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National Institute of Building Sciences

Provider Number: G168

Guaranteed Performance Construction

Course Number: WE2B

Speaker: James Bochat

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.





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Course Description

Today's sustainability movement has done a good job of delivering green buildings in all but the area of performance; most buildings do not perform at the level predicted by the design. Performance is defined as how well the building's indoor environmental quality meets the owner's requirements and the level of energy and water usage. Our existing design and construction processes make it very difficult to hold anyone responsible for the delivery of performance.

The answer is to utilize a Guaranteed Performance Contract where designers and contractors are held accountable to deliver the performance goals and demonstrate its delivery. This contract requires the general contractor to provide and manage all of these activities until the performance is demonstrated. This presentation describes the required components of the Guaranteed Performance contract and how it can be successfully implemented.





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Learning Objectives

At the end of the this course, participants will be able to understand:

- 1. What is Building Performance**
- 2. Why do buildings perform poorly**
- 3. How to “Guarantee” building performance**



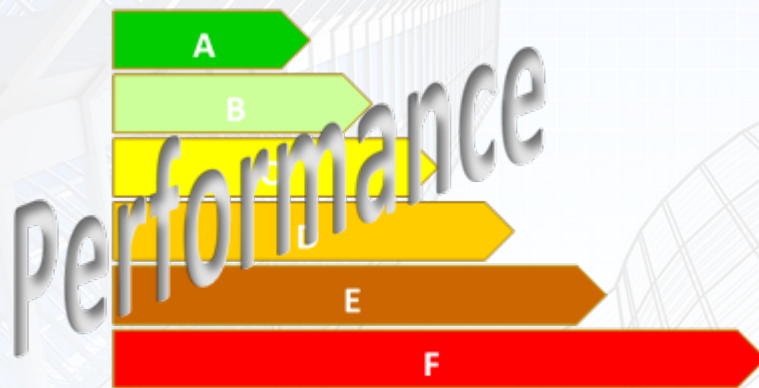
What is Building Performance?

- **Building meets the owners needs (OPR)**
- **IEQ Performance**
 - Occupant Comfort, temp & humidity
 - Indoor Air Quality
 - Space Lighting Level and Quality
 - Space Acoustic Quality
- **Energy and Water Use**
 - Meets projected usage values
 - Meets selected baselines





What Performance Level do you want?



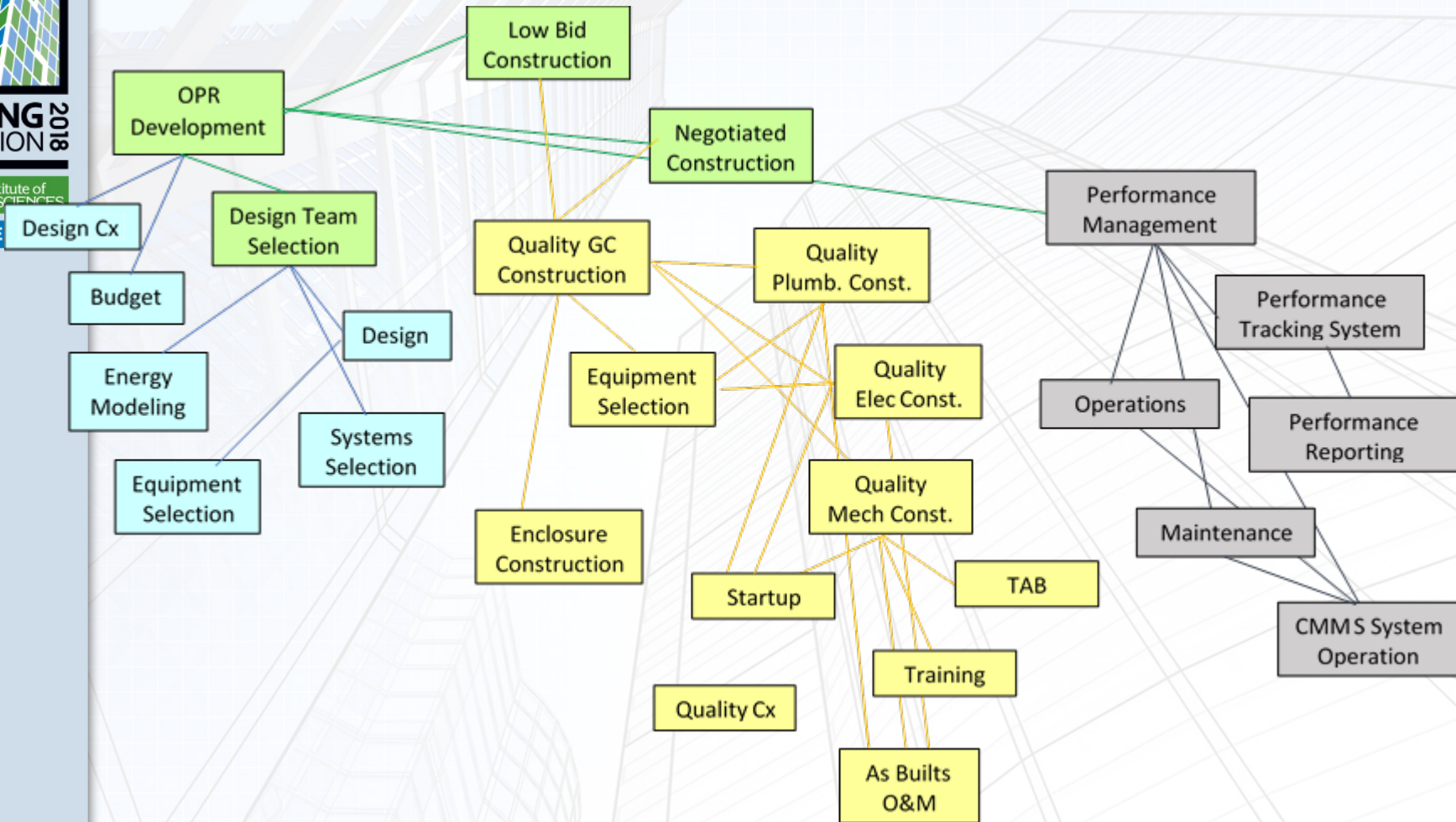
Whats Your Buildings Score?





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The Path to Performance?



Performance Flow Chart

Present Performance

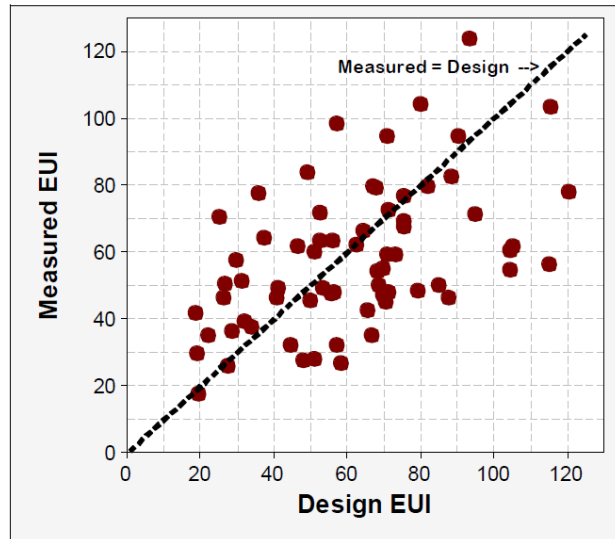


Figure ES- 4: Measured versus Design EUIs
All EUIs in kBTu/sf

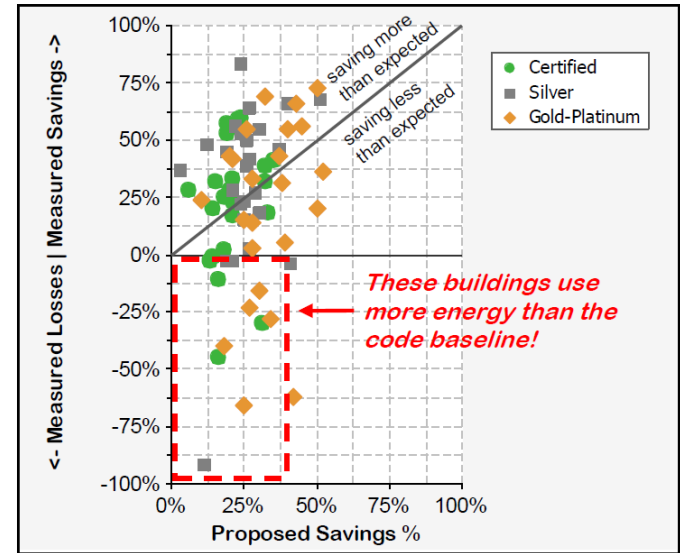


Figure ES- 5: Measured versus Proposed Savings Percentages

Energy Performance of LEED® for New Construction Buildings

FINAL REPORT March 4, 2008

This study analyzes measured energy performance for 121 LEED New Construction (NC) buildings, providing a critical information link between intention and outcome for LEED projects. The results show that projects certified by the USGBC LEED program average substantial energy performance improvement over non-LEED building stock.



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Why is Performance not Delivered?

- **Performance is implied but not contractual**
 - As long as general operation is delivered then there is no consequences to designers, contractors or commissioners if performance is not achieved

“No One is held accountable”



**Except
The Owner is left holding the bag**



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Why is Performance not Delivered?

- **Compressed Construction Schedules normally impacts testing & commissioning**
- **TAB may not be performed with enough intensity to provide performance**
- **Commissioning may not be performed with enough intensity to provide performance**





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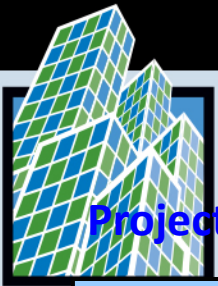
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Why is Performance not Delivered?

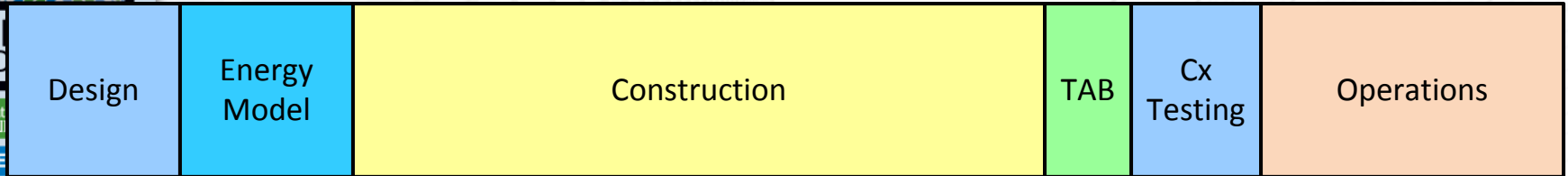
- Design team low level of field services
- Operator training not adequate to provide high performance operations
- Operators left to diagnose and deal with poor performance from delivered systems
- No performance tracking system installed or utilized
- No ongoing analytic or issue correction system



Major Components That Affect Performance

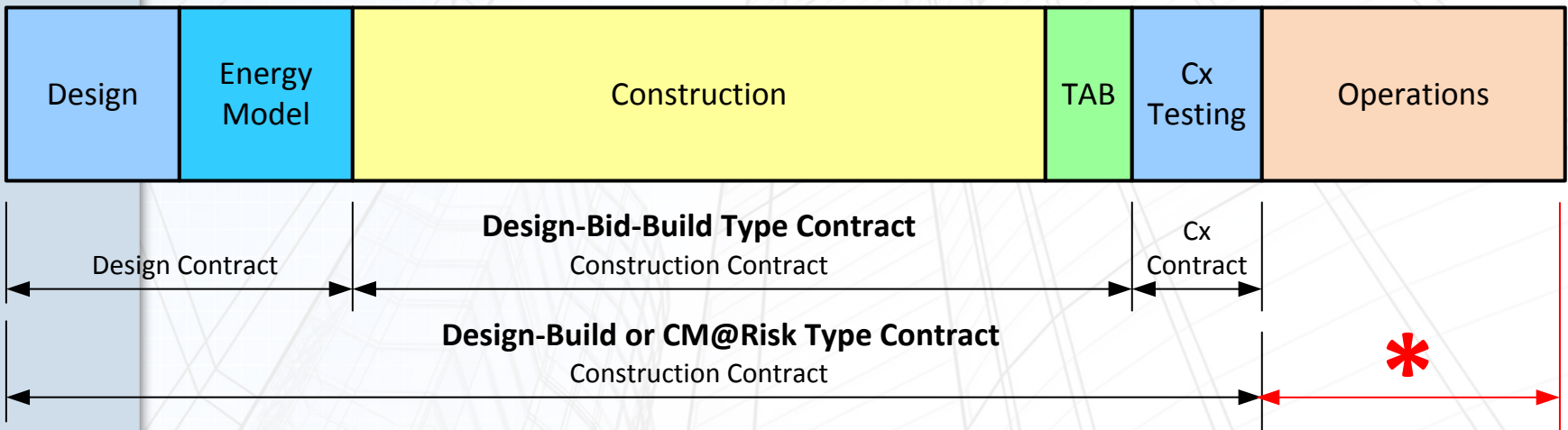


Project Components Required for Performance



Each Component Must be Done Correctly to
Deliver a High Performance Building

Do Current Project Contracts Allow for Performance Responsibility?





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Performance Costs



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Why Performance Matters

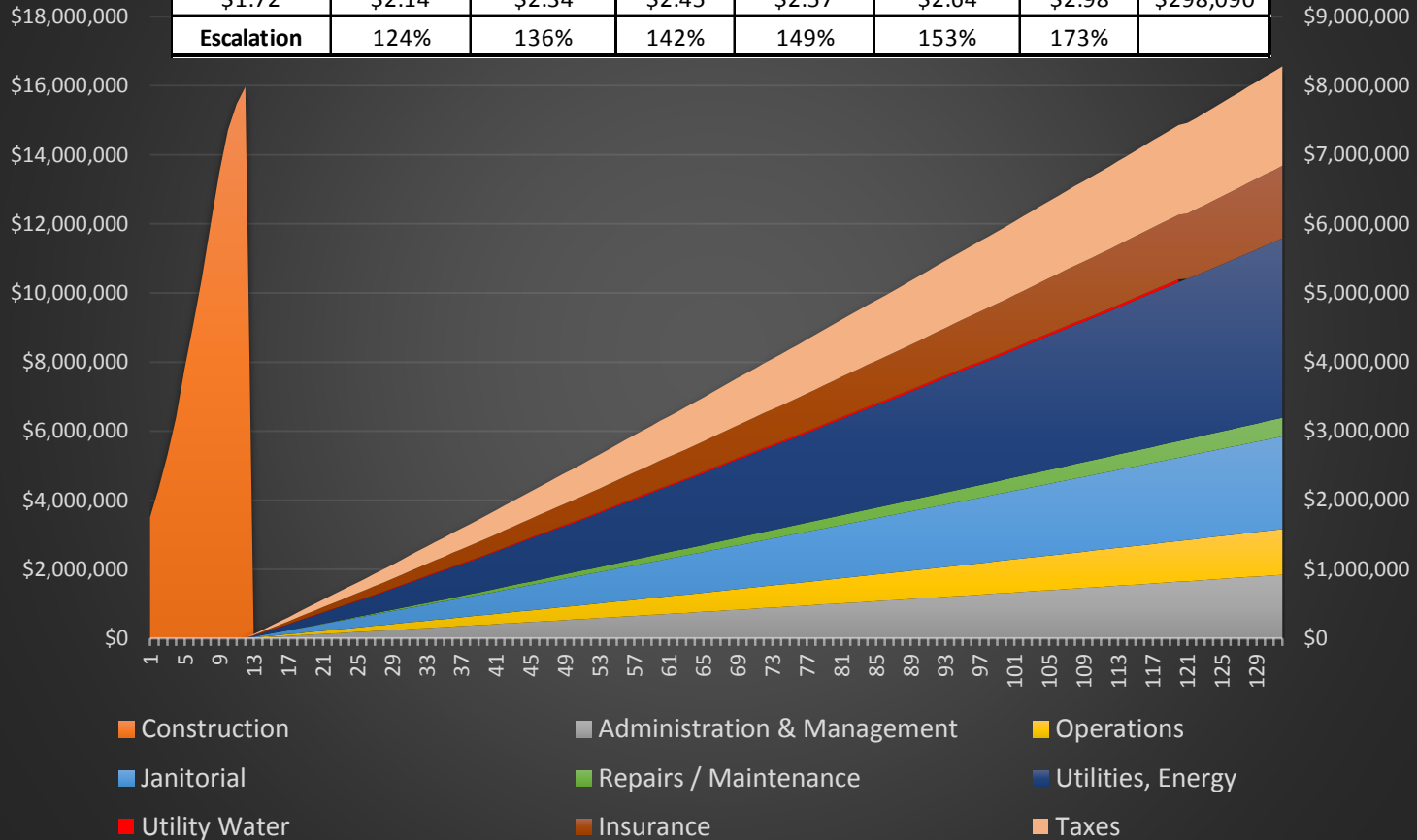
- **Cost Example Basis**

- 100,000 SF Standard Office Building
- 12 Hour, 5 day operation, 250 SF/Occupant
- National average ambient conditions
- National average costs
- Conservative utility costs < 10¢ KW,
\$1.50/1000gal
- National average for CO₂ produced

Why Performance Matters

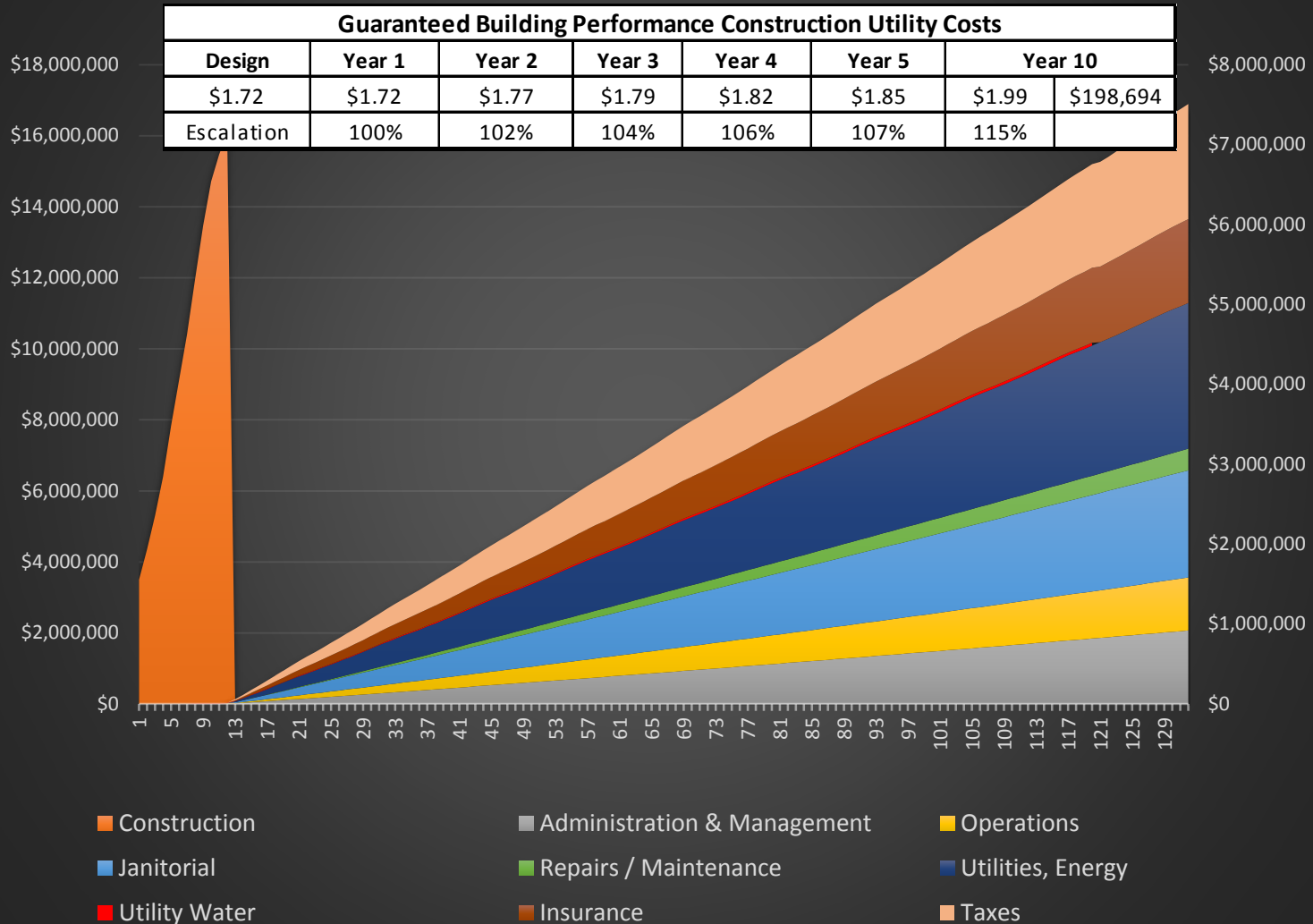
Total Operating Cost Standard Construction

Standard Construction Utility Costs							
Design	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	
\$1.72	\$2.14	\$2.34	\$2.45	\$2.57	\$2.64	\$2.98	\$298,090
Escalation	124%	136%	142%	149%	153%	173%	



Why Performance Matters

Total Operating Costs Guaranteed Performance Construction





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Why Performance Matters

Guaranteed Building Performance Construction Costs				
Performance Activities	Costs	Utilities	10 Year	Avg Year
Operations 1st Year	\$69,500	Standard	\$8,318,903	\$831,890
Tracking System	\$24,000	GBP	\$7,544,556	\$754,456
Total	\$93,500	Savings	\$774,347	\$77,435
		Simple Pay Back		1.21

- **Is GBP Construction worth it?**
 - Would you invest \$93,500 to get \$774,347 in 10 years?
 - Same as a 83% interest rate

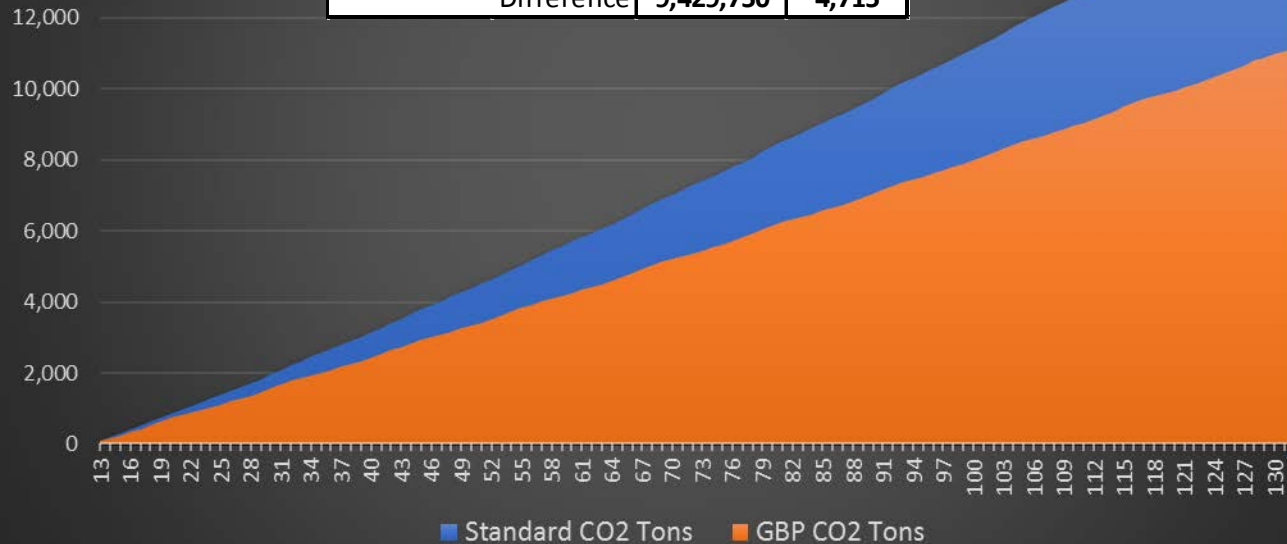
Why Sustainable Performance Matters



CO₂ and Sustainability

Guaranteed Building Performance CO₂

Type	Lbs	Tons
Standard Construction	31,717,019	15,859
GBP Construction	22,287,269	11,144
Difference	9,429,750	4,715



- Can you be sustainable without Performance?



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Guaranteed Performance Contracts

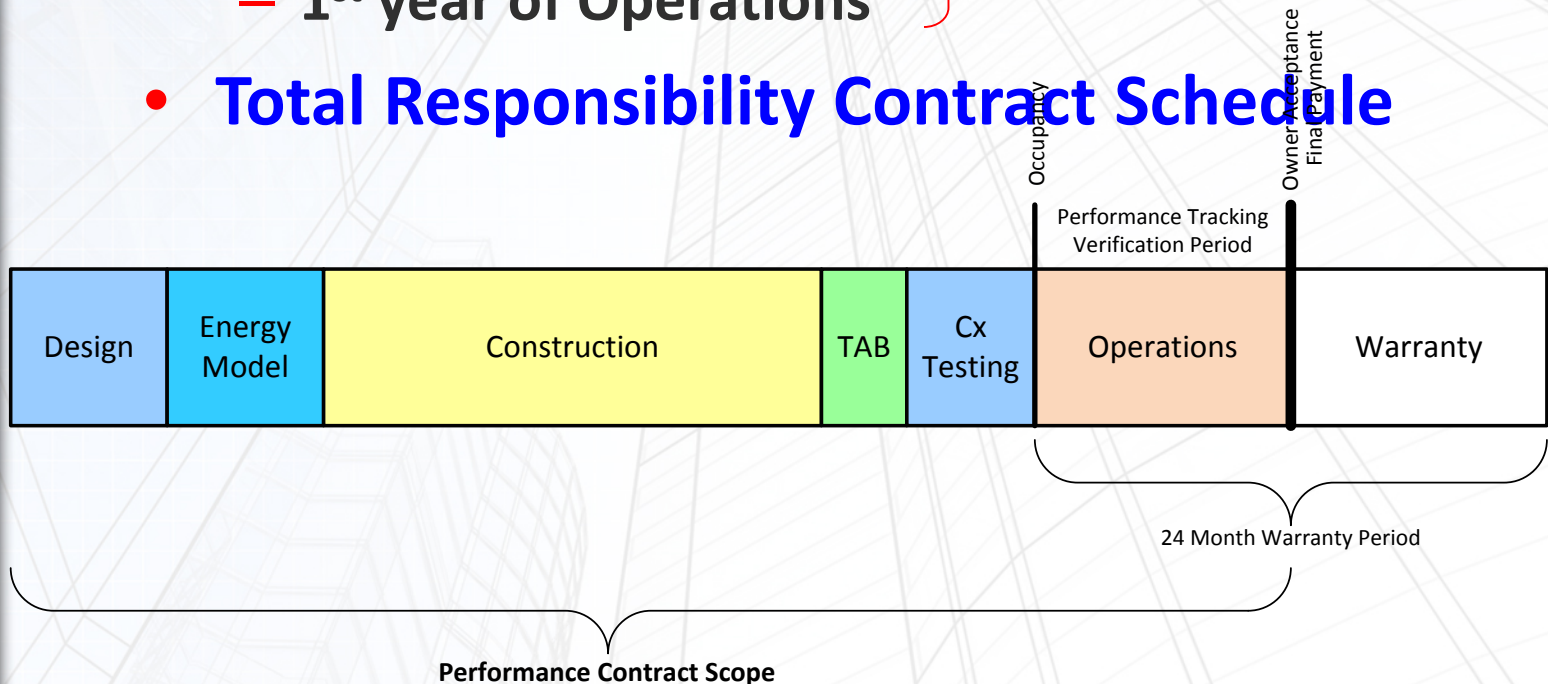
How do we make Performance Contractual?

- **Total Responsibility Contract**

- Design
- Model
- Construction
- Commissioning
- 1st year of Operations

**Proven
Performance**

- **Total Responsibility Contract Schedule**





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How does a Performance Contract Work?

- **Total Responsibility Contract**

- Includes Design responsibility
- Includes Energy Model
- Includes all Construction
- Includes Commissioning
- Includes performance tracking system, may include an analytic data software package
- Includes 1st year of Operations for performance verification



- **Performance is proven at the end of the Performance Tracking and Verification Period**

- 10% GC Contract Retention until occupancy
- 5% GC Contract Retention until performance is demonstrated
- Contract ends when performance is achieved at the end of the performance period



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Guaranteed Performance Contract Components?

- **Added GPC Component Specifications**

- 00 24 13 Guaranteed Performance Project Scope
- 01 09 00 Design Requirements
- 01 09 20 Energy & Building Modeling Requirements
- 01 80 10 Demonstrated Performance Requirements
- 01 83 16 Exterior Enclosure Performance Requirements
- 01 92 13 Facility Operation Requirements
- 01 93 13 Facility Maintenance Requirements
- 01 91 13 Commissioning Performance Requirements
- 22 08 50 Plumbing Performance Requirement
- 23 05 95 TAB Performance Requirements
- 23 08 10 Performance Tracking System Requirements
- 23 08 50 HVAC Performance Requirements
- 23 09 50 HVAC Controls Performance Requirements
- 23 09 60 FDD Analytic System Requirements
- 23 25 50 Water Treatment Performance Requirements
- 26 09 50 Electrical Performance Requirements



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Keys to a successful Performance Contract

- Contractor is incentivized to deliver design performance
- Contractors Key Success Factors:
 - Select high quality subcontractors
 - Select highest quality Technical Commissioning Consultant
 - Select technical operators who understand performance
 - Task the **commissioner** with delivering the end performance through all stages of the project
 - Design assistance & review
 - Overview of the modeling process
 - Construction observation and system testing
 - Final system commissioning & optimization
 - Supervision and tracking system management during the performance tracking period





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Keys to a successful Performance Contract



- **Performance Measurement**

- For each measurement period performance is measured to predicted performance
- Documented Original Model is re-run for actual weather, occupancy and schedule for each measurement period to compare predicted to actual results
- Goal is to achieve predicted energy and water usage values with no more than a 10% variance
- Goal is to achieve design interior ambient conditions for occupant comfort and productivity



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Keys to a successful Performance Contract

- **If Performance is not demonstrated what happens?**

- If results are not demonstrated then the contractor continues to operate and improve system performance until the required goals are reached

- Commissioner, designers, operators and contractors strive to adjust systems parameters to provide performance

- Demonstrated performance for any measurement period during the warranty period will complete contract





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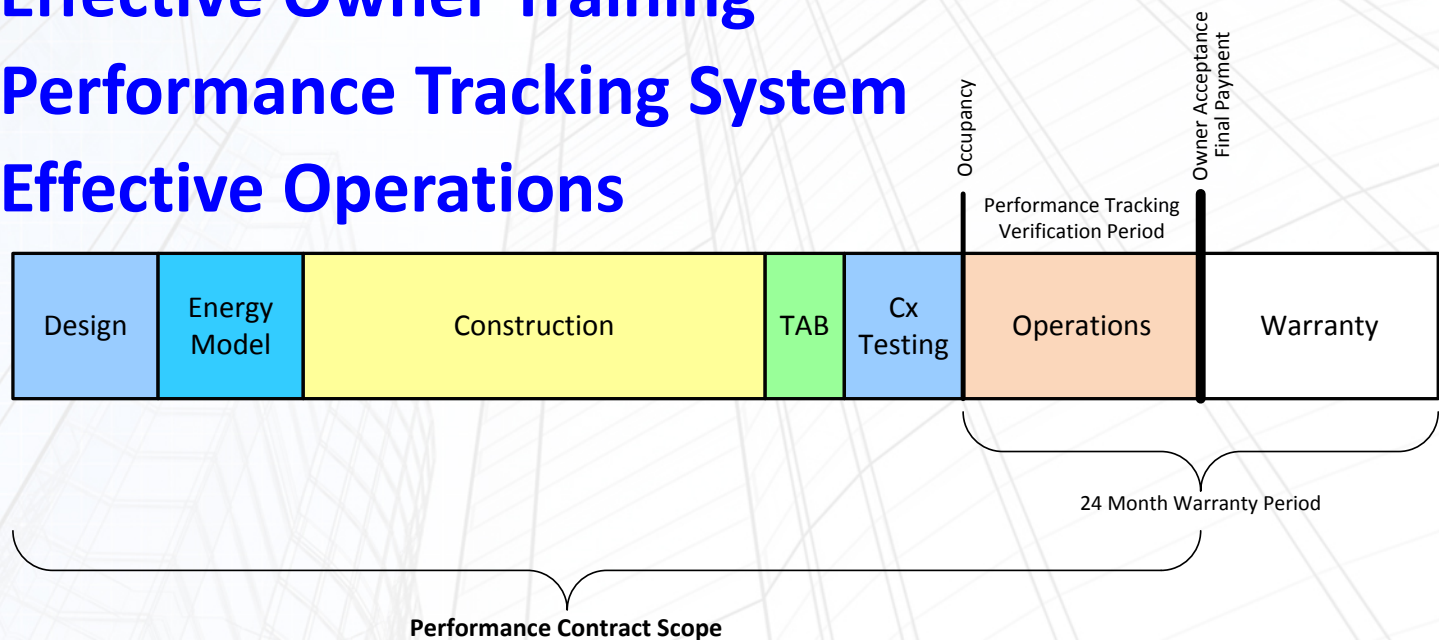
Keys to a successful Performance Contract

- **If at the end of the warranty period performance cannot be demonstrated**
 - Contractor, commissioner, designers and operators produce a report clearly defining why performance cannot be achieved
 - Contractor and owner negotiate settlement
 - 5% retention is at risk
 - **Negating Circumstances**
 - Misrepresented OPR instructions provided by owner
 - Failure of the owner to allow access
 - Owner personnel change operating parameters that negatively impact performance without contractors approval
 - Occupant actions that negatively impact performance



Key Guaranteed Performance Project Components

- Quality Design
- Accurate Energy Modeling
- Quality Construction
- Expert TAB
- Technical Commissioning
- Effective Owner Training
- Performance Tracking System
- Effective Operations



Building Performance

- If you truly want building performance you must eliminate the contractual barriers for its delivery
- If you want to keep performance you must measure it on a continual basis, it is the only way to prevent performance degradation





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Guaranteed Building Performance

1. Owner Benefits:

- a.** Demonstrated proven building performance
- b.** Building constructed to a higher quality standard
- c.** Performance tracking system up and running
- d.** Fully developed CMMS system
- e.** Fully trained operators
- f.** Operating tools and procedures are in place to maintain future performance
- g.** Cost of first year of operations is included in capital budget not the operations budget



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Guaranteed Building Performance

2. Contractor Benefits:

- a.** Improved contractor marketing profile which will provide additional sales opportunities for the future
- b.** Improved quality process provides a higher quality building which will lower warranty costs
- c.** Total responsibility contract provides more revenue
- d.** Higher customer satisfaction with constructed results





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This concludes The American Institute of Architects
Continuing Education Systems Course

Questions?

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