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The 'Hot House': Dealing with a West Facing House

The home my husband and I currently live in, has a east-west facing orientation. The major problem we experience every year, is a tremendous heat gain in the summer months because of the garage. The home is white stucco exterior, two stories with approximately 1650 square feet, has 3 bedrooms, 3 baths, a kitchen-dining area, and a vaulted greatroom with a loft and an attached 2 car garage. The master bedroom, (directly above the garage which is not heated or air-conditioned) and the greatroom face west (the front of the house), and receives the full brunt of the summer sun during the afternoons and early evenings. Both rooms have large window areas. The front yard is desert landscape with light colored gravel, river rock, and 1 newly planted mesquite tree that provides no shade. The back side of the house contains the kitchen-dining area and 2 bedrooms, one upstairs and one on the main floor. This receives morning sun every day until approximately 1 PM. The backyard has a pool to the north end of the yard with a very large expanse of cement patio. Next to the formal backyard is a separate fenced area, we call the toy yard. This is on the south side of the house, which has no windows. This part of the yard is covered with river rock and has no trees large enough to provide any shade for the house.

Front of house faces west.

We have lived in the home for 4 years and have done several things to help improve the problem, but there are more solutions which I feel we need to implement to solve the situation. Two years ago, we installed a more energy efficient heating and air-conditioning system (SEER Rating of 14). This has lowered our electric bills and made the house much

more comfortable in the afternoon and evening hours. We have also installed poly-wood plantation shutters on the large window areas in the greatroom and master bedroom. This also has helped lower the afternoon temperatures in these rooms.

The overall solution to this problem will require gradually implementing the following six independent projects:

1) Install a ventilation fan in the garage.
2) Install a potable evaporative cooler in the garage.
3) Replace the west facing windows with energy efficient windows.
4) Paint the exterior house walls and interior garage walls with a radiant barrier paint.
5) Install an insulated garage door.
6) Plant trees in the front yard to provide shade for western exposure.

Ventilation Fan

Installing an exhaust fan in the north wall of the garage is a relatively simple, inexpensive way to help remove heat. This could be either an house electric powered or solar electric powered exhaust fan with an air inlet on an adjacent exterior wall to induce air circulation. The exhaust fan could be programmed to run during the afternoons and evenings to lower the garage temperature during the hottest part of the day. [1]

Evaporative Cooler

I also want to use an evaporative cooler when working or doing laundry in the garage.[2] Since the laundry is located in the garage, I have found from previous experience that using an evaporative cooler makes it much more comfortable in the garage during the summer months and helps dry clothes faster, requiring less use of the electric dryer. I have found several models of portable coolers in the referenced website that are energy efficent and inexpense to operate.

Energy Efficient Windows

The installation of energy efficient windows could be an expensive project, but in the larger picture will significantly reduce air conditioning costs. This will make the house more

[1] www.northerntool.com and www.slesolar.com

[2] www.air-conditioner-home.com and www.homeenergy.org

comfortable year round and will help add to the house resale value. The current windows are original and dated from 1984 when the house was constructed. They are cheap, aluminum frame, single pane and non-tinted windows. They do very little to reduce heat gain during the summer months and allow the cold to infiltrate the great room and master bedroom during the winter months. Since the house is located in a cooling (load) - dominated climate, I am planning on selecting windows that have low to moderate solar gain low-e glazing (double or triple) with insulated vinyl frames.[3] By installing high performance windows, I hope to lower our heating and cooling bills, reduce winter heat loss and summer heat gain, reduce fading of carpeting and furnishings, and maintain room temperatures well within our comfort zone.

Radiant Barrier Paint

The fourth project I am planning on doing is painting the exterior of the house and the interior of the garage walls with radiant barrier paint.[4] Using this type of exterior paint will help reduce heat gain in the summer and heat loss in the winter. The paint I am considering for this use is a ceramic-aluminum barrier type paint. The aluminum pigment reflects radiant energy(heat) in the summer months and prevents radiant heat from escaping the house interior during the winter, reducing conductive heat transfer. This paint also contains a high concentration of insulating ceramics, which further helps reduce heat gain. The paint will help lower heating and cooling costs, save wear and tear of heating/cooling equipment, and improve the efficiency of the existing insulation by lowering temperatures that the walls are exposed to. Another added benefit of this paint is it is environmentally friendly – 0% volatile organic compund (VOC) pigment in a water base formula.

Insulated Garage Door

The fifth project I am considering is replacing the current garage door with one that has a higher insulation value.[5] The current garage door has styrofoam insulation about 1" thick on the interior of the panels. I was not able to find the brand name of the door, nor do I have any paperwork on it from the previous owner. I am assuming the door is original. In addition to installing a new door, I want to seal the opening around the door with insulated

[3] www.efficientwindows.org
[4] www.hytechsales.com
[5] www.clopaydoor.com

weatherstripping. This should help reduce the amount of heat gain in summer and heat loss in winter.

Trees

The last project I am planning on implementing is adding trees and more landscaping in the front yard to help shade the west facade (front) of the house. Currently the front yard is desert landscaping with light colored decomposed granite, river rock and one new mesquite tree. There are lantana bushes and ground-cover towards the street, two evergreen type trees flanking the great room window (trimmed to column shapes), and cat's claw vine growing over the top of the window. We also have 4 to 5 varieties of cacti and one bird of paradise bush in varous areas of the yard. These plants are fairly small since they were only planted last year. The yard has a drip irrigation system, so adding to it for additional plantings will not be a problem. My husband and I favor a combination of three of the suggested landscapes in the Landscape Revitalization Workbook found on the City of Scottsdale's website: EZscape, Nativescape and Shadescape.[6] We are working on drawing up a plan that uses simple planting designs, low water use, low maintenance and natural landscaping. We want to plant more trees and ground covers to help create more shade for the west side of the house. We are looking at a variety of trees which are native, fast-growing, low water use and with minimal shedding. There is also several mounds within the front yard and we are considering adding more contouring to help create visual interest as well as areas of shade that will accommodate plants requiring less than full sun exposure. We would like to plant a ground cover close to the house to help cut down on the heat radiation from the decomposed granite which is there now.

Existing vegetation at west facing front.

[6] www.ci.scottsdale.az.us/greenbuilding
Landscape Plants for the Arizona Desert
Ironwood Press, 2004
AMWUA Regional Water Conservation Committee

I know this project will take time to implement, but will be well worth the investment. Not only will it make the house more visually appealing but will help reduce the amount of direct sun the facade recieves, paticularly during the summer months. It will also help reduce the amount of heat loss on winter days as the prevailing wind usually comes from the west.