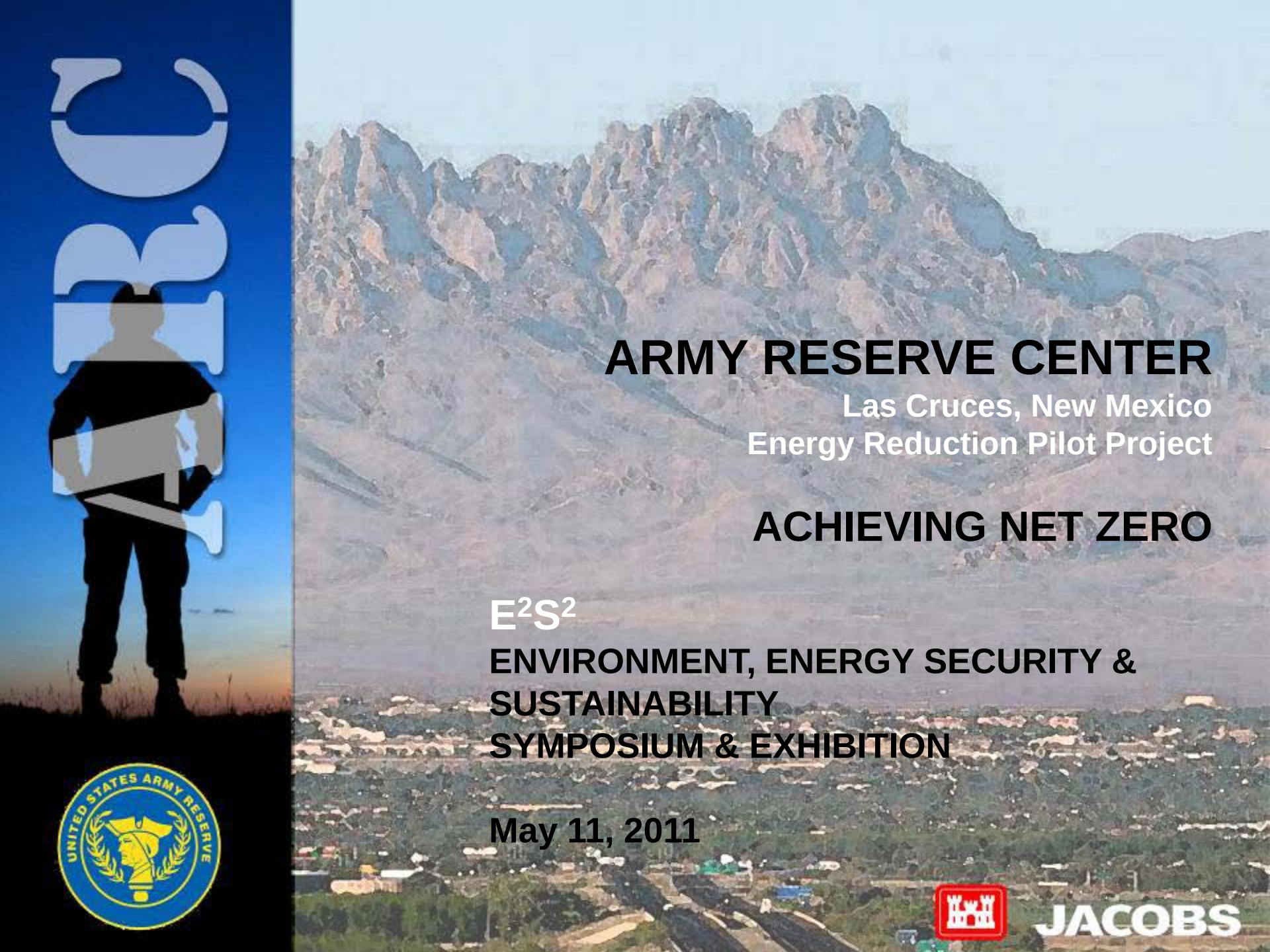

ARMY RESERVE CENTER

Las Cruces, New Mexico
Energy Reduction Pilot Project

ACHIEVING NET ZERO

E^2S^2

ENVIRONMENT, ENERGY SECURITY & SUSTAINABILITY SYMPOSIUM & EXHIBITION

May 11, 2011

JACOBS

Report Documentation Page

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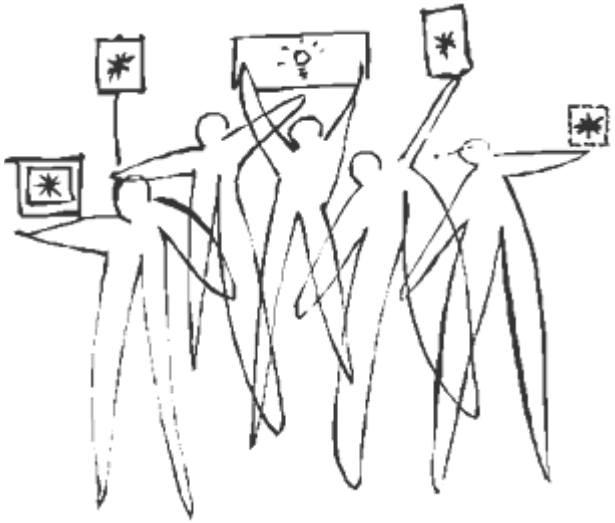
Jacobs

Greg Kight, AIA, LEED AP, CSBA

National Director of Sustainable Design



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Facility Program

Army Reserve Training Center		32,096 SF
Vehicle Maintenance Shop		4,841 SF
Unheated Storage		1,065 SF
Total		**38,002 SF**

Parking/Paving:

- Military Equipment Parking		15,760 SY
- POV Parking	149 Spaces	5,236 SY

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Energy Reduction Pilot Program Goals

1. **Determine impacts (costs, effort) of achieving the next level of energy reduction requirement**
2. **Develop new requirements and processes for energy reduction**
3. **Investigate LEED Platinum Rating**
4. **Investigate renewable energy opportunities**

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Regional Site Imperatives

- **Ideal orientation for efficiency and solar benefits**
- **Maximize natural ventilation**
- **Use of thermal mass**
- **Extensive Day-lighting design**
- **Extensive Shading and control of solar heat gain**
- **High-Performance glazing**
- **Well-Insulated envelope**
- **Water conservation measures**
- **Evaporative Cooling**
- **Radiant Heating**
- **Reduce Heat Island Effect with Reflective Roof and Paving – Using High Albedo Concrete vs. Asphalt**

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Sustainability Priorities

Priorities:

1. **Building Energy Efficiency – Least Expensive**
2. **Utilizing Passive Energy Systems**
3. **Utilizing Renewable Energy**

Order:

- **Understand Regional Imperatives**
- **Aggressive Load Reduction**
- **Use Free Energy / Passive Design**
- **Determine/Use Most Efficient Technology**
- **Renewable Energy**

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Project Site

Total Area – 15 Acres
Buildable Area with ATFP – 5.69 Acres

Flat Site with Hillocks

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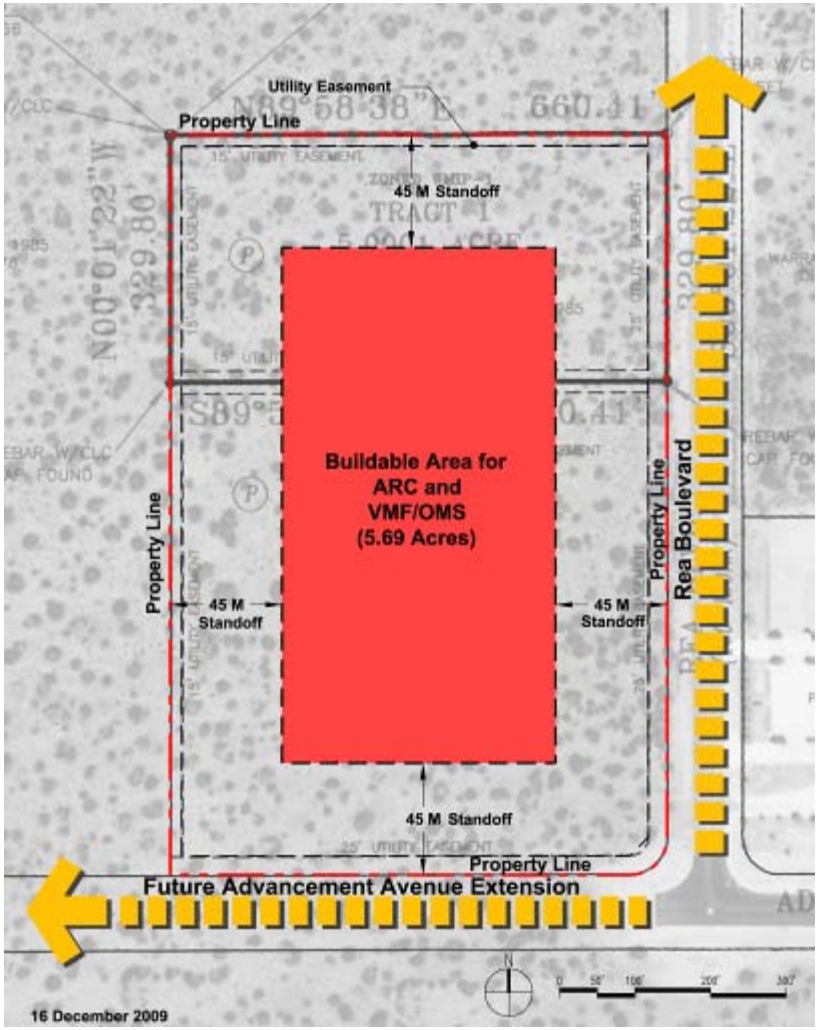
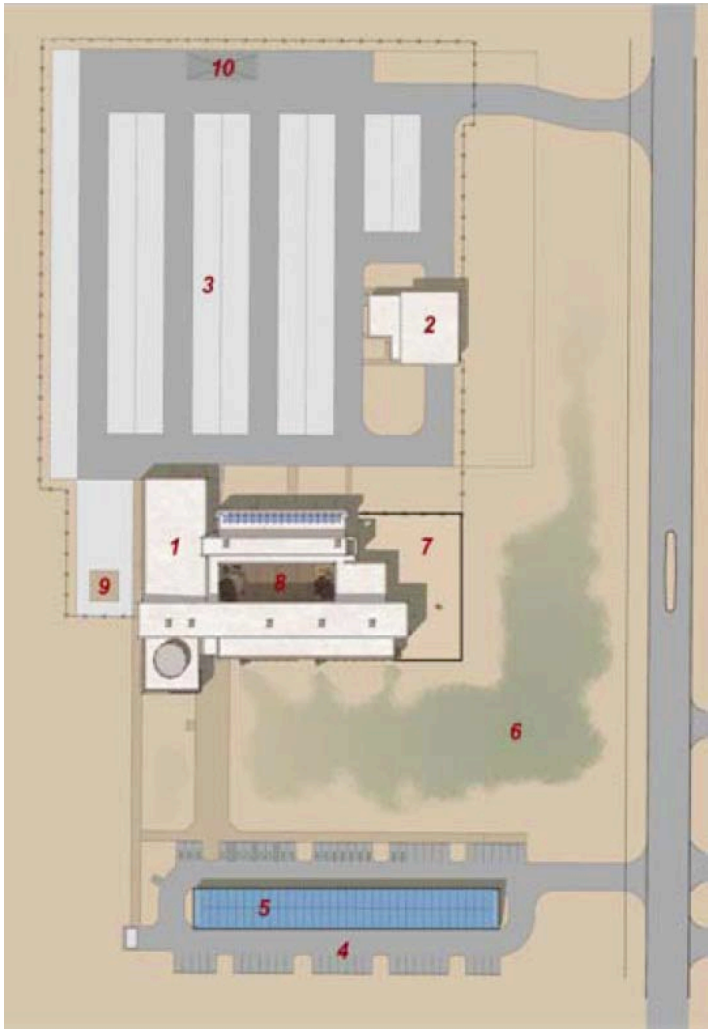
Project Site and ATFP





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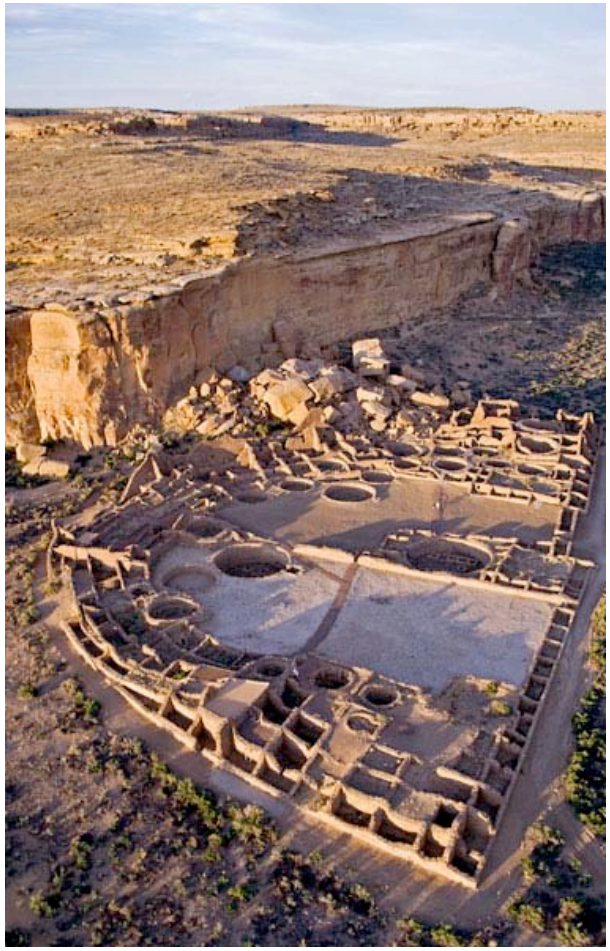
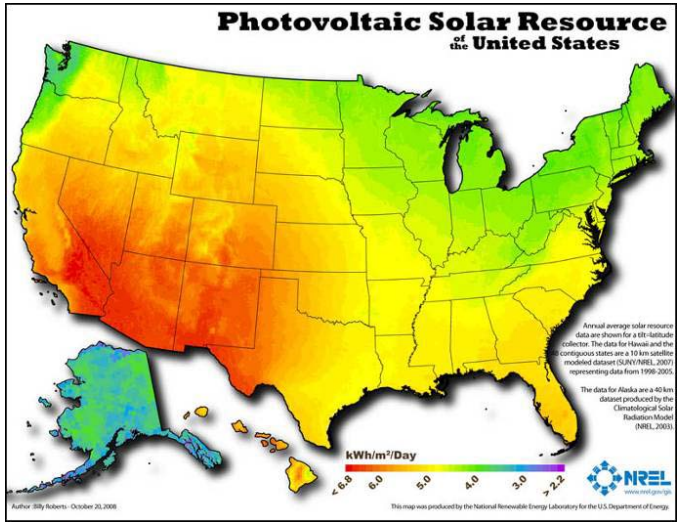
New Mexico – Regional Character





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Federal Sustainability Mandates

- **Executive Order 13123: Greening the Government Through Efficient Energy Management 1999**
- **Energy Policy Act of 2005 (EPAct)**
- **Federal Leadership in High Performance and Sustainable Buildings: Memorandum of Understanding (MOU) 2006**
- **Executive Order 13423: Strengthening Federal Environmental, Energy and Transportation Management (EO) 2007**
- **Energy Independence Security Act EISAct 2007**
- **Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance 2009**

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EPACT 2005

- **Reduce fossil fuel-generated energy consumption 55% by 2010, 100% by 2030**
- **Commissioning – High Performance Buildings**
- **Projects greater than 5000sf restore predevelopment hydrology**
- **Use water conservation technologies**
- **Meter natural gas and steam**
- **30% better than ASHRAE 90.1-2004**
- **Purchase Energy Star lamps & fixtures, appliances with standby power**

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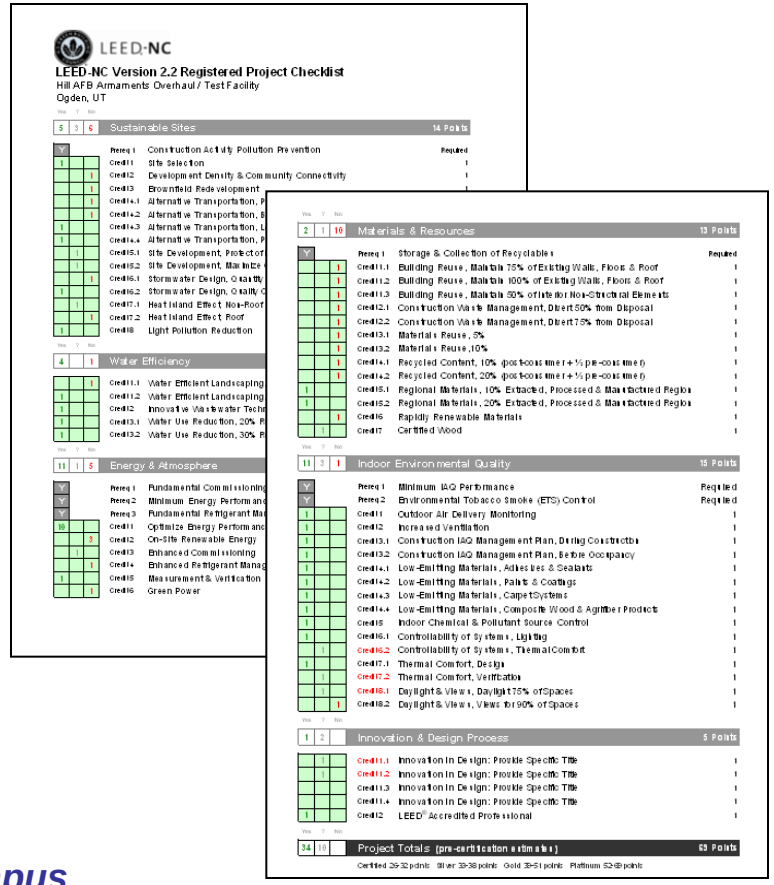
Sustainability / LEED

- **LEED NC v2.2 'Gold' required**
  - **39-51 Points**

  Currently Pursuing
- **LEED v2.2 'Platinum'***
  - **50-59 Points**
  - **55 Achievable Points**
  - **6 'Maybe' Points**
  - **Green Education**
  - **Enhanced and Fundamental CX**
  - **Building Envelope CX**
  - **M and V Plan**

**** Application Guide for Multiple Buildings and On-Campus Building Projects (AGMBC)***


LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

Hill AFB Armaments Overhaul / Test Facility

Ogden, UT

Sustainable Sites — 14 Points

Water Efficiency

Energy & Atmosphere

Materials & Resources — 13 Points

Indoor Environmental Quality — 15 Points

Innovation & Design Process — 5 Points

Project Totals (pre-certification estimates) — 69 Points

Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-69 points

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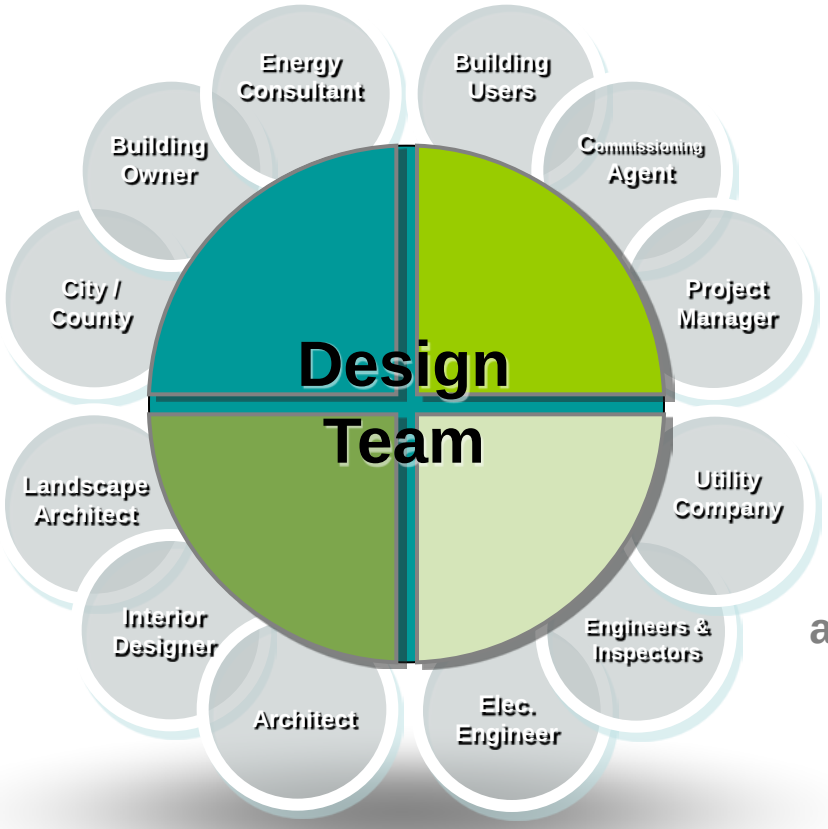
Sustainability – Processes and Implementation

Stakeholders and Sustainability

The Sustainability process is a collaboration of several disciplines that effectively integrates all aspects of site planning, building design, construction, operations and maintenance

Sustainable design is most effective when applied at the earliest stages of design



A Sustainability Charrette is an intensive workshop in which stakeholders and experts come together to address project sustainability issues

The Charrette should result in unified sustainability, design and construction goals for everyone to work toward

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Sustainability – Project Life Cycle

- Initial Feasibility Analysis
- Establish Sustainability Goals
- Master Planning & Programming
- Solar Orientation, Habitat, Wind
- Register Project with USGBC

- Project Administer
- Review Subcontractor Qualifications
- Review LEED RFIs

- Submit Const. Credits to USGBC
- Hang LEED Plaque

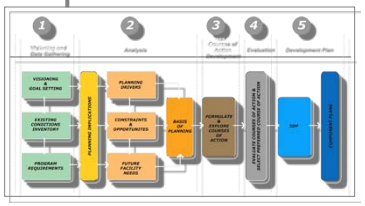
Pre-Design
Research & Analysis

Sustainability Charrette(s)

Bidding

Construction

Closeout & Occupancy



Master Planning Process

- Analysis of Materials
- Analysis of IAQ
- Energy Conservation, Management & Renewable
- Site, Land-Use & Low Impact Development
- LEED Checklist
- Construction Delivery Method
- Commissioning Approach
- Submit Design Package to USGBC

- GC and Sub Workshops
- Document Const. Credits
- LEED Status Checks
- Commissioning Building

Value Engineering

Feasibility / Master Plan | **Schematic Design & Design Development** | **Construction Documents** | **Bidding & Negotiations** | **Project Construction & Closeout**

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The Eco-Charrette Process

- Focus on sustainability
- Clear objectives
- All stakeholders engage early
- Highly interactive
- Results in agreed goals and tactics

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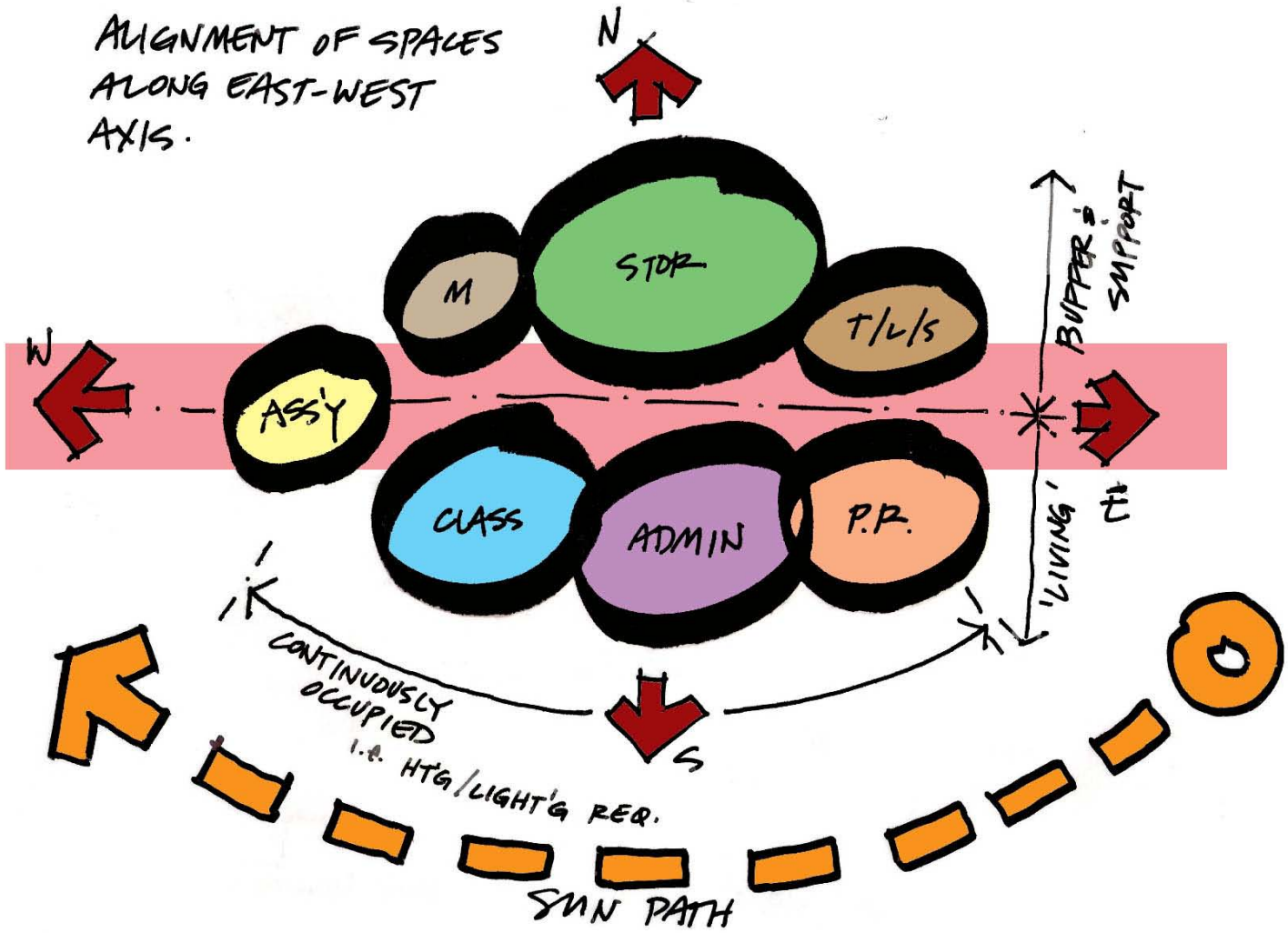
Design Process -Building Orientation



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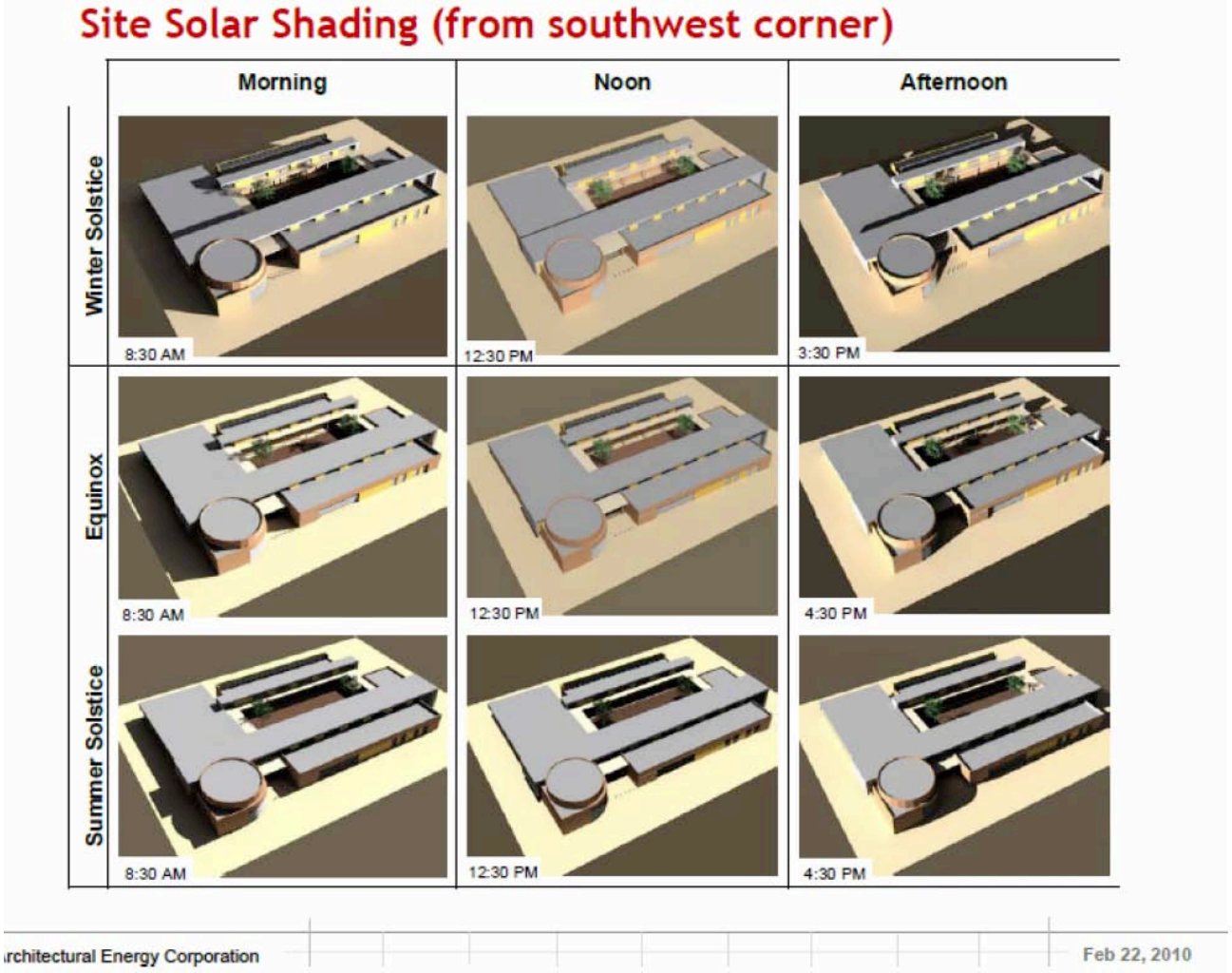
Daylight and Building Massing

Influenced Solar Hot Water And Courtyard Design



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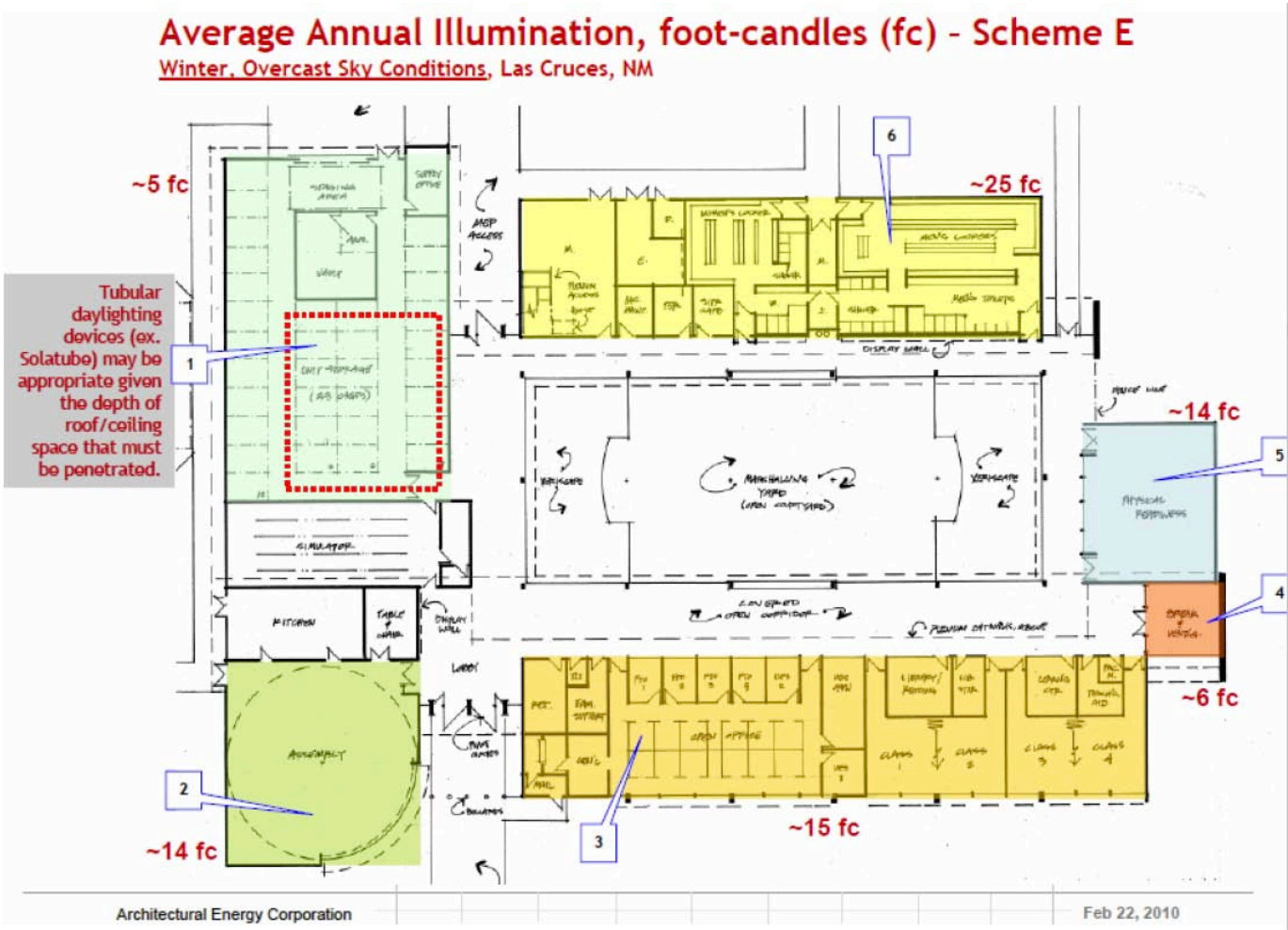
Daylight Harvesting

Internal Photometrics: 95% Spaces Natural Daylight

Solar Tubes Utilized



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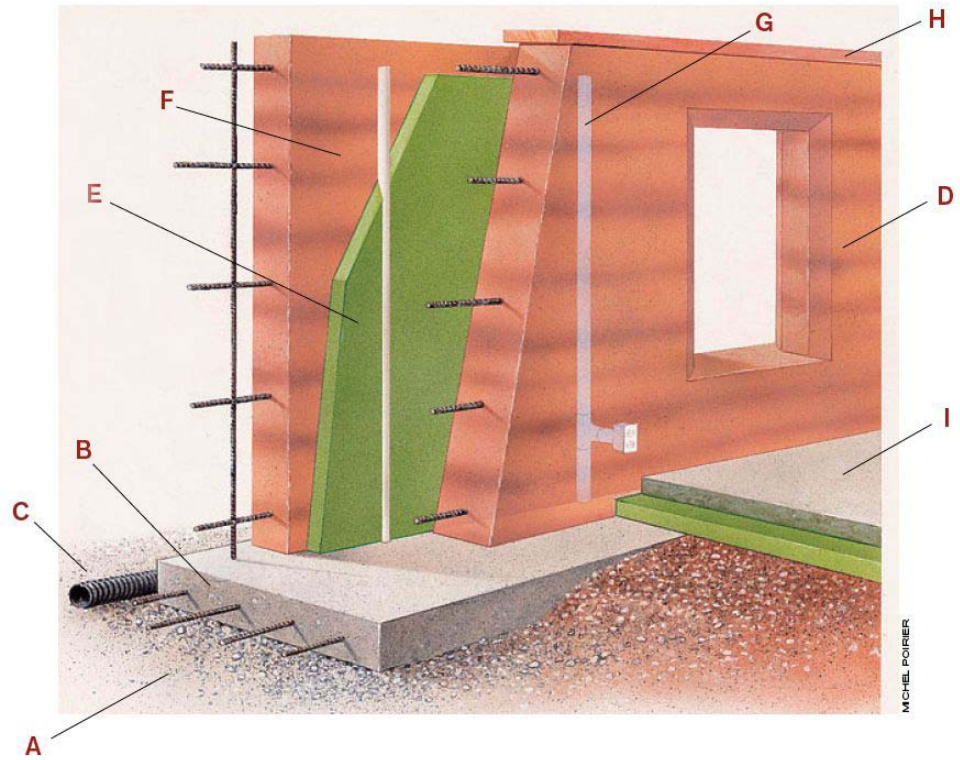
Insulated Rammed Earth



Strength dependant upon Quality of:

Soils, Construction, Tamping, Admixtures (6-10%cement)
Potential of 4500 psi in 18 days

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Kitchen Efficiency - Improvements

- **Eliminated equipment that was not needed**
  - ✓ **Dish washing equipment**
  - ✓ **Service ware equipment**
  - ✓ **Range with oven**
  - ✓ **Excess Refrigerator**
- **Added equipment to improve the operation**
  - ✓ **Powered pot sink**
  - ✓ **Combination oven/steamer**
  - ✓ **Smaller ice maker**
  - ✓ **Mini-pulper**
  - ✓ **Composting system**
  - ✓ **Drop-down power cords**
- **Added Janitor's closet for improved sanitation**
- **21% Less Energy than all-electric standard ARC kitchen**
- **Kitchen can go "Green"**

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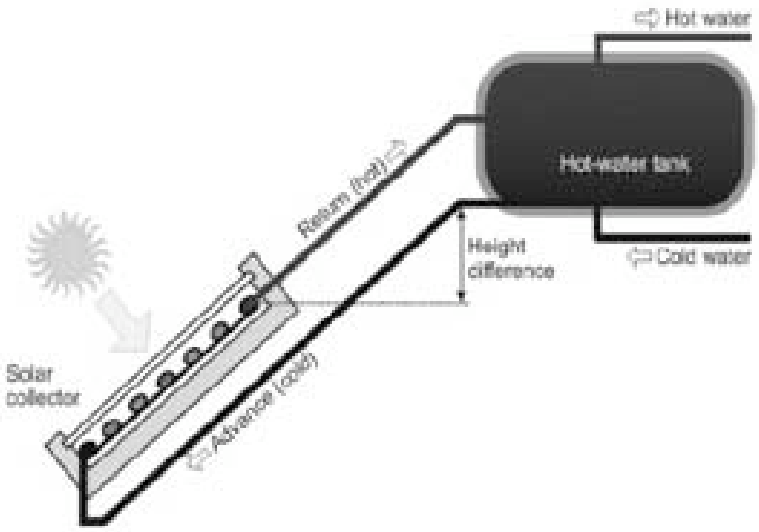
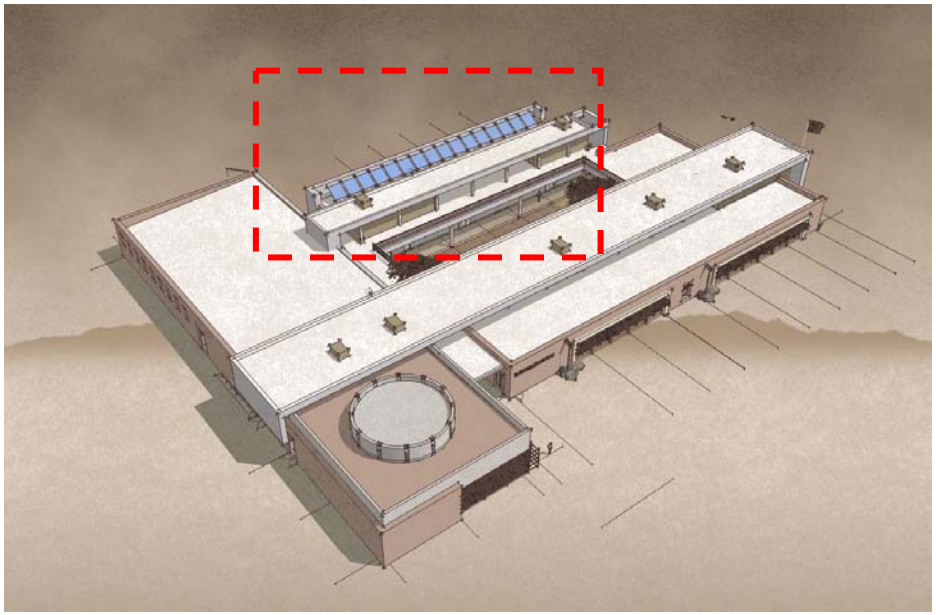
Solar Hot Water Panels

EISA 2007: 30% Domestic Hot Water Demand Minimum

Located at the Training Facility and the OMS Building





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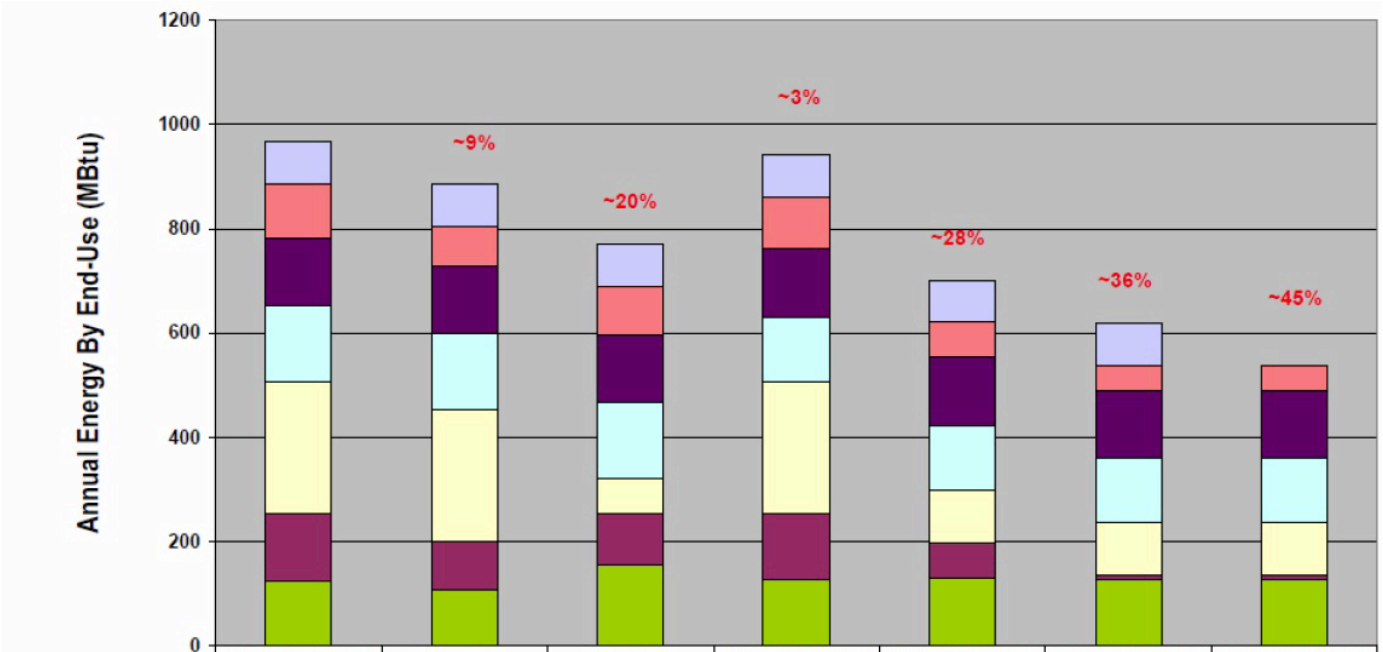
Preliminary Energy Analysis



	ASHRAE 90.1-04 Baseline	Envelope Improvements	Lighting Improvements	Miscellaneous Improvements	Env + Ltg + Misc Bundle	Env + Ltg + Misc + Evap Bundle	Env + Ltg + Misc + Evap + Sol DHW
DHW	80	80	80	80	80	80	0
Pumps	0	0	0	0	0	1	1
Fans	104	76	92	101	68	47	47
Exterior Lighting	131	131	131	131	131	131	131
Interior Equipment	145	145	145	123	123	123	123
Interior Lighting	253	253	68	253	100	100	100
Cooling	128	94	97	125	70	7	7
Heating	126	107	157	129	129	129	129

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Solar Energy – Photovoltaics

Study Findings:

- ARC energy usage =289,000 kWh's/year
- 184 kW PV system required
- 13,750 sf PV area (76 parking spaces)
- PV Incentives
  - No State PV Incentives
  - 30% Federal Tax Credit (may not apply)
- Financial Options
  - Direct Purchase
  - Power Purchase Agreement (PPA) Single/Multiple

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Solar Energy – Photovoltaics

POV Parking Solar Canopy:

- **9’ high minimum over parking aisles only**
- **Adequate space for 184 kW PV**
- **Shaded Parking assists with Heat Island Effect**

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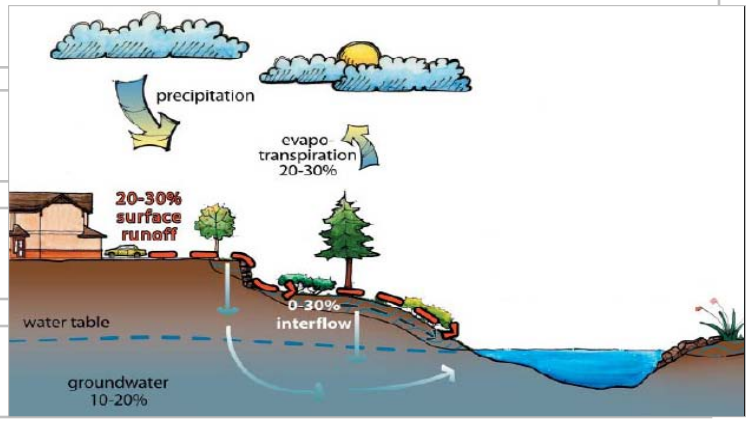
Low Impact Development

1. Supporting the “Hydrologic Cycle”
2. Natural Native Vegetation
3. Bio-Retention Swales
4. Permeable/Pervious Pavement
5. Minimize Pavement
6. Create Urban Areas
7. Reduce Land Consumption
8. Encourage Pedestrian Activity
9. Reduce Auto Dependence



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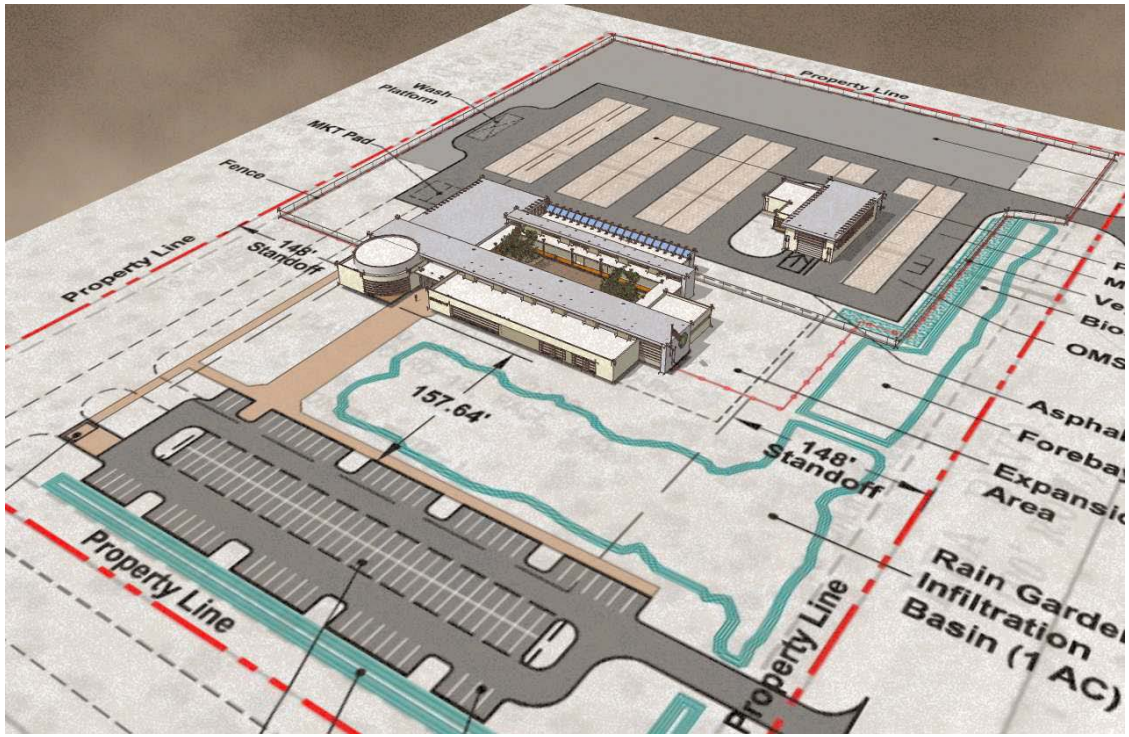
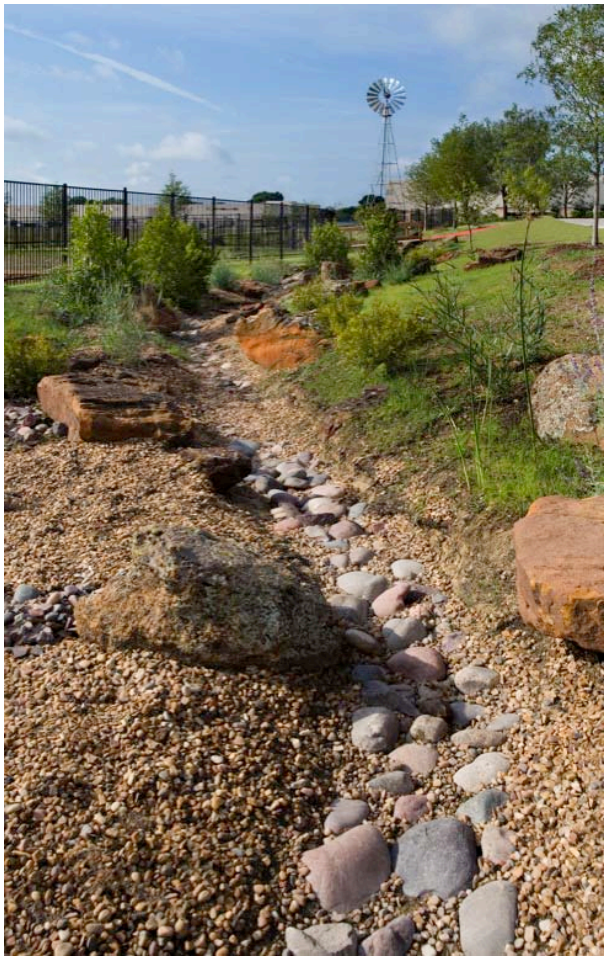
Stormwater Management





UFC 3-210-10: Low Impact Development
Bioswales, Raingardens, Pervious Surfaces

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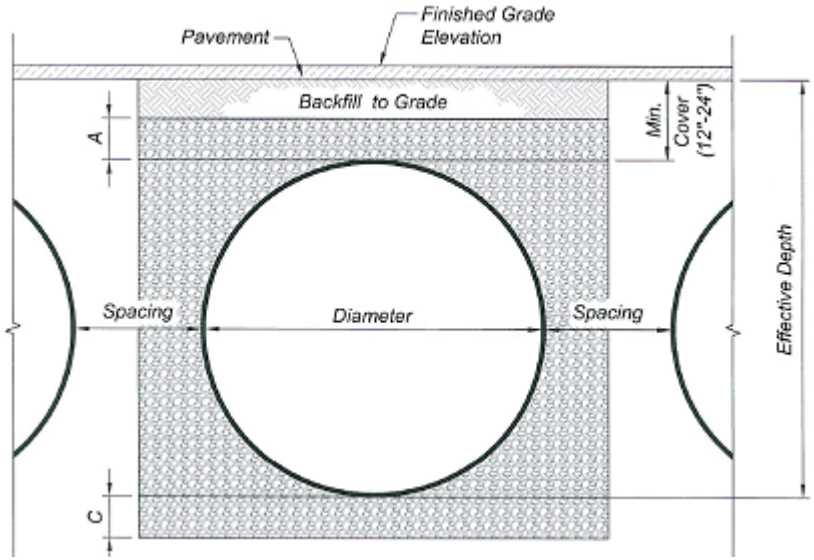
Rainwater Harvesting

Current Design

- 300,000 Tank for Site Irrigation
- 20,000 Tank for Evaporative cooling make up and toilet and plumbing fixtures



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Water Efficiency

Climate Appropriate Plants

Waterless Urinals

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Training Building – Plan

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Façade View

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NE Courtyard

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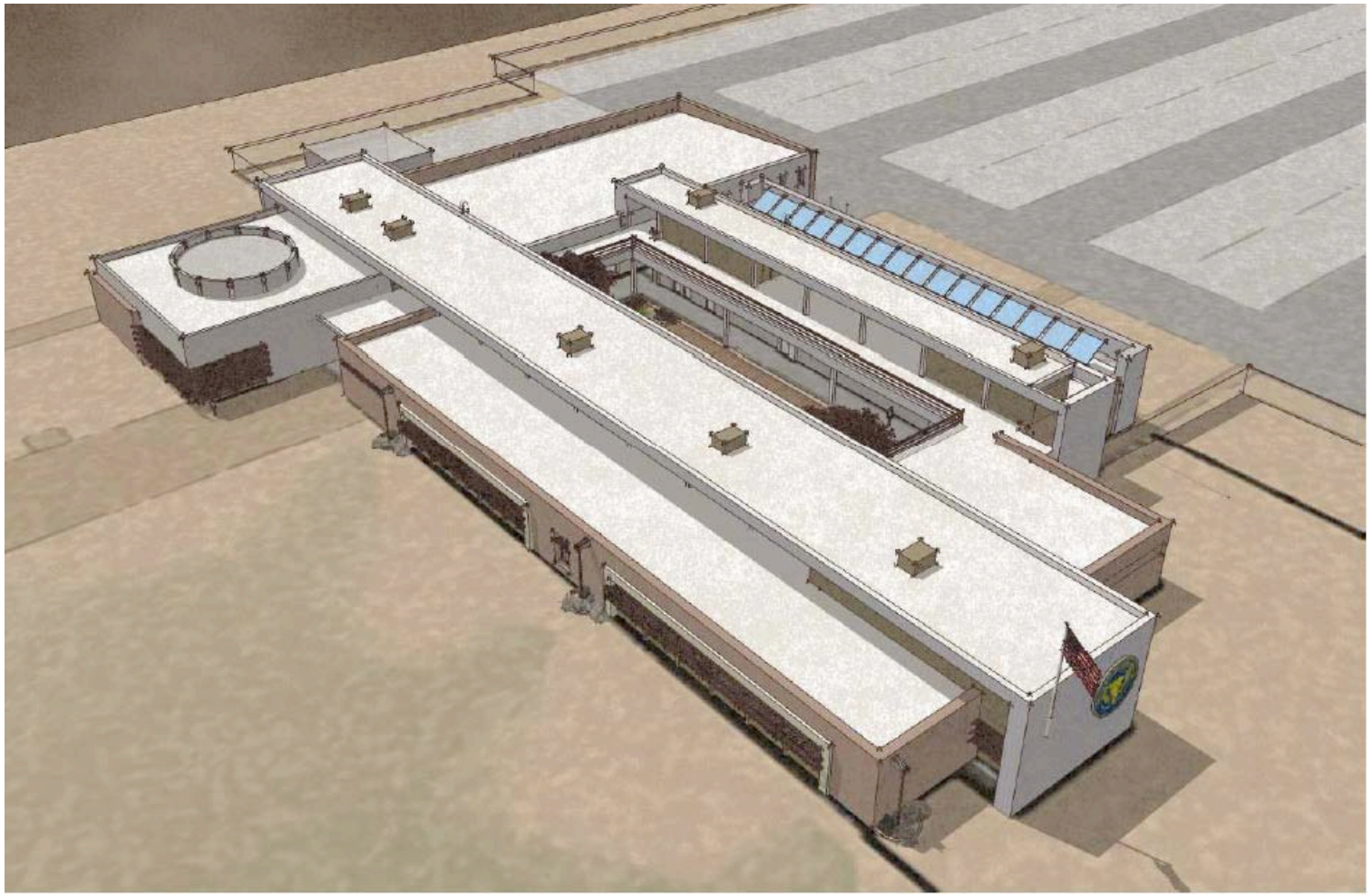
Training SE Aerial



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Sustainability Resources

www.wbdg.org

www.usgbc.com

www.dsire.org/incentives

www.energystar.gov

www.davislangdon.com/Global/

www.ilbi.org

www.buildinggreen.com

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Questions

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Thank you

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