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Value Engineering and the Impacts to Ongoing Maintenance/Operations

LHB

MCCFMA Fall Conference 2023

Agenda

- Introductions
- Why are We Here?
- Selecting A Design Standard
- What is Value Engineering?
- Value Saving Considerations
  - Building Envelope
  - Building Reclassification
  - Building Benchmarking
- System Considerations
  - Mechanical Systems
  - Acoustics
  - Lighting
- Funding Options
- Questions

We Don't Know What We Don't Know

- Donald Rumsfeld

Why Improve Our Buildings?

Reduce Building Maintenance Costs

Reduce Operating Costs/Energy Efficiencies

Modernize/Replace Obsolete Systems

Remove Hazardous Conditions/Materials

Address Complaints (Staff and Visitors)

Opportunities Provided by Added Funding

Improve/Expand Working Environments

So related to any of these projects, What does VALUE ENGINEERING mean to you?

ARE YOU STARTING WITH PROJECT GOALS ARE THEY PART OF YOUR CONTRACTS/AGREEMENTS

Your Tools to Guide Decision Making

INTERNATIONAL WELL BUILDING INSTITUTE

AIR

- Quality
- Purification
- Humidity

WATER

- Quality
- Treatment
- Drinking Promotion

LIGHT

- Natural Access
- Color
- Dimming/Circadian Rhythms

NOURISHMENT

- Selection/Availability
- Serving Size
- Information

FITNESS

- Fitness Centers
- Stairs
- Bike Room
- Incentives Programs

COMFORT

- Ergonomics
- Sound Reduction
- Olfactory Comfort

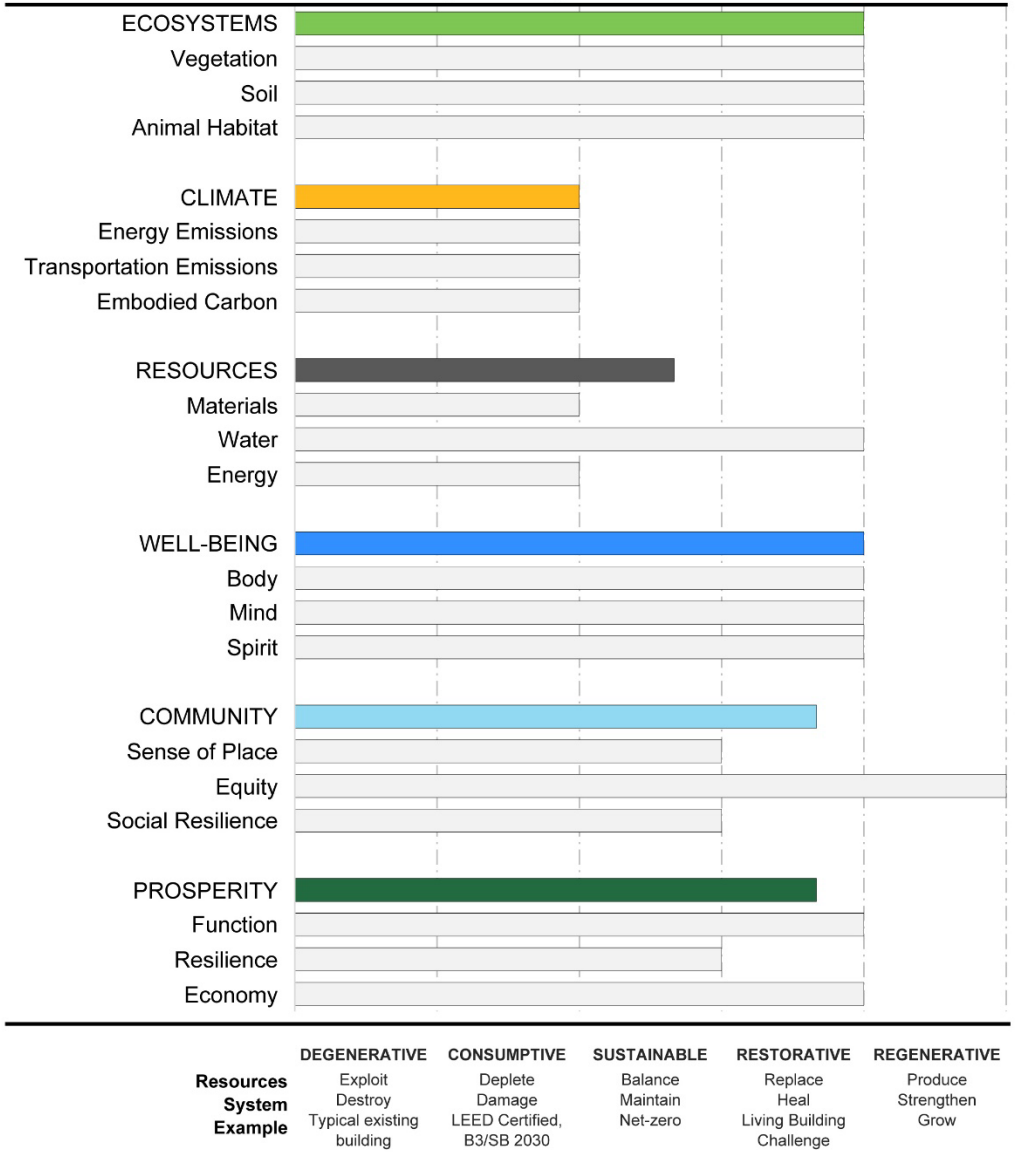
MIND

- Collaboration
- Quiet Rooms
- On-site Child Care
- Health & Wellness Library

THERE ARE MANY TOOLS AND OPTIONS FIND ONE WHICH REFLECTS YOUR PROJECT EXPECTATIONS

THRIVE

Ramsey County Environmental Service Center



	DEGENERATIVE	CONSUMPTIVE	SUSTAINABLE	RESTORATIVE	REGENERATIVE
Resources	Exploit	Deplete	Balance	Replace	Produce
System	Destroy	Damage	Maintain	Heal	Strengthen
Example	Typical existing building	LEED Certified, B3/SB 2030	Net-zero	Living Building Challenge	Grow

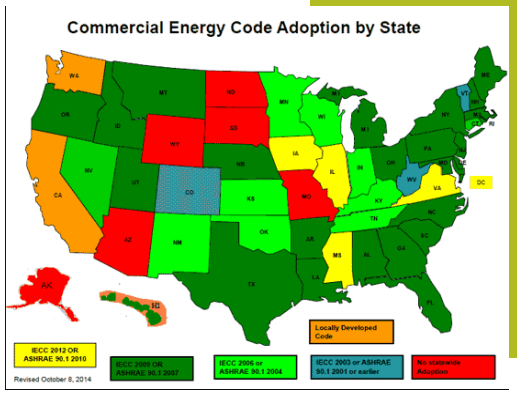
Updated: 10/27/2023

Changes to Building Codes

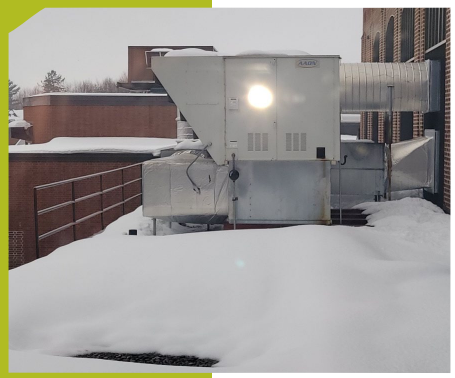
Which code you apply will allow for different design strategies and project processes. There is no longer a one size fits all application for the buildings.

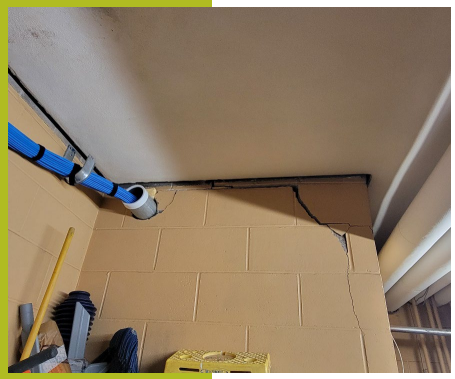
Building and Energy Code Changes (ASHRAE 90.1 vs IECC 2012)

- Renovations/Additions to Existing Buildings
- Exemptions to Historic Structures
- Insulation Requirements
- Air Barrier, Water Barrier and Vapor Barrier
- Lighting and Plug Load Controls
- Building and Systems Commissioning
- R-Values, u-Values, Reflectivity, Shading Co-Efficient
- NRFC Ratings for Windows and Doors
- Limits to the Window Wall Ratios
- Mandates for Energy Recovery
- Re-Roofing Projects
- Vestibules Locations
- Lighting Control and Lighting Reduction



AND THE SOCIAL CHALLENGES AND IMPACTS GENDER EQUITY I ADA I SAFE SECURE I STORMWATER I ROOF LOADS





What is Value Management?

Seemed Like a Good Idea

- Mechanical Retrofit and Reroofing Project
- Increases in wind and snow loading
- Point loads from the roof top units
- Roof draining off the north and east sides of building
- Walls are deteriorating due to water freezing and thawing
- Added railings puncture membranes

Implementation of the International Building Code

- Redesigning of the roof structure
- Wall repairs and flooring repairs
- Repair the tunnels and grade around the building
- Replace the mechanical system
- Operations and maintenance impacts (comfort/utilities)

Opportunity Costs Lost Due to Replacement Values

- Loss of quality interior and exterior finishes
- Environmental considerations: windows, lighting, IDAQ
- Repair of the existing structures and site

CHANGING CODES AND REGULATIONS IMPACTS COSTS OFTEN ARE NOT FULLY ADDRESSED PROJECT BY PROJECT

How Many Decision Are Made Every Day with a Small Bit of Information?

And How Many Decisions are Made Because That Is What We Always Do?

If I had asked people what they wanted, they would have said a faster horse

- Henry Ford

Building and System Assessments

Building Reclassification

- May be able to eliminate rated walls
- Identifies future design strategies
- Impacts to ventilation rates

Retro-Commissioning

- Functional testing and verification
- Depreciation and system age
- Controls and monitoring

Construction Types

- Heat Sink Structures: 1990 and Older
- Insulated Structures: 1990 and Newer
- System Impacts and Design Strategies

NOT UNDERSTANDING THE ENTIRE "BUILDING" CAN DRAMATICALLY IMPACT ALL COSTS OF OPERATIONS AND MAINTENANCE

Building Reclassification Benefits/Savings

Doors and Hardware Modifications

- **Fewer Doors with Fire/Smoke Gasketing**
- **Fewer Rated Doors, Frames and Hardware**

Mechanical and Life Safety Systems Modifications

- **Elimination of Fire/Smoke Dampers**
  Improved IDAQ, Efficiency, Maintenance, Operations
- **Simplified Building Automation Systems**
- **Reduced Scope for Detection Systems**

Other Operational and Maintenance Savings

- **Reduced Rated Penetrations Due to Fewer Rated Walls**
- **Fewer Inspections and Service Calls**

NOT UNDERSTANDING THE ENTIRE "BUILDING" WILL DRAMATICALLY IMPACT ALL COSTS

ISD 622 Savings Due to Building Reclassification

Across the district the number of fire walls dropped from 23 to 7

Cost to the District

- Based on Building Size, Age and Complexity: $8,500 average
- 5 Buildings x $8,500 = $42,500 total costs

Construction Savings

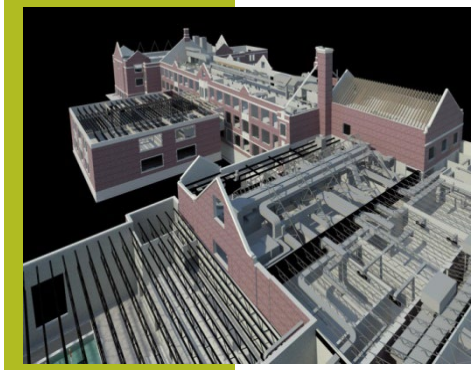
- Currently over $75,000 on just Five Buildings and Growing

Other Operational and Maintenance Savings

- Three Elementary Schools: $5,000 per year savings
- One Middle School: $8,250 per year savings
- One High School: $22,500 per year savings

Total One Year Savings (construction and operations): **$120,750**

CONSTRUCTION COSTS ARE COMPONENT REPLACEMENT OPERATIONS COSTS INCLUDE MAINTENANCE AND EFFICIENCIES



Strategies to Achieve Energy Reductions

- Include strategies to reduce consumption in COMPREHENSIVE FACILITIES PLAN(S).
- Complete RETRO COMMISSIONING or RECOMMISSIONING to help with staff training and identifying potential building and system improvements/replacement.
- Make “energy savings potential” a factor in considering CAPITAL PROJECTS or changes in space function.
- Prioritize building project REPAIR AND REPLACEMENT based on guaranteed energy savings and funds available, thereby freeing up money for other potential projects.
- Make Energy consumption a factor in more aggressively pursuing building/system RIGHTSIZING.
- Compile USER GROUP DATA. Use their comments to guide your goals and let them know how they impacted the process.

Three Areas of Energy Management

Energy-efficient operations

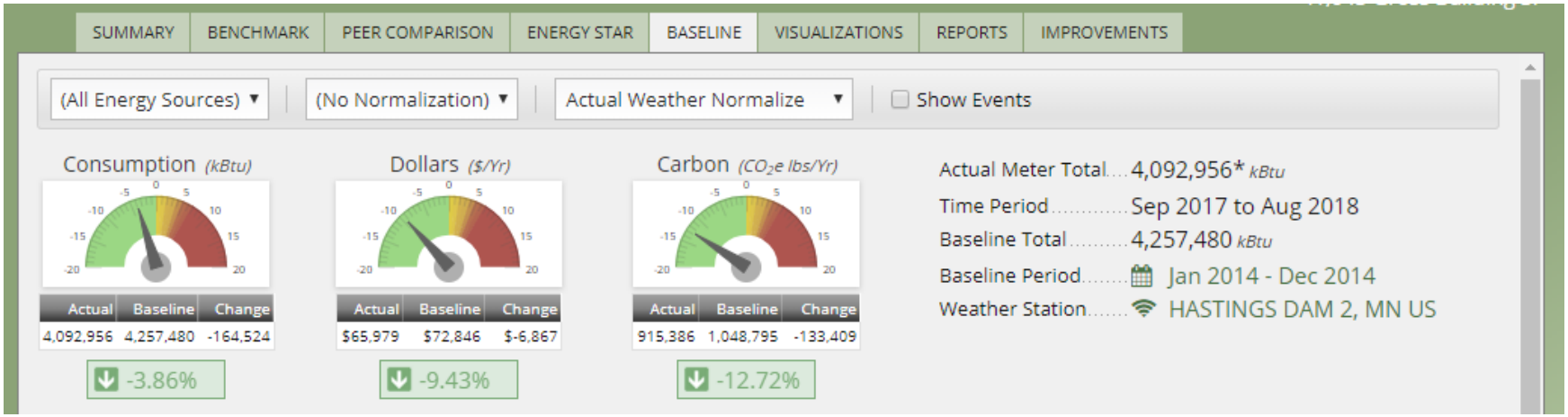
Savings Potential: 7% to 17%

Building and systems improvements

Savings Potential: 5% to 20%

Beyond the meter: understanding the rate structure

Savings Potential: 1% to 3%



B3 Benchmarking: Consumption vs Dollars

EUI: kBTU/sf/yr

#	Name	EUI (kBTU/SF/yr)	Completed Sq Ft	Total Sq Ft
136	Mankato	76.63	1,538,416	1,538,416
86	Wayzata Public Schools	63.80	992,240	1,613,919
-	Hopkins	0.00	81,526	1,621,933
132	Edina Public Schools	75.97	1,666,994	1,666,994
129	Minnetonka	75.26	1,689,112	1,689,112
107	North St. Paul, Maplewood, Oakdale	68.96	1,743,485	1,743,485
87	White Bear Lake	63.84	1,775,767	1,775,767
189	Mounds View	135.72	1,833,999	1,833,999
68	Eden Prairie	60.53	1,883,279	1,883,279
75	Burnsville-Eagan-Savage	61.84	1,900,504	1,900,504
109	Eastern Carver County Schools	69.69	1,912,060	1,912,060
77	Lakeville	62.23	1,918,474	1,918,474
122	St. Cloud	74.35	1,947,142	1,947,142

Ranking Among Districts of similar size (1.5 – 1.9 million sf)

1. Eden Prairie – 60.53 (68 /197)
2. Burnsville-Eagan-Savage – 61.84 (75/197)
3. Lakeville – 62.23 (77/197)
4. Wayzata Public Schools – 63.80 (86/197)
5. White Bear Lake – 63.84 (87 /197)
6. **North St. Paul, Maplewood, Oakdale – 68.96 (107/197)**
7. Easter Carver County Schools – 69.69 (109 /197)
8. St. Cloud – 74.33 (122 /197)
9. Minnetonka – 75.26 (130 /197)
10. Edina Public Schools – 75.97 (132 /197)
11. Mankato – 76.63 (174 /197)
12. Mounds View – 135.72 (189/197)

Target: 62.25
Data From 04/26/16

Dollars: $/sf/yr

#	Name	Dollars ($/SF/yr)	Completed Sq Ft	Total Sq Ft
81	Mankato	$0.90	1,538,416	1,538,416
130	Wayzata Public Schools	$1.02	992,240	1,613,919
-	Hopkins		81,526	1,621,933
125	Edina Public Schools	$0.99	1,666,994	1,666,994
98	Minnetonka	$0.94	1,689,112	1,689,112
143	North St. Paul, Maplewood, Oakdale	$1.08	1,743,485	1,743,485
64	White Bear Lake	$0.85	1,775,767	1,775,767
190	Mounds View	$1.76	1,833,999	1,833,999
69	Eden Prairie	$0.86	1,883,279	1,883,279
59	Burnsville-Eagan-Savage	$0.83	1,900,504	1,900,504
174	Eastern Carver County Schools	$1.28	1,912,060	1,912,060
87	Lakeville	$0.91	1,918,474	1,918,474
132	St. Cloud	$1.02	1,947,142	1,947,142

Ranking Among Districts of similar size (1.5 – 1.9 million sf)

1. Burnsville-Eagan-Savage – $0.83
2. White Bear Lake – $0.85
3. Eden Prairie – $0.86
4. Mankato – $0.90
5. Lakeville – $0.91
6. Minnetonka – $0.94
7. Edina Public Schools – $0.99
8. St. Cloud – $1.02
9. Wayzata Public Schools – $1.02
10. **North St. Paul, Maplewood, Oakdale – $1.08**
11. Easter Carver County Schools – $1.28
12. Mounds View – $1.76

Target: $0.78
Data From 04/26/16

ISD 622 District Wide Energy Performance

The average annual energy costs per square foot for IDS 622: $1.08
Note: costs for the last 12 month period.

The average annual energy costs per square foot for 15 districts: $0.96

The average annual EUI per square foot for NSP-M-O: 68.96 kBTU
Note: costs for the last 12 month period.

The average annual EUI per square foot for 15 districts: 68.41 kBTU

The difference between the energy costs average and ISD NSP-M-O: $0.12

There are 1,743,485 square feet in the district so the potential operational savings to "average"
$0.12 x 1,743,485 sf = $209,218 dollars annually.

Some of the best performers include across the state:
Albert Lea ($0.67), Duluth ($0.75), Burnsville ($0.79),
Bloomington ($0.84), Eden Prairie ($0.82), Minnetonka ($0.87)

Note: Building age has very little to do with the potential performance.
Data From 04/26/16
One Third of the utilities are provided by a small cooperative which charges more per kW
Due to the Extensive number of projects undertaken over the last 18 months, number have not been updated

Managing Costs and Consumption

Xcel Energy®

MAILING ADDRESS	ACCOUNT NUMBER
ISD 277 SCHOOL DISTRICT ATTN: BUSINESS SERVICES 5901 SUNNYFIELD RD E MOUND MN 55364-8250	51-6795009-8
	STATEMENT NUMBER: 530672653 / STATEMENT DATE: 01/10/2017

METER READING INFORMATION

METER 17956112 - Multiplier x 300 — Read Dates: 11/22/16 - 12/27/16 (35 Days)

DESCRIPTION	CURRENT READING	PREVIOUS READING	MEASURED USAGE	BILLED USAGE
Firm Demand	Actual			250 kW
Interrupt Demand	Actual			157 kW
Demand	Actual			407 kW
Billable Demand				407 kW
Power Factor Demand	91.66%			

ELECTRICITY CHARGES — **RATE: Peak Controlled Service**

DESCRIPTION	USAGE UNITS	RATE	CHARGE
Basic Service Chg			$55.00
Energy Charge	160617 kWh	$0.032010	$5,141.35
Fuel Cost Charge	160617 kWh	$0.024360	$3,912.59
Firm Demand Winter	250 kW	$9.960000	$2,490.00
Controllable Demnd	157 kW	$8.210000	$1,288.97
Affordability Chrg			$2.79
Resource Adjustment			$861.20
Interim Rate Adj			$695.59
Total			**$14,447.49**

Predetermined Demand Level 250

Premises Total **$5,007.10**

$9,440

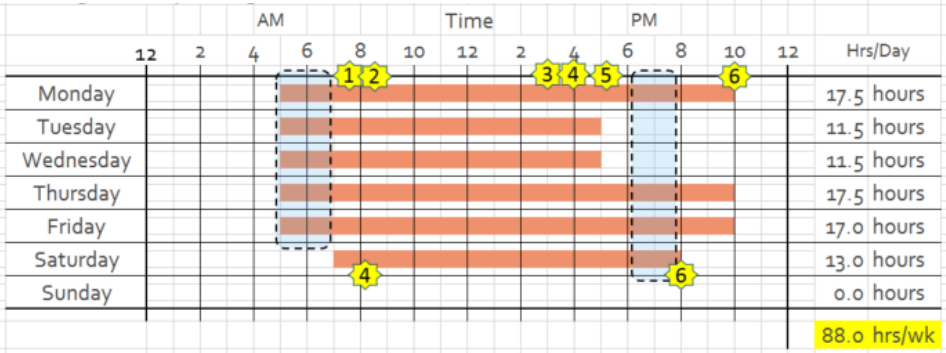
DAILY AVERAGES	Last Year	This Year
Temperature	32° F	24° F
Electricity kWh	4321.0	13492.6
Electricity Cost	$1,589.53	$1,327.52

Xcel Energy Invoice
Strategic Goal Review

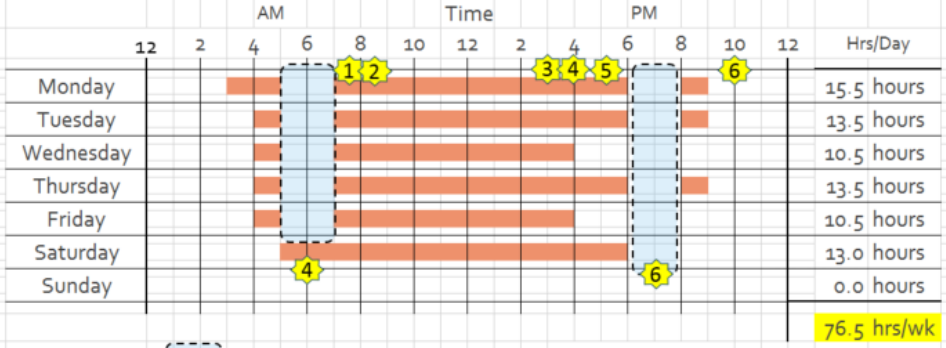
Highlights of January 2017 Invoice:

Page	Building	Program	Demand Level	Last Year Daily Average	This Year Daily Average	Savings
3	Hilltop Elementary	Peak Controlled	50	228.29	129.45	98.84
4	Mound Westonka HS*	Peak Controlled	250	1,589.53	1,327.52	262.01
11	Grandview MS	Peak Controlled	50	316.61	149.42	167.19
19	Shirley Hill Elementary	Peak Controlled	50	188.89	94.08	94.81

*Credit applied to MWHS invoice in the amount of $9,440.39.



Proposed AHU2 Operating Schedule



Symbol Key

- Peak Demand Charges
- AHU Operating
- 1 Staff and Students Arrive
- 2 Classes Begin
- 3 Classes End
- 4 Activities Begin
- 5 Classroom Staff Depart
- 6 Activities End

Considerations

A. How long can we suspend system operation and maintain occupant comfort during occupied hours
B. Can schedules be adjusted to avoid peak demand charges (PDC)
C. Can avoiding PDC also reduce the hours of operation
D. Can temperatures be reduced during Activities (athletics) and still maintain occupant comfort
E. Is it cost effective to continue night set-back schedules
F. Are the AHUs zoned to reflect operational needs and schedules
G. Understand the costs ($) vs. consumption (kbtu) values

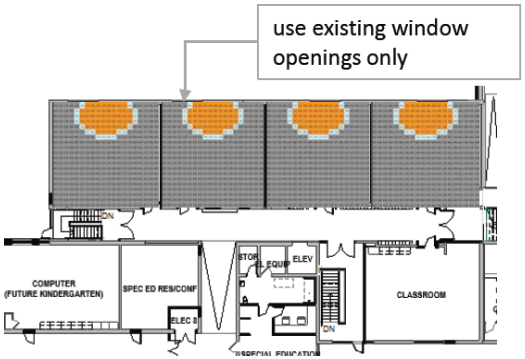
LHB

Daylighting Analysis and Design Options

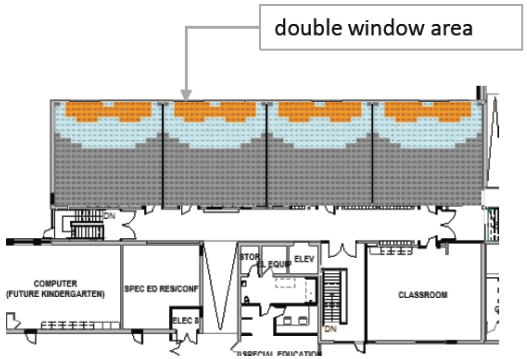
High contrast ratio may cause glare issues

Meets targeted daylight levels

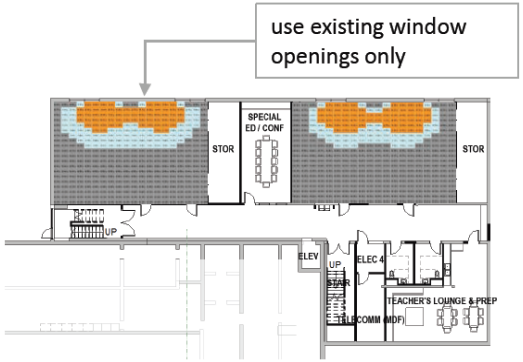
Does not meet targeted daylight levels



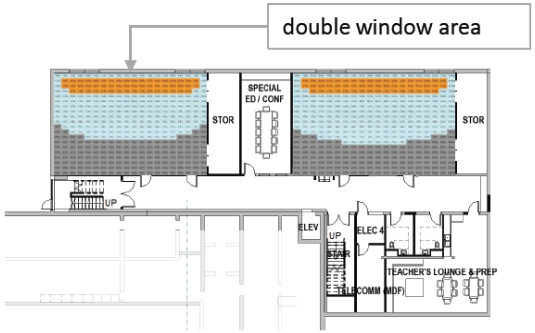
Level 1 – Current Design



Level 1 – Design Alternative



Basement – Current Design



Basement – Design Alternative

May 15, 2018

Lighting Systems

LED Lighting *(Light Emitting Diode)*

The technology was first utilized in 1968 with the first large scale lighting application in 2003.

Advantages

- Operations: Installation, Pay-Back, Warranty, Security
- Efficiency: Size, Dimming, Focus, Maintenance
- 3.5 times Bulb/System Life: *42,500 hours vs 12,500 hours*
  - *LED vs Incandescent: 85% Reduction in Carbon*
  - *LED vs Fluorescent: 34% Reduction in Energy*
- Occupant Comfort: Color of Light, Flicker, Ballast Buzz
  - *Occupant Headaches and Impacts to Special Needs Students*
- Daylight Harvesting: Every Fixture can be Addressable
  - *Teaching Tools and Community Communication Tool*

Disadvantages

- Operations: Heat

Getting The Full Benefit Of A System

An LED Lighting Replacement Project

Project Budget

- Construction
- Operations and Maintenance
- Benefit of Use

Control Light Intensity (Dimming)

- The Biggest Cause of Headaches
- Challenge for Students with Disabilities

We don’t know what we don’t know

Color and Tuneability

Day Light Harvesting

Mechanical Systems Performance

Mechanical Systems are the most critical component regarding occupant comfort. Systems should consider:

- **System Types**
  - Unit Ventilators
  - Central VAV/Constant Volume
  - Displacement and Radiant
- **Consistent and Constant Temperature**
  - Space Heights and Floor Area
  - Heating vs Cooling
- **Limited Drafts and Uncomfortably Cold Surfaces**
  - Radiant Heat vs Forced Air
  - Heat Sinks vs Insulated Structures
- **Reduce Air and System Noises**
  - Background Noises Impact Learning (33db background)
- **Indoor Air Quality**
  - Stale Air vs Sick Air (human illnesses)
  - Molds and Other Unwanted Growths
  - Cleaning Practices are a Big Challenge

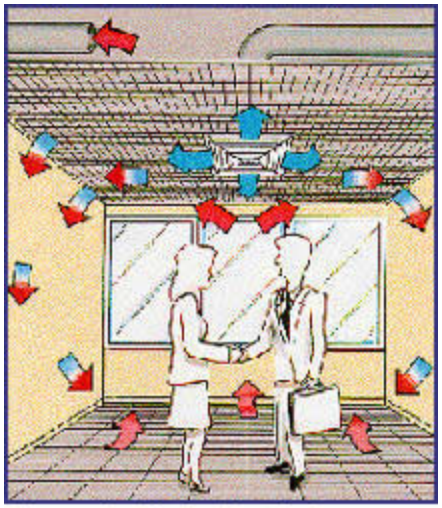


Figure 1 - Mixing Ventilation

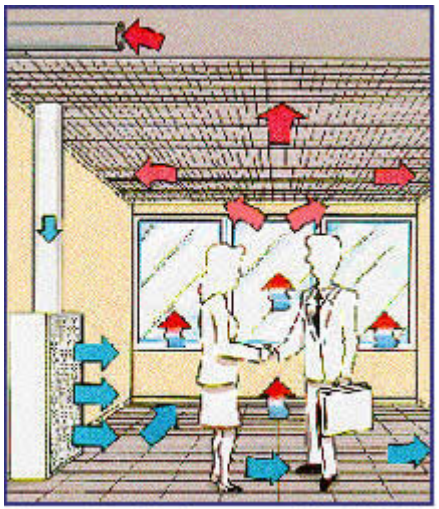
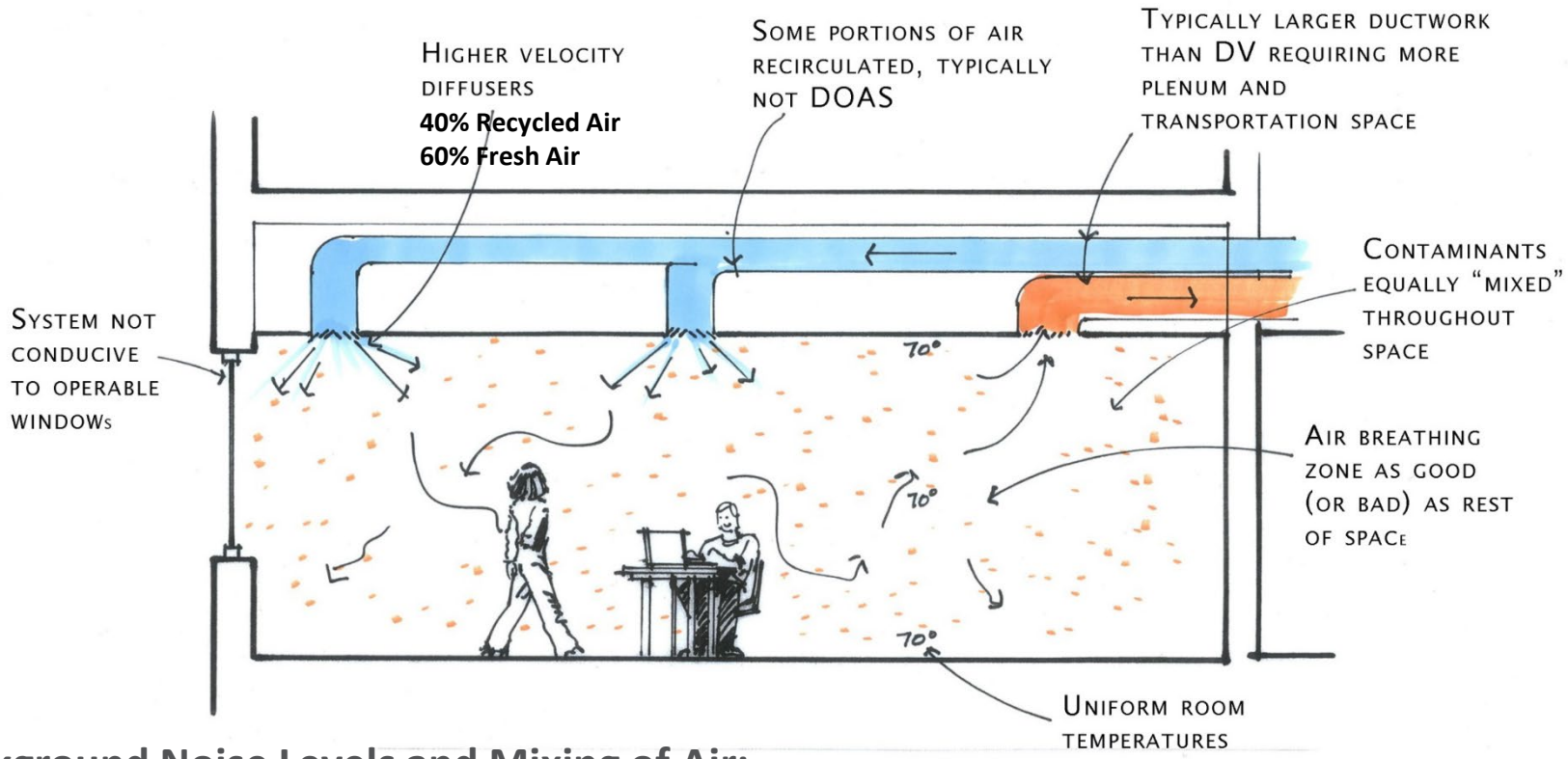


Figure 2 - Displacement Ventilation

http://www.iklimnet.com

Mechanical System: Traditional Mixed Air System

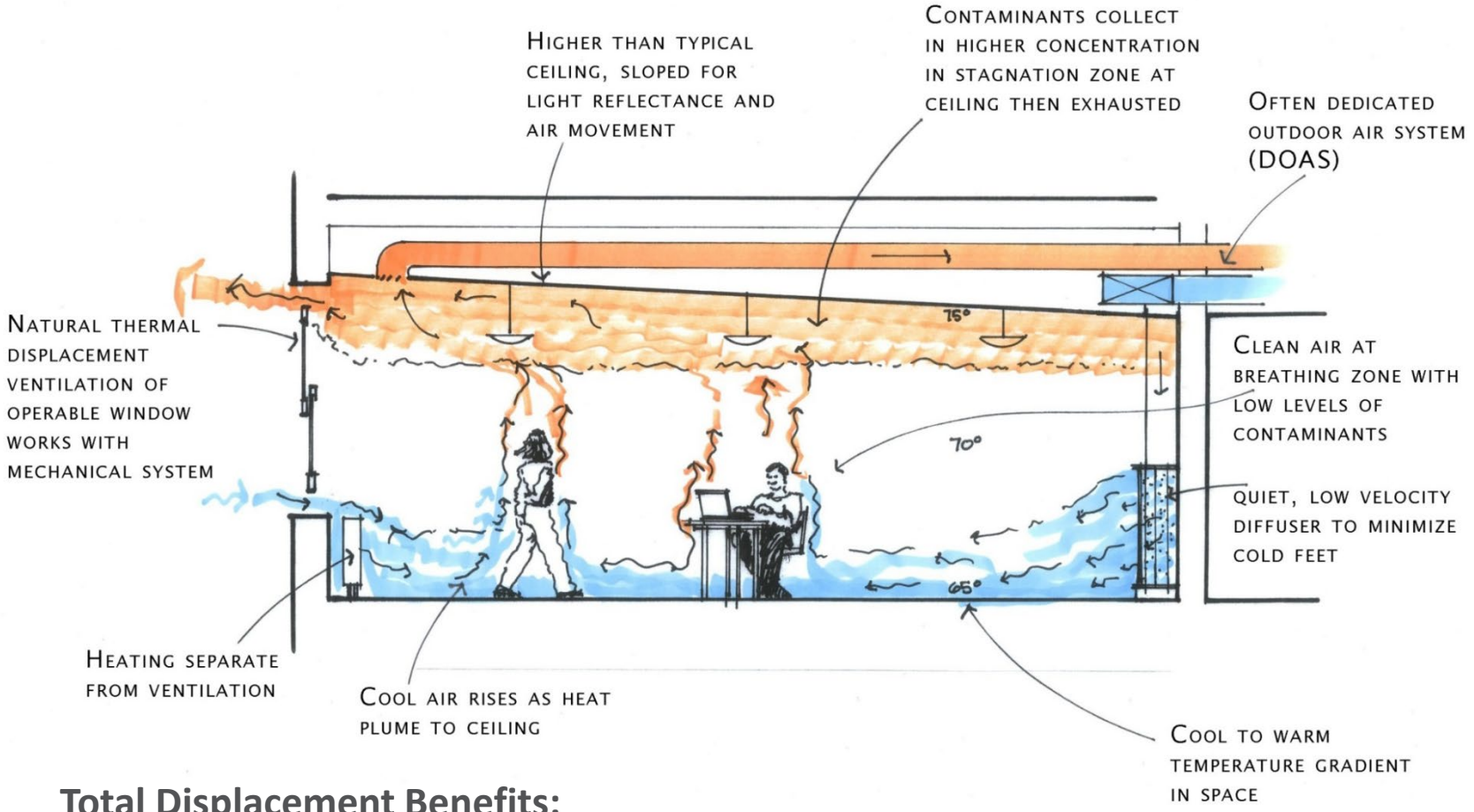


Background Noise Levels and Mixing of Air:

The typical VAV system generates an average of 40 dB of background noise due primarily from fans pushing air from the ceiling to the floor. The Displacement and Conditioned Air Systems are generating and average of 30db (less than half) the background noise levels.

Mixed Air Systems will mix 30% to 55% of the return room air (recycled existing room air). Other systems can incorporate 100% outside air without mixing airborne germs/particulates.

Mechanical System: Total Displacement Ventilation



Total Displacement Benefits:

A hybrid displacement system is part of our healthy buildings research efforts. The system incorporates 100% outside air. This system has proven to reduce the number of sick days, improved learning/test scores, and improve overall occupant comfort.

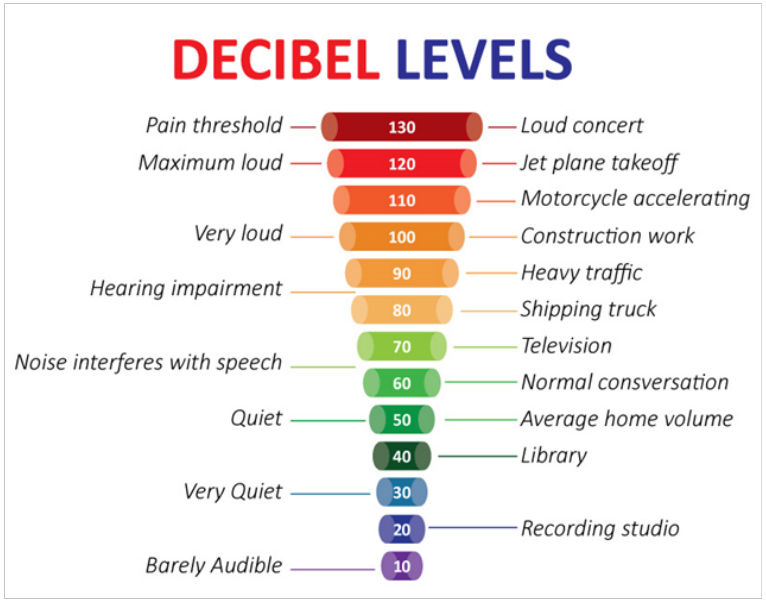
Background Noise Levels

With the rise in studies regarding teaching and learning, one of the greatest challenges is the level in Background NOISE. Areas of greatest impact include:

- **Student Challenges**
  - Special Needs Students
  - English as Second Language
- **Hearing Development**
- **Teacher Variables**
  - Soft Spoken Individuals
  - Suffering from Illness
- **We Combat Noise with…..**

MORE NOISE!!

For these reasons and others, many states (including Minnesota) are requiring background noise levels in learning spaces to be 35 dB or less.



http://tamco.com

Get Input on your projects

Monday Oct. 30, 2017 (LHB Offices)

Meets with	12:30-1:00	1:00-1:40	1:40-2:20	2:20-3:00	3:00-3:40	3:40-4:20	4:20-5:00
Meets with:	ALL	Mech/Elec - Studio 4A	Structural - Studio 4A	Civil/LA - Studio 4A	Aquatics - Studio 4A	Architecture - Studio 4A	ALL
Meets with:	ALL	City - Studio 4A	Aquatics - Red	Architecture - Studio 4B	Civil/LA - Studio 4B	Structural - Red	ALL
Meets with:	ALL	Civil/LA - Studio 4B	City - Studio 4A	Aquatics - Red	Architecture - Red	Mech/Elec - Red	ALL
Meets with:	ALL	Structural - Studio 4B	Architecture - Studio 4B	City - Studio 4A	Mech/Elec - Studio 4B	Aquatics - Studio 4B	ALL
Meets with:	ALL	Architecture - Red	Mech/Elec - Red	Structural - Red	City - Studio 4A	Civil/LA - Studio 4B	ALL
Meets with:	ALL	Aquatics - Red	Civil/LA - Studio 4B	Mech/Elec - Studio 4B	Structural - Red	City - Studio 4A	ALL

Value Engineering Summary

1. Every project should start with clear goals – prioritize outcomes.

2. Think holistically – A systems approach where all systems are connected.

3. Prioritize occupant comfort and well-being.

4. Use occupant surveys when appropriate.

5. Utilize a systematic “outside-in” approach to solving building issues.

Public Service Announcement

Energy Tax Incentives in the IRA

SEC. 13101. EXTENSION AND MODIFICATION OF CREDIT FOR ELECTRICITY PRODUCED FROM CERTAIN RENEWABLE RESOURCES – Section 45	SEC. 13401. CLEAN VEHICLE CREDIT – Section 30D
SEC. 13102. EXTENSION AND MODIFICATION OF ENERGY CREDIT - Section 48	SEC. 13402. CREDIT FOR PREVIOUSLY-OWNED CLEAN VEHICLES – Section 25E
SEC. 13103. INCREASE IN ENERGY CREDIT FOR SOLAR AND WIND FACILITIES PLACED IN SERVICE IN CONNECTION WITH LOW-INCOME COMMUNITIES – Section 48	SEC. 13403. QUALIFIED COMMERCIAL CLEAN VEHICLES – Section 45W
SEC. 13104. EXTENSION AND MODIFICATION OF CREDIT FOR CARBON OXIDE SEQUESTRATION – Section 45Q	SEC. 13404. ALTERNATIVE FUEL REFUELING PROPERTY CREDIT – Section 30C
SEC. 13105. ZERO-EMISSION NUCLEAR POWER PRODUCTION CREDIT – Section 45U	SEC. 13501. EXTENSION OF THE ADVANCED ENERGY PROJECT CREDIT – Section 48C
SEC. 13201. EXTENSION OF INCENTIVES FOR BIODIESEL, RENEWABLE DIESEL AND ALTERNATIVE FUELS Section 40A	SEC. 13502. ADVANCED MANUFACTURING PRODUCTION CREDIT – Section 45X
SEC. 13202. EXTENSION OF SECOND-GENERATION BIOFUEL INCENTIVES – Section 40	SEC. 13701. CLEAN ELECTRICITY PRODUCTION CREDIT – Section 45Y
SEC. 13203. SUSTAINABLE AVIATION FUEL CREDIT – Section 40B	SEC. 13702. CLEAN ELECTRICITY INVESTMENT CREDIT – Section 48E
SEC. 13204. CLEAN HYDROGEN – Section 45V	SEC. 13703. COST RECOVERY FOR QUALIFIED FACILITIES, QUALIFIED PROPERTY, AND ENERGY STORAGE TECHNOLOGY - Section 168(e)(3)(B)
SEC. 13301. EXTENSION, INCREASE, AND MODIFICATIONS OF NONBUSINESS ENERGY PROPERTY CREDIT – Section 25C	SEC. 13704. CLEAN FUEL PRODUCTION CREDIT – Section 45Z
SEC. 13302. RESIDENTIAL CLEAN ENERGY CREDIT – Section 25D	SEC. 13801. ELECTIVE PAYMENT FOR ENERGY PROPERTY AND ELECTRICITY PRODUCED FROM CERTAIN RENEWABLE RESOURCES, ETC –
SEC. 13303. ENERGY EFFICIENT COMMERCIAL BUILDINGS DEDUCTION - Section 179D	SEC. 6417. ELECTIVE PAYMENT OF APPLICABLE CREDITS
SEC. 13304. EXTENSION, INCREASE, AND MODIFICATIONS OF NEW ENERGY EFFICIENT HOME CREDIT – Section 45L	SEC. 6418. TRANSFER OF CERTAIN CREDITS.

Slide Credit: Jacob Goldman, Energy Tax Savers, Inc.

Alternative Energy Credits-§48, ITC (2022-…)

Technology	Base Credit	5x Bonus Credit (2022)	Domestic Content (2023)	Energy Community (2023)	Low Income (2023)	Range
Solar Technologies (2022)	6%	30%	2%/10%	2%/10%	10%/20%	6%-70%
Small Wind (2022)	6%	30%	2%/10%	2%/10%	10%/20%	6%-70%
Ground Source Heat Pump (2022)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Microturbine	2%	10%	2%/10%	2%/10%	0%	2%-30%
CHP (2022)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Microgrid Controller (2023)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Standalone Energy Storage Systems (2023)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Thermal Energy Storage Systems (2023)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Fuel Cell (2022)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Geothermal (2022)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Biogas (2022)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Waste Energy Recovery (2022)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Interconnection Property (2023)	6%	30%	2%/10%	2%/10%	0%	6%-50%
Electrochromic Glass (2023)	6%	30%	2%/10%	2%/10%	0%	6%-50%

Slide Credit: Jacob Goldman, Energy Tax Savers, Inc.

Direct Pay

Elective Payment of Applicable Credits-§6417 (2023-…)

- Some Gov't and Not-for-Profit can benefit from the credit
  - "(i) any organization exempt from the tax imposed by subtitle A,
  - "(ii) any State or political subdivision thereof, (NOT FEDERAL PROJECTS)
  - "(iii) the Tennessee Valley Authority,
  - "(iv) an Indian tribal government (as defined in § 30D(g)(9)),
  - "(v) any Alaska Native Corporation (as defined in section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. 1602(m)), or
  - "(vi) any corporation operating on a cooperative basis which is engaged in furnishing electric energy to persons in rural areas.
- **3 Ways to avoid 10% Haircut(§48(a)(13) → (§45(b)(10))**
  1. <1MW or
  2. Meets Domestic Content or
  3. Start of Construction prior to 1/1/24
  - Otherwise, 90% (Some exceptions exist)
- **Up to a 15% haircut for projects paid for with Tax-Exempt Bonds** §48(a)(4) → §45(b)(3)

Slide Credit: Jacob Goldman, Energy Tax Savers, Inc.

Alternative Energy Credits							
Ground Source Heat Pumps (GSHP)						Estimated 15 Ton system	
		Less than 280 tons cooling				> 75% energy load	
Assuming Financing with Tax Exempt Bonds		**Credit/Rebate**					
		5x bonus 6-30%	**Domestic 10% max**	**Energy Community 10% max**	**Sub total**	**Tax exempt bonds 15% Reduction**	
System / Construction	**Value**	**30%**	**0%**	**10%**	**40%**	**34.0%**	
Geothermal well field & exterior Piping	$ 358,000					$ 121,720	
Piping to heat pumps interior	$ -					$ -	
Water-to-air heat pumps	$ -					$ -	
Temp Controls	$ -					$ -	
Ductwork	$ -					$ -	
Grills, Registers, and Diffusers	$ -					$ -	
Subtotal of Downstream Equipment	$ 308,316					$ 104,827	
Design Fees for GSHP system	$ 33,316					$ 11,327	
Total Construction Value	**$ 666,316**			**Rebate / Credit**		**$ 237,875**	
Electric Boiler and Fluid Cooler	$ 58,000						
Ground Source System	$ 358,000			Added cost for GSHP system		$ 300,000	
				Net Cost of GSHP System		**$ 62,125**	

Alternative Energy Credits							
Ground Source Heat Pumps (GSHP)						Estimated 15 Ton system	
		Less than 280 tons cooling				> 75% energy load	
Assuming no Tax Exempt Bonds		**Credit/Rebate**					
		5x bonus 6-30%	**Domestic 10% max**	**Energy Community 10% max**	**Sub total**	**Tax exempt bonds 15% Reduction**	
System / Construction	**Value**	**30%**	**0%**	**10%**	**40%**	**40.0%**	
Geothermal well field & exterior Piping	$ 358,000					$ 143,200	
Piping to heat pumps interior	$ -					$ -	
Water-to-air heat pumps	$ -					$ -	
Temp Controls	$ -					$ -	
Ductwork	$ -					$ -	
Grills, Registers, and Diffusers	$ -					$ -	
Subtotal of Downstream Equipment	$ 308,316					$ 123,326	
Design Fees for GSHP system	$ 33,316					$ 13,326	
Total Construction Value	**$ 666,316**			**Rebate / Credit**		**$ 279,853**	
Electric Boiler and Fluid Cooler	$ 58,000						
Ground Source System	$ 358,000			Added cost for GSHP system		$ 300,000	
				Net Cost of GSHP System		**$ 20,147**	

Value Engineering and the Impacts to Ongoing Maintenance/Operations

LHB

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