

ARRC



ARMY RESERVE CENTER

**Las Cruces, New Mexico
Energy Reduction Pilot Project**

ACHIEVING NET ZERO

E²S²

**ENVIRONMENT, ENERGY SECURITY &
SUSTAINABILITY
SYMPOSIUM & EXHIBITION**

May 11, 2011



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Report Documentation Page

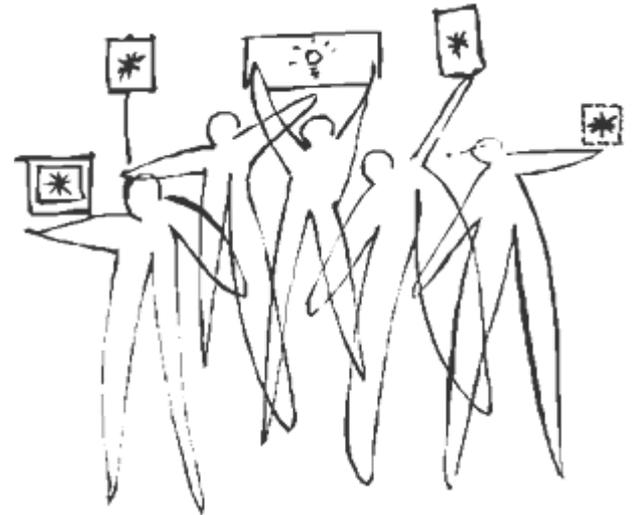
Form Approved
OMB No. 0704-0188

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1. REPORT DATE 11 MAY 2011	2. REPORT TYPE	3. DATES COVERED 00-00-2011 to 00-00-2011			
4. TITLE AND SUBTITLE Army Reserve Center Las Cruces, New Mexico Energy Reduction Pilot Project Achieving Net Zero		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Jacobs,1111 South Arroyo Parkway,Pasadena,CA,91105		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 9-12 May 2011 in New Orleans, LA. U.S. Government or Federal Rights License					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 35	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Jacobs

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National Director of Sustainable Design



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



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**

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**



Project Site

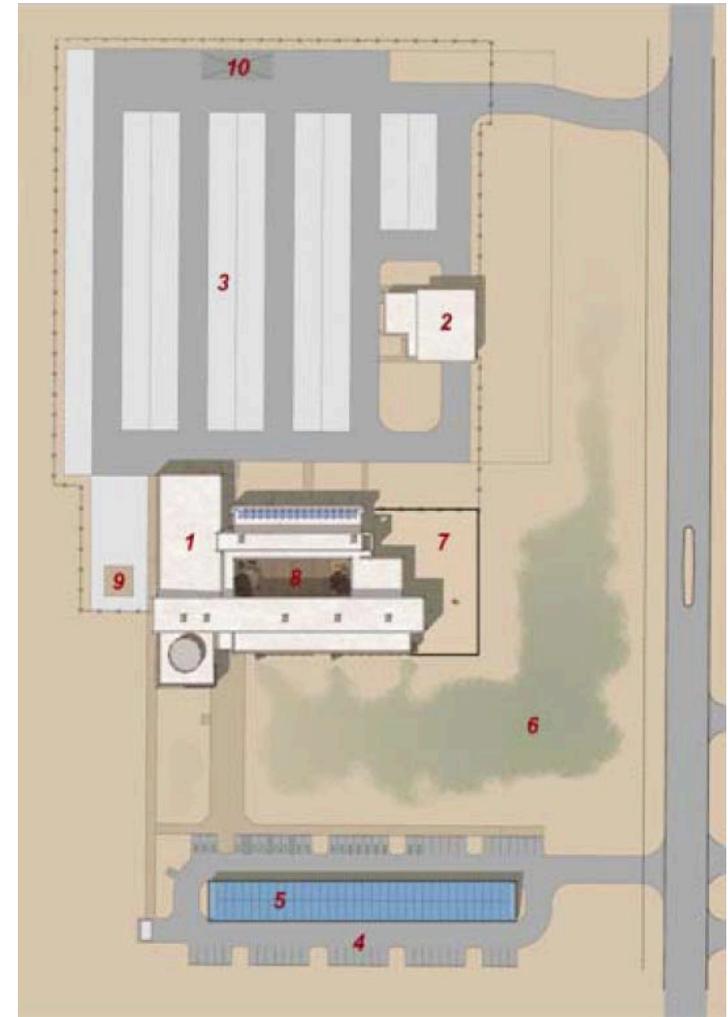
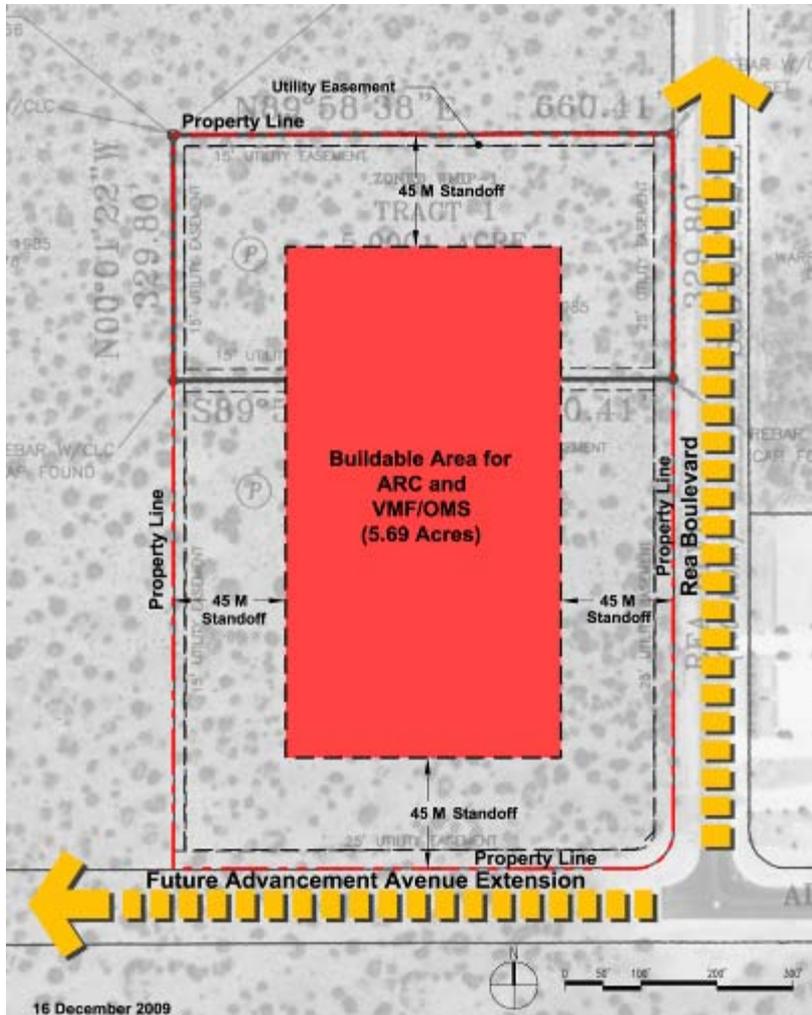


Total Area – 15 Acres
Buildable Area with
ATFP – 5.69 Acres

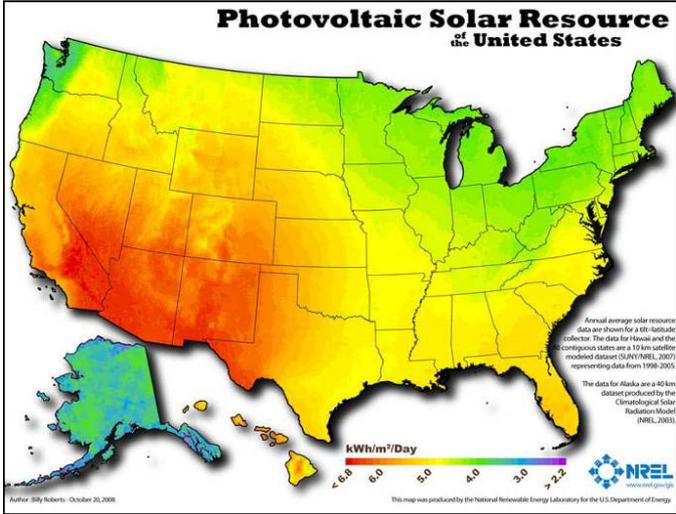
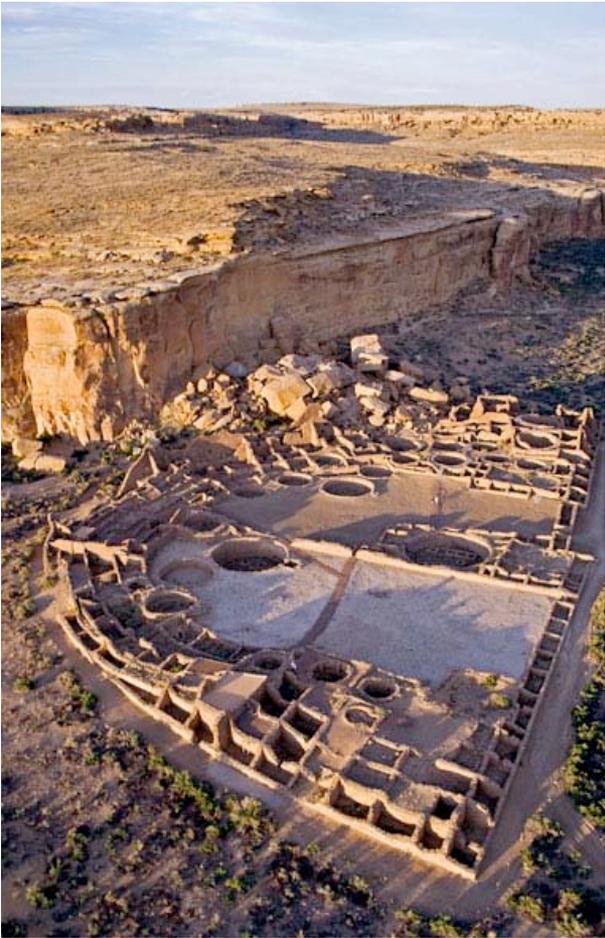
Flat Site with Hillocks



Project Site and ATRFP



New Mexico – Regional Character



Federal Sustainability Mandates

- **Executive Order 13123: Greening the Government Through Efficient Energy Management 1999**
- **Energy Policy Act of 2005 (EPAAct)**
- **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**



- **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**

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 Ammunition Overhaul/ Test Facility
 Ogden, UT

Category	Points Available	Points Earned
Sustainable Sites	14	14
Materials & Resources	13	13
Indoor Environmental Quality	18	18
Innovation & Design Process	5	5
Project Totals (pre-certification estimate)	63	63

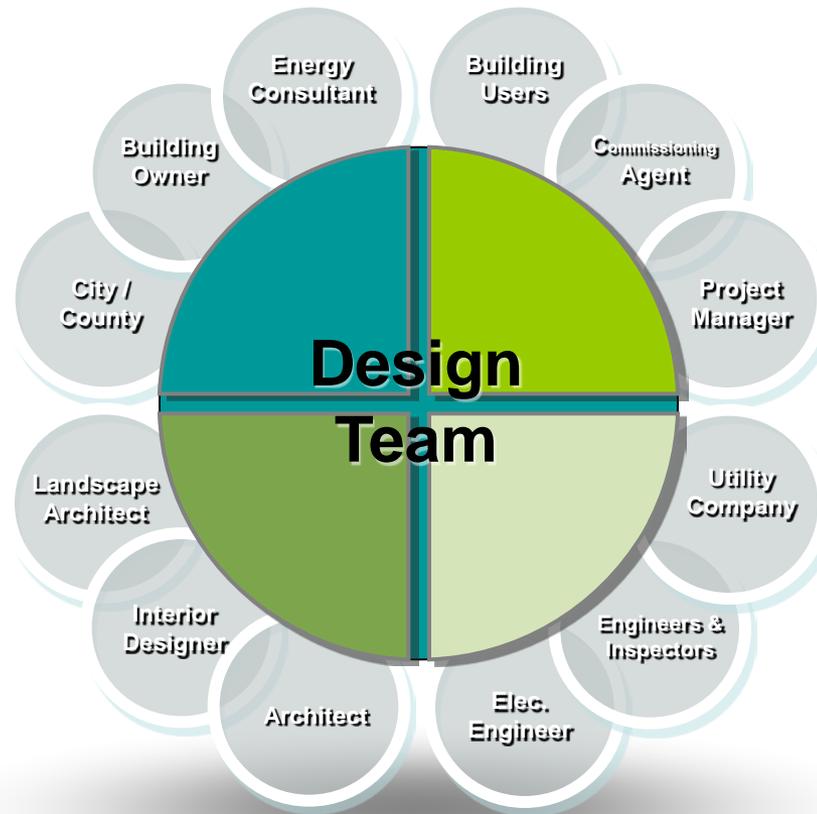


Sustainability – Processes and Implementation

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

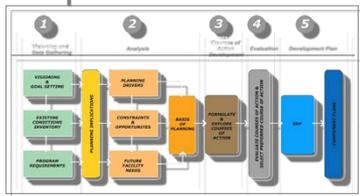
The Charrette should result in unified sustainability, design and construction goals for everyone to work toward

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

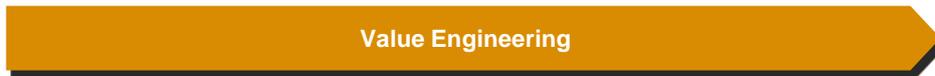
- Submit Const. Credits to USGBC
- Hang LEED Plaque



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



The Eco-Charrette Process

CHARRETTE OBJECTIVES

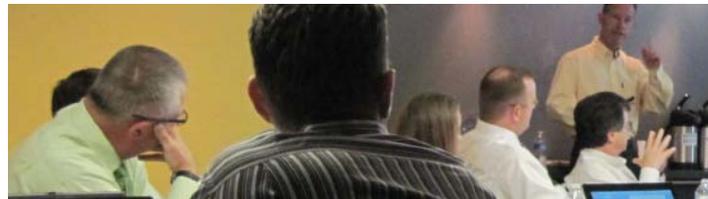
ESTABLISH A
MULTI-DISCIPLINARY TEAM
TO SET AND AGREE
ON COMMON
PROJECT GOALS

INITIATE
PLANNING PROCESS
WITH A VISIONING
AND EDUCATION SESSION

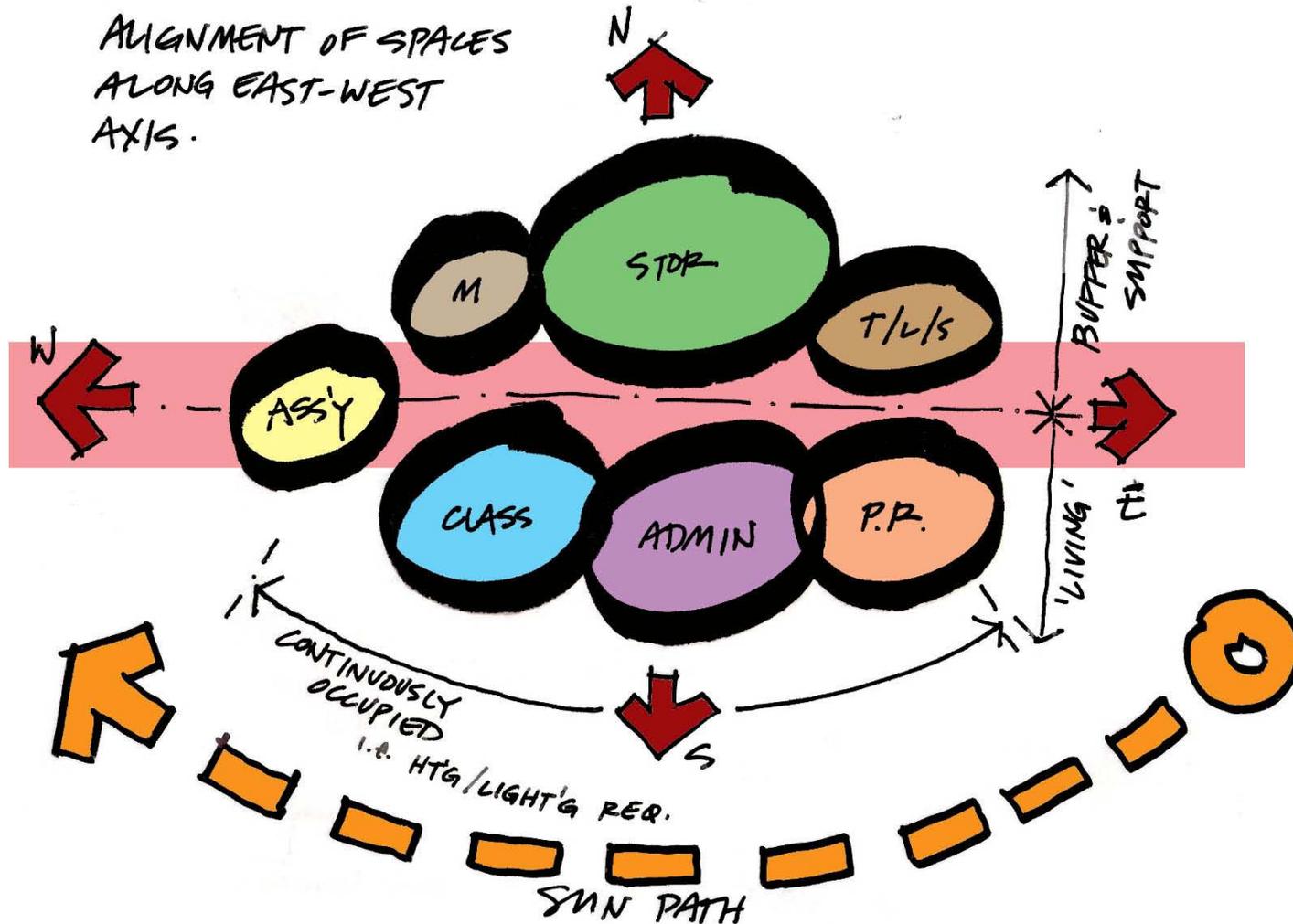
DEVELOP
EARLY CONSENSUS
ON PROJECT PLANNING
PRIORITIES

GENERATE
EARLY EXPECTATIONS/
QUANTIFIABLE METRICS
FOR FINAL ENERGY AND
ENVIRONMENTAL OUTCOMES

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



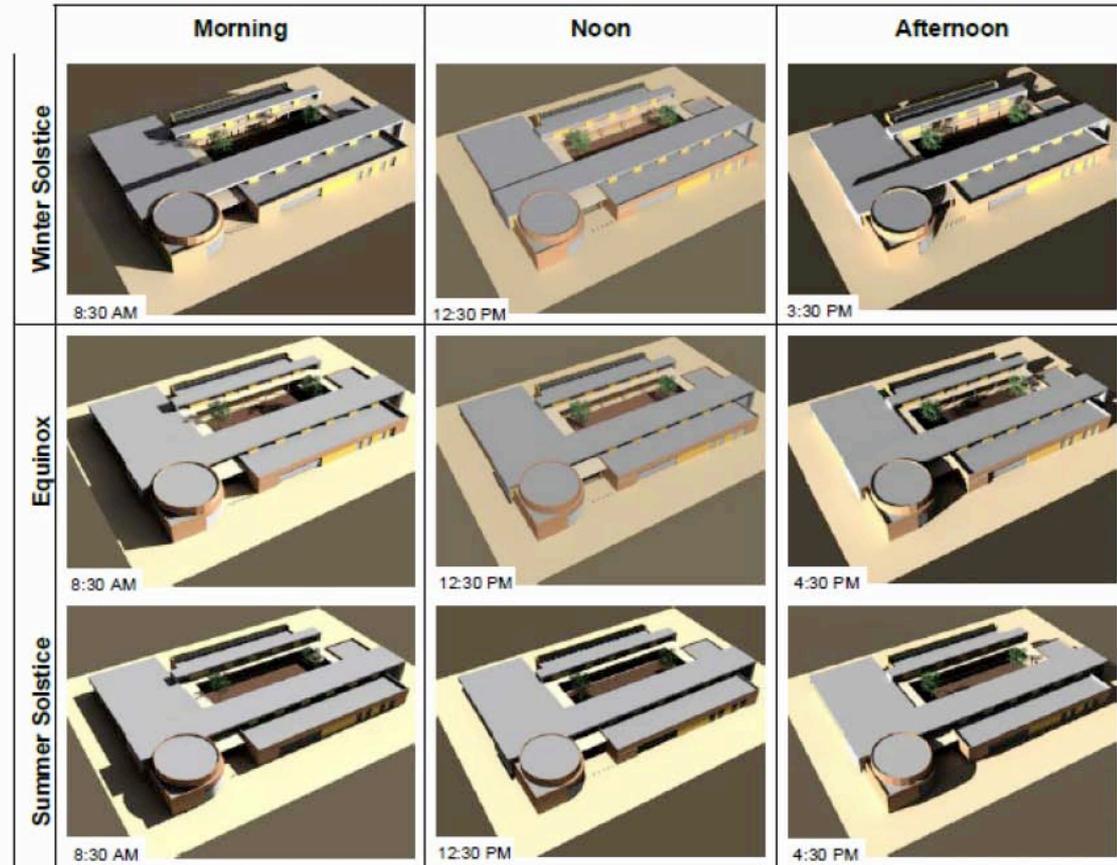
Design Process - Building Orientation



Daylight and Building Massing

Influenced Solar Hot Water And Courtyard Design

Site Solar Shading (from southwest corner)



Daylight Harvesting

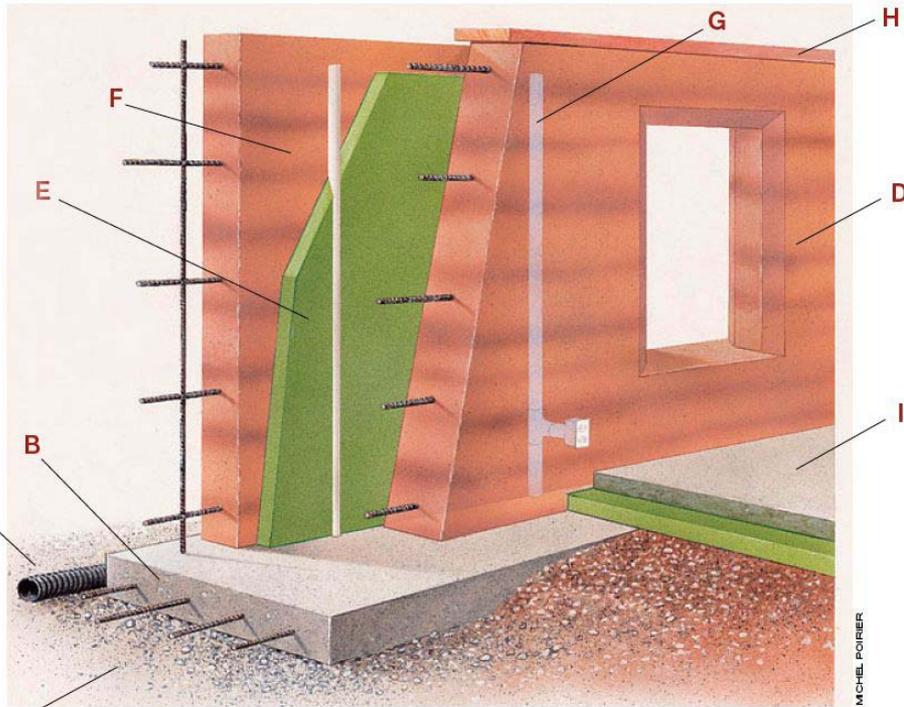
Average Annual Illumination, foot-candles (fc) - Scheme E
Winter, Overcast Sky Conditions, Las Cruces, NM



Internal
Photometrics:
95% Spaces
Natural Daylight

Solar Tubes
Utilized

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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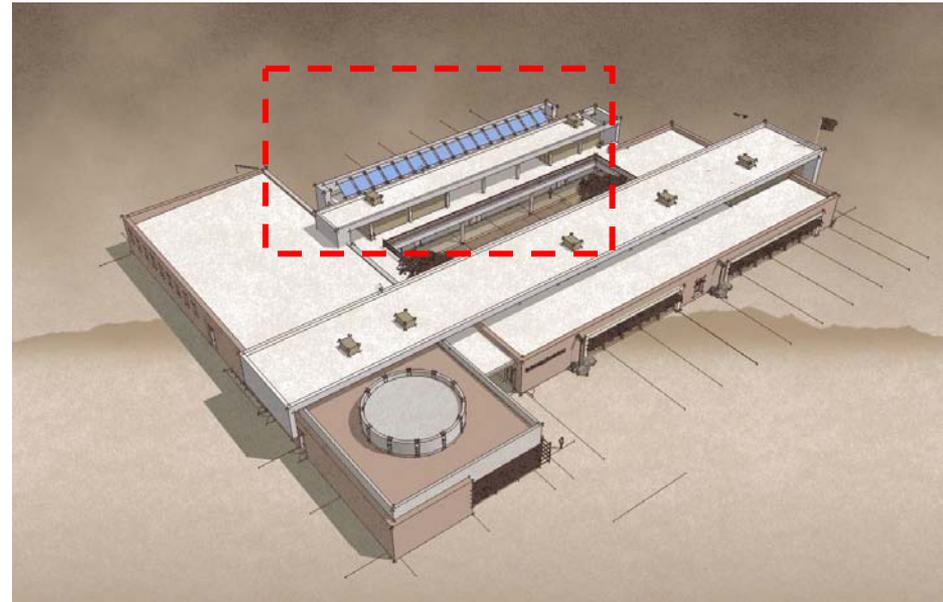
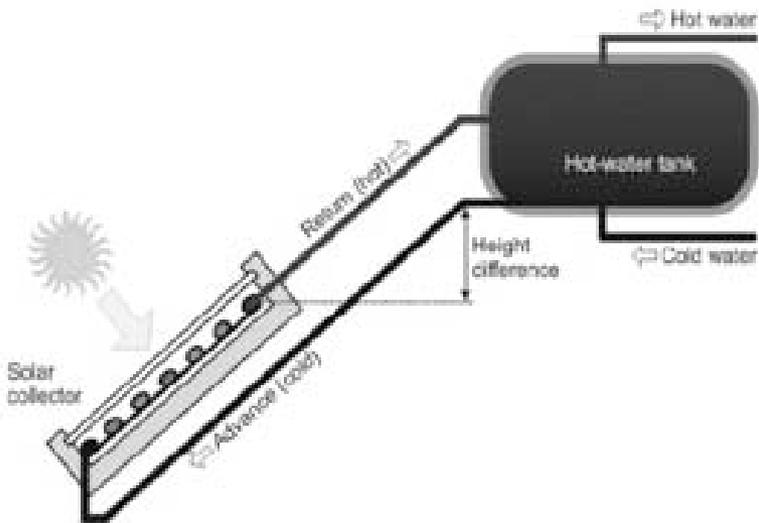
Kitchen Efficiency - Improvements

- **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"**

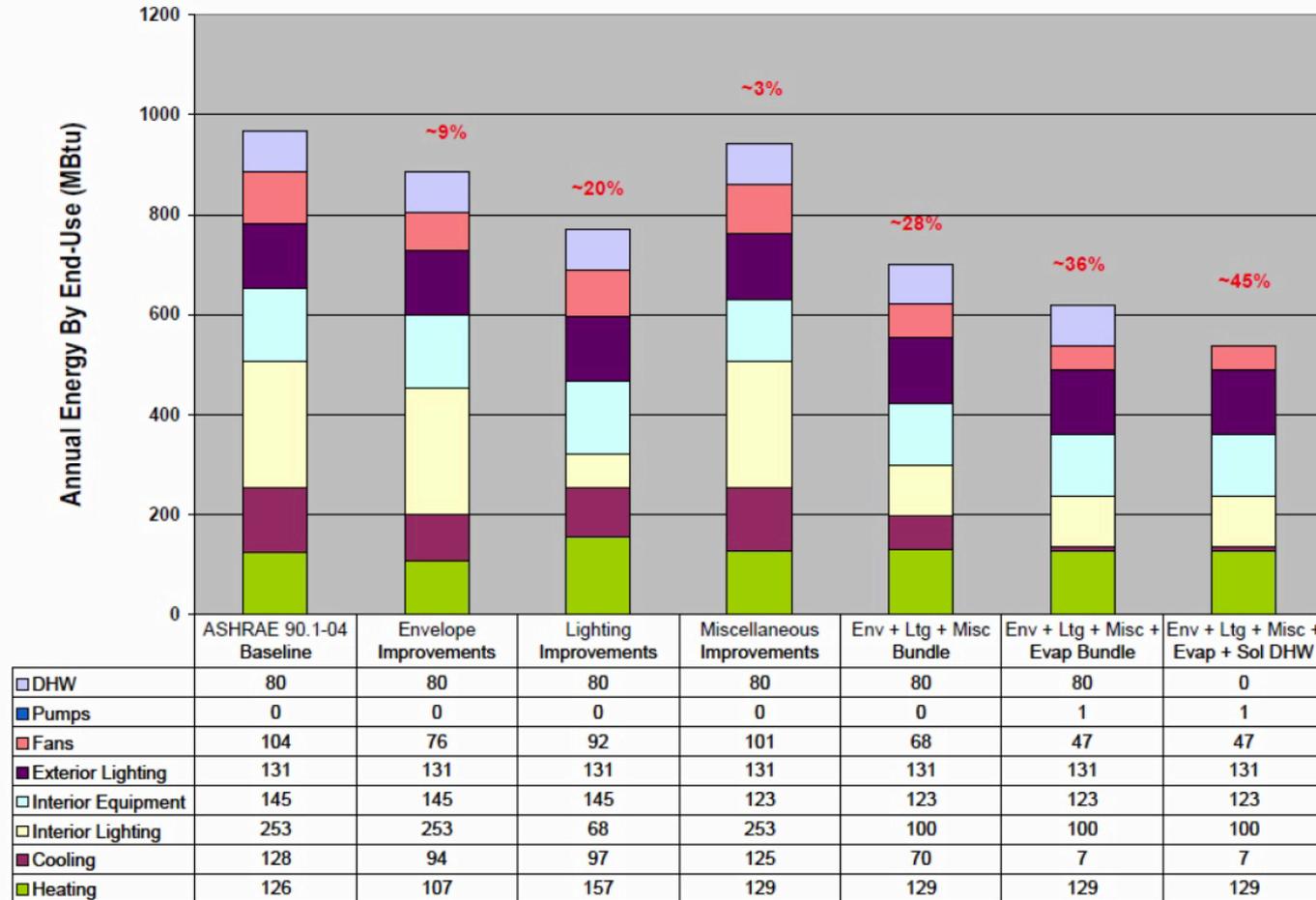
Solar Hot Water Panels

EISA 2007: 30% Domestic Hot Water Demand Minimum

Located at the Training Facility and the OMS Building



Preliminary Energy Analysis



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**

Solar Energy – Photovoltaics

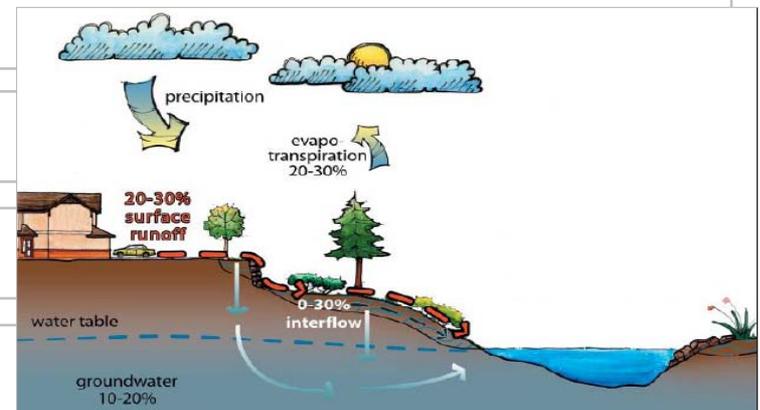
POV Parking Solar Canopy:

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

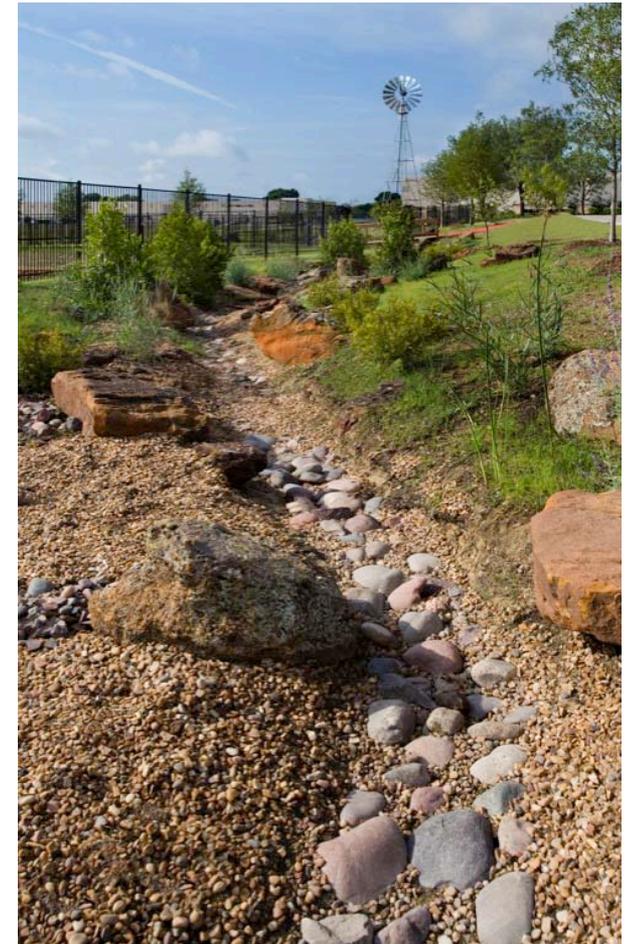
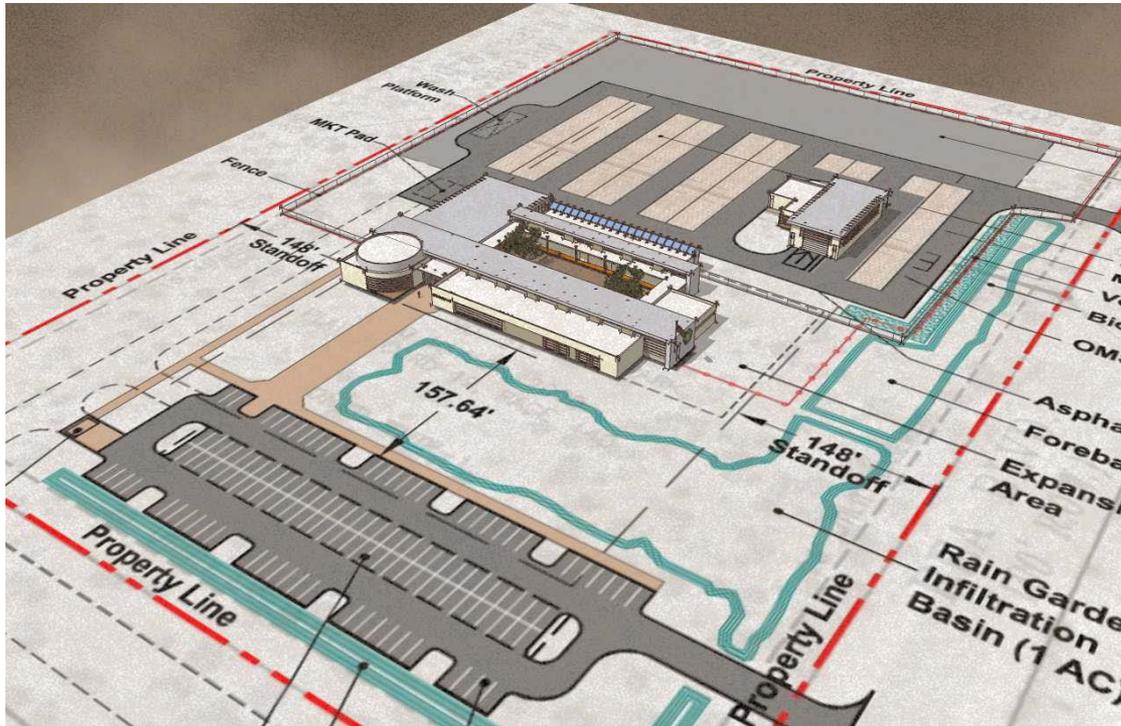


Low Impact Development

- 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



Stormwater Management

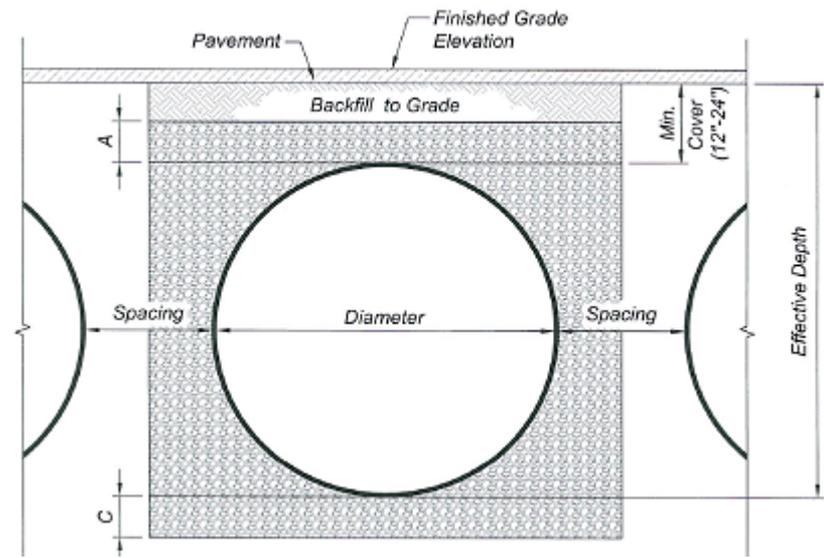


**UFC 3-210-10: Low Impact Development
Bioswales, Raingardens, Pervious Surfaces**

Rainwater Harvesting

Current Design

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



Water Efficiency



Climate Appropriate Plants



Waterless Urinals

Training Building – Plan



Façade View



NE Courtyard



Training SE Aerial



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



Thank you

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