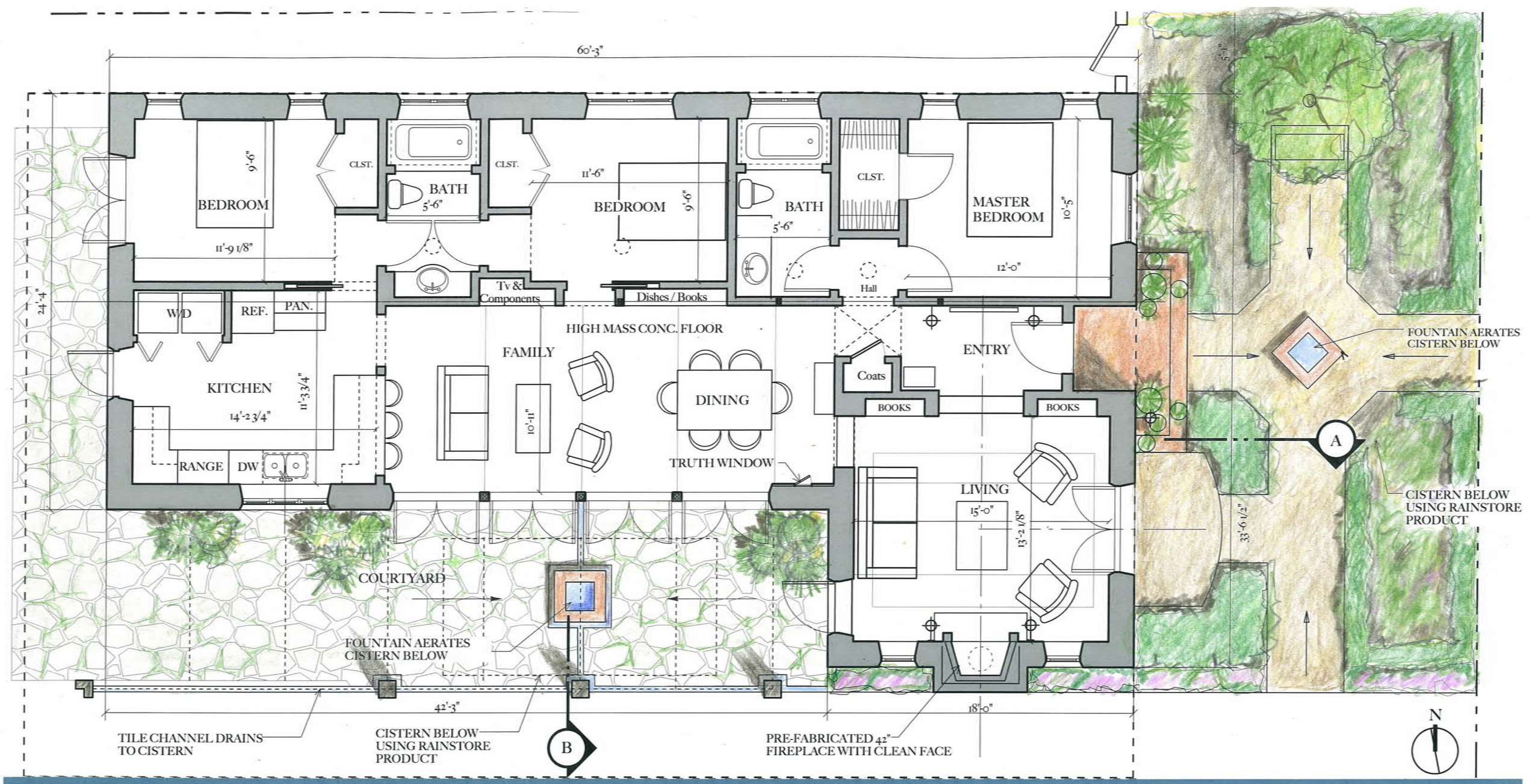
PLANTING LEGEND

1 ROSEMARY HEDGE
2 LAVENDER
3 POTTED SUCCULENTS
4 POTTED CITRUS
5 POTTED VEGETABLES
6 OCOTILLO
7 YUCCA ELATA
8 SALVIA ARGENTEA
9 PURPLE SAGE
10 VEGETABLES
11 HERBS



Site Plan

SC-C



Floor Plan

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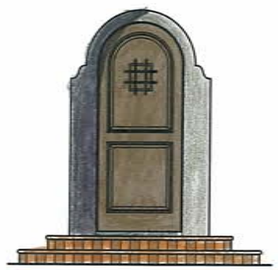
East Elevation

Entry Option A



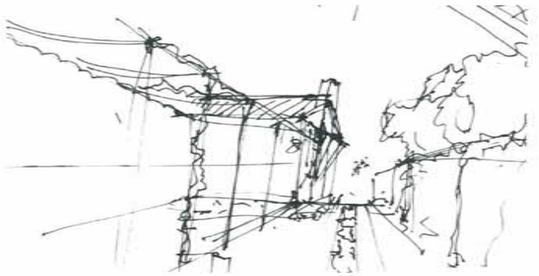
Entry Option B

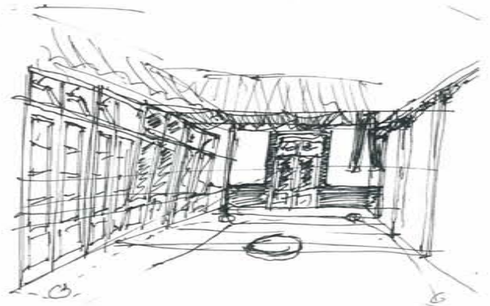
North Elevation

Elevations

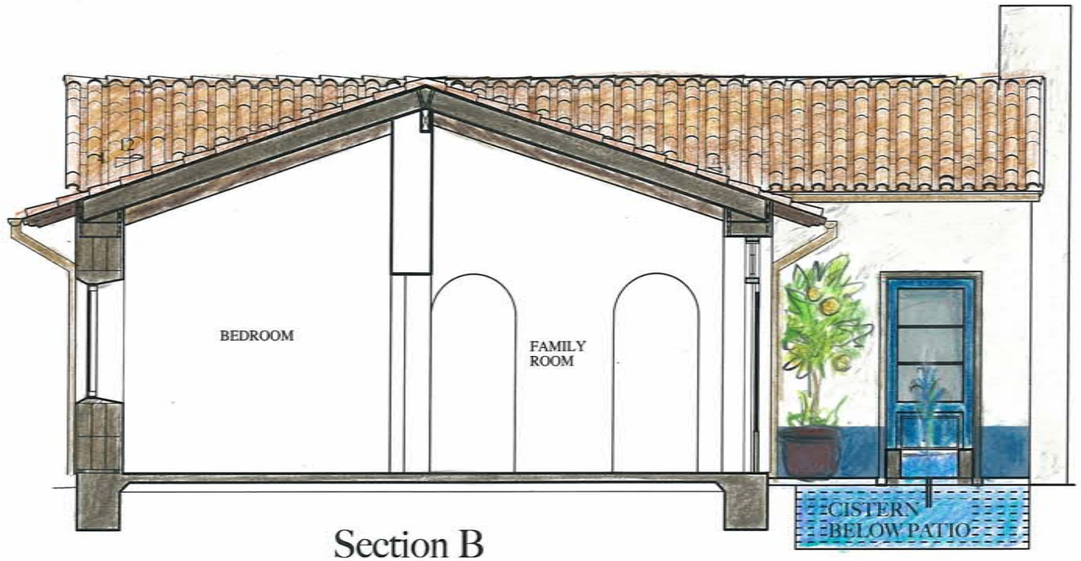
SC-C

West Elevation

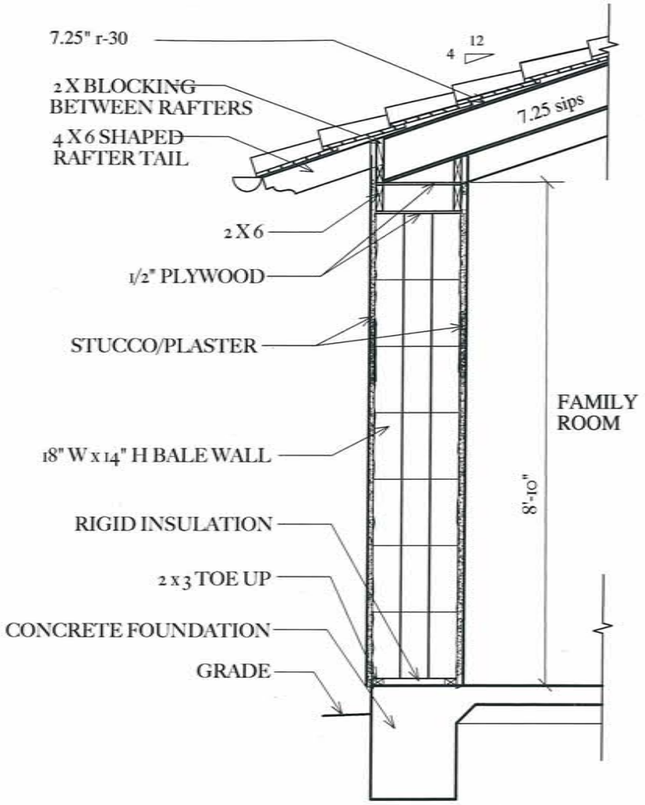




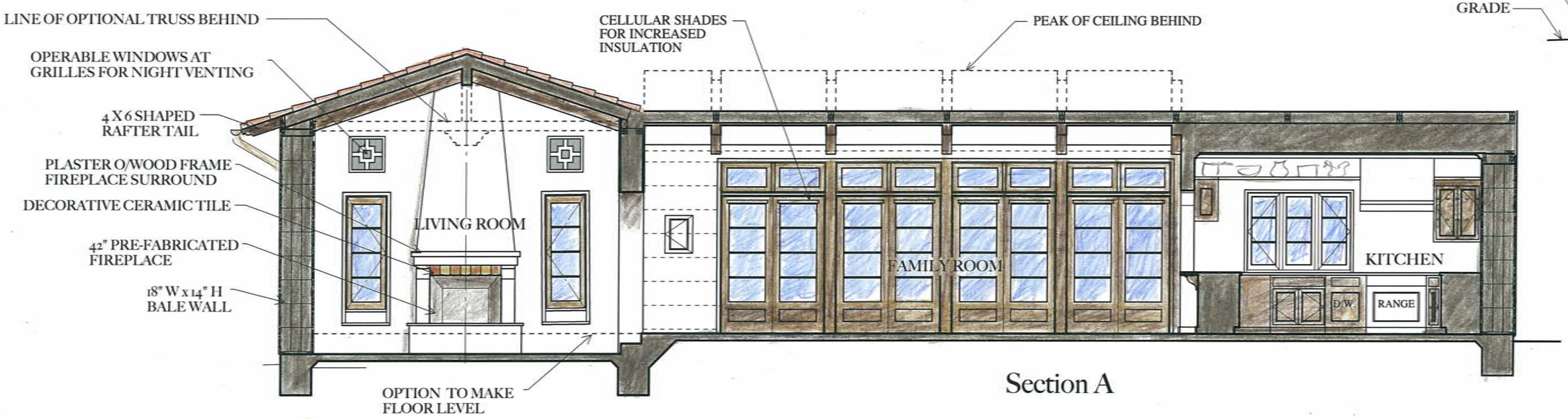
South Elevation



Section B



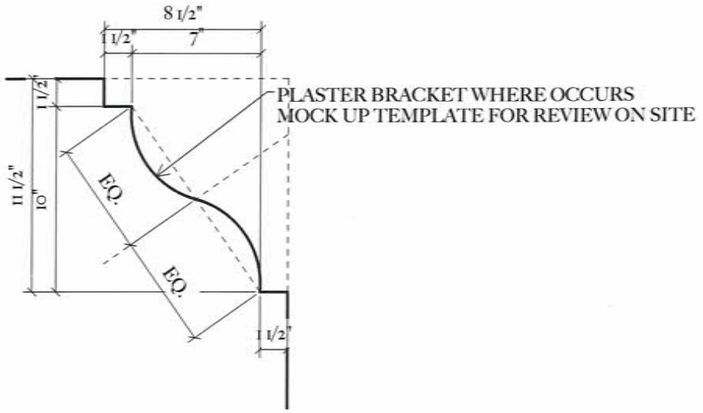
Detail A



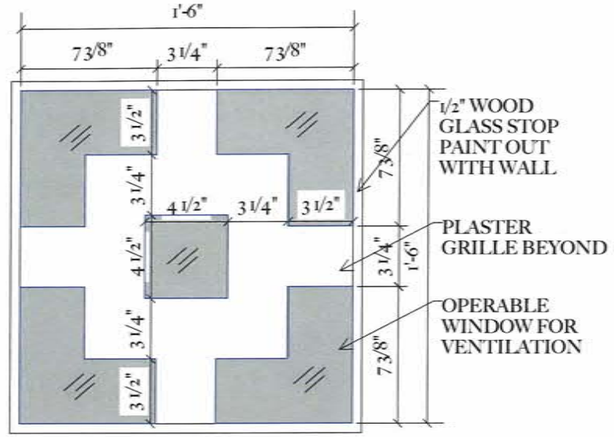
Section A

Sections

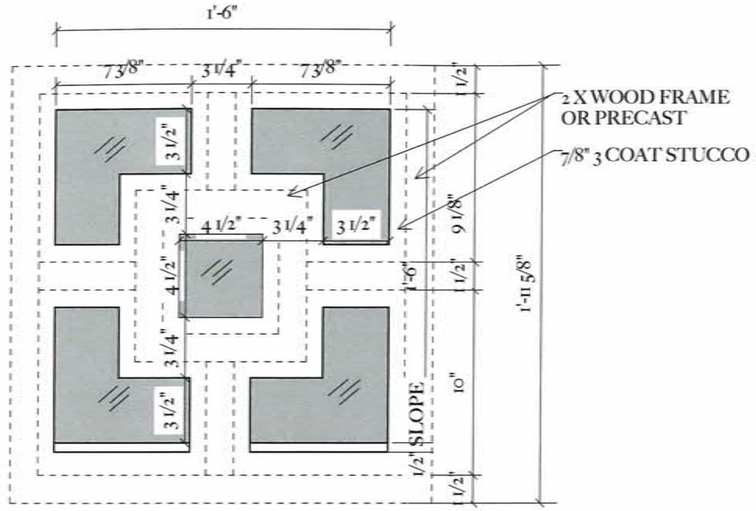
SC-C



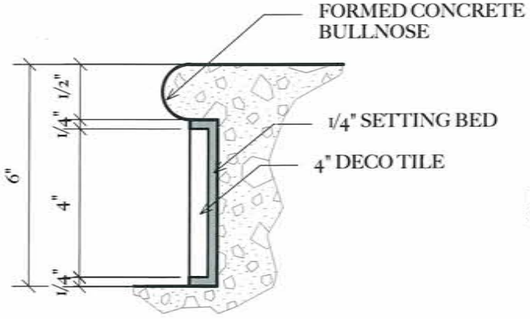
PLASTER BRACKET DETAIL
SCALE: 1 1/2" = 1'-0" (1)



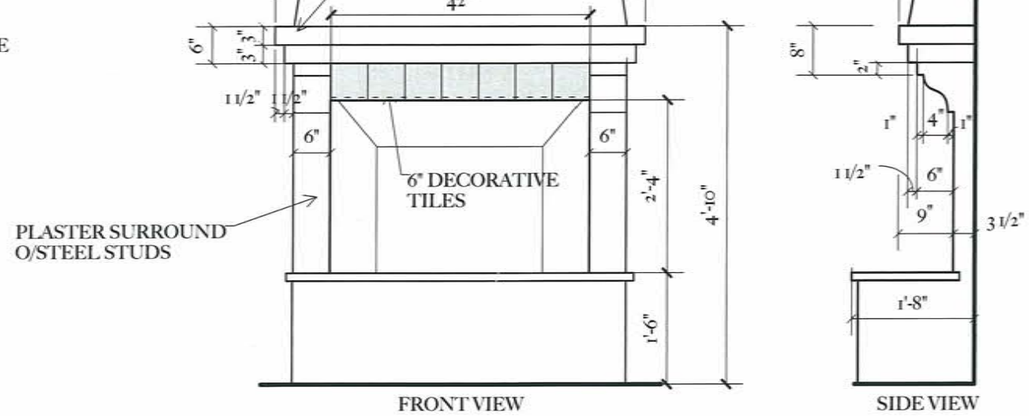
PLASTER GRILLE - INTERIOR
SCALE: 1 1/2" = 1'-0" (2)



PLASTER GRILLE - EXTERIOR
SCALE: 1 1/2" = 1'-0" (3)



TILE RISER DETAIL
SCALE: 3" = 1'-0" (4)



FIREPLACE SURROUND @ LIVING ROOM
SCALE: 1/2" = 1'-0" (5)

Casa de Paja Materials

Materials and systems for the Casa de Paja were selected for their ease of construction, local availability, ease of personalization, (i.e. plaster decorative details), low maintenance or operating costs, long life, and all with the goal of making the Casa de Paja as sustainable as possible.

Visible "Green" features:

- maximized daylight reduces the need for artificial lighting
- operable transoms over doors allow for secure natural ventilation
- FSC (Forest Stewardship Council) certified wood and FSC certified plywood for all cabinetry ensures that lumber is grown, harvested and milled in a sustainable manner.
- locally made wood FSC certified doors & windows (Five Star French Windows & Doors)
- Energy Star appliances keep energy costs down
- Dual Flush toilets by Toto or Caroma have the option to use even less water (0.8 gallons/flush) than conventional "low-flush" toilets (1.6 gallons/flush)
- fluorescent lights in bathrooms and kitchen (required by code) use less electricity
- permeable paving, (decomposed granite, broken concrete), in driveways, front garden, and courtyard allows water to permeate into the ground, and prevents run-off into storm drains. Broken concrete also reuses a waste material,
- edible or medicinal plants (rosemary, sage, lavender, yucca, olive, pomegranate, fig, citrus), and simply drought tolerant plants (rosemary, sage, lavender, yucca, palo verde, ocotillo, olive, pomegranate, citrus, succulents)
- Solatubes which provide daylight in north facing rooms (and also artificial light, and venting in the bathrooms)
- fountains provide evaporative cooling
- manually operable fabric shades over south courtyard provide shade during the summer
- trellis on west side of house, along with citrus hedge and fruit trees, provides shade from the hot afternoon sun

Invisible "Green" features:

- thermal mass in concrete floor reduces the need for heating and cooling
- fly ash, a coal combustion byproduct, can replace much of the Portland cement in the concrete, making the concrete stronger and also reducing the greenhouse gas signature of the concrete, since cement production is very energy intensive.
- straw bale walls substitute for wood framing and insulation, and provide R-26 insulation
- SIPs for roof have an R-value of 30
- clay roof tiles
- low or zero VOC paints (i.e. by AFM) for all walls and ceilings improve air quality
- natural, low VOC, and water-based finishes on concrete floor and exposed wood (beams, interior doors, etc.) are mostly plant-based rather than made with petro-chemicals, and easier to touch up or repair. Finishes from BioShield (www.bioshieldpaint.com) or AFM (www.afmsafecoat.com)
- radiant heating in floors provides clean and quiet heat and better air quality; alternate: forced air
- dual glazing on all doors and windows reduces heat gain and loss
- cisterns, with "Rainstore" units, used under the side and front courtyards collect 17,365 gallons of rainwater annually from the roof and permeable paved areas. The collected rainwater irrigates edible landscaping, contributes to evaporative cooling and reduces storm water run-off.
- attic fan on west gable helps cool house; Reggio registers in the bedrooms draw hot air out
- solar hot water on garage roof heats water with the sun, rather than natural gas
- OPTIONAL: photovoltaic grid-tied system installed on the carport roof for clean electricity

Straw Bale: FAQ

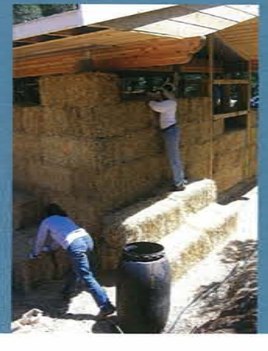
- Is the straw a fire risk?
  No, plastered straw bale walls meet ASTM's E-119 fire test and show a 2-hour fire resistance – higher than conventional wood frame construction. Bales are dense and difficult to burn.

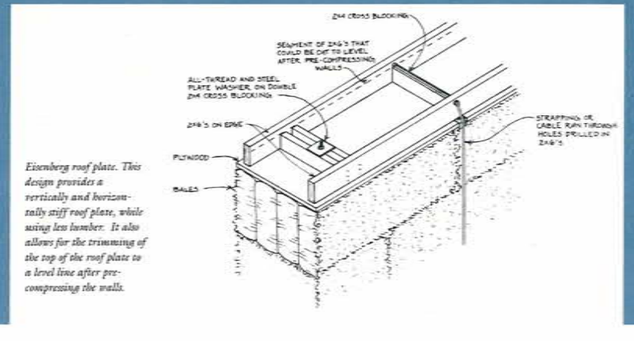
- Will the straw rot?
  Straw and wood are similar in composition, and both will rot under the right conditions. The danger point in straw bale walls is generally accepted to be around 20 % moisture content (above 85 % relative humidity), sustained for a week or two at warm temperatures. Proper construction details, such as lifting the bottom of the bales above the ground and roof overhangs, keep the wall from being exposed to moisture, and permeable wall finishes allow any moisture that does get in to transpire out of the wall.

- What about pests and termites?
  While straw is chemically similar to wood, it is different enough that termites tend to ignore it. Bales provide fewer spaces for pests than conventional wood framing.

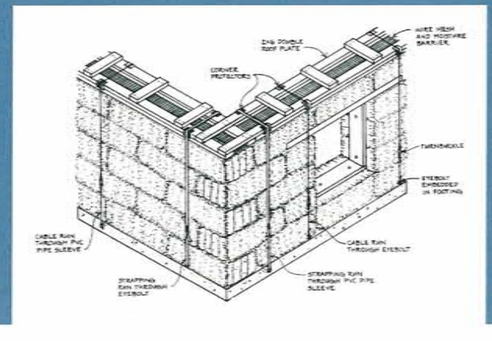
Estimated Construction Costs

Item	Cost	Notes
Concrete & Foundation	$16,500	Labor & Materials
Framing and Lumber	$38,000	
Electrical	$9,450	Labor & Materials
Plumbing	$10,700	Labor & Materials
Roofing- Clay Tile	$6,000	
Int. & Ext. Plaster	$4,400	
Paint	$2,000	
Fireplace	$2,200	Includes Flue
Cabinetry	$12,000	
Flooring	$500	Concrete. Pigment
Plumbing Fixtures	$4,000	
Doors & Windows	$18,000	Add $7,000 for FSC Certified Wood
Sheet Metal	$2,500	
Ceramic Tile	$1,500	
Water Heater	$1,000	
Radiant Heating	$14,000	
Fountain & Cistern	$5,000	
Total	$147,750	

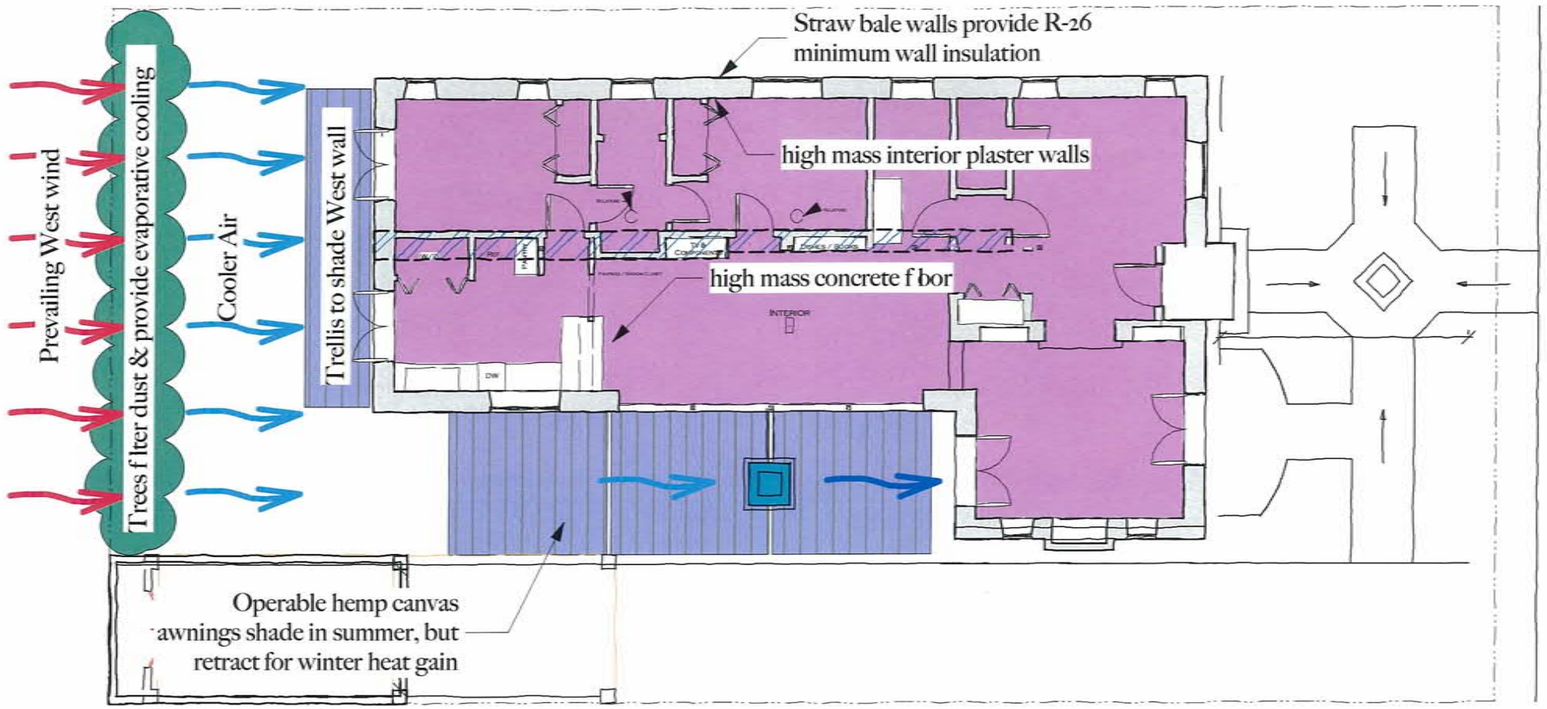


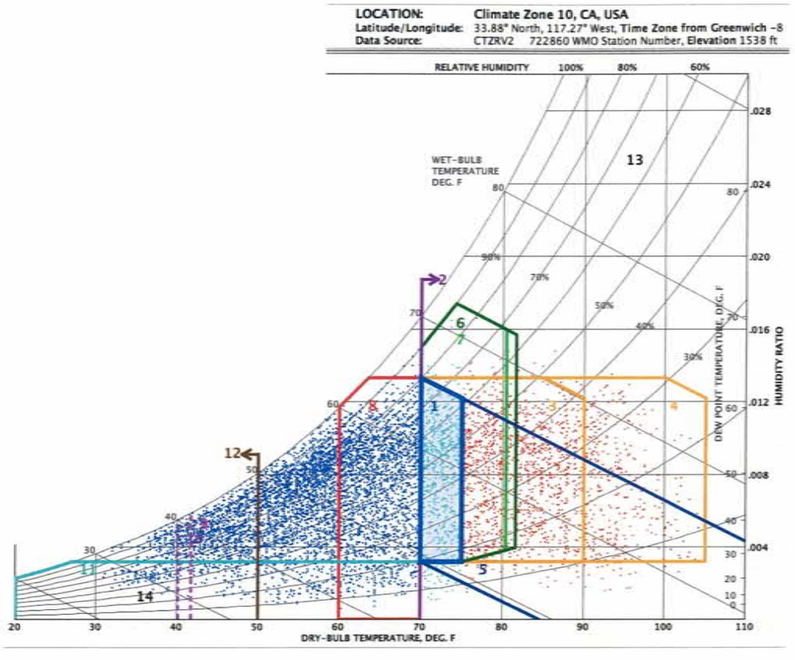


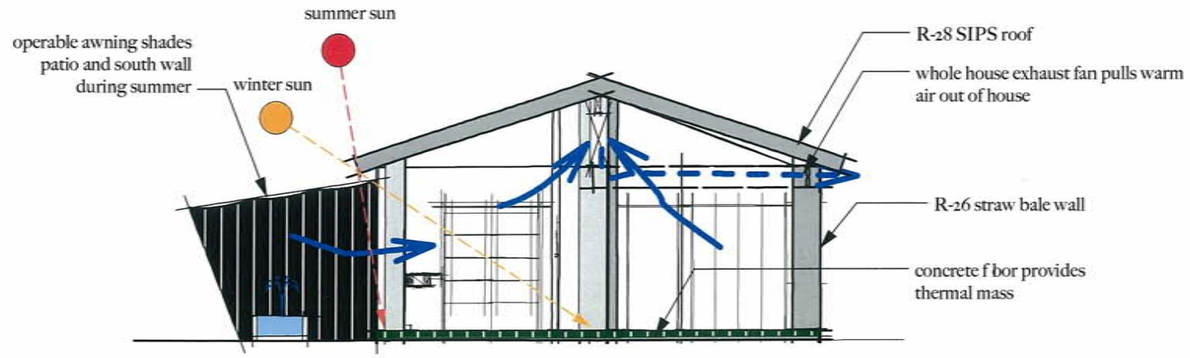
Eisenberg roof plate. This design provides a vertically and horizontally stiff roof plate, while using less lumber. It also allows for the trimming of the top of the roof plate to a level line after pre-compressing the walls.



SC-C Materials



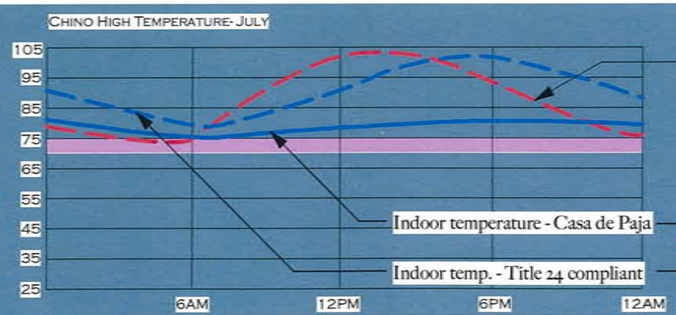




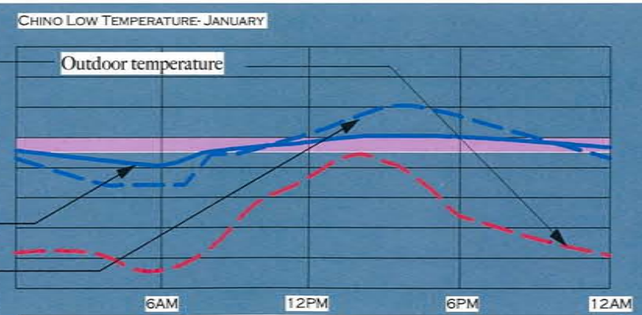
DESIGN STRATEGIES: JANUARY through DECEMBER

7.5%	1	Comfort (660 hrs)
22.0%	2	Sun Shading (1925 hrs)
15.3%	3	High Thermal Mass (1339 hrs)
4.3%	4	High Thermal Mass/Night Flushing (380 hrs)
15.9%	5	Direct Evaporative Cooling (1389 hrs)
6.1%	6	Natural Ventilation Cooling (534 hrs)
7.2%	7	Fan-Forced Ventilation Cooling (632 hrs)
26.3%	8	Internal Heat Gain (2303 hrs)
13.0%	9	Passive Solar Direct Gain Low Mass (1143 hrs)
16.6%	10	Passive Solar Direct Gain High Mass (1458 hrs)
6.2%	11	Humidification (540 hrs)
0.7%	12	Wind Protection (61 hrs)
0.5%	13	Conventional Air Conditioning (43 hrs)
31.8%	14	Conventional Heating (2783 hrs)

100.0% Composite of Selected Strategies



Even though outdoor temperatures reach 103˚, the Casa de Paja's interior is no hotter than 80˚



Even though outdoor temperatures reach 28˚, the Casa de Paja's interior is no colder than 65˚

Thermal Comfort

SC-C