

Optimization & Design: When is Green, GREEN?

Optimization and Innovation

OWEA Conference

Presented by Jones & Henry Engineers, Ltd.



When is green...GREEN?

✘ Usually, your Green is ...BLUE



The Cultural Revolution of the 60's



A Peace Sign of Naked People... Next Time Sit in Front



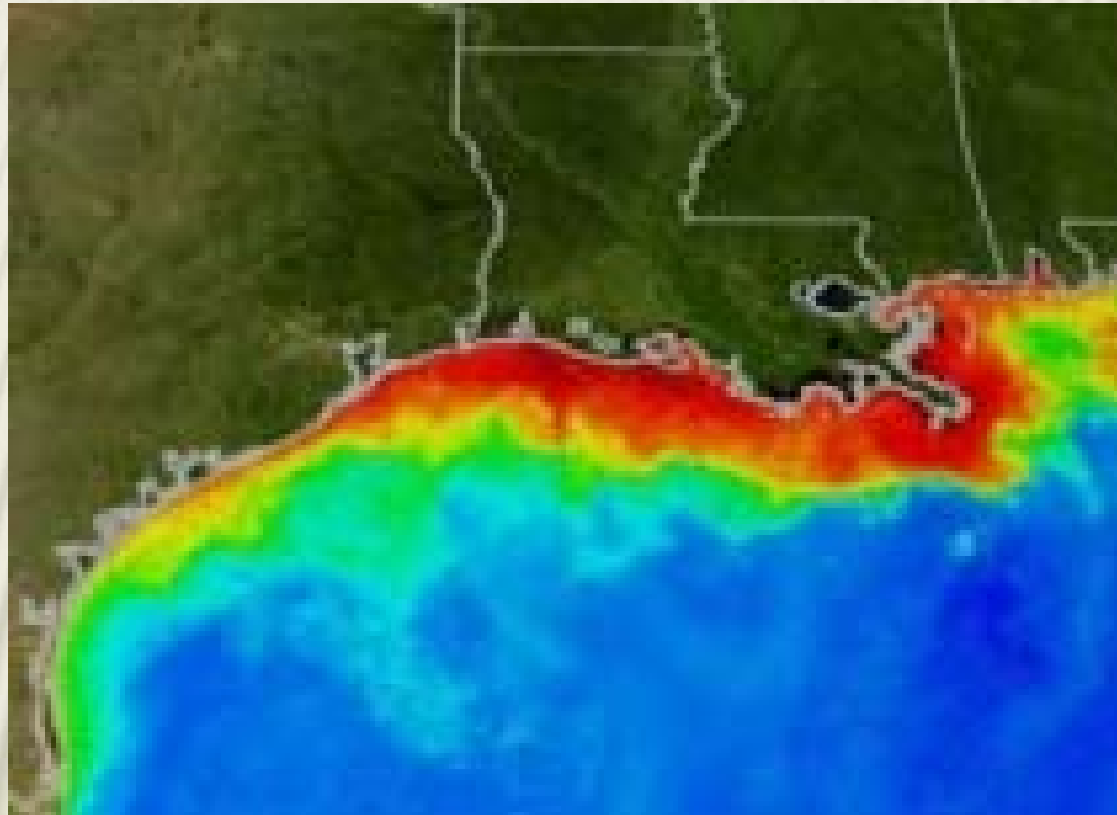
Rivers Ablaze...



Waterways Turned to Sewers...



Dead Zone in the Gulf of Mexico



Civic, Corporate, & Agricultural Abuse & Neglect



...We Made a Terrible Mess



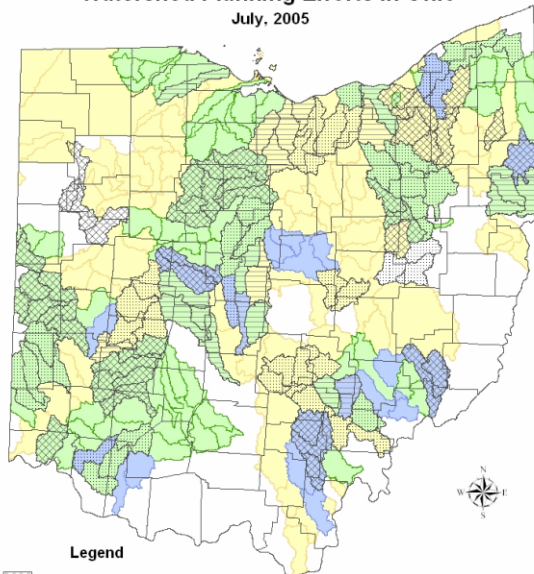
... Time to Take Action



... Time to Take Action

✕ OHIO EPA

Watershed Planning Efforts in Ohio
July, 2005

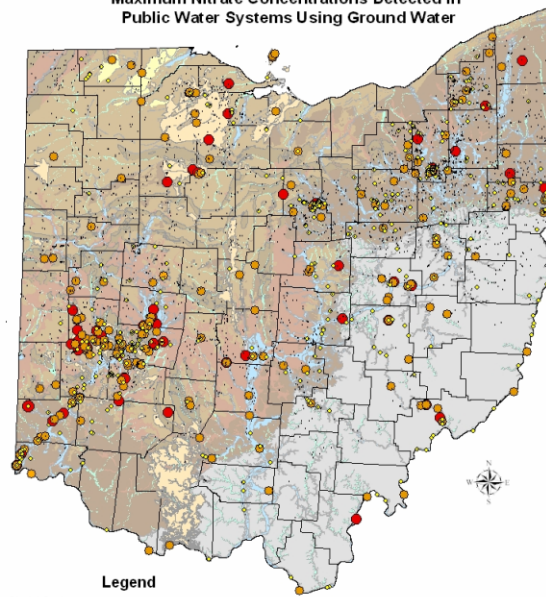


- Legend**
- Complete TMDL (approved by USEPA)
 - Draft TMDL
 - TMDL in Progress (assessment & development)
 - State Endorsed Watershed Action Plan*
 - Watershed Action Plan in Progress
 - Other Watershed Planning Activities
 - County Boundaries

* Includes conditionally endorsed and fully endorsed plans.

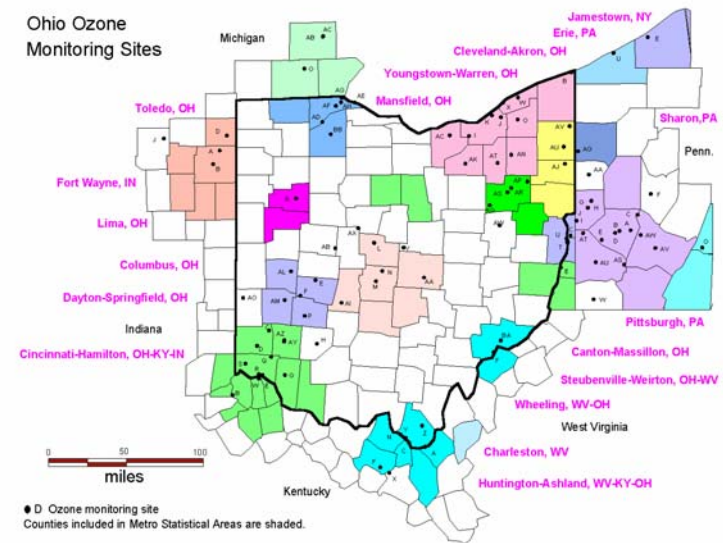
OhioEPA

Maximum Nitrate Concentrations Detected in Public Water Systems Using Ground Water



- Legend**
- Glacial Geology
- Alluvial
 - Beach Ridge
 - Buried Valley/Outwash
 - Complex
 - End Moraine
 - Ground Moraine & Lacustrine
 - Thin Upland
 - Unglaciated Region
 - Potential Karst Region
- Maximum Nitrate Value (ppm)
- 0.10 - 2.00
 - 2.01 - 5.00
 - 5.01 - 10.00
 - >10.00
 - counties polygon

Ohio Ozone Monitoring Sites



... Time to Take Action



The only
cure for
LITTER
is you.



When is Green Building... GREEN?

× Green...



When is Green Building... GREEN?

✘ Green...



✘ Green..



When is Green Building... GREEN?

✘ green...



✘ Green..



✘ GREEN...



... a Kumbaya Moment

× STRIVE to OPTIMIZE

× “Green”

Needs to Permeate
All that we do...

× In a way that is

+ Sensible

+ Effective

+ Affordable



OPTIMIZE

- ✘ To reduced environmental impact
- ✘ To reduce raw materials and energy consumption
- ✘ To reduce costs and economic impact



Green Building, Where do we Start?

- × Federal Codes ... and EPA
 - + Uniform Building Code
 - + Army Corps of Engineers
 - + Department of Energy
- × State Codes... Ohio EPA
- × County Codes
- × City Codes
- × USGBC and LEED

United States Green Building Council

- ✘ *A nonprofit organization committed to expanding sustainable building practices.*



Leadership in Energy & Environmental Design

- ✘ Uses the Leadership in Environmental and Energy Design (LEED) Green Building Rating System

USGBC & LEED



Leadership in Energy & Environmental Design

- ✘ Promotes Energy Savings & Reduced Environmental Impacts
- ✘ Offers Guidance in Green Design
- ✘ Provides a Standardized Way to Review and Compare Drawings
- ✘ Platinum, Gold and Silver Awards Quantify a Buildings Green Score
- ✘ LEED Registration Helps Promote and Identify GREEN BUILDING PROJECTS

Greening Our Buildings

- ✘ Cradle to Grave Environmental Impact
- ✘ Materials Choices
- ✘ Chain of Custody
- ✘ Renewables
- ✘ High Tech
- ✘ Solar and Wind
- ✘ Computer Controls and “Smart Buildings”



Green Building... or Green Business?

green
BUSINESS



Don't Forget the **FUNDAMENTALS**

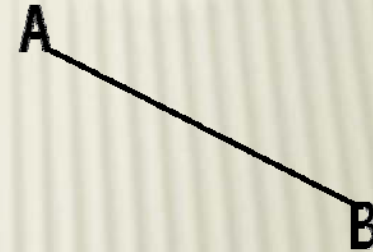
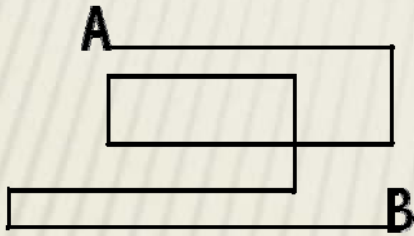
- × Optimized Design
- × Effective Site Location and Orientation
- × Efficient Building Envelope

design, Design, DESIGN

- ✘ Find a Qualified Consultant
 - + Use Qualifications Based Selection...”QBS”
 - + Network your professional contacts
- ✘ Find a consultant that **LISTENS**...
 - + Tell them what YOU need and want
- ✘ Include **EVERYONE** in the initial design...
 - + Everyone has a different perspective
 - ✘ In a perfect world...our new building would...
 - ✘ You might learn something too...

Optimize Design...

- ✘ A Building that is not Effectively Tailored to your Need **is not** Efficient



- ✘ A very “architectural solution” ...
 - + An overly complex, ridiculously expensive, design with no apparent additional benefit
- ✘ A Lifetime of Worker Inefficiency is **WASTE**

design, Design, DESIGN

- ✘ Consider more building than you need...
 - + Same core building
 - + Save HVAC, Restrooms, Communications
 - + Same permits and review

Optimize the Site

- ✖ Is this the Best Site?
- ✖ Solar Orientation and Natural Lighting
- ✖ Site Context and Existing Buildings

Optimize the Building Envelope

- × High Thermal Efficiency

 - + Reduces Energy Input for the Life of the Building

- × Durable Materials

 - + Reduces Maintenance Costs

 - + Increases the Effective Lifespan of the Building

Optimize and Innovate in Design

- × The essence of GREEN is to conserve
 - + Conserves ALL our Resources...
 - × Saves Materials
 - × Saves Energy
 - × Saves Time
 - × Saves Money



So, Even if you Don't Incorporate

- ✘ Wind Generation
- ✘ Solar Panels
- ✘ Bamboo Floors
- ✘ Waterless Urinals
- ✘ LED Lighting



Congratulate Yourself!

✖ Good Design is not a Stack of Paper...



✖ It is a Treasure Map!



Design

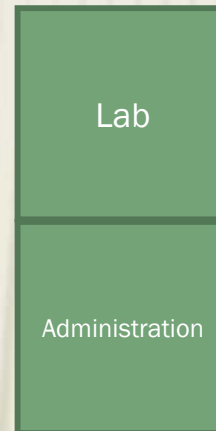
- ✖ Meet, Listen, Design...Plan to be Efficient
- + Laboratory

Lab



Design

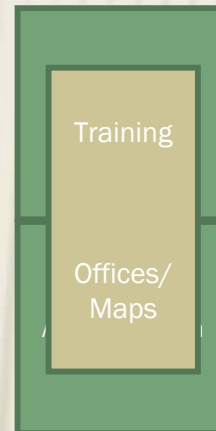
- ✘ Meet, Listen, Design...Plan to be Efficient
 - + Laboratory
 - + and Administration



Design

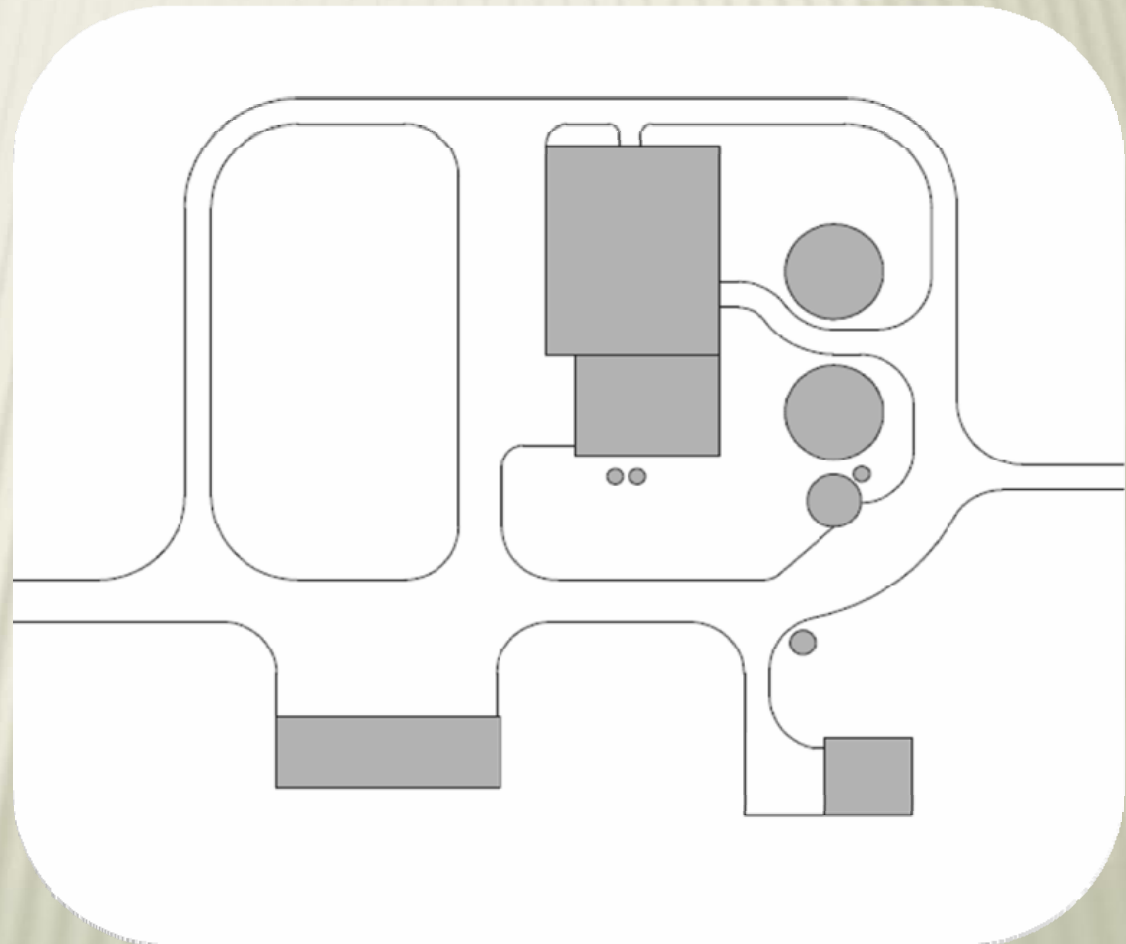
✘ Meet, Listen, Design...Plan to be Efficient

- + Laboratory
- + and Administration
- + and Training
- + and Storm Water
- + and Collections



Site Orientation

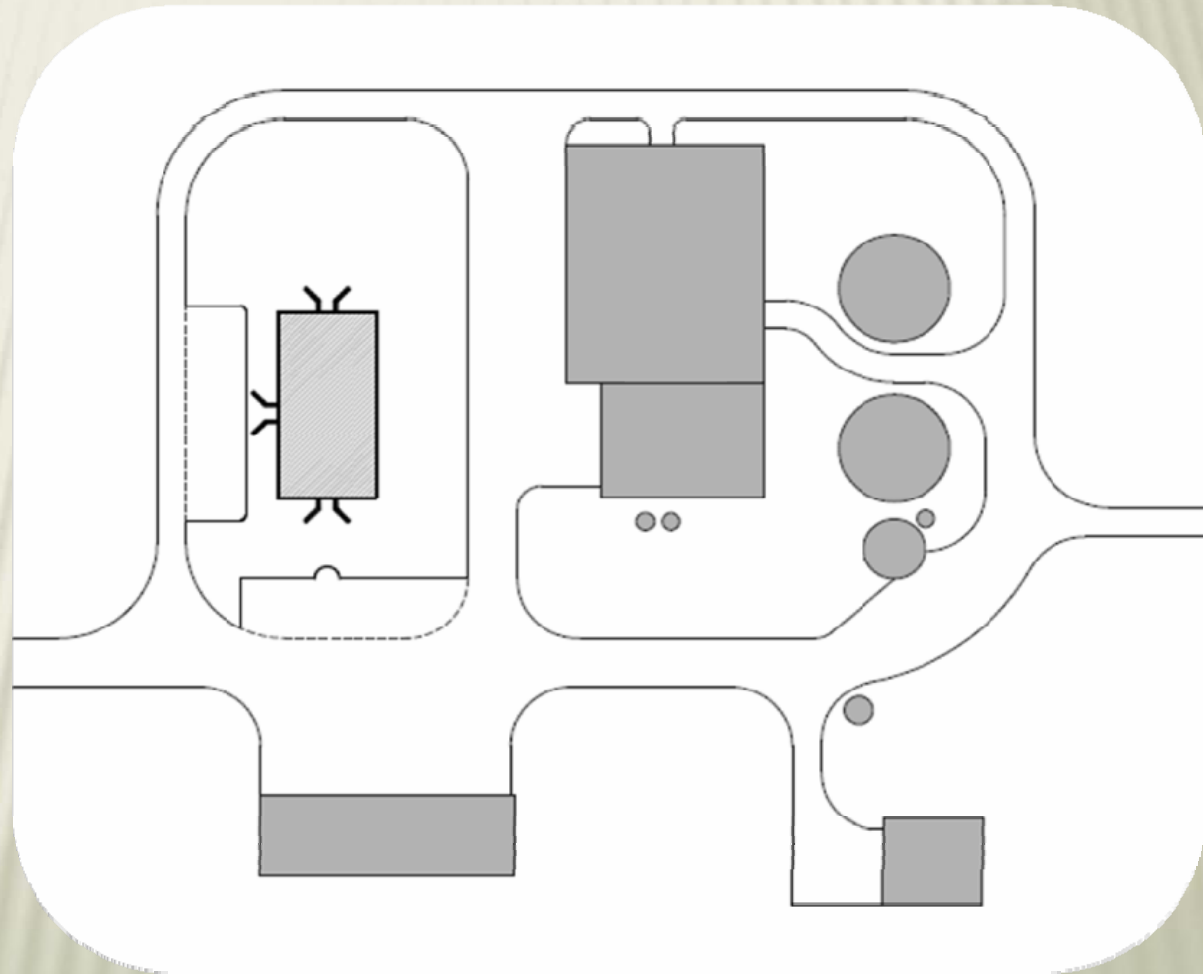
✖ Pre-Existing Conditions



✖ North ^

Original Site Plan

✖ Pre-Existing Conditions



✖ North ^

Conceptual Design

- ✘ Meet, Listen, Design...Plan to be Efficient
- ✘ Visit other Facilities
 - + Talk to them and get their input
 - + Steal their good ideas
 - + Avoid their mistakes
- ✘ Review and Refine conceptual design

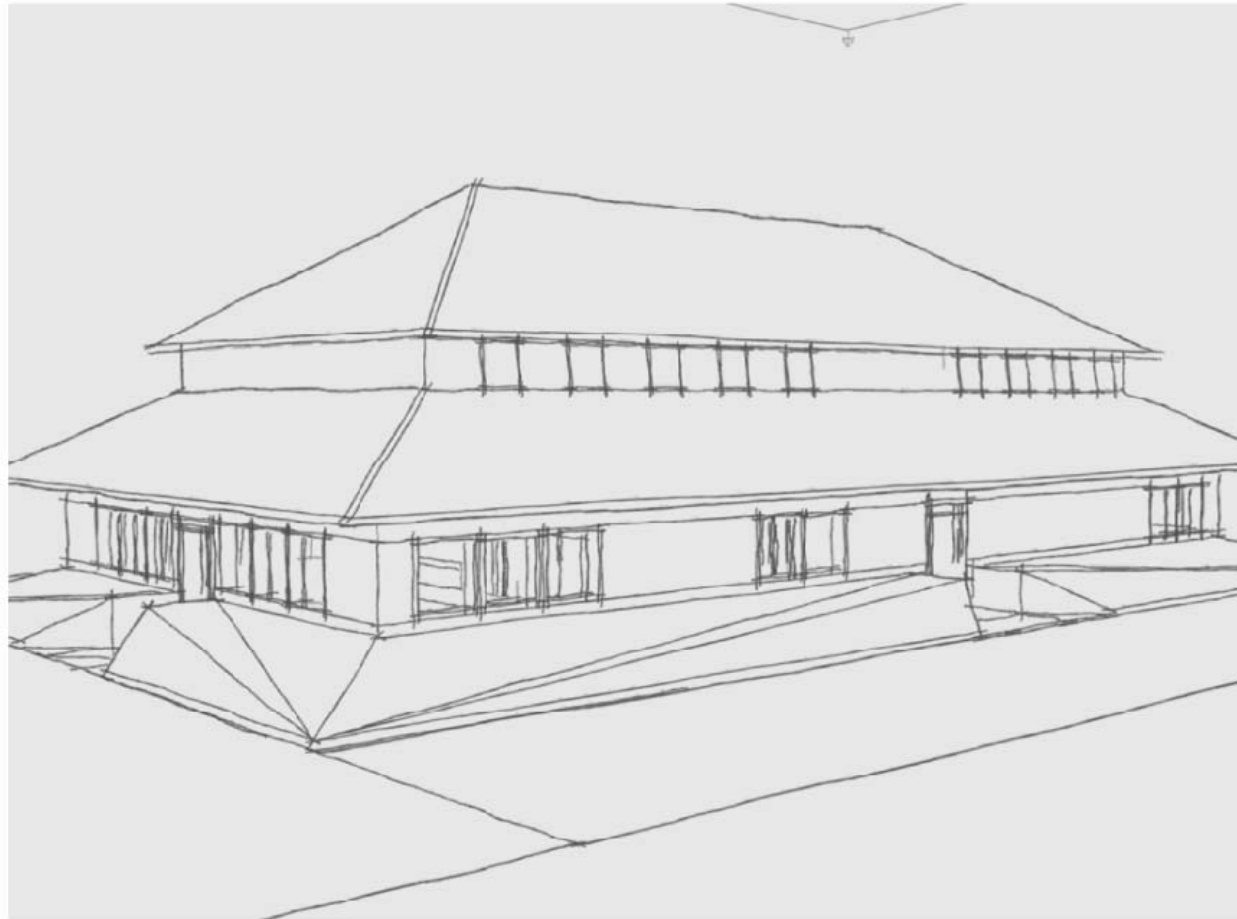
Conceptual Design

- ✘ Select a site
 - + Orient the building
- ✘ Plan to design an efficient shell
 - + Consider materials and construction options

- ✘ Prepare for the Construction Document Phase

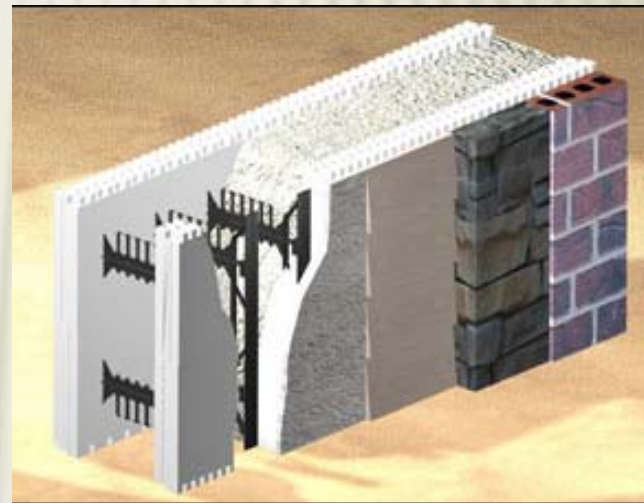
Design Ideas...Become Drawings

3D Modeling Helps Everyone



Efficient Building Envelope

- ✘ Insulated Concrete Forms ICF's
- ✘ One of the **NEWEST** old Technologies
 - + Thermal Mass
 - ✘ Caves
 - ✘ Castles
 - ✘ Adobe
 - ✘ Sod houses
 - ✘ Basement
 - + Thermal Lag
 - + Super Insulation
 - ✘ Better Insulation Means Less Heating and Cooling Costs



Efficient Building Envelope

- ✖ Radiant Floor Heat
 - + High Efficiency
 - + Zone Control
 - + Warm Feet...
 - ✖ Cool Head...



Efficient Heating and Cooling

✖ GEOTHERMAL?

+ ABSOLUTELY !

- ✖ US EPA says GEOTHERMAL is the most energy-efficient, environmentally clean, and cost-effective space conditioning system.
 - ✖ Energy costs are typically 25-50% less
 - ✖ Lower life-cycle cost than traditional HVAC

CHALLENGES...

× GEOTHERMAL

+ NEGATIVES

× High COST of BTU Harvesting...

* Water source and disposal

- × Closed loop system, trenched or radial
- × Open loop system, well source and discharge
- × OR...if you have available a water source of nearly 18.0 million gallons...there are millions of BTU's flowing by every day.

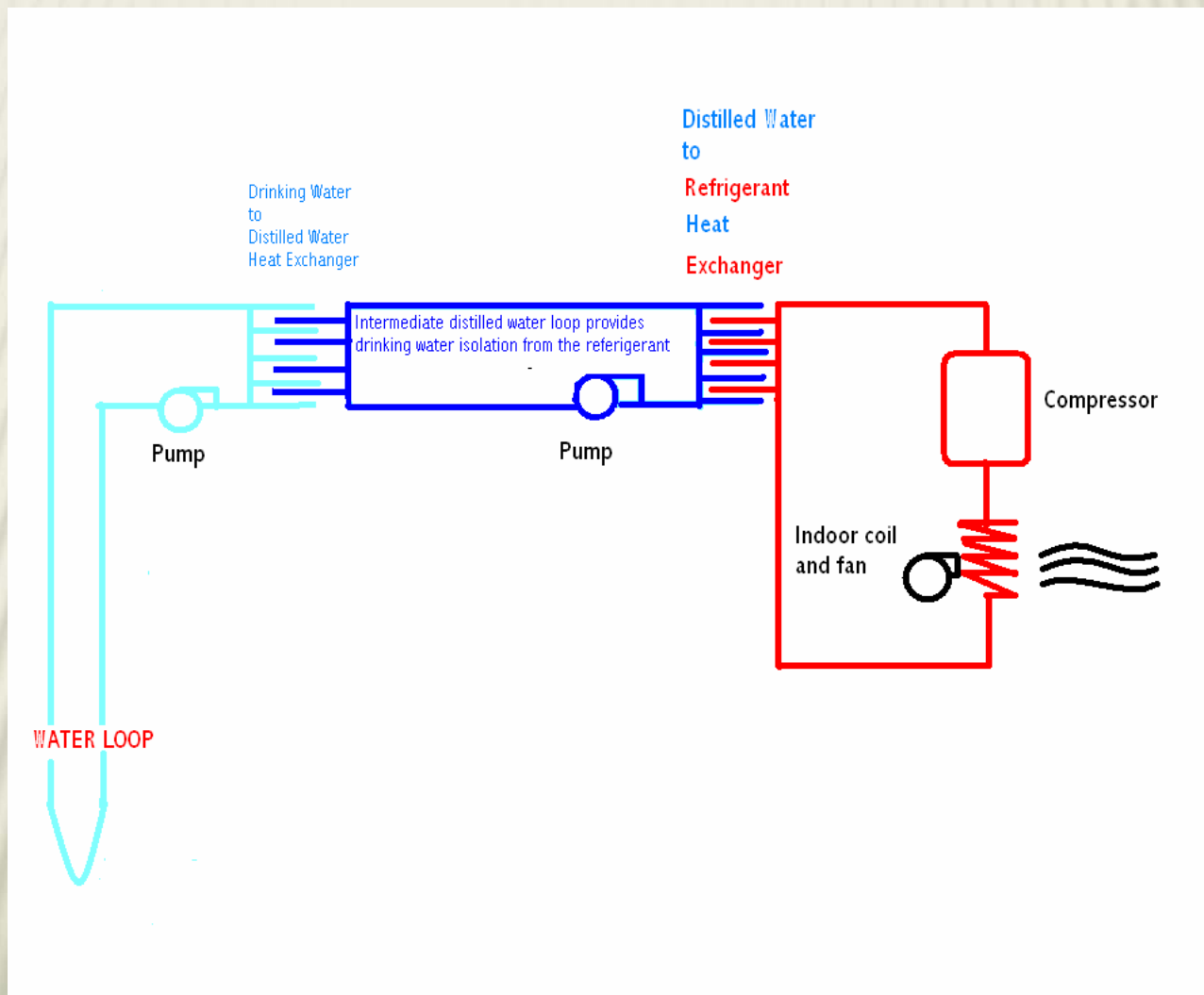
INNOVATE

× GEOTHERMAL

+ SOLUTION

- × Source the municipal water supply
 - * 18,000,000 gallons per day
 - * Average temperature 53-58 degrees Fahrenheit
 - * A 2" pipe can supply virtually all the BTU's required for the entire office and administration area...60 gpm.
 - * 18.0 mgd...60 gpm...
 - * Less than 1/2 of 1% of the available flow

OPTIMIZED ENERGY EFFICIENCY



Efficient Building Envelope

✕ Energy Star Windows

WHAT MAKES A WINDOW ENERGY EFFICIENT?



Today, manufacturers use an array of **advanced technologies** to make ENERGY STAR-qualified windows.

IMPROVED FRAME MATERIALS

Wood composites, vinyl, and fiberglass frames reduce heat transfer and help insulate better.

LOW-E GLASS

Special coatings reflect infrared light, keeping heat inside in winter and outside in summer. They also reflect damaging ultraviolet light, which helps protect interior furnishings from fading.

GAS FILLS

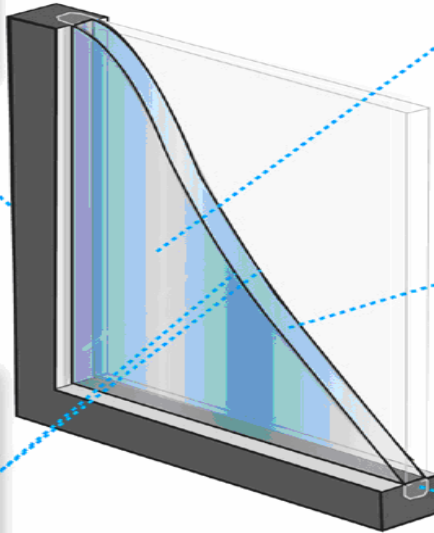
Some energy-efficient windows have argon, krypton, or other gases between the panes. These odorless, colorless, non-toxic gases insulate better than regular air.

MULTIPLE PANES

Two panes of glass, with an air or gas-filled space in the middle, insulate much better than a single pane of glass. Some ENERGY STAR-qualified windows include three or more panes for even greater energy efficiency, increased impact resistance, and sound insulation.

WARM EDGE SPACERS

A spacer keeps a window's glass panes the correct distance apart. Today's warm edge spacers—made of steel, foam, fiberglass, or vinyl—reduce heat flow and prevent condensation.



Design...



Design...Becomes Construction



... Becomes Construction



... Becomes Construction



... Becomes Construction



... Becomes Construction



... Becomes Construction



Design...



Design Becomes Reality



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Green Building is GREEN...

When you Remember the Fundamentals

Good Design will Optimize and Innovate:

- + Site and Environment
- + Building Function and Efficiency
- + The Building Materials and Lifecycle
- + The Dollars of the Utility
- × Good Design will Optimize
 - + YOU...and Your Employees

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