High Performance K-12 Building Design

Thomas Fernandez, Energy Manager
Colorado Springs School District 11
(719)477-6011 fernatom@d11.org

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D11’s New Schools

• 4 different design teams
• Attractive designs
• Highly functional
• Excellent comfort levels
• D11’s best student achievement scores
Energy Performance

- Trailblazer Elementary 68 KBTU/SF/YR
- Scott Elementary 71 KBTU/SF/YR
- Jenkins Middle 76 KBTU/SF/YR
- Tesla Middle 101 KBTU/SF/YR
- D11 Average 70 KBTU/SF/YR
- National K-12 80 KBTU/SF/YR
Energy Use Index

(Gas+Electric)/Total Sq. Ft. = KBTU/SF/YR
Why It Matters To D11

D11 Energy Cost & Use

ENERGY USE INDEX

120

110

100

90

80

70

60

50

$6,000,000

$5,000,000

$4,000,000

$3,000,000

$2,000,000


COST

USE (KBTU/SF/YR)
Lessons Learned

- No clear understanding of HP buildings
- No clear understanding of HP design
- No specific building energy goals
- Traditional “architect down” design
- Passive during design
Traditional Design Hierarchy

Owner

- Architect
  - Electrical
  - Mechanical
  - Structural
  - Specialist
Traditional Design Process

- Owner sets budget & functional scope
- Architect designs for form & function
- Mechanical & electrical systems must fit around architect’s design
- Minimal interaction between disciplines
- Fixed design fees – no incentive
High Performance Design Process

- Form & function designed around HVAC and lighting systems
- Maximizes use of natural lighting, heating, cooling, ventilation
- Reduced equipment sizing & run time
- Reduces energy use
Integrated Design Team

• All team members onboard from concept
• Energy goals clearly understood
• Architect allows team to interact freely & collaboratively to achieve energy goals
• The power of performance based fees
• Design process costs more
High Performance Energy Difference

- K-12 High Performance 25KBTU/SF/YR
- K-12 National average  80KBTU/SF/YR
- Does not have to cost more to build
- LEED certification doesn’t guarantee high performance
- Higher design cost - quick payback
The Lifecycle Cost Difference

Lifecycle Cumulative Difference
Trailblazer Elementary

$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0

68K BTU/SF/YR
25K BTU/SF/YR

Years
0 10 20 30 40 50 60 70 80 90 100
Owner Responsibilities

- Understands the HP concept
- Sets specific energy goals
- Finds the right design team
- Budgets for higher design fees
- Hire an integrated design process expert
D11 Building Performance Goals

- 25 KBTU/SF/YR - total building energy
- 2.4 GAL/SF/YR - domestic water
- 4.5 GAL/SF/YR – irrigation
- Power factor > 0.95 lag
- Elementary school construction <$110/SF
D11 Authored Documents

- Educational / Functional Specifications
- High Performance Design Specifications
- RFP for design services
- Performance based fee schedule
Finding The Right Team

• Ask for documented KBTU/SF/YR results for similar building type
• Demonstrated use of integrated design team approach
• Willing to accept performance based fees
• Don’t rely on LEED certification
Owner Direct Design Team Structure

- Owner direct – HP expert project manager
- Owner direct - all design disciplines
- Design team free to meet design goals collaboratively without traditional barriers
- Performance bonus for all members.
Useful Tools

• During design - EPA Energy Star “Target Finder” tool - KBTU/SF/YR
• During verification - EPA Energy Star “Portfolio Manager” benchmarking tool KBTU/SF/YR
Conclusion

• High performance buildings are achievable
• They don’t have to cost more
• They already exist - go visit them
• But it won’t happen without a educated determined owner – at least not yet!
• It’s the right thing to do - for generations to come
Contact Information

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