

Partners in Progress

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Bidding Green: The Future of Construction Contracting

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THE WALDINGER CORPORATION

Definition of Terms

- Sustainability

meeting our needs without compromising the ability of future generations to meet their needs.

“Sustainable” vs. “Green”

- Green Building

a building that provides the specified building performance requirements while minimizing disturbance to and improving the functioning of local, regional, and global ecosystems both during and after its construction and specified service life.

ASTM Standard E 2114 – 06a, 2006

- LEED Leadership in Energy & Environmental Design

an interdisciplinary rating system for green buildings, administered by USGBC.

SMACNA

HVAC Contractor's Guide to Bidding Green Building Projects

Sheet Metal and Air Conditioning
Contractors' National Association, Inc.
Bidding Green Task Force

HVAC CONTRACTOR'S GUIDE TO BIDDING GREEN BUILDING PROJECTS

Thomas E. Glavinich, D.E., P.E.
The University of Kansas

Purpose: To introduce the HVAC contracting firm to green building construction and provide information that will help the HVAC contracting firm successfully bid green building construction projects.

Guide Format

- Question and answer format.
- Twelve sections addressing different green building topics of interest to HVAC contractors.
- Make the HVAC contractor aware of additional requirements it may be responsible for on green building projects.
- Not a substitute for the actual third party green building rating criteria or specific contract requirements.

Guide Outline

- 1.0 What is green construction and how does it affect me?
- 2.0 Can your firm be green without having a green project?
- 3.0 What green building requirements will affect my business?
- 4.0 Do my employees need any special training or certifications to work on a green project?
- 5.0 How does bidding differ on a green building project?
- 6.0 Can a green building project be design build?
- 7.0 What should I look for in a green contract?
- 8.0 Are there special products that I need to use on a green building project?
- 9.0 Do green requirements impact my fabrication shop operations?
- 10.0 Will green requirements affect my field productivity?
- 11.0 Are there special commissioning and closeout requirements on a green project?
- 12.0 How do I market my firm's green building experience and expertise?

Green Building Market Situation

- USGBC Membership grew 60% in 2007
- 43,000 LEED APs
- LEED Project status
 - 9000 registered, 1200 certified
 - Up 75% cumulative in 2007

Who is building green, and why?

- LEED-Certified buildings have been built by:
 - Ford Motor Company
 - Delta Airlines
 - Goldman-Sachs
 - U.S. Navy and Air Force
 - Harley-Davidson
 - Pfizer
 - Anheuser-Busch
- There must be a business case for green buildings.

Trends Accelerating Green Building

- High energy prices
- Increasing number of successful green commercial buildings
- Growing evidence for the business case benefits of green buildings
- Sustained actions by local and state governments to promote green buildings (nearly 100 cities mandate)
- City regulations beginning to require green buildings from the private sector
- Design teams learning how to build green on a budget
- Major new push by AIA and others
- Growing actions by institutional funders to require LEED certification

Yudelson Associates: *Branding and Positioning Your Green Building Offering*

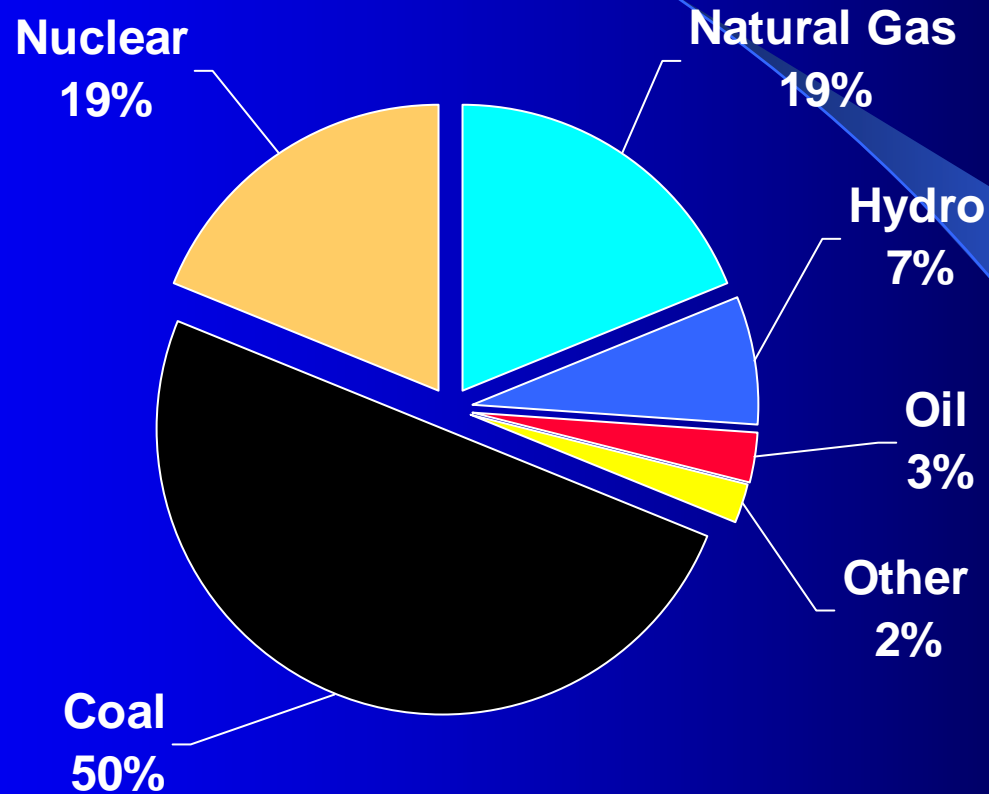
Green Business Case Elements

- Savings in future utility costs (energy/water)
 - Direct increase in commercial building value (15x savings)
- Productivity enhancements
- Risk management benefits
- Resale value, rent growth, occupancy for offices
- Marketing and public relations
- Key employee recruitment and retention
- Public policy drivers
- Project finance

U.S. Energy Security

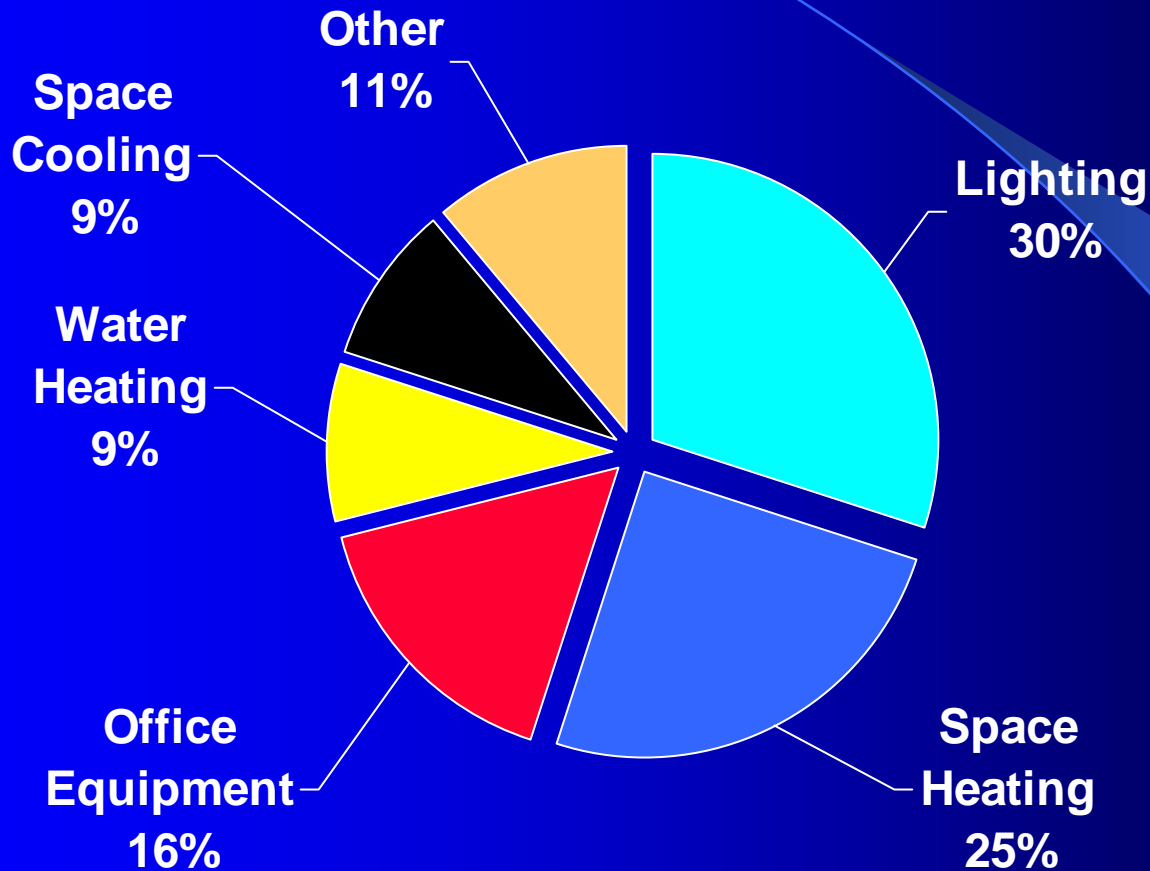
- U.S. economy depends on an adequate & steady supply of energy.
- DOE predicts 40% increase in U.S. energy consumption by 2025.
- Total energy consumption to increase more rapidly than domestic production requiring increased energy imports.
- Continued growing dependence on imported energy represents a major risk to U.S.

Fuels To Generate Electricity



Data Source: U.S. Department of Energy, Energy Information Administration (EIA), 2005 Preliminary Data

Commercial Building Energy Use



Data Source: U.S. Department of Energy, Energy Efficiency & Renewable Energy (EERE) Building Technologies Program

AIA High Performance Building Position Statements

- *Promote sustainable design including resource conservation to achieve a minimum 50 percent reduction from the current level of consumption of fossil fuels used to construct and operate new buildings by the year 2010, and promote further reductions of remaining fossil fuel consumption by 10 percent or more in each of the following five years.*
- *The AIA supports the development and use of rating systems and standards that promote the design and construction of communities and buildings that contribute to a sustainable future.*

Carbon-Neutral Buildings & Zero Energy Buildings (ZEBs)

- AIA “2030 Challenge” sets the goal for carbon-neutral buildings by 2030.
- ASHRAE plans to create a “Net Zero” guide for building design and construction by 2020.
- U.S. Department of Energy’s (DOE) Building Technologies Program has set a goal of “zero-energy buildings” by 2025.

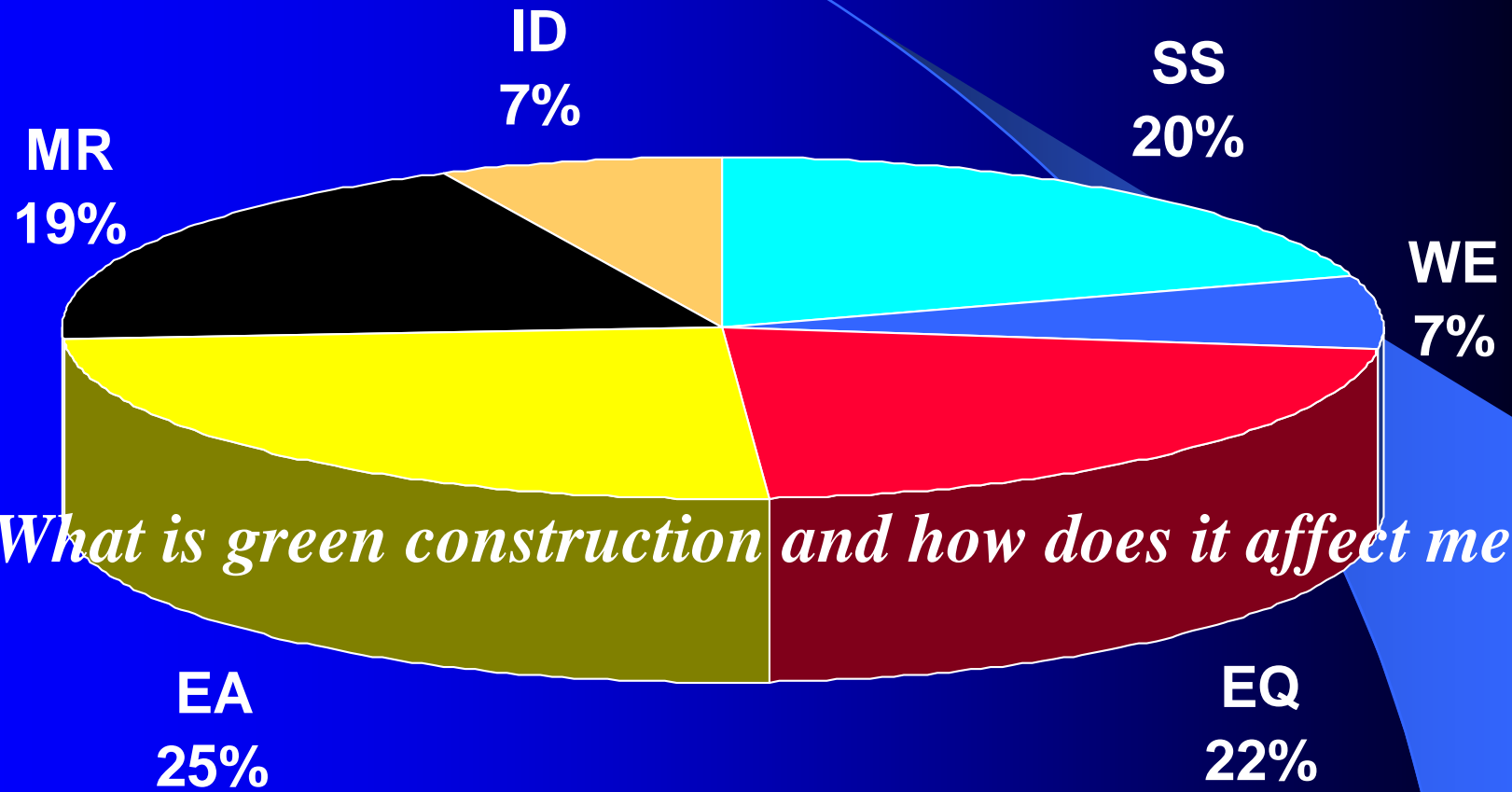
USGBC LEED™ Rating Systems

LEED Designator	Rating System Purpose	Version	
		No.	Date
NC	New Construction & Major Renovations	2.2	2005
CS	Core & Shell	2.0	2006
CI	Commercial Interiors	2.0	2005
EB	Existing Buildings: Upgrades, Operations, & Maintenance	2.0	2005
	Homes (Pilot)	1.11a	2007
	Neighborhood Development (Pilot)		2007
	Retail: New Construction & Major Renovation (Pilot)	2.0	2007
	Schools: New Construction & Major Renovation (Pilot)		2007
	Multiple Buildings & On-Campus Bldg Projects (Pilot)		2007

LEED-NC Categories

Category Designation	Category Name	Possible Points	Percent Total
SS	Sustainable Sites	14	20
WE	Water Efficiency	5	7
EA	Energy & Atmosphere	17	25
MR	Materials & Resources	13	19
EQ	Indoor Environmental Quality	15	22
ID	Innovation & Design Process	5	7
Total Possible Points		69	100

LEED-NC Point Distribution



1.0 What is green construction and how does it affect me?

$$EA + EQ = 47\%$$

LEED-NC Certification

Certification Level	Points Required	Min Pct Pts Possible For Level
Certified	26 – 32	38%
Silver	33 – 38	48%
Gold	39 – 51	57%
Platinum	52 – 69	75%

The LEED Checklist

Project Name:
Project Address:

Yes ? No **Sustainable Sites** 14 Points

Y	Prereq 1	Construction Activity Pollution Prevention	Required
	Credit 1	Site Selection	1
	Credit 2	Development Density & Community Connectivity	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	1
	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Site Development, Protect or Restore Habitat	1
	Credit 5.2	Site Development, Maximize Open Space	1
	Credit 6.1	Stormwater Design, Quantity Control	1
	Credit 6.2	Stormwater Design, Quality Control	1
	Credit 7.1	Heat Island Effect, Non-Roof	1
	Credit 7.2	Heat Island Effect, Roof	1
	Credit 8	Light Pollution Reduction	1

Yes ? No **Water Efficiency** 5 Points

	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
	Credit 3.1	Water Use Reduction, 20% Reduction	1
	Credit 3.2	Water Use Reduction, 30% Reduction	1

Yes ? No **Energy & Atmosphere** 17 Points

Y	Prereq 1	Fundamental Commissioning of the Building Energy Systems	Required
Y	Prereq 2	Minimum Energy Performance	Required
Y	Prereq 3	Fundamental Refrigerant Management	Required

*Note for EAc1: All LEED for New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1.

	Credit 1	Optimize Energy Performance	1 to 10
		10.5% New Buildings or 3.5% Existing Building Renovations	1
		14% New Buildings or 7% Existing Building Renovations	2
		17.5% New Buildings or 10.5% Existing Building Renovations	3
		21% New Buildings or 14% Existing Building Renovations	4
		24.5% New Buildings or 17.5% Existing Building Renovations	5
		28% New Buildings or 21% Existing Building Renovations	6
		31.5% New Buildings or 24.5% Existing Building Renovations	7
		35% New Buildings or 28% Existing Building Renovations	8
		38.5% New Buildings or 31.5% Existing Building Renovations	9
		42% New Buildings or 35% Existing Building Renovations	10
	Credit 2	On-Site Renewable Energy	1 to 3
		2.5% Renewable Energy	1
		7.5% Renewable Energy	2
		12.5% Renewable Energy	3
	Credit 3	Enhanced Commissioning	1
	Credit 4	Enhanced Refrigerant Management	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

Yes ? No **Materials & Resources** 13 Points

Y	Prereq 1	Storage & Collection of Recyclables	Required
	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
	Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1
	Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1
	Credit 3.1	Materials Reuse, 5%	1
	Credit 3.2	Materials Reuse, 10%	1
	Credit 4.1	Recycled Content, 10% (post-consumer + 1/2 pre-consumer)	1
	Credit 4.2	Recycled Content, 20% (post-consumer + 1/2 pre-consumer)	1
	Credit 5.1	Regional Materials, 10% Extracted, Processed & Manufactured Regionally	1
	Credit 5.2	Regional Materials, 20% Extracted, Processed & Manufactured Regionally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

Yes ? No **Indoor Environmental Quality** 15 Points

Y	Prereq 1	Minimum IAQ Performance	Required
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
	Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 2	Increased Ventilation	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
	Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
	Credit 4.3	Low-Emitting Materials, Carpet Systems	1
	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Lighting	1
	Credit 6.2	Controllability of Systems, Thermal Comfort	1
	Credit 7.1	Thermal Comfort, Design	1
	Credit 7.2	Thermal Comfort, Verification	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 80% of Spaces	1

Yes ? No **Innovation & Design Process** 5 Points

	Credit 1.1	Innovation in Design: Provide Specific Title	1
	Credit 1.2	Innovation in Design: Provide Specific Title	1
	Credit 1.3	Innovation in Design: Provide Specific Title	1
	Credit 1.4	Innovation in Design: Provide Specific Title	1
	Credit 2	LEED® Accredited Professional	1

Project Totals (pre-certification estimates) 69 Points

Certified: 26-32 points, Silver: 33-38 points, Gold: 39-51 points, Platinum: 52-69 points

Energy & Atmosphere Category

EA	P1	Fundamental Commissioning of Bldg Energy Systems	-----
EA	P2	Minimum Energy Performance	-----
EA	P3	Fundamental Refrigerant Management	-----
EA	C1	Optimize Energy Performance	1-10
EA	C2	On-Site Renewable Energy	1-3
EA	C3	Enhanced Commissioning	1
EA	C4	Enhanced Refrigerant Management	1
EA	C5	Measurement & Verification	1
EA	C6	Green Power	1
Total Energy & Atmosphere Category Points Possible			17

LEED-NC EA Prerequisite 1

Fundamental Commissioning

- Designate individual as the commissioning authority (CxA) to lead, review, and oversee commissioning process.
- CxA to review Owner's Project Requirements (OPR) and design team's Basis Of Design (BOD).
- Develop & incorporate Cx requirements in construction documents.
- Develop & implement Cx plan.
- Verify installation and performance of systems to be Cx'd.
- Prepare Cx report.

LEED-NC EA Prerequisite 1

Fundamental Commissioning:

Systems To Be Commissioned

- HVAC&R systems and associated controls.
- Lighting and daylighting controls.
- Domestic hot water systems.
- Renewable energy systems.

LEED-NC EA Credit 3

Enhanced Commissioning

- Prior to start of construction documents phase, appoint independent CxA to lead, review, and oversee Cx process.
- CxA to at least one Cx review:
 - Owner's Project Requirements (OPR)
 - Basis Of Design (BOD)
 - Mid-Design Phase Documents
 - Check Review Comments In Design Documents
- Review contractor submittals for OPR & BOD compliance.
- Develop system O&M documentation for owner.
- Verify training of bldg operating personnel and occupants.
- Involve CxA in reviewing bldg operation within 10 months of substantial completion with bldg operating personnel and occupants.

Commissioning Activities

- Prefunctional Equipment Testing
- Control System Checkout & Testing
- Testing, Adjusting, & Balancing (TAB)
- Functional System Testing
- Operational Training
- Commissioning Outcomes Documentation

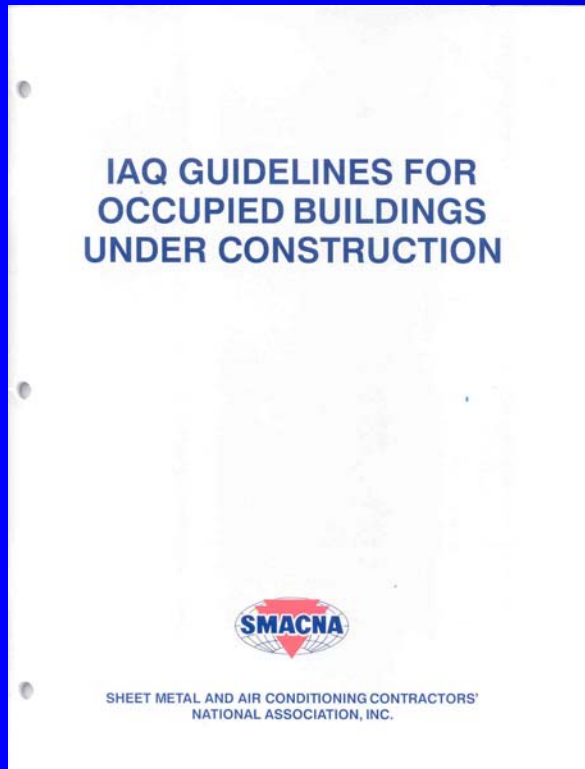
11.0 Are there special commissioning and closeout requirements on a green project?

Indoor Environmental Quality Category

EQ	P1	Minimum IAQ Performance	-----
EQ	P2	Environmental Tobacco Smoke (ETS) Control	-----
EQ	C1	Outdoor Air Delivery Monitoring	1
EQ	C2	Increased Ventilation	1
EQ	C3.1	Construction IAQ Management Plan: During Construction	1
EQ	C3.2	Construction IAQ Management Plan: Before Occupancy	1
EQ	C4.1	Low-Emitting Materials: Adhesives & Sealants	1
EQ	C4.2	Low-Emitting Materials: Paints & Coatings	1
EQ	C4.3	Low-Emitting Materials: Carpet Systems	1
EQ	C4.4	Low-Emitting Materials: Composite Wood & Agrifiber Products	1
EQ	C5	Indoor Chemical & Pollutant Source Control	1
EQ	C6.1	Controllability Of Systems: Lighting	1
EQ	C6.2	Controllability Of Systems: Thermal Comfort	1
EQ	C7.1	Thermal Comfort: Design	1
EQ	C7.2	Thermal Comfort: Verification	1
EQ	C8.1	Daylight & Views: Daylight 75% Of Spaces	1
EQ	C8.2	Daylight & Views: Daylight 90% Of Spaces	1
Total Indoor Environmental Quality Category Points Possible			15

LEED-NC EQ Credit 3.1

Const IAQ Mgt Plan: During Construction Control Measures During Construction



- Ch 1 Introduction
- Ch 2 Air Pollutants Associated With Construction
- Ch 3 Control Measures
- Ch 4 Managing The Construction Process
- Ch 5 Quality Control
- Ch 6 Communicating With Occupants
- Ch 7 Example Projects
- Ap A References
- Ap B Resources
- Ap C Planning Checklist
- Ap D Inspection Checklist

IAQ Guidelines For Occupied Buildings Under Construction, Sheet Metal And Air Conditioning Contractors' Association, Inc., First Edition - November 1995.

LEED-NC EQ Credit 3.1

SMACNA IAQ Guidelines During Construction

Chapter 3: Control Measures

- Contain Work Area
- Modify HVAC Operation
- Reduce Emissions
- Intensify Housekeeping
- Reschedule Work Hours
- Move Occupants

10.0 Will green requirements affect my field productivity?

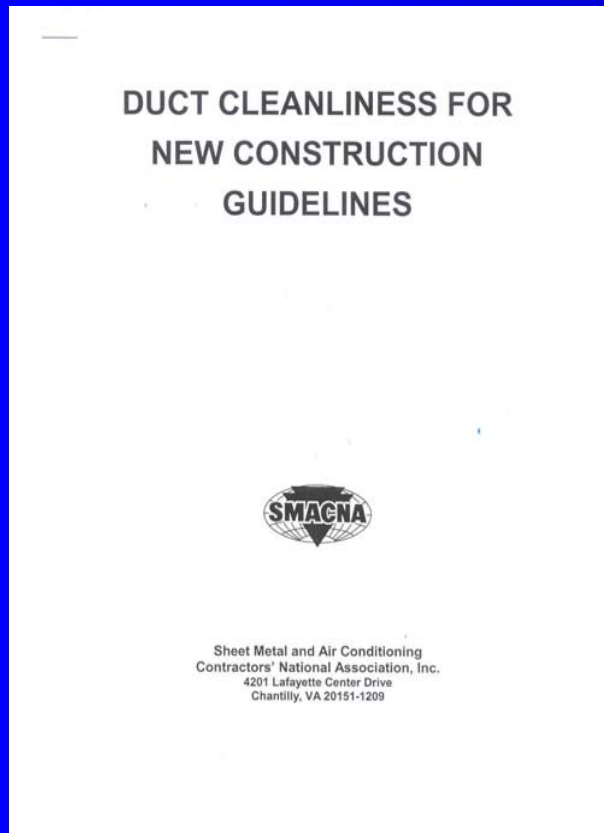
LEED-NC EQ Credit 3.1

Const IAQ Mgt Plan: During Construction IAQ Plan Considerations

- To achieve credit IAQ plan must meet or exceed requirements of Chapter 3 of SMACNA IAQ Guidelines.
- Success in this area depends on coordination and cooperation among trades as well as GC or CM.
- HVAC contractor should carefully consider these requirements and how they will be met prior to submitting bid or proposal.

LEED-NC EQ Credit 3.1

Const IAQ Mgt Plan: During Construction Protect On-Site Materials From Moisture



Section 1 - Overview

Section 2 - General Requirements

- 2.1 General Requirements
- 2.2 Duct Design & Duct Access
- 2.3 Job Site Cleanup
- 2.4 Temporary Storage
- 2.5 Scheduling Work

Section 3 - Levels Of Duct Cleanliness

- 3.1 Cleanliness Levels
- 3.2 Basic Level
- 3.3 Intermediate Level
- 3.4 Advanced Level

Appendix - References

Duct Cleanliness For New Construction, Sheet Metal And Air Conditioning Contractors' Association, Inc., 2000.

LEED-NC EQ Credit 3.1

Const IAQ Mgt Plan: During Construction Duct & Matl Protection Considerations

- Could restrict the delivery and storage of duct and equipment on site.
- Duct and equipment openings may need to be protected when stored or during installation when not being worked on.
- May require closer coordination between fabrication shop and equipment suppliers and the field.

9.0 Do green requirements impact my fabrication shop operations?

JIT Delivery Vs. Stacking The Floor

LEED-NC EQ Credit 3.1

Const IAQ Mgt Plan: During Construction Temp Heat/Cool Using Permanent HVAC

- LEED-NC recommends *avoid using permanently installed air handlers for temporary heating/cooling during construction.*
- LEED-NC requires *filter media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return grille, as determined by ASHRAE 52.2-1999 if permanently installed AHUs are used during construction. Replace all filtration media prior to occupancy.*
- Consider the impact of early start-up and use of HVAC system on cleaning, filter replacement, equipment warranties, among others.

Early Start-Up Of Permanently Installed HVAC Systems, Sheet Metal And Air Conditioning Contractors' Association, Inc., Undated Position Paper.

LEED-NC EQ Credit 3.2

Const IAQ Mgt Plan: Before Occupancy

- *Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.*
- Option 1 - Flush-Out
 - Option 1A - Prior To Occupancy
 - Option 1B - Prior To & After Occupancy
- Option 2 - Air Testing
- Flush-out can be used where occupancy is not required immediately upon substantial completion.
- IAQ testing can minimize schedule impacts but may be more costly.

LEED-NC EQ Credit 4.1

Low-Emitting Mtls: Adhesives & Sealants Compliance Recommendations

- Included are general construction adhesives, fire stopping sealants, caulking, duct sealants, plumbing adhesives, and others.
- Verify that adhesives and sealants specified meet LEED-NC EQ Credit 4.1 requirements. Watch out for defective specs.
- Train procurement, warehouse, and field personnel regarding the required use of low-VOC adhesives and sealants.
- Establish procedures for ensuring that adhesives and sealants delivered to jobsite meet low-VOC requirements and avoid maverick purchases in the field.
- Wrong material could result in rework that impacts cost and schedule.

8.0 Are there special products that I need to use on a green building project?

LEED-NC MR Credits 2.1 & 2.2 Construction Waste Management Meeting The Requirements

- Understand the goals set forth by the GC or CM and the HVAC materials covered.
- Know how the GC or CM is going to structure and locate collection facilities. Understand how this will impact your field productivity and address it in your bid or proposal.
- Educate your field personnel about construction waste management and the GC's or CM's construction waste management plan.
- Keep detailed records of the materials you dispose of in the format required by the GC's or CM's waste management plan. Submit disposal records on a regular basis.

LEED-NC ID Credit 2

LEED Accredited Professional

- Objective is to *support and encourage the design integration required by a LEED-NC green building project and to streamline the application and certification process.*
- *At least one principal participant of the project team shall be a LEED Accredited Professional (AP).*
- Not required but LEED-AP personnel can be valuable to HVAC contracting firm from both an operations and a management standpoint.

Office & Field Personnel

- Biggest problem encountered by HVAC contracting firms on green building projects is understanding the requirements and how those requirements impact both direct construction costs and project overhead.
- Responsible for work required by the green building rating system not explicitly noted in the HVAC plans & specs.
- Knowledgeable office and field personnel will help the HVAC contracting firm avoid mistake of overlooking green-related requirements in bid or proposal as well as during construction.
- GCs & CMs prefer working with specialty contractors knowledgeable in green building requirements. Reduces their risk.

4.0 *Do my employees need any special training or certifications to work on a green project?*

Identifying Green Requirements

- Green project requirements can be required in a variety of places in the contract documents.
- Green project requirements will normally be found in the project specifications.
- Green requirements may also be incorporated into the project requirements and owner-contractor agreement by reference to local laws, codes, or regulations that include green building requirements and require that the building be certified or certifiable as a green building.

Green Contract Documents

- Should include:
 - LEED checklist
 - Green requirements integrated into specs
 - Commissioning roles and responsibilities
 - Clear delineation of scope
- Should not include:
 - Clauses like this: *“The contractor shall ensure that the Project achieves LEED.”*

7.0 What should I look for in a green contract?

Know “Spec” Requirements



*Education is what
you get when you
read the specs ...*

*Experience is what
you get when you
don't ...*

*Green Requirements May Not Always Be
Where You Think They Are Going To Be*

Cost Elements of LEED

- Is LEED treated as a program strategy, or as an added requirement?
- Commissioning
- Paperwork / Application Fees
- High-efficiency equipment
- IAQ Measures

What Does a Green Building Cost?

- Business case deals with benefits
 - Anticipated, future
- But cost is critical
 - Real, immediate
 - BD&C Survey: 86% say green buildings cost more, 73% say more than 5%, 41% say more than 10%

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Resources

- *HVAC Contractor's Guide to Bidding Green Projects* – from SMACNA
- BD+C White Papers:
www.bdcnetwork.com
- Whole Building Design Guide:
www.wbdg.org
- USGBC Website: www.usgbc.org

The background is a dark blue gradient that transitions to a lighter blue at the bottom. A thin, light blue curved line starts from the top left and arcs across the upper portion of the image. A spotlight effect, represented by a lighter blue cone, originates from the bottom right and points towards the center of the text.

Questions?