



Leading By Example: Energy Efficiency

Highlights

Renewable Energy Production

- Photovoltaic: 6 kW system

Passive Climate Control

- Southern Orientation: the longest side of the building is oriented towards true south to optimize the use of the sun's energy
- Daylighting:
 - Clerestory (High Vertical Windows): every room has Armaclad (i.e. top of the line) glazing with fiberglass frames.
 - Sunspace: 4 Solar tubes
- HVAC: Geothermal – 4 Boreholes – 400 l.f. deep with ground-source heat pump. No gas to the building.

Appliances and Building Material

- Lighting: All LED lighting
- Low Flow Toilets
- U Factor Windows: .13 (Above Code - .33)
- No-VOC Paints
- Electric Vehicle Charging Station on Shop
- Insulation and R-Value:
 - Walls – R-23 (Above Code - 20) loose-fill Insulation with 1 ½" Polyisocyanurate Rigid Insulation on the exterior
 - Attic Space – R-50 Blown-in
 - Spray foam at all top-plate to roof truss tie-ins and bottom plate to foundation
 - Foundation - 1 ½" Polyisocyanurate Rigid Insulation
 - Under-Slab - 1 ½" Polyisocyanurate Rigid Insulation

Location, Landscaping, and Transportation

- Xeriscaping
- Southside Deciduous Trees: Netleaf Hackberries, Bigtooth Maples, Hoptrees, and Mountain Ash.

Certification, Designations and Accolades

- Designed and Built to LEED Gold Standard
- Energy Star Certification applies to buildings 5,000 SF or larger (Ineligible)

Natural Areas Administration Building

Project Manager: Ethan Cozzens

Department Liaison: Aaron Reed

The Natural Areas Administrative building (4,103 ft²) is one of the most energy efficient buildings in the City's 75 building inventory. The energy modeling predicted 24.5 kBtu/ft²/year and in the first 12 months the facility is at 21.4 kBtu/ft²/year. Our best performing office facility (215 N Mason) was at 44.7 kBtu/ft²/year in 2014.

In 2014, the City spent \$1,191,499 on electricity costs so designing buildings with energy conservation measures will provide on-going savings. By reducing electrical use, less NO_x, SO_x and particulate matter (PM) are released. NO_x, SO_x and PM emissions aggravate conditions for asthma and allergy sufferers.



Environmental Benefits

Reduced electric use means less greenhouse gas and particulate emissions.



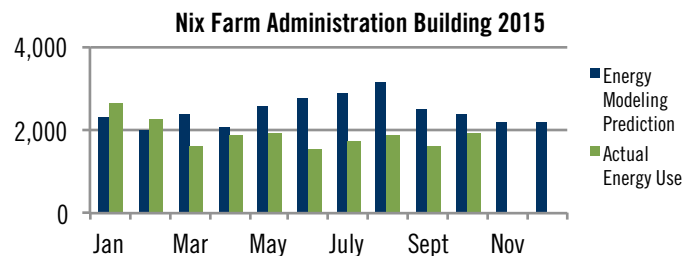
Social Benefits

Less emissions means better air quality and health for residents.



Economic Benefits

Less electricity and water usage means lower energy and water bills. The savings can be used for other essential City services.





Energy Saving Terms

Embodied Energy

Some building products are indigenous to an area, meaning that they, for example, are harvested on the site, such as rock or wood, and have almost no additional energy costs in fuels, manufacturing or building, to get them to and on the building. Embodied energy is the energy used by the individual building material from acquisition of the natural resource to manufacturing and production, to product transportation and delivery.

For example, pine beetle kill is readily available in Colorado.

Efficient Lighting

LED (Light emitting diodes) are the most efficient lighting. One LED will last as long as 42 incandescent bulbs. The second most efficient is induction lighting. This is the type of lighting that we see in many commercial buildings; however they have been reduced in size in order to fit into normal and typical light fixtures. They use only about 25% of the electricity that a typical light bulb uses.

Electric Vehicle Charging Infrastructure

Including a plug/s in a garage makes a home more suitable for the future and the present as electric vehicles become more common. Level 1 can be used with a simple 120 volt household outlet and is used with a charging cable. It may take up to 8 hours to fully charge a car. A Level 2 charges a car in approximately four hours and requires a 240 outlet.

Energy Star Appliances

Dishwashers, laundry machines, dryers, etcetera should all be Energy Star certified. If trying to conserve remember to replace the most energy intensive appliances first dryer (39%), refrigerator (25%), TV and gaming (10%) and washers (4%).

Ground Source Heat Pumps

Ground source heat pumps tap geothermal energy to control the temperature of homes and water. These pumps draw heat from the earth, concentrate it using refrigeration technology, than pump the heat into the house. These systems use about 25 to 50 % less energy than conventional heating and cooling systems.

High R – Values

The R stands for resistance (resistance to heat loss). When used in referring to insulation, the higher the number means that the wall, roof, or floor is less likely to allow heat to move between one side and the other. The insulating ability of material(s) to prevent the migration of heat from warm to cold is rated numerically and is expressed as 1/U. The higher the number means the slower heat loss. That is a good thing.

Low U-Factor

U-factors often fall between .15 and 1.20. Lower U-factors indicate a windows increased capacity to keep heat inside of a building. U-factors consider conductance, emissivity, and effect of convection around the window.

Low-VOC Paints (or No-VOC Paint)

VOC stands for volatile organic compounds. These paints do not contain them because VOCs outgas and affect indoor air quality.

Photovoltaic

(PV or Solar Cells) Light is converted to electricity in DC voltage that can be directly used in the house, or sold back to the utility company or stored in a battery array. The energy is converted through an inverter. These systems can be either off the grid, meaning that they are not hooked up to a company that supplies electricity, or grid tied, where the electricity can be sold back to the utility.

Trees

Deciduous trees work well in front of southern facing windows. During the winter, their bare branches minimally reduce southern sun exposure, allowing for passive solar heating. During the summer, their leafy branches help keep houses and yards cool.

Xeriscaping

This is the use of native plants and vegetation, which, in our climate, means drought tolerant. This type of vegetation needs very little, if any, water to survive. However, it might take a year or more to establish the plants, but after that, they should be okay and not need any but the minimum amount of water.



For more information:

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