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Biographical information:

Merle Kindred, PhD, lives in both America and India promoting communications that support change in attitude and actions relating to energy use in the residential built environment. She has published on her award-winning, energy efficient home in Michigan along with Kindred-designed homes for Habitat for Humanity. She also publishes and presents about the energy efficient, cost-effective COSTFORD home she's building with a Malayali family in Kerala.

[PowerPoint presentation: 34 slides 255 MB full-size pdf; 19.1 MB compressed pdf]

Slide 1: (title and introduction)

An Indo-American Venture: Building an Energy Efficient House in Kerala, India with the Centre of Science and Technology for Rural Development (COSTFORD) Using Indigenous Knowledge and Appropriate Technology, Part II

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Notes:

In April of this year at our first meeting in Thiruvananthapuram, I introduced you to the Green Architecture of COSTFORD, myself as representing *Amerikerala*, and the Earth-friendly house I've commissioned in a rural location in Kerala. What follows is our project 6 months later.

Slide 2: (with Elizabeth)

Architect Laurie Baker made his transition in April, 2007, exactly a year before we met for *Women in Energy*, but his wife, Dr. Elizabeth Baker still lives at The Hamlet where we have our Thiruvananthapuram office and she's published a book, *The Other Side of Laurie Baker*, about his early life and the background of their extraordinary life as architect and physician deeply involved in societal change.

Slide 3: (rubble retaining wall)

Here's the granite rubble retaining wall recently completed on the lower site of our plot to keep our soil from washing downhill during monsoon season.

Slide 4: (split granite fence posts)

Malayalis like high walls around their plots and use stone, brick, or concrete blocks. We chose split granite – natural layers of granite that's softer than the foundation granite....

Slide 5: (biofencing)

....and can be split into posts.

Slide 6: (close-up of biofencing)

Wire is then strung and we'll be adding plants – food-bearing, ornamental, medicinal, etc. -- for organic boundary marking that will add beauty and bounty to our lives.

Slide 7: (5,000-litre storage tank)

Because of the spring water flowing onto the site, we built a 5,000 litre tank built in an excavation lined with granite rubble and coated with plaster. This, plus the rainwater storage tank, means we won't dig a well.

Slide 8: (construction of vault)

Our spring water has a rock-filled catchment area with a small plastered concrete dam at the bottom piped into the retaining tank and overflow directed back into the small stream on the property.

Slide 9: (concreting of vault)

The catchment area was then concreted. We'll capture only half the day's non-monsoon water with the rest flowing directly into the stream to be shared with our neighbours.

Slide 10: (cap & maintenance hatch for vault)

A hatchway is provided for servicing the dam at the bottom of the catchment area.

Slide 11: (cowshed)

Since we're going to cook with biogas, we decided to have cows. The cowshed is made from Tamil Nadu country burnt bricks, the same as used for the house, and the wood is coconut from the trees felled in clearing the building site. A biogas system will be the main source of cooking fuel with LPG as back-up. Initially, we'll buy a small native Kerala cow and calf of the *vechur* breed for production of milk and cow dung. The manure, along with kitchen scraps and waste from the toilets, will provide methane-generating material for the tank.

Slide 12: (worker's toilet)

We have a proper and permanent toilet for our workers along with an engineered pit.

Slide 13: (craftsmanship)

I honour the skilled craftsmanship of Indian artisans. Notice the mortise and tenon joinery on this door made of native jackwood.

Slide 14: (Rachel at window frames of anjali)

Here's the youngster in our family, Rachel (8), at our window frames of native anjali wood.

Slide 15: (steel rod – rebar – for concreting)

Steel rod is used for strengthening concreting on floors and roofs. Here a steel worker cuts needed lengths on the site.

Slide 16: (steel worker's tools)

Simple tools are commonly used.

Slide 17: (rainwater harvesting)

Kerala requires all new construction to harvest rainwater. Our 23,000-litre tank is built under the tower at the east end of the site. Here is final plastering of the tank, which had rough plastering, *chicken wire* for reinforcing, and then a layer of fine plaster.

Slide 18: (shuttering – wooden formwork)

Before starting brickwork, certain areas of the foundation have to be strengthened to support the weight to come. Wood formwork or rows of brick, in a process called *shuttering* in India, form the edges of areas to be filled with concrete.

Slide 19: (steel cages for plinth beam)

Cages of steel rod wired together provide a frame for pouring *plinth beams*, the areas that support brick walls.

Slide 20: (concreting tank and plinth)

Here is concreting of the rainwater harvesting tank and plinth beams of the ground floor.

Slide 21: (concreting)

Here is another view of the concreting process.

Slide 22: (steel rod grid)

Steel rod is placed in a grid pattern over the floor area for reinforcement and half bricks are placed in the centre of each grid to indicate the depth of the concrete to be poured.

Slide 23: (concreting)

A mixture of cement, sand, and chipped granite called *chally* is poured onto the floor and steps and compressed by pounding. Then sand is sprinkled on top and water is splashed over the concreting to seal the surface and provide a smoother finish.

Slide 24: (rat-trap bond)

COSTFORD brickwork uses the rat-trap bond, which sets bricks on edge and alternates them at 90-degree angles. This 9-inch-wide double wall reduces brick used by 25 percent and reduces the amount of mortar. The air space created also provides increased insulation from outside heat. And, no, rats can't enter the finished walls!

Slide 25: (rat-trap vs. standard brickwork)

4-1/2 inch walls are enough for interior walls and are laid using traditional brickwork.

Slide 26: (Sobha and Rachel at the plot)

This will be a permanent home for Sobha, a high school biology teacher, and Rachel along with Sobha's parents, Thomas and Salome.

Slide 27: (COSTFORD 1900 s.f. house completed in Feb 08)

Here's a COSTFORD house of the same square footage (1,900 s.f.) as ours completed earlier this year.

Slide 28: (another view of COSTFORD 1900 s.f. house completed in Feb 08)

Here's another view of the same house.

Slide 29: ("Energy" sign on brick wall in panchayat office in Kollam, Kerala)

The signature feature of COSTFORD buildings is this rustic burnt brick – unplastered and unpainted. I saw this sign recently at a panchayat office in Kollam, Kerala.

Our house in Vattappara demonstrates COSTFORD's concern with reducing our energy needs by:

- using indigenous, renewable materials with low embodied energy cost (the energy needed to secure, process, and transport materials) – such as stone, mud, country burnt brick & bamboo
- using renewable resources – solar hot water, biogas, rainwater and spring water harvesting, biofencing.
- encouraging manual labour and decreasing use of mechanisation

Slide 30: (Onam)

And lest we think it's all work and no play, here's part of our extended family at Onam *sadhya* luncheon celebrating the harvest season

Slide 31: (with Rachel at outing to 18th c. palace)

Here's Rachel and me on an outing with the women of the family to an 18th c. Kerala palace.

Slide 32: (Simi, Thomas, and me)

This is a multi-cultural, multi-generational, gender-sensitive project: Simi is a civil engineer serving as Site Engineer supervising construction. Grandfather Thomas orders all our materials, under COSTFORD's supervision, and pays our workers.

Slide 33: (Earth Pledge)

I found this plaque in the museum park in Thiruvananthapuram commemorating the Viswadarsanam holistic community in Kerala. It's a fitting summary of the philosophy and Green Architecture we're practicing at COSTFORD: "The consumer culture which depletes the resources of the earth poses itself as a menace to the very existence of humankind. We know that the future of our planet is in danger. If we have the will to discard the trodden path, the way out is open before us to shape a life-style in consonance with the artistic, cultural and geographical traditions of our land, providing an opportunity to the future generations to experience the peace and tranquility of this earth. Bowing before the primeval nature, let us take the pledge to work prayerfully for the welfare of all creations."

Slide 34: (cousins Harry and Rachel in Vattappara)

In closing, I suggest that COSTFORD is both different architecture and architecture that makes a difference that will directly affect the lives of not only cousins Harry and Rachel in Vattappara, but all beings on this, our one and only precious Earthship.

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