tahoe center for environmental sciences

j. david maino

the pennsylvania state university

architectural engineering

lighting/electrical

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background

location:	Incline Village, NV
owners:	UC Davis, SNC, DRI
architect:	Lundahl & Associates
electrical:	Integrated Design Associates
lighting:	David Nelson & Associates
mechanical:	Rumsey Engineers
size:	45,000sf
stories:	3 floors + basement
consideration:	LEED Platinum Rating

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outline

- Lighting Depth
  - Lobby
    - Daylighting
  - Case Study Classroom
  - Chemistry Lab
  - Exterior
- Electrical Depth
  - Cogeneration
  - Photovoltaics
  - System Design
- Mechanical Breadth
  - Solar Hot Water
- LEED Breadth
  - LEED points analysis

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lighting

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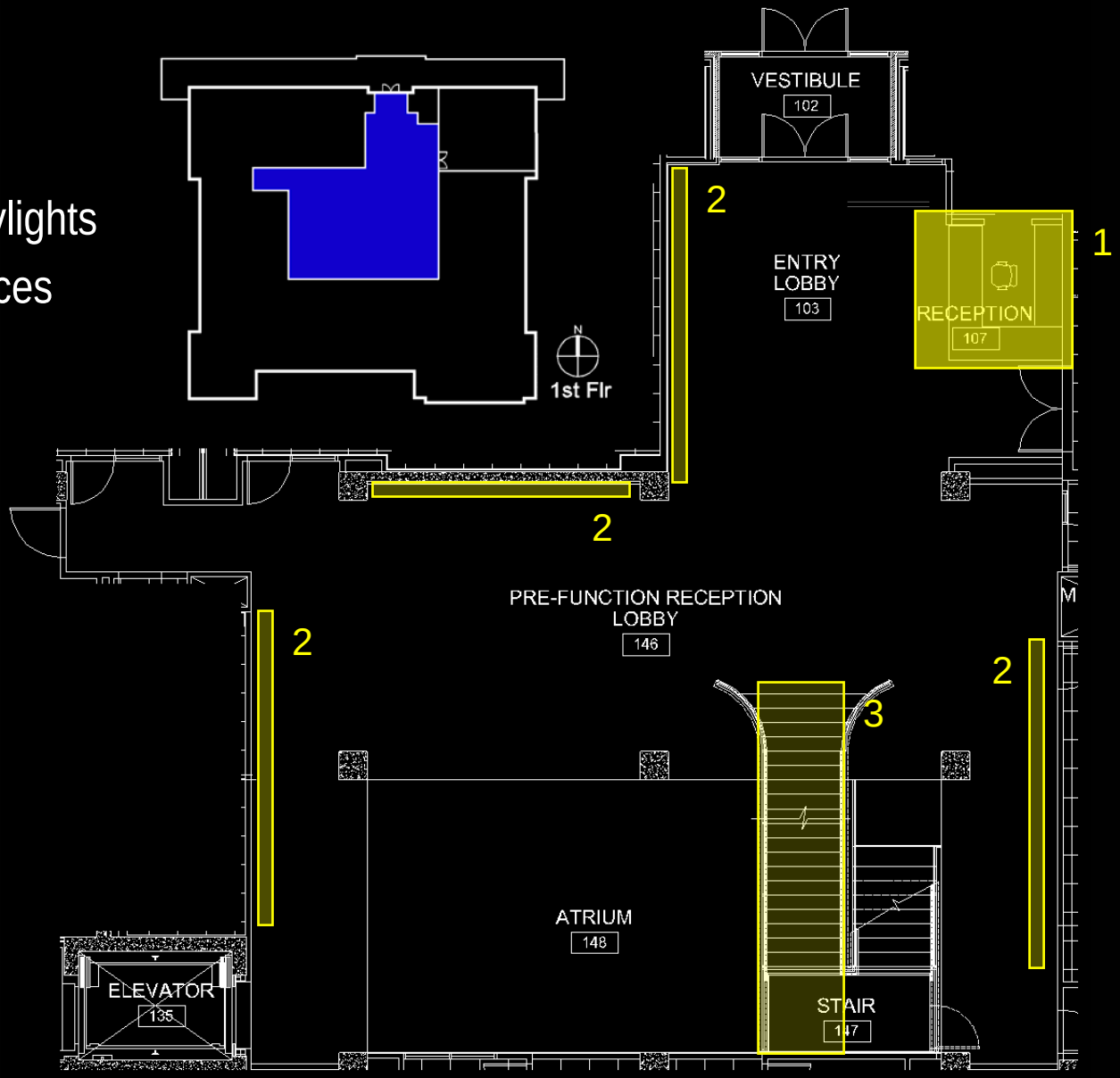
lighting - lobby

- Architecture
  - 3 story atrium w/ skylights
  - Bare concrete surfaces
  - Gyp. bd. art walls
  - Central stair case
- Design Goals
  - Green design
  - Fixture appearance
  - Visual hierarchy



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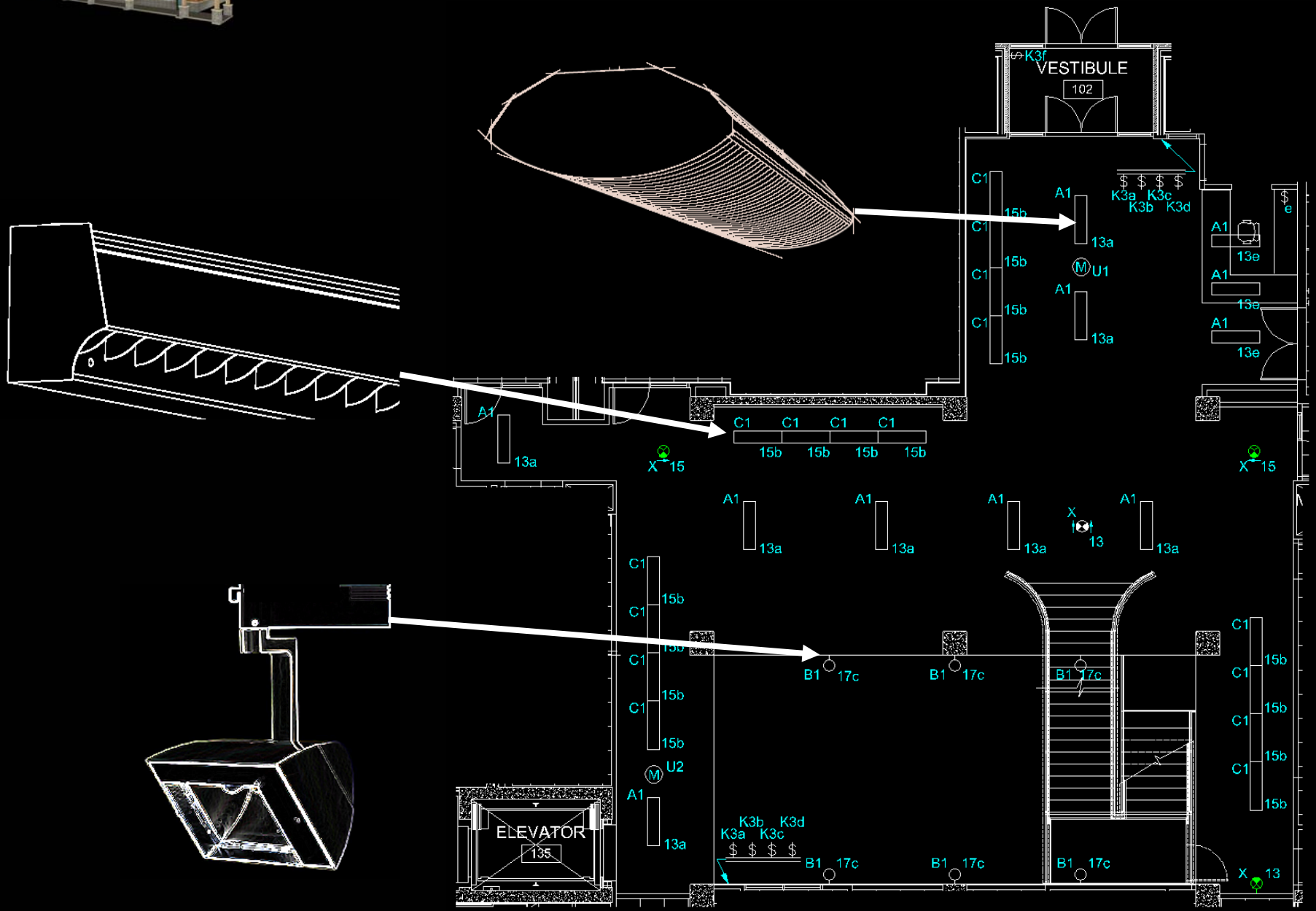
lighting - lobby



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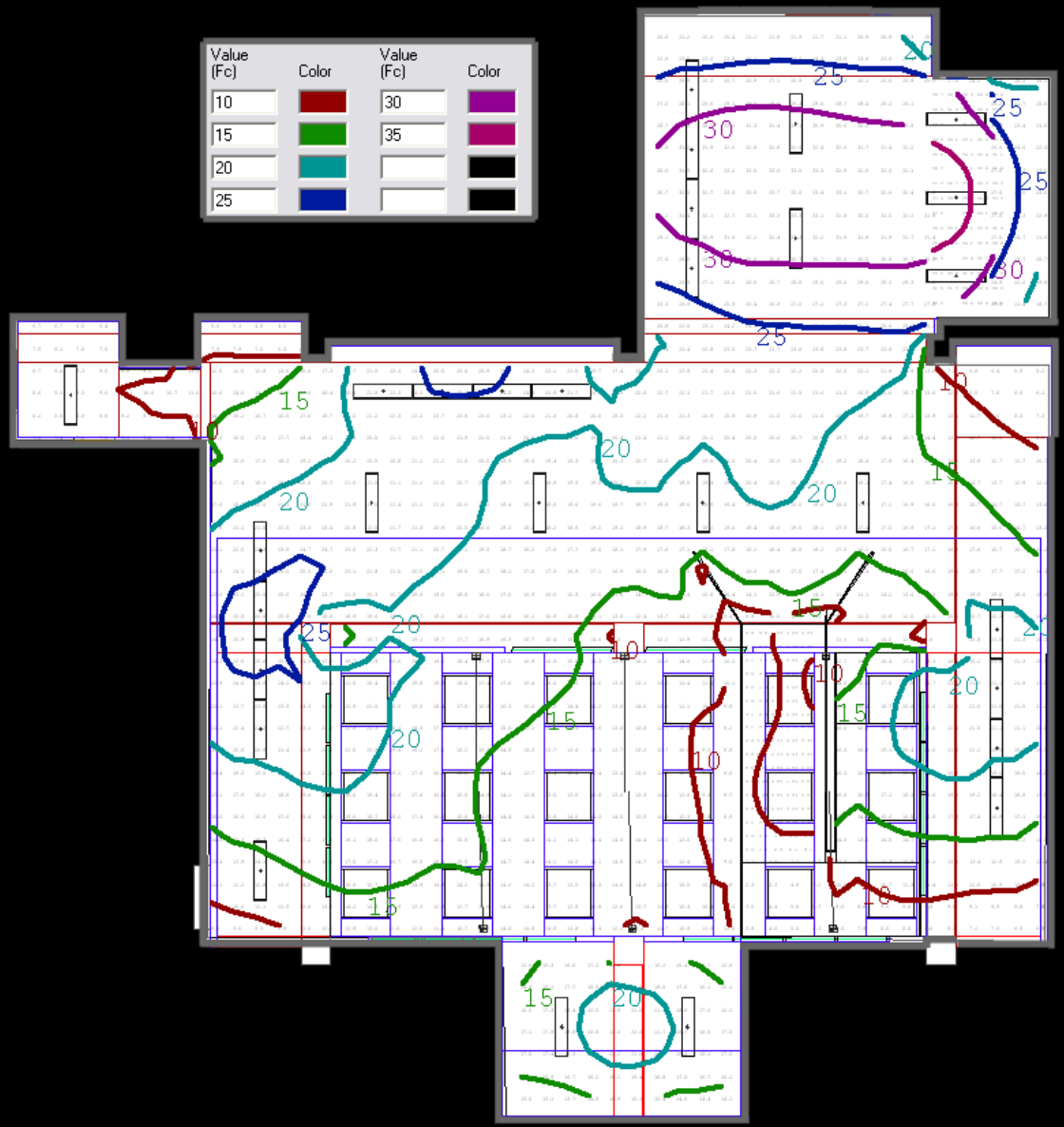
lighting - lobby

- Light Levels
  - 32 fc receptionist desk
  - 18 fc lobby floor
  - 25 fc wall
  - 10 fc stairs
- Power Density
  - 0.55 W/sf



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lighting - lobby

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lighting - lobby

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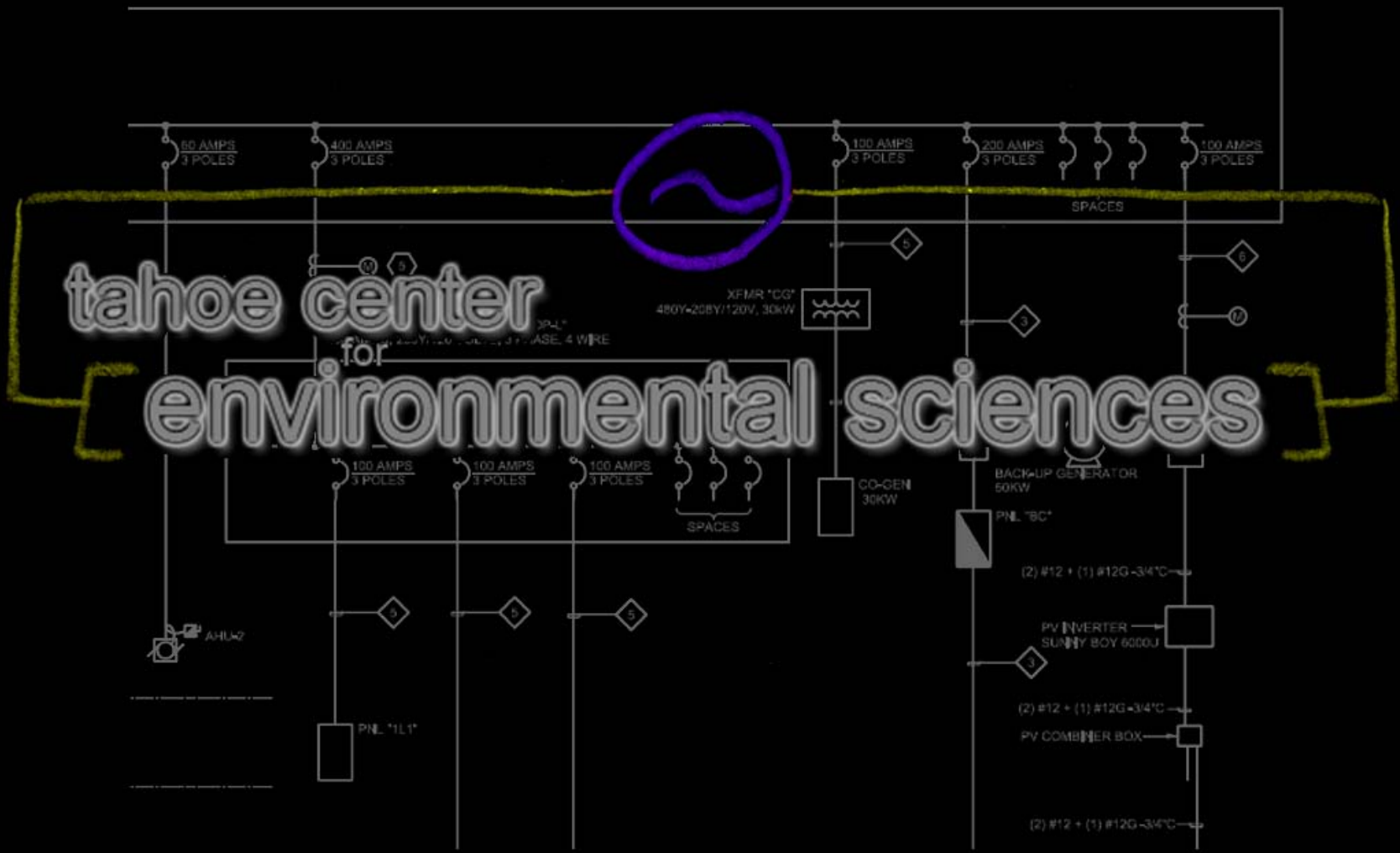
electrical



- Design Goals
  - Power generation makes sense with load
  - Generate less emissions than grid
  - Payback < 10 years

- Load Characteristics
  - Found using eQuest
  - < 30kW at night
  - 190kW < Load < 300kW during the day

Abbreviated eQuest output	
Month	**Load (kW)**
January	193.2
February	204.5
March	220.0
April	268.7
May	254.7
June	255.5
July	268.1
August	244.7
September	302.6
October	236.0
November	234.0
December	196.8

- Design Solution
  - (2) 30kW Microturbines
  - Both on during the day
  - One on at night
- Load
  - 60kW of generation during day
  - Constant generation ~30kW at night
  - Makes sense with Load

Abbreviated eQuest output	
Month	**Load (kW)**
January	193.2
February	204.5
March	220.0
April	268.7
May	254.7
June	255.5
July	268.1
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electrical - cogen

- Emissions
  - Based on Electric Power Annual
  - SAVES: 340 lbm particulates per year
  - SAVES: 3,900 lbm SO_x per year
  - SAVES: 2,200 lbm NO_x per year
  - SAVES: 660,000 lbm CO_2 per year
- Payback
  - $1,500 per installed kW
  - $40,000 for BOS, contingencies, etc.
  - Elec. and Gas prices obtained from Nevada Power
  - 8 year payback

I WOULD Recommend

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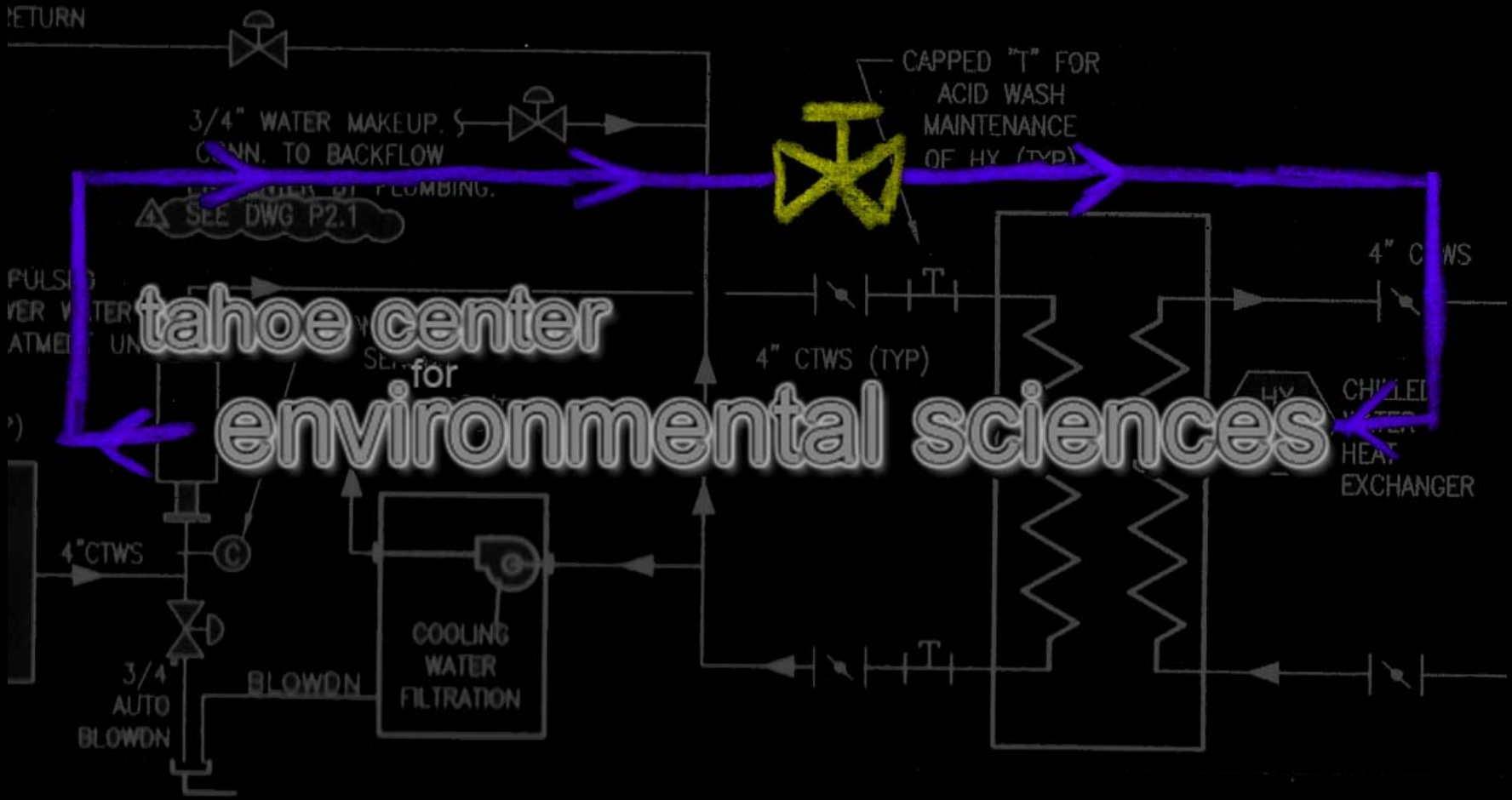
mechanical



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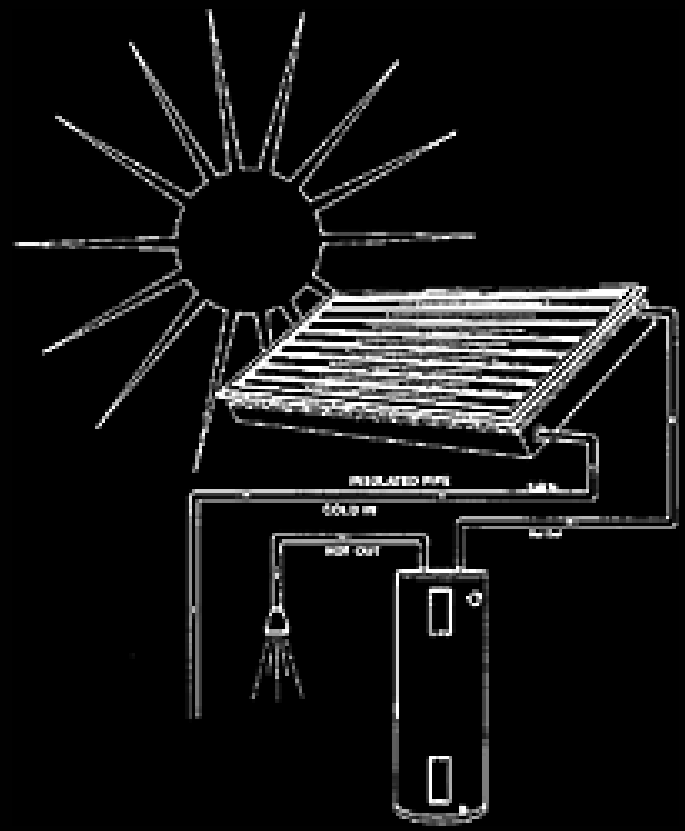
mechanical - SHW

- Design Goals
  - Reasonable with building hot water load
  - Fits onto roof area
  - Payback < 10 years
  - Emissions < using nat. gas boiler
- Hot Water Load
  - Obtained from eQuest and RETScreen
  - 2.2 million BTUs per hour total
  - Cogen units produce 0.3 million BTUs per hour
- Roof Area
  - 360sf useable, continuous roof area



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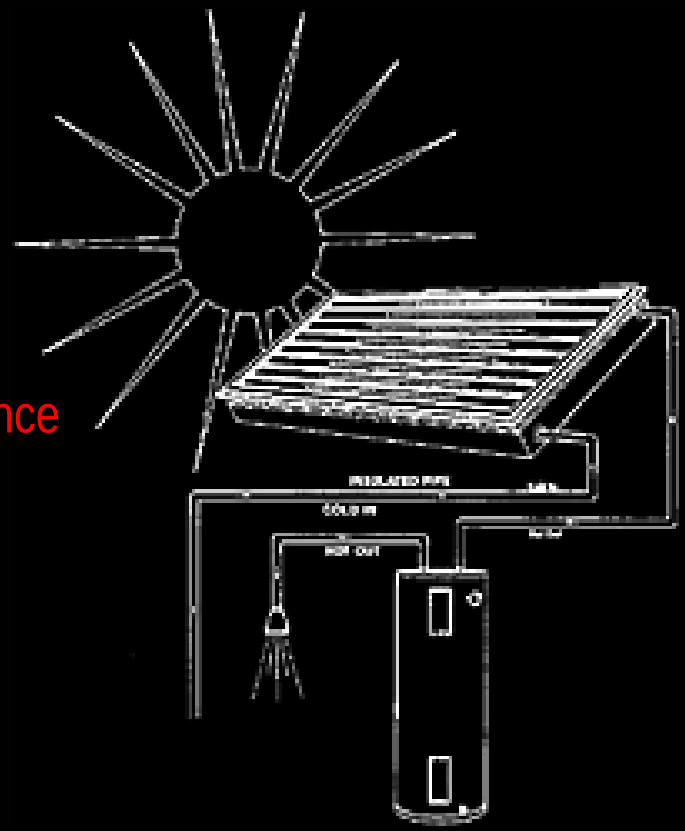
mechanical - SHW

- Design Solution
  - (6) 4’ x 10’ flat plate collectors
- Hot Water Load
  - Gain of 0.049 million BTUs per hour
  - 2.2% of Load
- Roof Area
  - Fits into area available, but little room for maintenance
- Emissions
  - RETScreen & EPA data used
  - SAVES: 2,200 lbm CO_2 per year
- Payback
  - RETScreen cost database used
  - 16 year payback



I Would NOT Recommend

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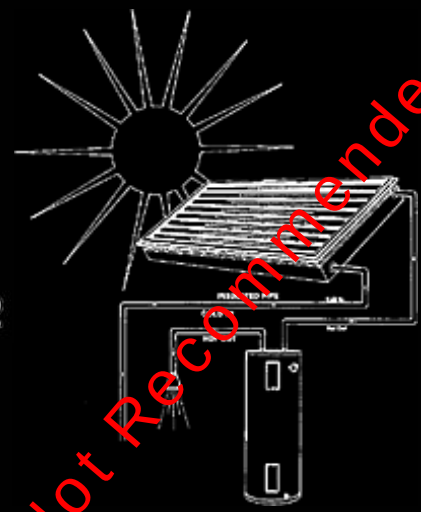
conclusions

- Lighting
  - Fixtures fit with architecture and are efficient
  - Light levels adequate for space use
  - Visual hierarchy achieved
- Cogeneration
  - (2) 30kW microturbines fit with building load
  - Hot water is usable
  - Large emissions savings
  - 8 year payback
- Solar Hot Water
  - (6) 4’ x 10’ collectors provide little load
  - Collectors fit, but no other room
  - Small emissions savings
  - 16 year payback



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questions