



ARMY RESERVE CENTER

Las Cruces, New Mexico
Energy Reduction Pilot Project

ACHIEVING NET ZERO

E²S²

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

May 11, 2011

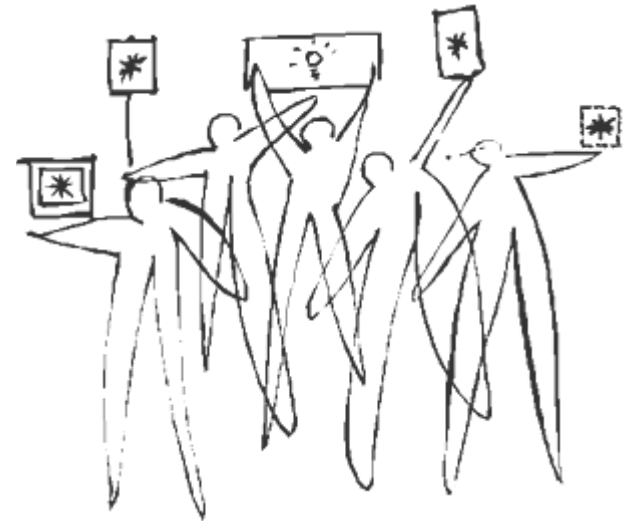


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Jacobs

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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
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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



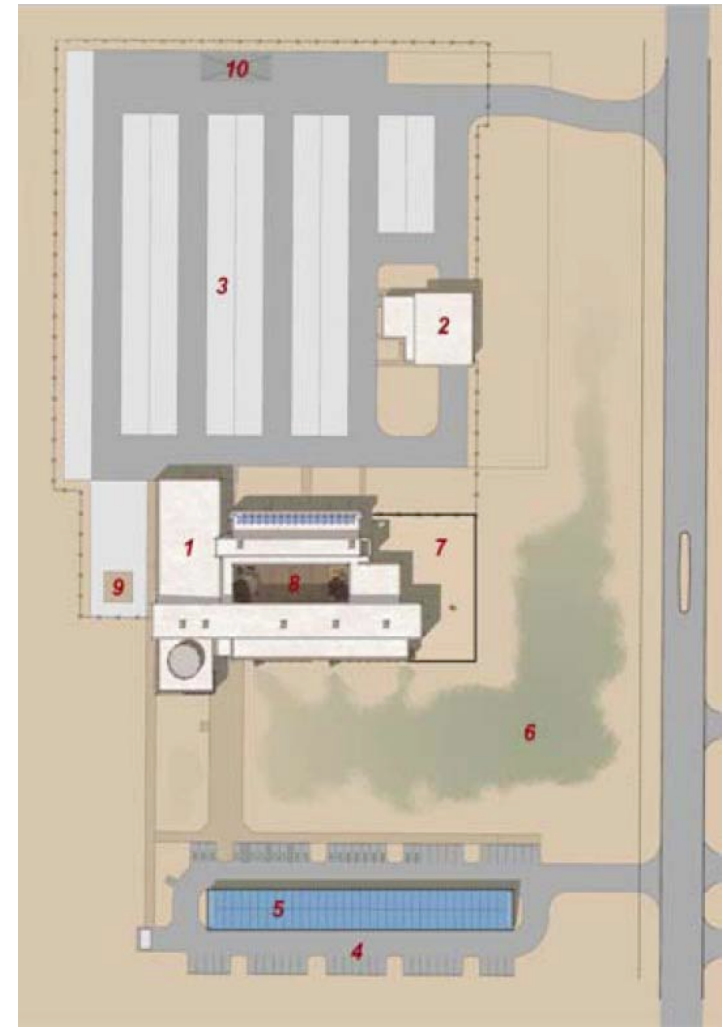
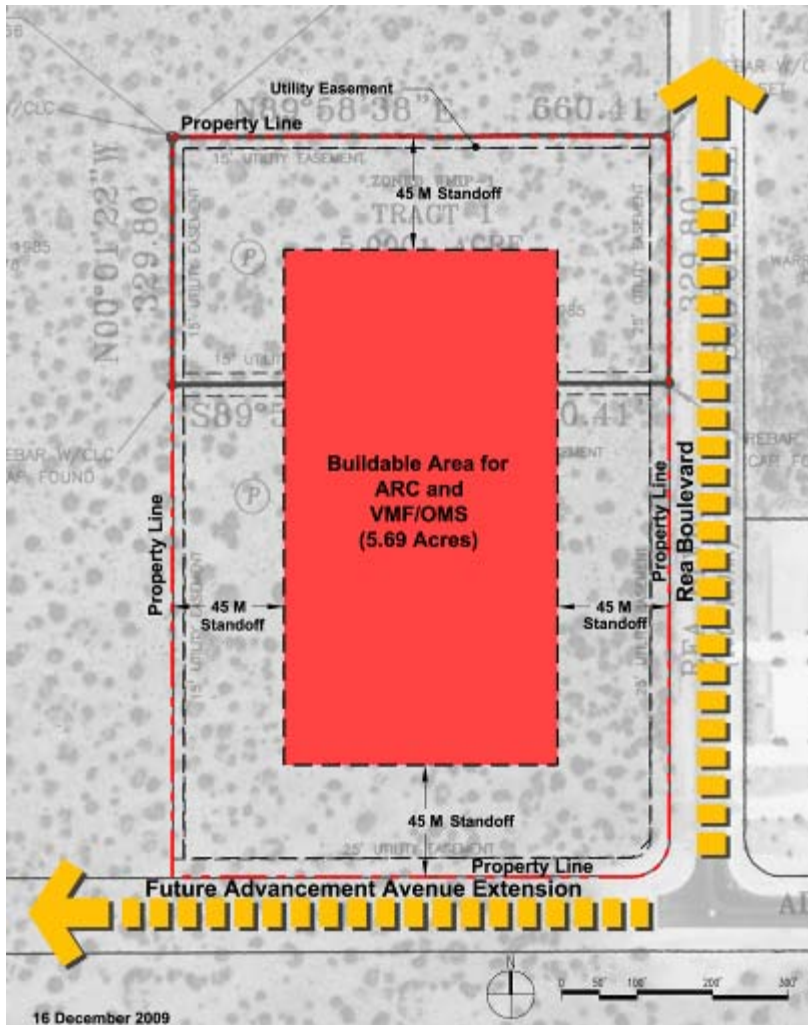
Total Area – 15 Acres
Buildable Area with
ATFP – 5.69 Acres

Flat Site with Hillocks

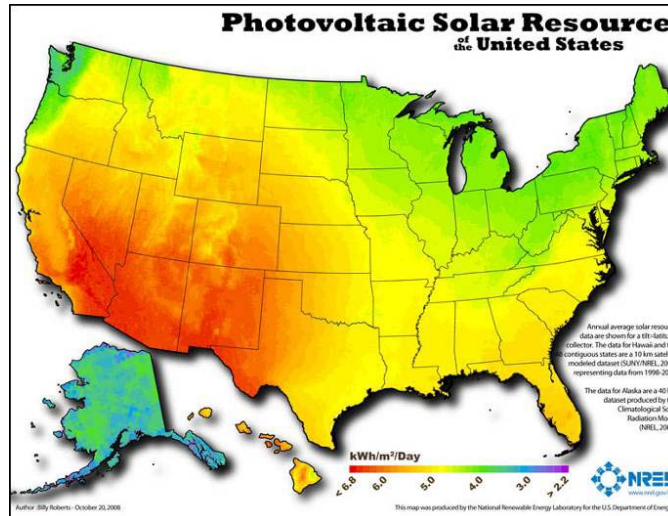
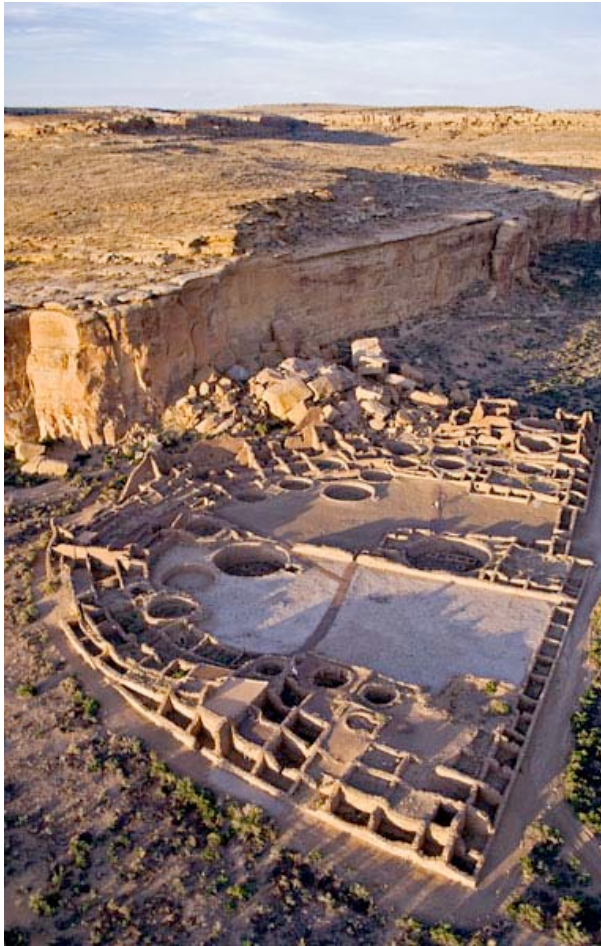


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Project Site and ATFP



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 Armaments Overhaul / Test Facility
 Ogden, UT

5 14 Sustainable Sites 14 Points

Req	Cr	Points	Required	Achievable	Maybe
Req1	Construction Activity Pollution Prevention	1			
Cr11	Site Selection	1			
Cr12	Development Density & Community Connectivity	1			
Cr13	Brownfield Redevelopment	1			
Cr14	Alternative Transportation, P	1			
Cr15	Alternative Transportation, S	1			
Cr16	Alternative Transportation, L	1			
Cr17	Alternative Transportation, P	1			
Cr18	Site Development, Protect or	1			
Cr19	Stormwater Design, Quality	1			
Cr20	Stormwater Design, Quantity	1			
Cr21	Heat Island Effect, Non-Roof	1			
Cr22	Heat Island Effect, Roof	1			
Cr23	Light Pollution Reduction	1			

4 1 Water Efficiency 4 Points

Req	Cr	Points	Required	Achievable	Maybe
Req1	Water Efficient Landscaping	1			
Cr1	Water Efficient Landscaping	1			
Cr2	Innovative Water Efficient Tech	1			
Cr3	Water Use Reduction, 20% P	1			
Cr4	Water Use Reduction, 30% P	1			

11 1 Energy & Atmosphere 11 Points

Req	Cr	Points	Required	Achievable	Maybe
Req1	Fundamental Commissioning	1			
Req2	Minimum Energy Performance	1			
Req3	Fundamental Refrigerant Man	1			
Cr1	Optimize Energy Performance	1			
Cr2	On-Site Renewable Energy	1			
Cr3	Enhanced Commissioning	1			
Cr4	Enhanced Refrigerant Manag	1			
Cr5	Measurement & Verification	1			
Cr6	Green Power	1			

13 1 Materials & Resources 13 Points

Req	Cr	Points	Required	Achievable	Maybe
Req1	Storage & Collection of Recyclables	1			
Cr1	Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1			
Cr2	Building Reuse, Maintain 100% of Existing Walls, Floors & Roof	1			
Cr3	Building Reuse, Maintain 20% of Existing Walls, Floors & Roof	1			
Cr4	Construction Waste Management, Divert 75% from Disposal	1			
Cr5	Construction Waste Management, Divert 50% from Disposal	1			
Cr6	Materials Reuse, 2%	1			
Cr7	Materials Reuse, 10%	1			
Cr8	Recycled Content, 10% post-consumer + 1% pre-consumer	1			
Cr9	Recycled Content, 20% post-consumer + 1% pre-consumer	1			
Cr10	Regional Materials, 10% Extracted, Processed & Manufactured Regionally	1			
Cr11	Regional Materials, 20% Extracted, Processed & Manufactured Regionally	1			
Cr12	Rapidly Renewable Materials	1			
Cr13	Certified Wood	1			

15 1 Indoor Environmental Quality 15 Points

Req	Cr	Points	Required	Achievable	Maybe
Req1	Minimum IAQ Performance	1			
Req2	Environmental Tobacco Smoke (ETS) Control	1			
Cr1	Outdoor Air Delivery Monitoring	1			
Cr2	Increased Ventilation	1			
Cr3	Construction IAQ Management Plan, During Construction	1			
Cr4	Construction IAQ Management Plan, Before Occupancy	1			
Cr5	Low-Emitting Materials, Adhesives & Sealants	1			
Cr6	Low-Emitting Materials, Paints & Coatings	1			
Cr7	Low-Emitting Materials, Composite Wood & Agglomerate Products	1			
Cr8	Indoor Chemical & Pollutant Source Control	1			
Cr9	Controllability of Systems, Lighting	1			
Cr10	Controllability of Systems, Thermal Comfort	1			
Cr11	Thermal Comfort, Design	1			
Cr12	Thermal Comfort, Verification	1			
Cr13	Daylight & Views, Daylight 75% of Spaces	1			
Cr14	Daylight & Views, Views to 90% of Spaces	1			

5 1 Innovation & Design Process 5 Points

Req	Cr	Points	Required	Achievable	Maybe
Req1	Innovation in Design, Prerequisite Specific Title	1			
Cr1	Innovation in Design, Prerequisite Specific Title	1			
Cr2	Innovation in Design, Prerequisite Specific Title	1			
Cr3	Innovation in Design, Prerequisite Specific Title	1			
Cr4	LEED Accredited Professional	1			

63 10 Project Totals (pre-certification estimate) 63 Points
 Certified 30-32 points Silver 33-35 points Gold 36-40 points Platinum 41-49 points

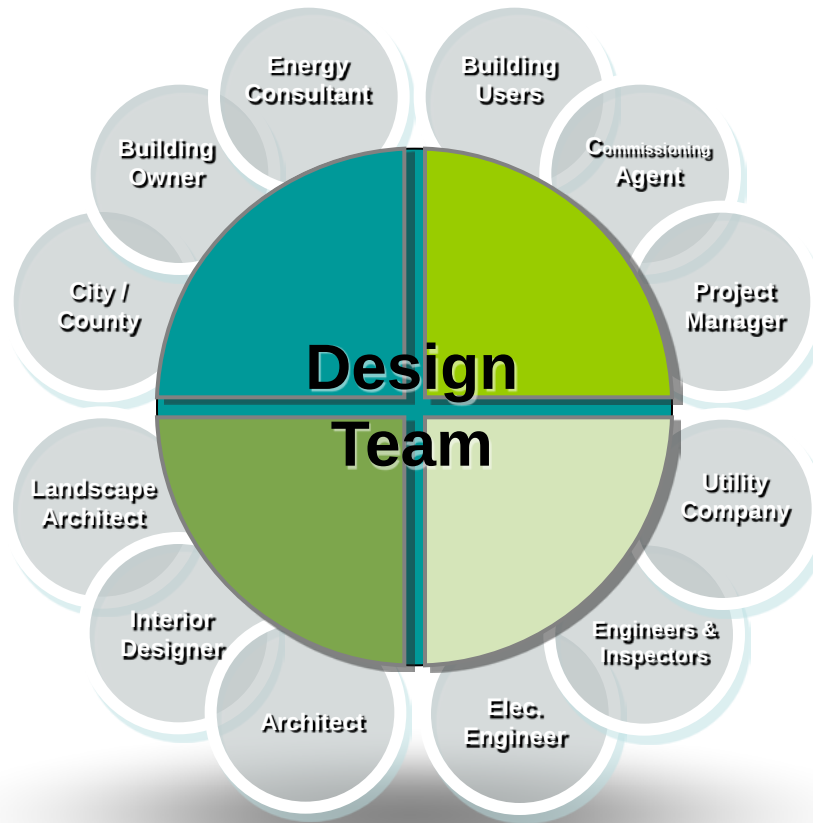
Sustainability – Processes and Implementation

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

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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

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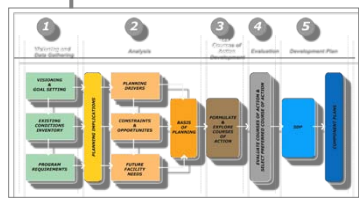
The Charrette should result in unified sustainability, design and construction goals for everyone to work toward

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

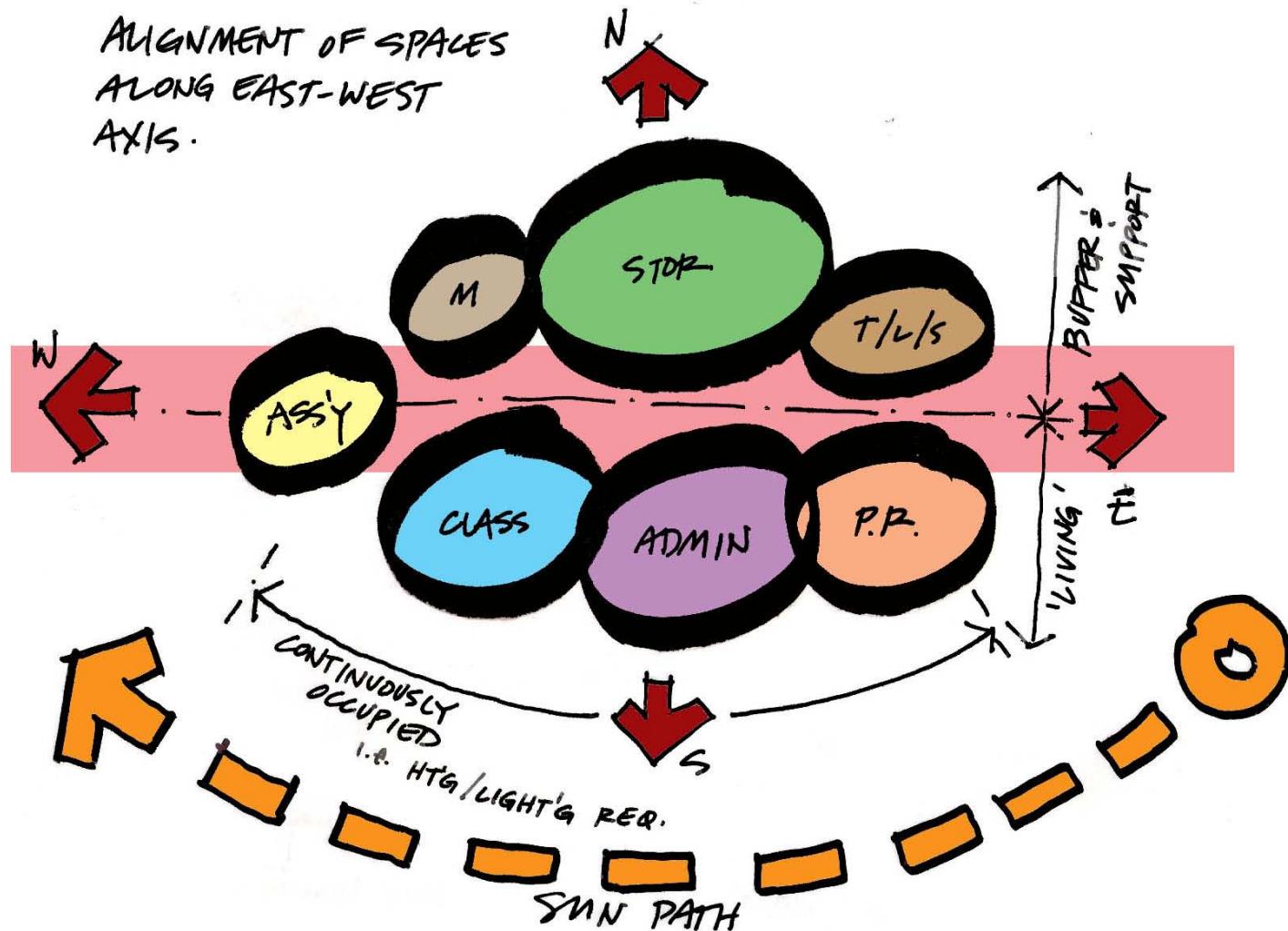
DEVELOP
EARLY CONSENSUS
ON PROJECT PLANNING
PRIORITIES

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



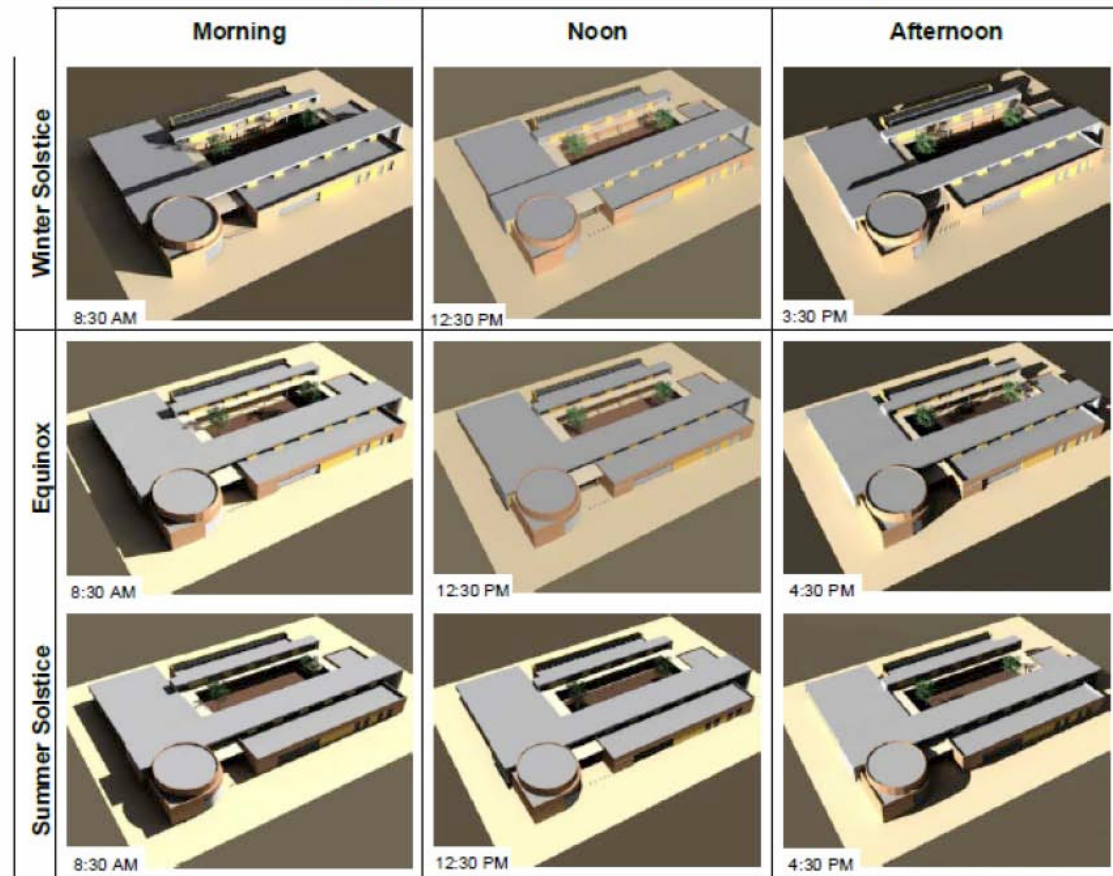
Design Process - Building Orientation



Daylight and Building Massing

Influenced Solar Hot Water And Courtyard Design

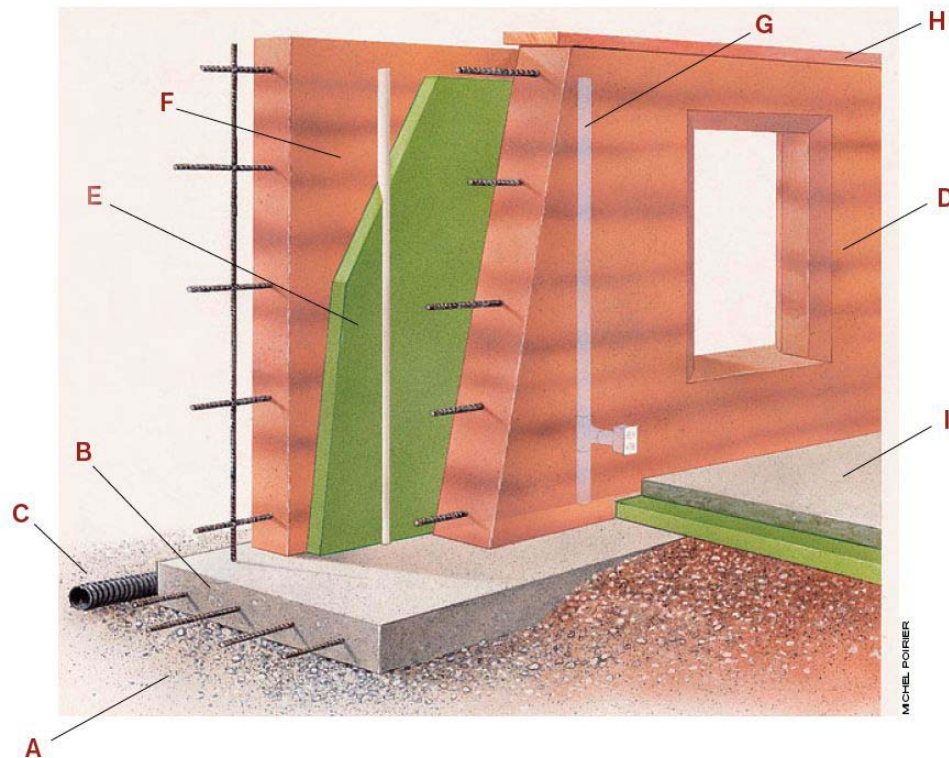
Site Solar Shading (from southwest corner)



**Internal
Photometrics:
95% Spaces
Natural Daylight
Solar Tubes
Utilized**

[illegible]

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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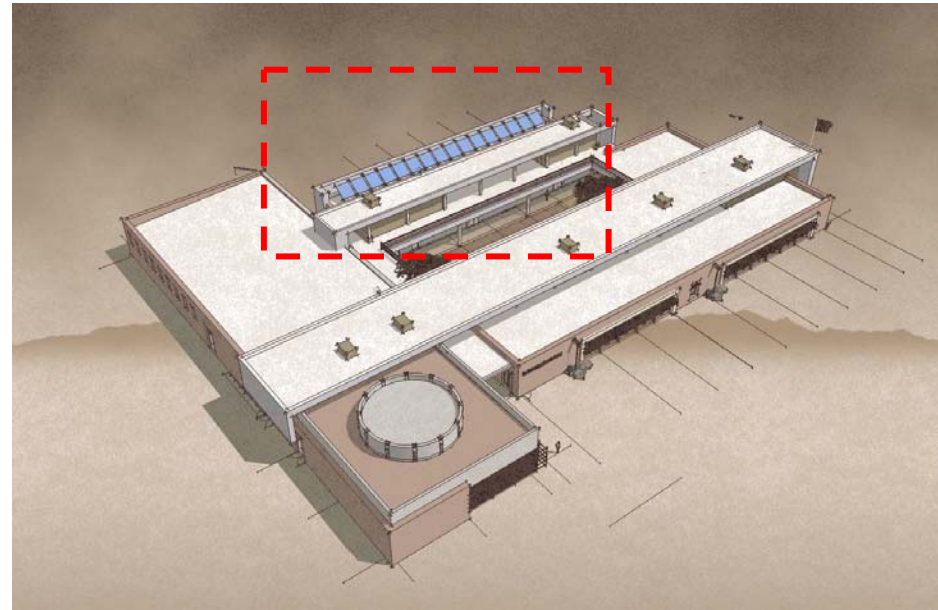
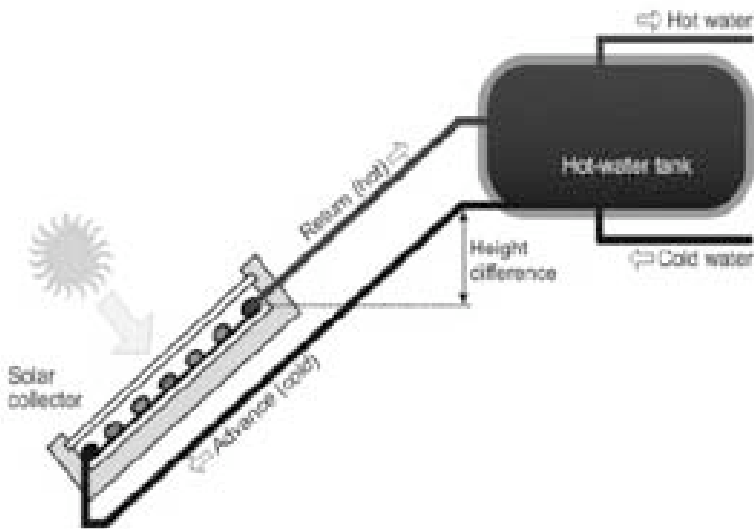
Kitchen Efficiency - Improvements

- 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"

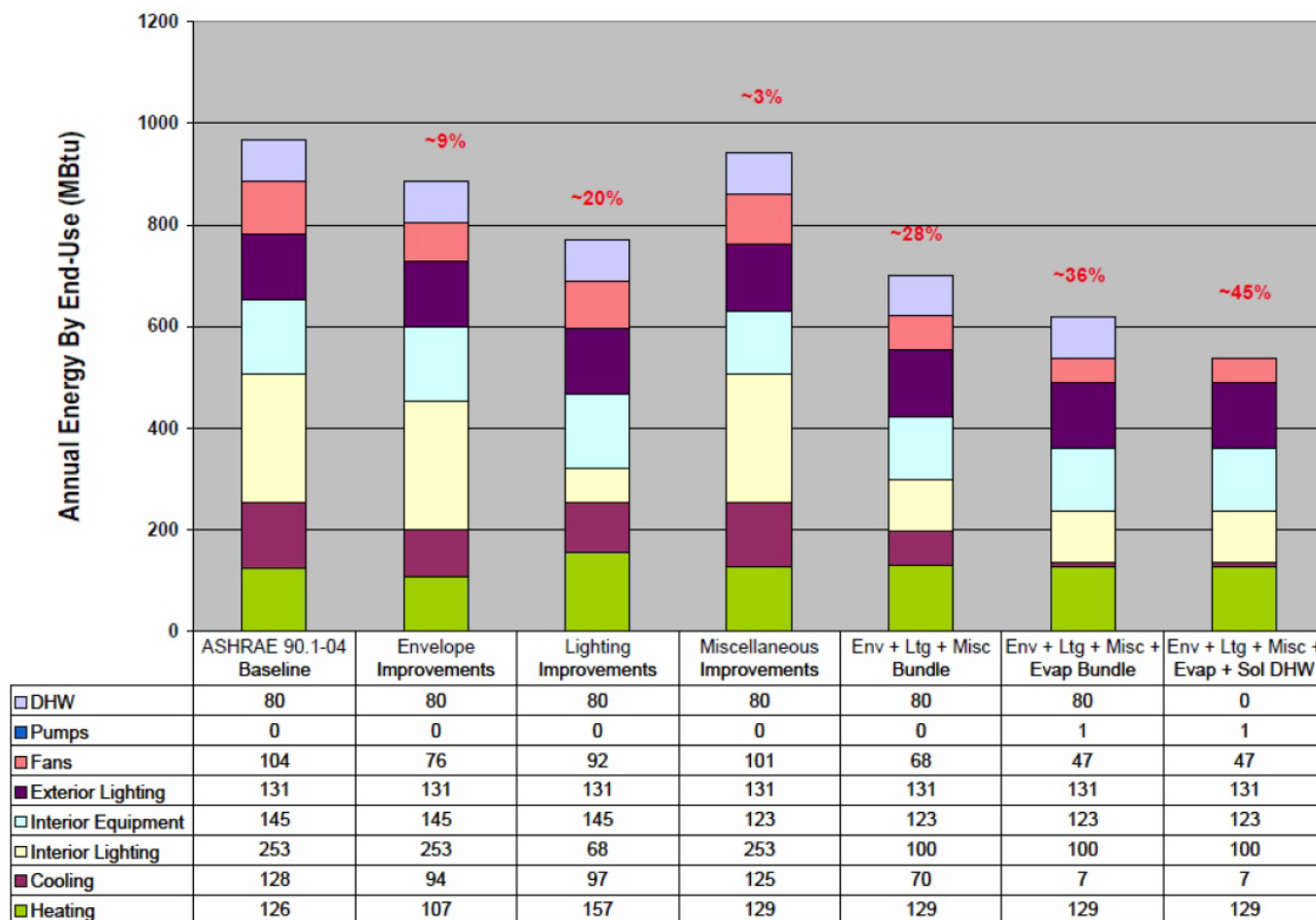
Solar Hot Water Panels

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

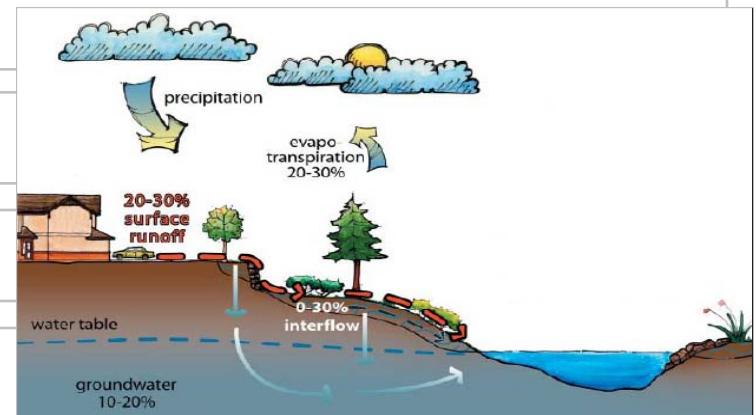
POV Parking Solar Canopy:

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

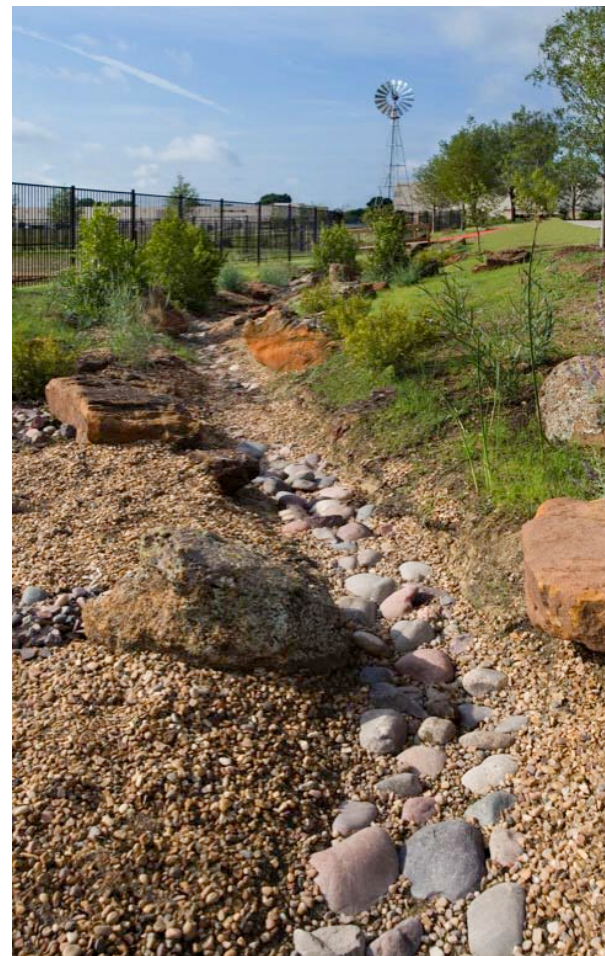
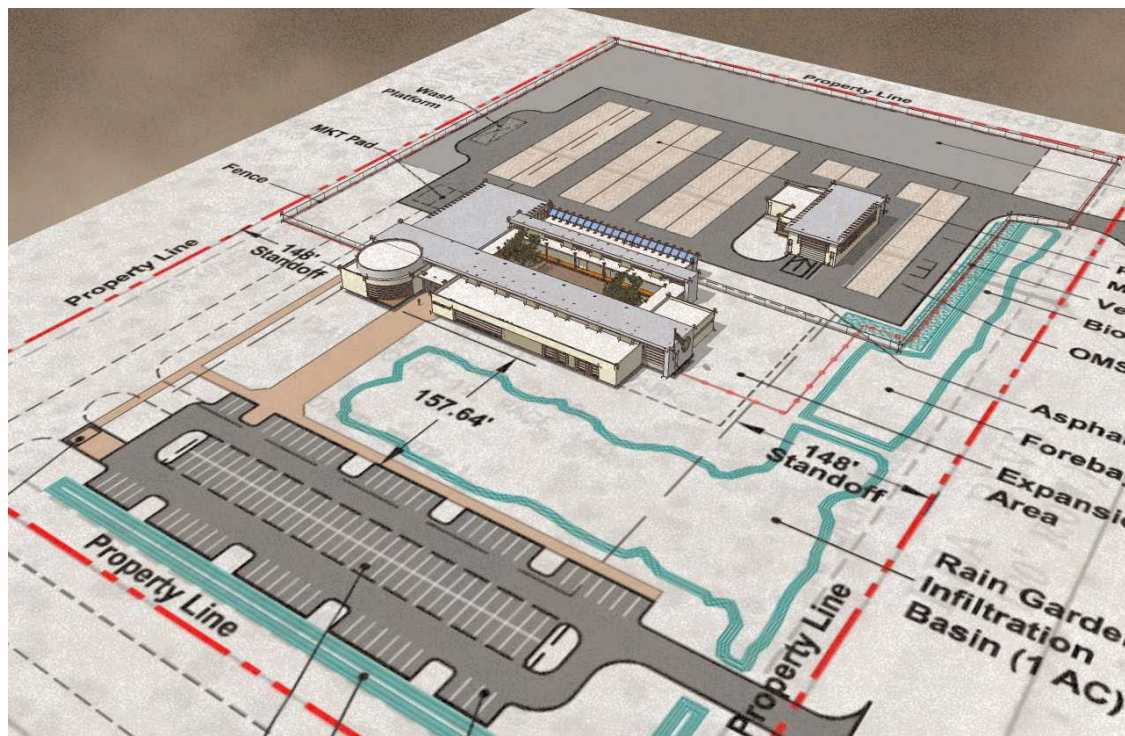


Low Impact Development

- 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

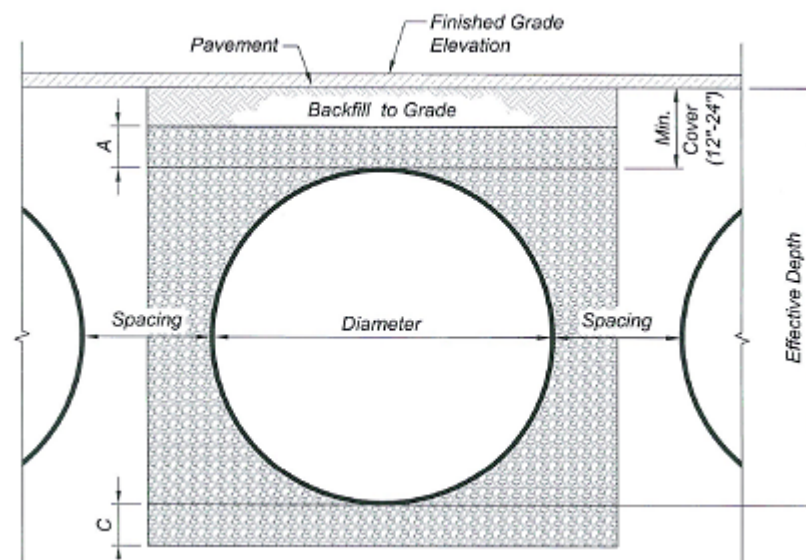
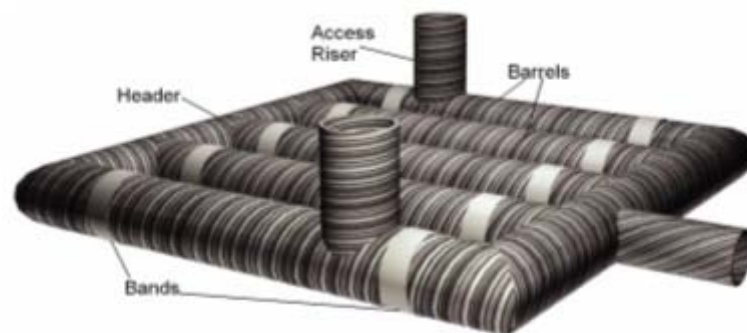


UFC 3-210-10: Low Impact Development
Bioswales, Raingardens, Pervious Surfaces

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

Questions



Thank you

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