Energy Efficient Construction and Air Quality

Karl Kassel
K2 Custom Construction, Owner
Arctic Sun, LLC, General Manager
Fairbanks North Star Borough, Mayor
Chronological Highlights:

Phys Ed Teacher, Rochester, NY
UAF – Pub Manager, Student Activities, Canoe Instructor
General Contactor, Home Designer
1988 Arctic Winter Games, Executive Director
FNSB Parks Superintendent
FNSB Parks and Recreation Director
Retired
Arctic Sun, LLC, General Manager
FNSB Assembly
Retired
FNSB Mayor
Life in Fairbanks

-14,000 heating degree days
$8,100/year in energy costs
- Improved efficiency reduces fuel consumption
- Reducing load or demand reduces fuel consumption
- Adding passive energy reduces fuel consumption
- Utilizing renewable energy technology reduces fuel consumption
The Design

P = Perimeter
Passive Solar - Priority One

- Solar Gain
- Thermal Mass
- Efficient Envelope
Solar Gain

Zero Space Heat Required
March 6 thru October 10
Thermal Mass

Concrete Slab
Stone Work
- Planters
- Benches
- Masonry Heater
Efficient Envelope

Air Tight
No Thermal Bridges
R65
Scissor-truss Roof
24” Cellulose

10” EPS Foam under slab
#1. Passive Solar Design
  a) solar gain
  b) thermal mass storage
  c) efficient envelope

#2. Renewable Energy

Wind
Solar PV
Generator Diesel

Solar Thermal
Lights, TV, Appliances

Radiant Floor Heat

Preheat Tank
50 gal

Propane Heater

Domestic Hot Tank
120 gal

Cold Supply

Seasonal Storage

The Energy Plan
Masonry Heater
Total Annual Energy Demand

(Two bedrooms, 1860 sq. ft., three people)

- 1.2 cords of wood (space heat and domestic water)
- 18 gallons of diesel (electric generator)
- 160 gallons of propane (cooking, refrigeration and domestic hot water)
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- Reduced fuel consumption saves you money
Reduced fuel consumption reduces PM2.5