

## LOVINS' NET ZERO ENERGY RESIDENCE: LIGHTING MAKEOVER HIGHLIGHTS

WHAT WE STARTED WITH: A dull, dreary “cave” with lots of bare bulb compact fluorescent lamps screwed into porcelain sockets.

THE GOAL: Create a luminous environment that is warm and welcoming, versatile for home and work activities, and uses the least amount of energy possible for each application.



### FRONT COURTYARD AND SIDE YARDS

The copper path lights lining the walkways and steps are equipped with 3 watt LED sources. The LED emitter is concealed below the top cap's glass diffuser, totally shielding the light source. It's mounting stem telescopes and can be seasonally adjusted relative to snowfall or perennial landscape growth.

The steps to the west side of the home are illuminated by miniature LED fixtures. These domed, half-dollar sized step light fixtures are recessed into the 4' X 4" posts of the handrail, and draw 3 watts each.

Miniature 3 watt LED bullet style swivel lights illuminate the entrance by the exterior door into the living room, by the greenhouse, while 9 watt compact fluorescent sconces flank the front door.

A motion activated, double headed bullet style floodlight illuminates the entry and steps outside the East entrance to the structure and is lamped with 10 watt screw-in LED lamps.

#### ENTRY FOYER AND MASTER BEDROOM HALLWAY

Low voltage track is equipped with 3 watt MR16 LED spotlights to highlight art and architecture.

#### HALLWAY FROM ENTRY FOYER TO GREENHOUSE

Three ceiling mounted linear fixtures located opposite the bookshelves “graze” the stone walls, while all of the bookshelves are gently illuminated by concealed LED strip lights. The LED ceiling fixtures draw 8 watts while each LED bulb in the strip lights draws only 0.2 watts of power. Note the Shoji screen diffuser above the bookshelves distributes daylight into the space via ingeniously simple light pipes.

#### KITCHEN, DINING, ROOM, LIVING ROOM, AND KITCHEN

Suspended low voltage rail follows the contours of the perimeter interior walls and is equipped with 3 watt MR16 LED spotlights to highlight art and architecture.

Low voltage cables tensioned over the dining table and kitchen island are also equipped with 3 watt MR16 LED spotlights and/or pendants for task lighting and décor.

The aluminum metal lip rimming the curved shelves on the North kitchen wall conceals LED strip lighting, providing soft evening lighting, while the ceiling mounted LED fixtures wash the millwork and counter.

Under-cabinet LED bar lights provide task lighting by the cabinet to the left of the range and in the pantry, and are also used to highlight the “trophy case” in the living room. General lighting in the pantry is provided by a 17 watt LED floodlight.

4 watt copper LED monopoints mounted in the range exhaust hood provide task and accent lighting.

#### GREENHOUSE

4 watt LED underwater lights highlight the ponds and waterfall after dark while 1 watt LED copper path lights delineate the main steps down to the office. 4 watt monopoints are mounted on the single beam bisecting the greenhouse and filter light through the plant canopy. 3-watt bronze finish monopoints flanking the entrance to the powder room off of the greenhouse highlight photographs.

#### POWDER ROOM OFF OF GREENHOUSE

An eco-resin based diffuser is backlit by an LED ribbon light. The ultra warm white ribbon draws 2.2 watts per ft.

A single monopoint dramatically highlights the panoramic photograph above the sink; a “trick” lens elongates the beam pattern from its 3 watt LED source.

A 12 watt LED recessed can in the shower pumps the space with light when higher levels are desired.

#### OFFICE

Three sand-coated drum shaped pendants provide general illumination using 40 watt compact fluorescent circline lamps.

The perimeter bookshelves and stone walls are dramatically illuminated by 17 watt ceiling mounted LED wall grazers which incorporate linear spread optics.

The underside of the pivoting sun shade flanking the office desks that look into the greenhouse are illuminated by 8 watt LED floodlights.

#### AMORY'S LOFT OFFICE

Field-formed low voltage rail follows the contours of the perimeter wall and provides accent and task lighting using 3-watt LED spotlights.

8 watt LED floodlights illuminate Amory's main work desk.

0.2watt LED strip lights illuminate the book shelves to the right of the desk.

A compact fluorescent lamp, sand-coated pendant illuminates the round meeting table.

#### MASTER BEDROOM

Field-formed low voltage rail follows the contours of the perimeter wall and provides accent and task lighting using 3-watt LED spotlights.

An amber toned LED ropelight mounted in the toekick under the vanity serves as a night light.

General lighting is provided by a compact fluorescent lamp pendant diffused with a mulberry paper cone shade.

#### CONTROLS

The limited capacity of the original, conventional switching was dramatically expanded with the use of radio frequency (RF) enabled "smart switches," allowing for the creation of multiple lighting layers and scenes. Where a single switch leg originally existed, one or more additional switch legs were added by "piggy-backing" smart switches downstream of the power source. Centrally located keypads allow for lighting scenes (e.g., Work, Play, Party, After Hours, Security) to be composed and controlled, making "whole house" lighting control possible from any location, including wall mounted hardwired keypads, portable table top remote controls, and key fobs. The lighting commands can be issued manually or from time clock, occupancy, or photocell input.

RF enabled occupancy and daylight sensors were installed in the workshop/laundry to control the lighting there.

Brought to you by: "Sardo" Robert Sardinsky, LC, IESNA  
President