

Risk Management Issues on Green Building Projects
06 November 2008

E. Mitchell Swann P.E., LEED AP
Partner
swann@mcdsystems.com
www.MDCSystems.com



©2000
MDCSystems

Program Overview

The program will identify and discuss:

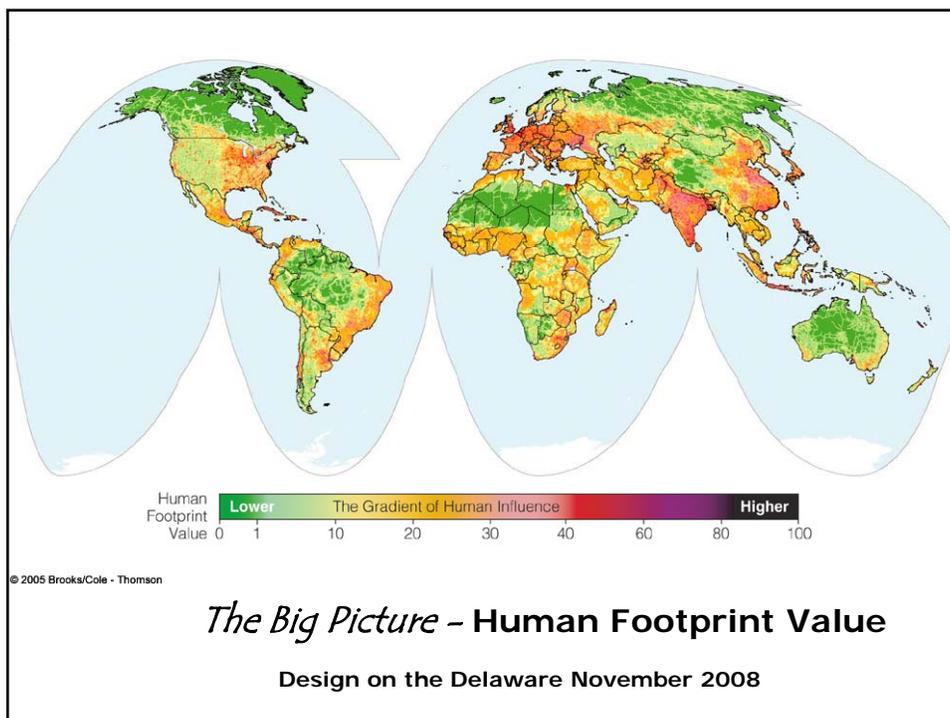
- key project facets and considerations in green building projects
- the resultant risk issues
- variances and the interplay between design, construction and operations
- management and execution techniques to mitigate or manage those risks
- how to resolve disagreements or disputes should they arise.
- identify which party is best suited to address certain risks
- overview current industry practice
- current industry trends which alter the project delivery process and the allocation of risks.

Design on the Delaware November 2008

Learning Objectives

- Identify the risks that are particular to green building projects;
- Determine the source of those risks and which party is best suited to cope;
- Present management and/or mitigation strategies to address those risks;
- Identify other industry trends which also alter the project execution landscape.

Design on the Delaware November 2008



A simpler way to look at it...

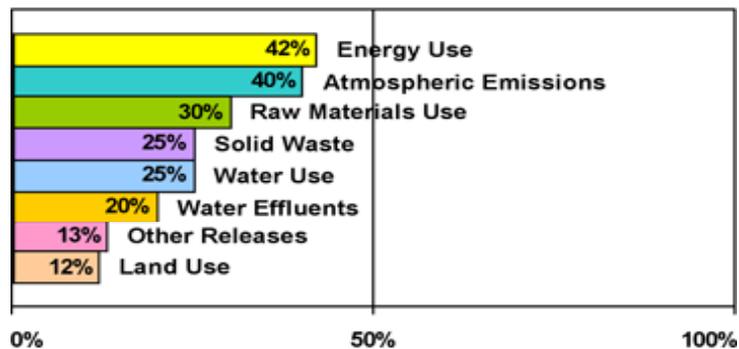


5

Where do buildings fit in the picture?

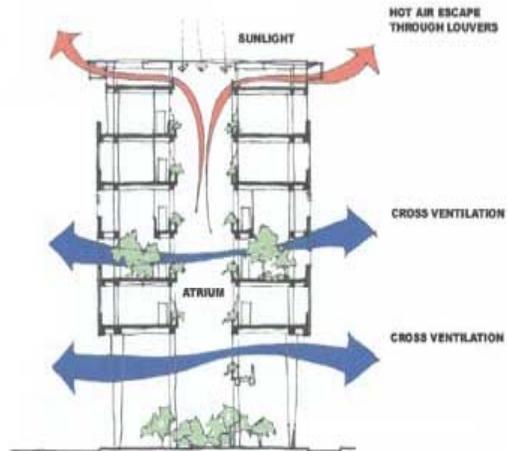
Environmental Impact of Buildings

Percentage of U.S., Annual Impact



Green Building Objectives

- **greater efficiency**
 - *energy, water & resources*
- **lower life cycle cost**
- **healthier environment**
 - *better siting,*
 - *design,*
 - *construction,*
 - *operations & maintenance,*
 - *waste removal*
- **higher asset value**



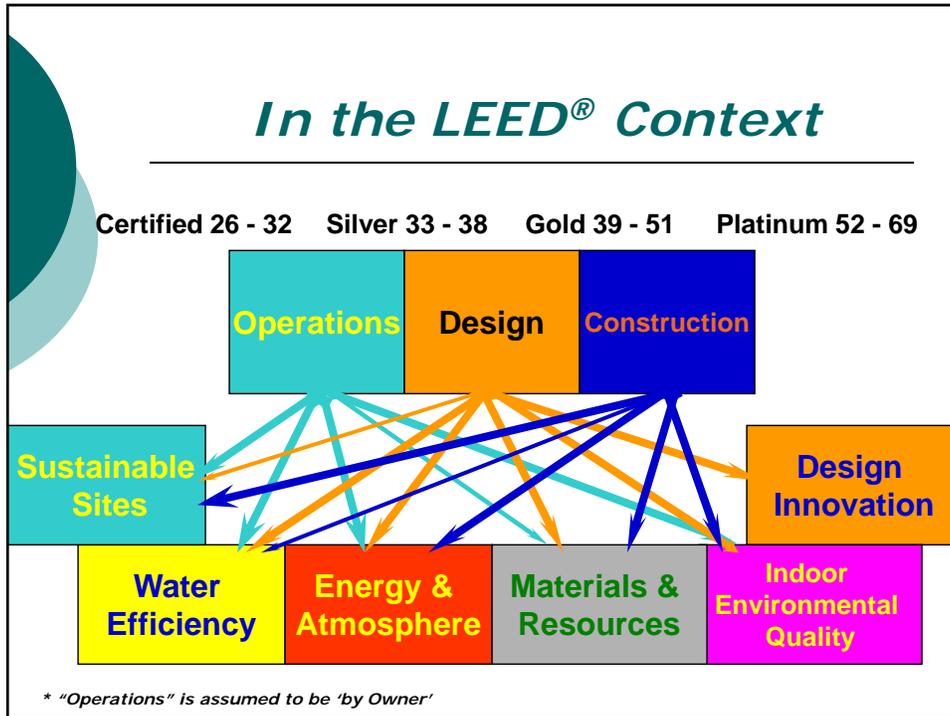
"Traditional" or "sustainable" What's the difference?

The objectives...

- ...**more** energy efficient
- ...**reduced** resource demand
- ...**a healthier** indoor environment

Performance metrics

- *Energy use*
- *Resource use*
- *Environmental Quality*
- *Operating expenses*
- *Certifications**



The objective is

'high performance' buildings

lower costs, better environment, higher value

Does 'high performance' require...

- **Additional design time and effort?**
 - How does this affect fee?
- **Specialty consultants?**
 - How does this affect "Standard of Care"?
- **Special construction techniques?**
 - How does this affect 'custom & practice'?

The implications of 'performance' Nature of Risk – Nature of Damages

Energy - Design/Installation/Performance

- "A consequence of.." or "A direct result of..."?
 - Standard of Care"
 - Defective Workmanship
 - On-going Operations

Building Certification/Rating

- Would "failure to achieve" imply...
 - ...an 'error' or 'omission'?
 - As a requirement of contract (a "guarantee"?)
 - Mandated by statute

What does this do to liability insurance?

The implications of 'performance' Nature of Risk – Nature of Damages

Green Building Tax Credits...

- An Owner's commitment to performance?
 - Is this a 'guarantee of performance'?
 - An "Implied Warranty"?
- If performance or cert application fails
is the credit rescinded?
 - is that 'foreseeable'?

What does this do to liability insurance?

What about the contractor?

Materials, means & methods...

- **Product substitutions**
 - pricing, delivery, interruption
- **Product “compatibility”**
 - defective workmanship?
- **Defaults**
 - “suitable replacement”
 - Failure to replace in a “timely fashion”
 - Potential delay or LD costs.

The Owner

some new considerations

Does the Owner impact performance?

How is that mitigated?

*Guidelines or criteria
for “proper” operation & use?*

An Owner’s Manual?

Establishing Performance Targets

10,000sf Office Bldg
 10,000sf, 20000 Btu, 1 KW, 12hr, 5000, 5300, 40, 7400
 10,000sf = 1000000 Btu, 1000000 Btu / 10000sf = 100 Btu/sf
 10,000sf = 1000000 Btu, 1000000 Btu / 10000sf = 100 Btu/sf

Establishing 'reasonable' performance targets:

...establish targets which accommodate some "misbehavior".

HVAC learn what is "customary" based on industry 'norms' including first cost.

Summary of building heating and cooling performance.

1. General Summary

2. System: VAV Single Duct

2.1 Heating Loads

2.2 Cooling Loads and Airflow Rates

3. System: Constant Airflow Fan Coil

3.1 Heating Loads

3.2 Cooling Loads and Airflow Rates

1. General Summary

Model Data: Project No: "Sample Model"
 Model total floor area = 25000.0 m²
 Model total volume = 100000.0 m³
 Number of rooms = 62

Heating Calculation Data: Heating results for Sample Model
 Calculated at 13.43 on 12/Feb/07
 Calc. Period: January

Cooling Calculation Data: Cooling results for Sample Model
 Calculated at 13.43 on 12/Feb/07
 Calc. Period: May - Sep

2. System: VAV Single Duct

2.1 Heating Loads

System Heating Loads

Room Heating Load (kW)	Outdoor air volume (for 4.000)	DHW (kW)	Plant load ¹
Service	Flow (m ³ /s)	Max. vent.	Heating demand (Plant load ²)
00 (Tot)	21.10	0.00	0.00

¹Includes pipe & duct heat losses

Room Heating Plant Loads

Room Name	Area (m ²)	Construction gain (kW)	Ventilation sensible gain (kW)	Area heat gain (kW)	Internal gain (kW)	Plant load ¹	Only heating demand (kW)
01 Office	21.00	-0.00	0.00	-0.00	0.00	0.00	0.00
02 Office	21.00	-0.00	-0.10	-0.10	0.00	-0.10	0.00
03 Office	21.00	-0.00	-0.10	-0.10	0.00	-0.10	0.00
04 Office	21.00	-0.00	-0.10	-0.10	0.00	-0.10	0.00
05 Office	21.00	-0.00	-0.10	-0.10	0.00	-0.10	0.00
06 Office	21.00	-0.00	-0.10	-0.10	0.00	-0.10	0.00
07 Office	21.00	-0.00	-0.10	-0.10	0.00	-0.10	0.00

Can you spot the high performance building?



Building Performance Certificate

Energy Certificate

Building Energy Performance >

Building Type: Office
 Whole or part of building: Whole building

Very energy efficient

A B C D E F G

Not energy efficient

As built: B
 In use: D

Operational energy rating: 48 (As built) / 83 (In use)

GB 2005

Building name: UK National Standards 2005
 Organisation: UK National Standards 2005
 City: London
 Country: United Kingdom
 Date: 12/02/07

Some Tools...

Performance...

- *original input, assumptions and criteria...*
 - *used as a basis to evaluate operations performance.*
 - *Include some weather data 'basis'*
 - *and some acceptable deviation*
- **Documentation:**
 - 'what did I say' of design...*
 - 'what did I mean' of operations...*
- *Modeling, monitoring, and optimization.*

Is a new framework required?

- **Indemnification**
 - *May not be possible.*
- **Limits of Liability**
 - *on-going "operating costs"?*
 - *'consequentials' of marketplace?*
 - *'economic loss' theory*
- **PLI for 'specialty' consultants**
 - *Energy modelers*
 - *Commissioning Agents*

In Design...

Monitoring and Measurement

Consider...

- Audit and Verification Clause
 - If a dispute arises, allow design/construct team to monitor/audit operation and performance history.
 - (“notice” and “opportunity” to “cure”)
 - 3rd Party Auditor
 - Use the BAS to track compliance

Building Automation Systems can provide...

- *Data Logging, Retention and Trending*
 - *Enhance the Operator’s capacity to “mitigate” operational damages*

In Construction ...

Delays, Defaults, Substitutions, etc.

- *‘time is of the essence’ ...*
 - *a waiver of certification requirements*
 - *“EB” instead of “NC”*
 - *compensation for ‘extended duration’ costs*

Defaults

- *Surety: ‘qualified’ replacement contractors*

Certification ‘failure’

- *Performance bonds to cover remedial work*

In Operations...

Go beyond traditional operating manuals.

- ***Training Programs for Owners/Operators***
 - *include methods, modes and schedules of operation;*
 - *develop maintenance guidelines.*
 - ***integral with project execution***
 - *require sign-off*

Consider...

- ***Videotaping training sessions***
- ***'fault-tree' studies and analysis (up front!)***

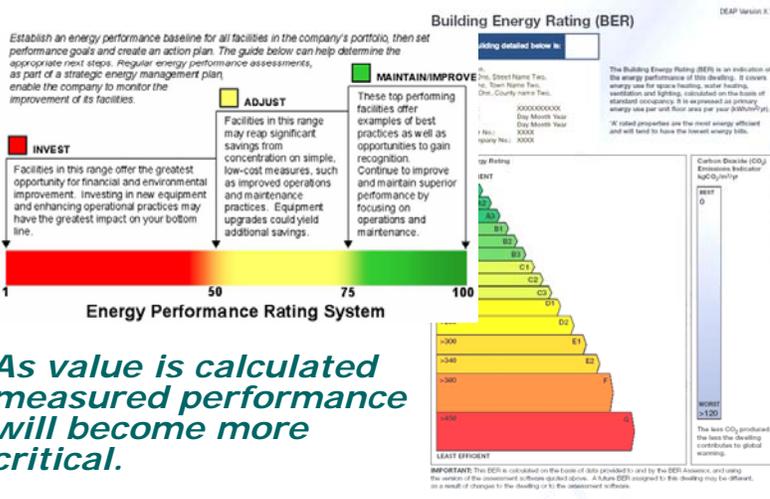
Challenges to Sustainability

- **Balancing Economic Pressures and Technological Possibilities**
- **Guard against 'overstating' capabilities**
 - *"Underpromise" and "Overdeliver"*
- Focus on performance and not 'medals'**
- **Rating systems help to...**
 - **Align thinking**
 - **Create common language**
- But!**
- **Too much "alignment" can lead to 'group think'**
 - **thinking only 'on the checklist'**

What becomes of Sustainability?

- **value will increase as demand increases;**
 - Both 'resource' driven and 'market' driven
- **integration into 'the custom and practice';**
 - New contractual context for new 'custom and practice'.
- Differences in execution, delivery and evaluation of sustainable projects will require new approaches to defining a successful project...
... and evaluating contract compliance.

What becomes of Sustainability?



- **As value is calculated measured performance will become more critical.**



Thank you

Design on the Delaware November 2008

E. Mitchell Swann, P.E., LEED AP
swann@mdcsystems.com
Principal and Partner
MDC Systems, LLC

Licensed Professional Engineer:
 Pennsylvania, New Jersey, New York, Connecticut, California, Michigan, Illinois, Georgia, Kentucky
 US Green Building Council LEED Accredited Professional

Mr. Swann has over 20 years of extensive experience on both domestic and international projects in the areas of management consulting and problem solving, engineering design, project and construction management, forensic engineering and construction claims analysis. Mr. Swann's career includes the analysis, evaluation and design of complex systems across a wide range of industries and buildings types including commercial, institutional and industrial facilities, hospitals laboratories, pharmaceutical manufacturing, microelectronic operations and data centers. Mr. Swann has chaired technical committee within national and international organizations and been a contributing author and editor for a number of technical publications and journals. He is a frequent speaker both nationally and internationally and is a listed member of the speakers' bureau in the Distinguished Lecturer program of ASHRAE. He has recently presented on Green Building issues in Abu Dhabi, Dubai, Delhi, Detroit, Chicago, Seattle, New York City, Indianapolis, Kansas City, Virginia and Delaware. He is a contributing author to the ASHRAE "Green Guide – The Design, Construction and Operation of Sustainable Buildings" and co-author of the ASHRAE Survival Guide to Design/Build Project Execution.

Professional Affiliations:
 American Bar Association, American Society of Heating, Refrigeration, and Air Conditioning Engineers, International Society of Pharmaceutical Engineering, US Green Building Council, Defense Research Institute

Other Activities:
 Pennsylvania Environmental Council - Board
 The Engineer's Club of Philadelphia – Board of Directors
 Enterprise Heights CDC - Board Chair
 Drexel University - Alumni Board of Governors
 National Association of Asian American Professionals (Philadelphia Chapter) – Board of Directors
 National Society of Black Engineers Greater Philadelphia Chapter – President Emeritus

Design on the Delaware November 2008

MDCSystems®

Providing Expert Project Delivery Solutions Worldwide

MDC Systems is a project and construction management consultancy with over 40 years of experience serving a wide array of clients and industries both nationally and around the globe.

MDC has worked on projects as diverse as residential property developments to pharmaceutical plants to highway excavation and construction.

MDC concentrates its services in primarily four areas: program management, project management consulting, forensic engineering and construction claims consulting.

One of the key facets of **MDC's** professional staff is our expertise in the technology driven issues that are so frequently at the heart of today's complex projects.

MDC's construction claims consulting practice combines all of the skills inherent to our other service offerings and deploys it for our clients when and where projects don't go quite as smoothly as everyone had hoped. **MDC** is an industry leader in the area of construction schedule development and analysis including delay, acceleration, interruption and extended duration. **MDC** pioneered the court tested and approved Time Impact Analysis methodology for scientifically analyzing construction schedules and the impact of events upon their execution and completion.

www.MDCSystems.com

MDCSystems® *Summary of Services*

Program & Project Development including...

- Performance Assessment & Benchmarking

Project Modeling including...

- "What if..." Scenario Analyses
- Variability/Sensitivity Analyses
- 'Out of Bounds'/'Go – No Go' Limits

Project Planning including...

- Feasibility Studies
- Master Scheduling including...
 - Resource & Constraint Analysis

Project Monitoring including...

- Schedule Compliance
- Cash Flow & "Burn rate" projections
- Resource Utilization

Consulting Services including...

- Sustainability/Green Buildings
- Peer Review
- Practice Management

Forensic Analyses including:

- Building Systems:
 - Architectural incl. Building Envelope
 - HVAC/Mechanical, Electrical & Piping
 - Structural
 - Instrumentation & Controls
- Design Errors & Omissions (Standard of Care)
- Differing Site Conditions

Forensic Project Management®

- Schedule Analysis
 - Delay, Disruption, Suspension & Acceleration
- Labor Productivity & Inefficiency
- Scope Definition and Change
- Termination - Default or Convenience
- Procurement - Bid/Award Transparency

Forensic Accounting including...

- Valuation of Damages
 - Overhead & General Conditions
- Business Interruption & Lost Profit

Selected Recent Assignments

<i>Engineering Consulting and Technical Analyses:</i>	<i>Project Management, Execution & Construction Claims :</i>
<ul style="list-style-type: none"> ○ Analysis of Moisture Migration and RH Control in a Microelectronics Product R&D Facility (Colorado). ○ Analysis and Improvement of Energy Consumption at a "Green" School (Pennsylvania) ○ Peer Review & Design Supervision for a Radiant Heating/Cooling Floor System (New Jersey) ○ Peer Review of Schematic Engineering Design Effort for Hospital Complex (Qatar) ○ Analysis of Formaldehyde Outgassing from Construction Materials (Pennsylvania) ○ HVAC System Failures in Pharmaceutical Packaging Facility (New Jersey) ○ Analysis of Process Technology Failure at Waste Treatment Plant (New Jersey) ○ Analysis of Piping System Joint Failures at a Hospital central Plant (New Jersey) ○ Analysis of Destructive Vibration\ Harmonics on Large Industrial Compressors at a Chemical Plant (Louisiana) 	<ul style="list-style-type: none"> ○ Excess Rock Excavation Claim on a Highway Project - Unforeseen Conditions (New Jersey) ○ Electrical Contractor Inefficiency Claim on Multi-Prime Project (New Jersey) ○ Electrical Usage Charge Dispute Between Landlord & Tenant (New York) ○ Schedule Delays and Change Orders on multiple Airport Projects for Major Equipment Supplier (various) ○ Schedule Delays and Associated Cost Overruns for Underwater Pipeline Project (Ireland) ○ "Standard of Care" Defense - Design of a Food Processing Facility (Pennsylvania) ○ "Custom & Practice" – Specifications Development and Bid Transparency Issues (California) ○ "Standard of Care" Defense – Design and Documentation of a Pharmaceutical Plant using 3D Modeling (Texas) ○ "Standard of Care" Plaintiff – Delay and Cost Overruns for a Pharmaceutical Plant using 3D Modeling (Singapore)



Design on the Delaware
November 2008