LEED ACCREDITED PROFESSIONAL O+M TRAINING

July 7, 2009

Session 5 of 5

Presented by: CTG Energetics
Celia Hammond

Today's Agenda

- Green Cleaning
- Refrigerant Review
- IDP (Integrated Design Process)
- Basics
- Practice Questions

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INDOOR ENVIRONMENTAL QUALITY

GREEN CLEANING

Introduction

- Americans spend 90% of time indoors
- EPA designated indoor air pollution as a top environmental risk to public health
  - Liability concerns for building owners
  - Increased resale value
  - Increased productivity

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EQp3

Green Cleaning Policy

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EQp3 Green Cleaning Policy

- **Intent:** reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment

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EQp3 Green Cleaning Policy

Requirements:

Have in place a green cleaning policy for the building and site, addressing:

- Sustainable cleaning and floor care products meeting EQc3.3 criteria
- Cleaning equipment such as in EQc3.4
- Establishment of standard operating procedures addressing effective cleaning

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EQp3 Green Cleaning Policy

Requirements – cont'd:

- Have in place a green cleaning policy for the building and site, addressing:
  - Development of strategies for promoting and improving hand hygiene
  - Development of guidelines addressing the safe handling and storage of cleaning chemicals

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EQp3 Green Cleaning Policy

Requirements – cont'd:

- Have in place a green cleaning policy for the building and site, addressing:
  - Development of requirements for staffing and training of maintenance personnel appropriate to the needs of the building
  - Provision for collecting occupant feedback and continuous improvement

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EQc3.1

Green Cleaning–
High-Performance Cleaning Program

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EQc3.1 Green Cleaning– High-Performance Cleaning Program

- **Intent:** reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment.
- Difference - Actions and documentation

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EQc3.1 Green Cleaning– High-Performance Cleaning Program

- Requirements:
  - Appropriate staffing plan
  - Train personnel in hazards in use and disposal of cleaning chemicals, dispensing and packaging

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EQc3.1 Green Cleaning– High-Performance Cleaning Program

- Requirements:
  - Use concentrates with dilution system
  - Use sustainable materials including paper products, microfiber wipes, janitorial equipment and trash bags

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EQc3.1 Green Cleaning– High-Performance Cleaning Program

- Requirements:
  - Use cleaning and hard care floor products from EQc3.3
  - Use cleaning equipment from EQc3.4

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EQc3.1 Green Cleaning– High-Performance Cleaning Program

- Additionally consider:
  - Paper dispenser with limiting the paper
  - Toilet tissue holders for 2 rolls
  - Coreless rolls – les packaging
  - Hands free dispensers
  - Equipment that needs only water to clean
  - Floor buffer pads that minimize chemical use

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EQc3.1 Green Cleaning– High-Performance Cleaning Program

Documentation:

- Policy – with procedures listed
- Maintain a log of cleaning equipment and maintenance
- Maintain a schedule and sign in for the training
- Establish the purchasing and tracking of all cleaning related materials

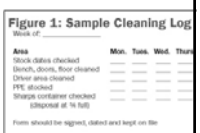

Figure 1: Sample Cleaning Log

Week of: _____

Area	Mon.	Tues.	Wed.	Thurs
Stock dates checked				
Bench, doors, floor cleaned				
Driver area cleaned				
PPE stocked				
Sharps container checked (disposal at ¾ full)				

Form should be signed, dated and kept on file

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EQc3.2

Green Cleaning– Custodial Effectiveness Assessment

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EQc3.2 Green Cleaning– Custodial Effectiveness Assessment

- **Intent:** reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment by implementing , managing and auditing cleaning procedures and processes

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EQc3.2 Green Cleaning– Custodial Effectiveness Assessment

Conduct an audit in accordance with the APPA Custodial Staffing Guidelines

Score a 3 or less

1 point – exemplary performance is 2 or less

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EQc3.2 Green Cleaning– Custodial Effectiveness Assessment

- Independent 3rd party with custodial knowledge
- 2 individuals not on cleaning staff – part of project

- *Level 1 - Orderly Spotlessness*
- *Level 2 - Ordinary Tidiness*
- *Level 3 - Casual Inattention*
- *Level 4 - Moderate Dinginess*
- *Level 5 - Unkempt Neglect*

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Level 3 - Casual Inattention

This is the minimum level that should be maintained

- Floors are swept clean, but upon close observation dust, dirt and stains, as well as a buildup of dirt, dust and/or floor finish in the corners and along walls, can be seen
- All vertical and horizontal surfaces have obvious dust, dirt, marks, smudges, and fingerprints
- Lamps all work and all fixtures are clean
- Washroom and shower tile and fixtures gleam and are odor free

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EQc3.2 Green Cleaning– Custodial Effectiveness Assessment

- Count up the square footage and space types within facility
- Randomly select rooms equivalent to at least 10% of each space type AND 10% of each floor
- If 10% is less than 5 rooms – do all rooms
- Weighting heavy on floors – visible areas

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Audit Form for Office Space

Rooms Required to Audit	23	Rooms Audited										
Provide the room number/name of each room audited in the cells to the right.		Governors Office	Treasury Office	Office House	Spar Office	Majority Office	100	102	103	104A	104	105
Provide the square footage for each room audited in the cells to the right.		700	400	600	400	427	427	427	427	427	427	427
Appearance Items	Weighting Factor	Indicate the Appearance Level for Each Room* For each room audited, provide the appearance level achieved for each ap 1 = Orderly Spotlessness, 2 = Ordinary Tidiness, 3 = Casual Inattention, 4 = Moderate D										
Floors	55	1	1	1	1	1	1	1	1	1	1	1
Horizontal surfaces	12	2	1	1	2	2	2	2	2	2	2	2
Lighting and light fixtures	3	2	2	2	2	2	2	2	2	2	2	2
Trash containers	23	1	1	1	1	1	1	1	1	1	1	1
Vertical surfaces	7	1	1	1	1	1	1	1	1	1	1	1
Total Raw Score (Weighting Factor x Appearance Level)		115	103	103	115	115	115	115	115	115	115	115
Level Achieved (Raw Score/100)		1.15	1.03	1.03	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Audit Average for Space Type		1.1	Total Square Footage Audited								###	

Audit Form for Restrooms

Rooms Required to Audit	5	Rooms Audited										
Provide the room number/name of each room audited in the cells to the right.		020A	021A	068A	129	098A						
Provide the square footage for each room audited in the cells to the right.		300	300	168	180	168						
Appearance Items	Weighting Factor	Indicate the Appearance Level for Each Room* For each room audited, provide the appearance level achieved for each appe 1 = Orderly Spotlessness, 2 = Ordinary Tidiness, 3 = Casual Inattention, 4 = Moderate Ding										
Floors	13	2	2	1	1	1						
Lighting and light fixtures	1	2	2	2	2	2						
Toilets, urinals, washbowls, soap dispensers, and drying	67	1	1	1	1	1						
Trash containers	3	1	1	1	1	1						
Vertical surfaces	16	2	2	2	2	2						
Total Raw Score (Weighting Factor x Appearance Level)		130	130	117	117	117	0	0	0	0	0	0
Level Achieved (Raw Score/100)		1.3	1.3	1.17	1.17	1.17	0	0	0	0	0	0
Audit Average for Space Type		1.2	Total Square Footage Audited								###	

EQc3.2 Green Cleaning– Custodial Effectiveness Assessment

Audit Form for Storage Rooms

Rooms Required to Audit	5	Rooms Audited												
Provide the room number/name of each room audited in the cells to the right.		Custodial Mn	Whouse	S. Shwell	Storage									
Provide the square footage for each room audited in the cells to the right.		864	300											
Appearance Items	Weighting Factor	Indicate the Appearance Level for Each Room* For each room audited, provide the appearance level achieved for each appearance item 1 = Orderly Spotlessness, 2 = Ordinary Tidiness, 3 = Casual Inattention, 4 = Moderate Dinginess, 5 = Un												
Floors	89	2	2											
Lighting and light fixtures	6	2	2											
Vertical surfaces	5	2	2											
Total Raw Score (Weighting Factor x Appearance Level)		200	200	0	0	0	0	0	0	0	0	0	0	0
Level Achieved (Raw Score/100)		2	2	0	0	0	0	0	0	0	0	0	0	0
Audit Average for Space Type		2	Total Square Footage Audited								###			

*Refer to the "Appearance Levels" tab for definitions.

EQc3.2 Green Cleaning– Custodial Effectiveness Assessment

- Sample 1 of 2 person audit – Roll-up

Classification by Space Type	Total sq. ft.	No. of Rooms by Type	Number of Rooms to Audit (10% or min of 5)	Square Footage for Audit	Audit Average for Space Type
Office	177,510	224	23	10,213	1.1
Restroom	3,792	25	5	1,116	1.2
Conference/Classroom	66,067	11	5	3,098	1.1
Entry & Lobby	1,500	6	5	1,500	1.2
Locker	NA	NA	#VALUE!	0	0.0
Public Space	74,944	2	5	34,472	1.0
Storage	300	2	5	1,164	2.0
Lab w/ Haz Mat	NA	NA	#VALUE!	0	0.0
Lab w/o Haz Mat	NA	NA	#VALUE!	0	0.0
Totals	324,113	270	#VALUE!	51,563	[illegible]
				Overall Appearance Level	1.3

EQc3.3

Green Cleaning– Purchase of Sustainable Cleaning Products and Materials

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EQc3.3 Green Cleaning– Purchase of Sustainable Cleaning Products and Materials

- Intent: To reduce the environmental impacts of cleaning products, disposable janitorial paper products and trash bags.

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EQc3.3 Green Cleaning– Purchase of Sustainable Cleaning Products and Materials

- General cleaners, disinfectants, glass cleaners, floor finishes
  - Green Seal or Environmental Choice CCD
- Janitorial Paper products and trash bags
  - EPA Comprehensive Procurement Guidelines
  - Green Seal
  - Environmental Choice

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EQc3.3 Green Cleaning– Purchase of Sustainable Cleaning Products and Materials

- Hand soaps
  - No antimicrobial agents – except where required
  - Green Seal
  - Environmental Choice
- 1 point for 30% - exemplary for 60%

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EQc3.3 Green Cleaning– Purchase of Sustainable Cleaning Products and Materials

Table 11. Sample Sustainable Cleaning Product Purchases

Date of Purchase	Item Purchased	Purchasing Entity	Product Category	Sustainability Criteria Met	Cost per Item	Quantity Purchased	Product Documentation	Percentage of Total Purchase Value	Value
Total cost of cleaning materials and products, disposable janitorial paper products and trash bags									$1,000
2/24/2004	Brand X bathroom cleanser	Jones Property Mgmt	Cleaning product	GS-37	$10	25	Yes	25%	$250
2/24/2004	Brand Y toilet tissue	Initech	Janitorial paper, trash bags	EC CCD-082	$2	150	No	30%	$300
Total sustainable purchases									$550
Sustainable purchases as percentage of total purchases									55%
The project team has provided documentation from project manufacturers or suppliers that verifies product compliance with the specified sustainability criteria for the following percentage of the purchased value of the sustainable purchases listed above (must be 20% minimum, by cost, to demonstrate compliance)									45%

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EQc3.4

Green Cleaning– Purchase of Sustainable Cleaning Equipment

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EQc3.4 Green Cleaning– Sustainable Cleaning Equipment

- **Intent:** reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment from powered cleaning equipment

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EQc3.4 Green Cleaning– Sustainable Cleaning Equipment

- Vacuums – Green Label with decibels 70 or less
- Carpet Extractor certified by CRI "Seal of Approval"
- Floor equipment has bumpers, guards, captures fine particulates and less than 70 dBA

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EQc3.4 Green Cleaning– Sustainable Cleaning Equipment

- Propane equipment meets California Air Resources Board (CARB) 90dBA or less
- Automatic scrubbers with variable speeds
- Battery Powered – gel batteries
- Ergonomic design power equipment

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EQc3.4 Green Cleaning– Sustainable Cleaning Equipment

- Count all equipment used in facility
- 20% must meet a sustainable criteria for the project to get the point
- Any purchased during performance period on must meet criteria
- Keep a log for purchases and maintenance

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EQc3.4 Green Cleaning– Sustainable Cleaning Equipment

Table 12. Sample Maintenance Log

Equipment Type	Daily Maintenance	Weekly Maintenance	Bi-Weekly Maintenance	Monthly Maintenance	Quarterly Maintenance
Vacuum cleaner	Replace bag before start of cleaning shift	Clean filter	Replace bag	Clean interior	NA
Backpack vacuum	Check and replace bag every 3 hours	1. Clean cloth bag 2. Clean filter 3. Clean exterior	Inspect electrical elements	Replace electrical outlet cord	NA
Floor buffer	Clean machine and electrical outlet cord after each use	NA	NA	NA	General inspectio
Carpet extractor machine	Clean machine and electrical outlet cord after each use	NA	NA	NA	General Inspectio

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EQc3.5

Green Cleaning– Indoor Chemical and Pollutant Source Control

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EQc3.5 Green Cleaning– Indoor Chemical and Pollutant Source Control

- Intent: reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment

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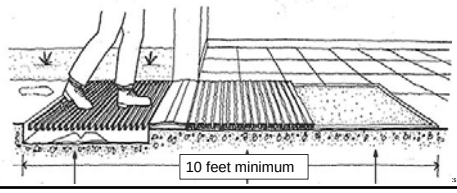
EQc3.5 Green Cleaning– Indoor Chemical and Pollutant Source Control

- Must have in place 10 feet of entry systems – grates, grills, carpets from entrance to interior
- All entrances – not emergency



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EQc3.5 Green Cleaning– Indoor Chemical and Pollutant Source Control

- Grates and grills best
- High volume carpet
- Cleaning programs in place

1 point – no exemplary

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EQc3.6

Green Cleaning–
Indoor Integrated Pest Management

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EQc3.6 Green Cleaning– Indoor Integrated Pest Management

- Intent: reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment

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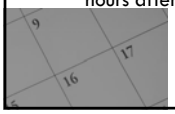
EQc3.6 Green Cleaning– Indoor Integrated Pest Management

- Development and implement an IPM program:
  - Integrated methods, site inspections controlling pest through non or least toxic methods possible – start with prevention
  - Specify situations that are considered emergency application
  - Have a communication strategy to notify occupants of use: **72** in advance of normal application, within **24** hours after emergency application



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EQc3.6 Green Cleaning– Indoor Integrated Pest Management

Standards of Performance

1. INTEGRATED PEST MANAGEMENT

Orkin Commercial Services strongly advocates the use of Integrated Pest Management (IPM). IPM is an environmentally responsible approach to pest management that relies on a combination of practices. IPM programs use current, comprehensive information on pest biology and their interactions with the environment. This information, in combination with the best available pest management methods, is used to manage pests by the most economical means, with minimal hazard to people, property and the environment. IPM programs take advantage of *all* pest management options possible, starting with non-chemical techniques, and if necessary, judiciously employing other pest control materials, always considering the least-toxic formulations first.

Understanding pests' needs is essential to implementing IPM. Pests seek habitats that provide basic needs such as food, water and shelter. Pest populations can be

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EQc3.6 Green Cleaning– Indoor Integrated Pest Management

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Questions?

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ENERGY AND ATMOSPHERE

Refrigerants - Review

EAp3

Refrigerant Management: Ozone Protection

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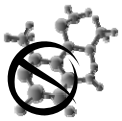
EA Overview

- Eliminating CFCs…
  - CFC = Chlorofluorocarbons
  - From Refrigerants
  - Destroys ozone molecules in the stratosphere
  - Creates green house gas
  - Banning use of CFC's in refrigerants mitigates climate change



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EAp3 – Refrigerant Management: Ozone Protection

- Intent: reduce stratospheric ozone depletion
- Requirements:
  - Do not use CFC-based refrigerants in HVAC&R systems unless replacement/conversion is not **economically feasible** or is already scheduled
  - Small units (less than .5 lbs of refrigerant) are exempt

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EAp3 – Refrigerant Management: Ozone Protection

- Approach:
  - Eliminate CFCs
  - Perform **economic analysis** of feasibility of replacement/conversion
  - Payback = more than 10 years = exempt
  - Minimize refrigerant leakage
    - Less than 5% annual leakage allowed
    - Life of unit less than 30% of charge

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EAp3 – Refrigerant Management: Ozone Protection

- Points: Required Prerequisite
- Referenced Standard:
  - **EPA Clean Air Act, Title VI, Section 608-** provides regulations on the use and recycling of ozone-depleting compounds

EAp3 – Refrigerant Management: Ozone Protection

- Documentation Guidance:
  - Where applicable, develop and track the phase-out plan
  - Retain manufacturers' documentation demonstrating the type of refrigerant used

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EAp3 – Refrigerant Management: Ozone Protection

- Submittal Documentation OPTION I:
  - Provide USGBC final LEED review for new building;
  - If a **CFC phase-out plan was performed**, list the components already phased out

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EAp3 – Refrigerant Management: Ozone Protection

- Submittal Documentation OPTION 2:
  - Project building **uses no CFC-based refrigerants** in base systems:
  - List year of installation
  - **Or conversion of all base building systems**; provide building's refrigerant management program, OR provide manufactures data showing refrigerant use for each base building system

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EAp3 – Refrigerant Management: Ozone Protection

- Submittal Documentation OPTION 3
  - Project building **uses CFC-based refrigerants** in base systems:
  - Provide building's **refrigerant management program** listing refrigerant use for each building, including those with CFCs and those without; OR
  - Provide **manufacturer's data** showing refrigerant AND provide CFC phase-out plan implemented during performance period

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EAp3 – Refrigerant Management: Ozone Protection

- Calculation:

Simple payback of **replacement** =
Cost of replacement / sum of annual cost avoidance for energy savings resulting from replacement

Simple payback of **conversion** =
Cost of conversion/ sum of annual cost avoidance for energy savings resulting from conversion

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EAp3 – Refrigerant Management: Ozone Protection

- Calculations:

Annual Leakage rate:

lbs refrigerant added/lbs refrigerant in full charge) X (365 days/year/Te) X 100%

Where Te (time elapsed) = the shorter of 365 (1 year) or number of days since refrigerant was last added.

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EAc5

Refrigerant Management

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EAc5 – Enhanced Refrigerant Management

- Intent: Reduce ozone depletion and support early compliance with the **Montreal Protocol** while minimizing direct contributions to global climate change
- Referenced Standard: None
- Points: 1 Point

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EAc5 – Enhanced Refrigerant Management

- Requirements:
  - Option 1: Do not use refrigerants in base building HVAC&R systems
  - Option 2: select refrigerants that minimize the emission of compounds that contribute to ozone depletion/global warming, AND do not operate fire-suppression systems that contain ozone-depleting substances

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EAc5 – Enhanced Refrigerant Management

- Approach:
  - Do not use refrigerants
  - Use only natural refrigerants
  - Select refrigerants with low ozone-depletion and global-warming potentials
  - Minimize refrigerant leakage
  - Select equipment with efficient refrigerant charge
  - Select equipment with long service life
  - Choose appropriate fire-suppression systems

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EAc5 – Enhanced Refrigerant Management

- Calculations:
  - Annual Leakage Rate
  - Lifecycle Ozone Depletion Potential (LCODP)
  - Lifecycle Direct Global Warming Potential (LDGWP)
  - Refrigerant Atmospheric Impact
  - Average Refrigerant Atmospheric Impact

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EAc5 – Enhanced Refrigerant Management

- Documentation Guidance:
  - List base building systems containing refrigerants and the associated type of refrigerant. Include ODP and GWP
  - Retain manufacturers' documentation indicating the type and quantity of refrigerant used
  - Track annual refrigerant leakage rates

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Related Supplemental Reading

The Treatment by LEED® of the Environmental Impact of HVAC Refrigerants

Understand **trade off** between **ozone depletion** & **global warming** potential as it relates to the hydrochlorofluorocarobons (HCFCs) and the Hydrofluorocarbons (HFCs)

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REFRIGERANT	ODP	GWP	APPLICATION
Cholorofluorocarbons - phasing out			
CFC-11	1.000	4,680	Centrifugal chillers
CFC-12	1.000	10,720	Refrigerantors, chillers
Hydrocholorofluorocarbons			
HCFC-22	0.040	1,780	Centrifugal chillers
HCFC-123	0.020	76	CFC-11 replacement
Hydrofluorocarbons			
HFC-23	$< 4x10^{-4}$	12,240	ultra-low temperature
HFC-134a	$< 1.5x10^{-5}$	76	CFC-12 or HCFC-22 replacement
Natural Refridgerants			
CO_2	0.000	1	n/a - not efficent
NH3	0.000	0	n/a - not efficent
Propane	0.000	3	n/a - not efficent

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INTEGRATED DESIGN PROCESS

Integrated Project Delivery - IPD

- Intent – Transform the traditional fragmented d and construction process, reduce waste (of time resources)
- Outcome – Collaborative project approach with an integrated team
- Author – The American Institute of Architects AIA National and California

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Integrated Project Delivery - IPD

- Principles of Integrated Project Delivery
  - Mutual Respect, Trust, Benefit & Reward
  - Collaborative Innovation and Decision Making
  - Early Involvement of Key Participants
  - Early Goal Definition & Intensified Planning
  - Open Communication & Appropriate Technology
  - Organization & Leadership

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Integrated Project Delivery - IPD

- Setting Up an Integrated Project
  - IPD Team Building and Functioning
  - Definition of Roles, Responsibility and Scope of Services, Confidentially Agreements
  - **Building Information Modeling (BIM)**
  - Defining and Measuring Project Outcome
    - Goals, Standards, Schedule, Quality, Sustainability, Etc.
  - Legal Considerations

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Integrated Project Delivery - IPD

- Delivering an Integrated Project
  - Building an Integrated Team
  - Project Execution/Redefining Project Phases

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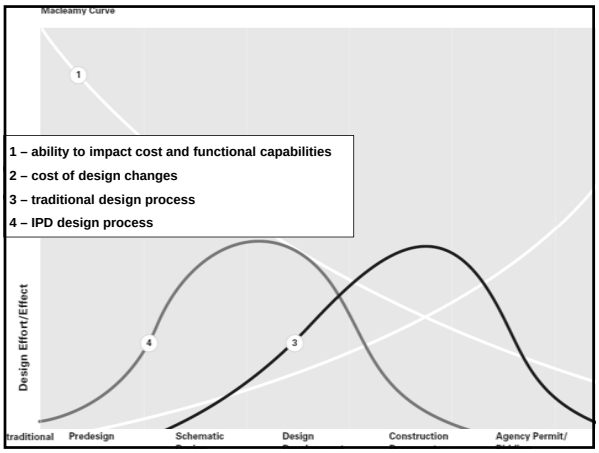

Integrated Project Delivery - IPD

- Multi-Party Agreements
  - Impact on Contracts, Design, Decision Making and Risks and Rewards
- Delivery Model Commentary
  - Multi-Prime, Construction Manager at Risk, Design-Build, Design-Bid-Build

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Questions?

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Break

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BASICS

BASICS

- USGBC
  - Communication
  - Logos
  - Inclusions
- LEED
  - NC, CS, CI, EB
  - Resources/References
- LEED ONLINE
  - Practices
- SUPPLEMENTAL READING

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PRACTICE QUESTIONS REVIEW

Question 1

A project has superseded their expectations of points and received the rating one level better than Certified. What level of certification did they receive?

A. Certified Plus
B. Platinum
C. Silver
D. Gold
E. Bronze

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Answer 1

A project has superseded their expectations of points and received the rating one level better than Certified. What level of certification did they receive?

C. Silver

Answer: C – Ref Guide pg. ix

The four levels of certification are: Certified, Silver, Gold, Platinum

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Question 2

These items contribute to Open Space (Select 3)

A. Eliminating and controlling nonnative species
B. Monoculture plantings, including turf
C. Regional natural landscape features like exposed rocks and bare ground
D. Where feasible, installing vegetative roof with native species
E. Tropical butterfly gardens

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Answer 2

These items contribute to Open Space (Select 3)

A Eliminating and controlling nonnative species
C Regional natural landscape features like exposed rocks and bare ground
D Where feasible, installing vegetative roof with native species
Answer – A, C, D – Ref Guide Pg 36-37
Tropical gardens are depend on the climate
Monoculture planting – like turf - cannot contribute even if it is considered native

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Question 3

Energy efficiency and occupant comfort can cause tradeoffs and synergies in all but which credit?

A. Occupant Survey
B. Emission Reduction Reporting
C. Increased Ventilation
D. Optimize Energy
E. Daylight and Views

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Answer 3

Energy efficiency and occupant comfort can cause tradeoffs and synergies in all but which credit?

B Emission Reduction Reporting

Answer – B

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Question 4

What is an acceptable way of showing compliance with the Water Efficient Landscaping credits?

A. Install a meter for all landscaping and base building systems
B. Follow the EPA Guidelines for water performance measurement and verification
C. Use landscape factors to develop a baseline and actual case calculation
D. Compare the previous year's data with the current year.

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Answer 4

What is an acceptable way of showing compliance with the Water Efficient Landscaping credits?

C. Use landscape factors to develop a baseline and actual case calculation

Answer: C – Ref Guide pg. 101

Installing a meter is not enough.

There is no EPA Guideline on measuring landscape water usage

Need more than 1 year's worth of data – page 106

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Question 5

If the facility manager, property manager and hired consultant are LEED Accredited Professionals on one project, what is the maximum number of Innovations points they may receive?

A. 4
B. 3
C. 2
D. 1

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Answer 5

If the facility manager, property manager and hired consultant are LEED Accredited Professionals on one project, what is the maximum number of Innovations points they may receive?

D. 1
Answer: D, Ref Guide pg. 473
Max of 1 regardless of how many are on the project

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Question 6

The VOC levels of paint are addressed in which credits in addition to MRc3 – Sustainable Purchasing – Facility Alterations and Additions? (Select 2)

A. SSc8 - Heat Island Effect: Roof
B. EQc1.1 – IAQ Management Plan
C. EQc3.5 – Green Cleaning - Indoor Chemical and Pollutant Source Control
D. SSc2 – Building Exterior and Hardscape Plan
E. MRc9 – Solid Waste Management – Waste Stream Audit

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Question 6

The VOC levels of paint are addressed in which credits in addition to MRc3 – Sustainable Purchasing – Facility Alterations and Additions? (Select 2)

B. EQc1.1 – IAQ Management Plan

Answer: B Ref Guide pg 357, D Ref Guide pg.10
Not SSc8 -Heat Island is about the color of the roof not the air quality
Not EQc3.5 is about Particulates and Proper plumbing drains – pg 454-456
Not MRc9 – Solid Waste Disposal is not directly related to the VOC limits

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Question 7

LEED Online Registration on the GBCI website gives the project team access to: (Select 3)

A. Errata
B. Reference Guides
C. Software tools
D. Critical Communication

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Answer 7

LEED Online Registration on the GBCI website gives the project team access to: (Select 3)

A. Errata
C. Software tools
D. Critical Communication

Answer: Ref Guide: pg xv
Reference Guides need to be purchased on their own

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Question 8

A Credit Interpretation Ruling (CIR) must be submitted

A. Online in 500 words or less listing the AP on the project for communication.
B. After the final application review with details noting the challenges .
C. Through the appeal process prior to submittal through LEED Online (LOL).
D. All at once in a pdf document with all supporting plans and documents for a thorough review.
E. Online in brief but clear description of the challenge, listing which credit or prerequisite, with potential solutions.

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Answer 8

A Credit Interpretation Ruling (CIR) must be submitted

E. Online in brief but clear description of the challenge, listing which credit or prerequisite, with potential solutions.

Answer: E See the Reference Guide pg xv and xvi – understanding CIRs and Appeals.

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Question 9

On average a LEED certified building uses how much less energy than a conventional building?

A. 45-50%
B. 15-20%
C. 25-30%
D. 5-10%
E. 35-40%

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Answer 9

On average a LEED certified building uses how much less energy than a conventional building?

C. 25-30%

Answer – C. Ref Guide Pg 6
SSc1 Economic Issues

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Question 10

The IPM implemented in IEQc3.6 must also be implemented in which credit?

A. SSc1 – LEED Certified Building
B. SSc3 – Landscape Management
C. SSc5 – Protect and Restore Open Habitat
D. EQc1.4 – Reduced Particulates

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Answer 10

The IPM implemented in IEQc3.6 must also be implemented in which credit?

B. SSc3 – Landscape Management

Answer – B Ref Guide pg 15

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Question 11

Erosion and sedimentation control are related to:

A. Ongoing landscaping and future construction
B. Future construction and green roofs
C. Pest control and fertilization
D. Ongoing landscaping and water efficient irrigation

E. Water efficient irrigation and pest control

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Answer 11

Erosion and sedimentation control are related to:

A. Ongoing landscaping and future construction

Answer - A Ref Guide pg 17
Construction activities cause significant erosion and landscaping needs mulch and proper planting to also prevent soil erosion.

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Question 12

Alternative Commuting uses which rule as a guideline for collecting data on occupant's transportation?

A. American Society of Heating, Refrigeration Air Conditioning Engineers
B. ISO 14000
C. EPA Green Power
D. California Society of Fuel Efficient Vehicles
E. South Coast Air Quality Management District

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Answer 12

Alternative Commuting uses which rule as a guideline for collecting data on occupant's transportation?

E. South Coast Air Quality Management District

Answer – E Ref Guide pg 27

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Question 13

Alternative Commuting Survey should cover:

A. Only regular building occupants on a typical work week
B. All occupants who enter the facility during the typical work week
C. Only regular occupants over the course of 30 calendar days
D. All FTE who use validated public transportation
E. 80% or more of the FTE's

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Answer 13

Alternative Commuting Survey should cover:

A. Only regular building occupants on a typical work week

Answer – A Ref Guide A – all regular occupants should be surveyed and non-responses should be counted as single-occupancy vehicle commuting (worst-case) unless there is a response rate of 80% or better)
Review the guidelines for the Alt Com Surveys

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Question 14

The ongoing commissioning cycle must not exceed how many months?

A. 3
B. 12
C. 24
D. 36
E. None of the above

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Question 14

The ongoing commissioning cycle must not exceed how many months?

C. 24

Answer – C Ref Guide 185

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Question 15

What operating condition does the air-handler need to be under when measuring the cfms per person?

A. Minimum
B. Maximum
C. Normal
D. Extended hours

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Answer 15

What operating condition does the air-handler need to be under when measuring the cfms per person?

C. Normal

Answer – C – Ref Guide pg 329

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Question 16

Site area is synonymous with:

A. Building footprint
B. Property area
C. LEED project boundary
D. Hardscape and landscape – not including building footprint
E. Natural areas

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Answer 16

Site area is synonymous with:

B. Property area

Answer – B Ref Guide Pg 40
Understand the definitions and what is included in each.

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Question 17

Low solar reflectance is

A. Not beneficial because the greenhouse gas emissions is reduced gradually
B. Beneficial because the green vegetation helps restores the open space
C. Beneficial because it eliminates the light pollution emitted into the night sky
D. Not beneficial because the darker paving materials contribute to the heat island effect
E. Beneficial because the light colors contribute to earning the Heat Island – non Roof credit

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Answer 17

Low solar reflectance is

D. Not beneficial because the darker paving materials contribute to the heat island effect

Answer – D - Ref Guide pg 50-51
Darker materials absorb heat and are not as reflective.

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Question 18

Outdoor Air Delivery Monitoring for naturally ventilated buildings does not apply if

A. A room is smaller than 150 sq ft
B. A room is smaller than 250 sq ft
C. The CO2 levels conditions outside exceed 530 pp
D. The total square footage is less than 10%
E. The total square footage is less than 15 %

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Answer 18

Outdoor Air Delivery Monitoring for naturally ventilated buildings does not apply if

A. A room is smaller than 150 sq ft

Answer – A – Ref Guide Pg 362

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Question 19

When measuring the light leaving the boundary at night, measurements between exterior lights on versus lights off may not exceed what percentage against the IESNA zone requirements?

A. 10%
B. 20%
C. 30%
D. 40%
E. 50%

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Answer 19

When measuring the light leaving the boundary at night, measurements between exterior lights on versus lights off may not exceed what percentage against the IESNA zone requirements?

B. 20%

Answer – B Ref Guide pg 71

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Question 20

Processed grey water may be used for which 3 features?

A. Landscape irrigation
B. Flushing fixtures
C. Dishwashing
D. Lavatories
E. Cooling Tower

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Answer 20

Processed grey water may be used for which 3 features?

A. Landscape irrigation
B. Flushing fixtures
E. Cooling Tower

Answer – A, B, E Ref Guide pg 91
Not of use for hand washing or dishwashing. Those are sources of grey water. WEp1

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Question 21

Cooling Towers use conductivity meters to: (choose 2)

A. Save energy and increase efficiency
B. Increase efficiency and operate at lower cycles for energy saving
C. Increase water usage for more energy efficient cooling
D. Adjust the bleed rate, operate and maintain at higher cycles

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Answer 21

Cooling Towers use conductivity meters to: (choose 2)

A. Save energy and increase efficiency
D. Adjust the bleed rate, operate and maintain at higher cycles

Answer – A&D, Ref Guide pg 116 and 117
Economic Issues and Implementation

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Question 22

An underground water bearing rock-formation or group of formations that supply ground water, wells, or springs

A. Aquifer
B. Make-up water
C. Bioswale
D. Rain Garden

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Answer 22

An underground water bearing rock-formation or group of formations that supply ground water, wells, or springs

A. Aquifer

Answer: A- Reference Guide Page 120

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Question 23

A Member of the USGBC is a

A. Building
B. Organization
C. Person
D. Facility

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Answer 23

A Member of the USGBC is a

B. Organization

Answer – B
Organizations are members – employees of that organization may log in as member. People are Accredited and Buildings/Facilities are Registered or Certified

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Question 24

Implementing no or low cost operational improvements and creating a capital plan for major retro-fits or upgrades is a requirement of which prerequisite/credit?

A. Fundamental Refrigerant Management
B. Optimize Energy Performance
C. Building Commissioning (Cx) – Investigation and Analysis
D. Building Commissioning (Cx) – Implementation
E. Building Commissioning (Cx) – Ongoing Cx

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Answer 24

Implementing no or low cost operational improvements and creating a capital plan for major retro-fits or upgrades is a requirement of which prerequisite/credit?

D. Building Commissioning (Cx) – Implementation

Answer – D Ref Guide pg 179

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Question 25

An Energy Star score of 72 or greater is equivalent to 22 percent better than

A. All other buildings similar in size
B. The national average
C. The national median
D. 50 local facilities

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Answer 25

An Energy Star score of 72 or greater is equivalent to 22 percent better than

C. The national median

Answer – C Ref Guide Pg 157

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Question 26

Water efficiency measures can easily reduce water usage in an average commercial office building by close to what percentage?

A. 45%
B. 35%
C. 30%
D. 15%
E. 10%

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Answer 26

Water efficiency measures can easily reduce water usage in an average commercial office building by close to what percentage?

C. 30%

Answer – C Ref Guide pg 77

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Question 27

Which two are ineligible as on-site renewable energy

A. Geothermal energy systems
B. Architectural features
C. Low-impact hydroelectric
D. Bio-fuel based
E. Geoexchange systems (ground-source heat pumps)

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Answer 27

Which two are ineligible as on-site renewable energy

B. Architectural features
E. Geoexchange systems (ground-source heat pumps)

Answer – B, E Ref Guide Pg 206

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Question 28

Which is not a refrigerant?

A. Ammonia
B. CFC-12
C. Propane
D. Mercury
E. HFC-134a

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Answer 28

Which is not a refrigerant?

D. Mercury

Answer – D Ref Guide pg 219
Understand the “best and worst” refrigerants

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Question 29

Under the Montreal Protocol , ratified in 1989, refrigerant with nonzero ODP will be phased out by when?

A. 2010
B. 2020
C. 2030
D. 2040

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Answer 29

Under the Montreal Protocol , ratified in 1989, refrigerant with nonzero ODP will be phased out by when?

C. 2030

Answer – C – Ref Guide Pg 217

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Question 30

Office paper cost $350 and contains 15% postindustrial material and 75% FSC certified paper product - how much is applied toward sustainable purchases?

A. $175
B. $350
C. $525
D. $700

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Answer 30

Office paper cost $350 and contains 15% postindustrial material and 75% FSC certified paper product - how much is applied toward sustainable purchases?

B. $350

Answer – B – Ref Guide Pg 251
Only meets 1 criteria – the FSC certified paper

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Question 31

Programmed after hours lighting controls must equal or exceed what % of annual nighttime hours?

A. 25% (1,095 hours)
B. 50% (2,190 hours)
C. 75% (3,285 hours)
D. 100% (4,380 hours)

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Answer 31

Programmed after hours lighting controls must equal or exceed what % of annual nighttime hours?

B. 50% (2,190 hours)

Answer – B Ref Guide pg 65

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Question 32

MERV 8 filters must be used to earn credit in which credit?

A. IAQ Management for Increased Ventilation
B. Environmental Tobacco Smoke Control
C. IAQ Management for Facility Alterations and Additions
D. Green Cleaning Custodial Effectiveness
E. Optimize Energy Performance

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Answer 32

MERV 8 filters must be used to earn credit in which credit?

C. IAQ Management for Facility Alterations and Additions

Answer – C Ref Guide Pg 383

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Question 33

Task lighting needs to be hardwired to meet the Controllability of Lighting Systems credit T/F?

A. True
B. False

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Answer 33

Task lighting needs to be hardwired to meet the Controllability of Lighting Systems credit T/F?

B. False

Answer – B Ref Guide Pg 398

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Question 34

Sampling intervals of measuring humidity cannot exceed how many minutes?

A. 5
B. 15
C. 30
D. 60
E. 120

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Answer 34

Sampling intervals of measuring humidity cannot exceed how many minutes?

B. 15

Answer - B Ref Guide Pg 403

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Question 35

Economic payback must take less than x years to be considered feasible for replacement of a chiller with CFC's.

A. 2
B. 10
C. 3
D. 5
E. 7

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Answer 35

Economic payback must take less than x years to be considered feasible for replacement of a chiller with CFC's.

B. 10

Answer – B Ref Guide Pg 147

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Question 36

What year is considered when developing the baseline for water fixture flush and flow rates?

A. 1989
B. 1999
C. 2006
D. 2000
E. 1993

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Answer 36

What year is considered when developing the baseline for water fixture flush and flow rates?

E. 1993

Answer – E Ref Guide pg 85
The Energy Policy Act of 1992 (EPACT 1992) included the maximum flush and flow rates (i.e.: 1.6 for water closets etc). Therefore the O&M LEED Rating system uses a construction date of 1993 as a cut off for having high flush and flow fixtures

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Question 37

The nationally accepted design storm that represents the largest amount of rainfall over a specified period, which is the rate used for planning and designing stormwater management features.

A. The 1 year, 24 hour
B. The 1 year, 48 hour
C. The 2 year, 24 hour
D. The 2 year, 48 hour

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Answer 37

The nationally accepted design storm that represents the largest amount of rainfall over a specified period, which is the rate used for planning and designing stormwater management features.

C. The 2 year, 24 hour

Answer – C – Ref Guide pg 41

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Question 38

If CFC-based refrigerants are maintained in the building, reduce annual leakage to x % or less using the XX standard.

A. 5%, SMACNA Systems Analysis
B. 3%, EPA Clean Air Act Title VI
C. 5%, Montreal Protocol
D. 3%, Kyoto Protocol
E. 5%, EPA Clean Air Act, Title VI

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Answer 38

If CFC-based refrigerants are maintained in the building, reduce annual leakage to x % or less using the XX standard.

E. 5%, EPA Clean Air Act, Title VI

Answer – E Ref Guide Pg 145 & 146

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Question 39

What is the certification for Renewable Energy Certificates?

A. Green-e
B. CRI Green Label Plus
C. Green Seal
D. ISO 14021

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Answer 39

What is the certification for Renewable Energy Certificates?

A. Green-e

Answer – A – Ref Guide Pg 207

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Question 40

Refrigerants are mainly used in what building systems? (choose 2)

A. Fire suppression systems
B. Chillers
C. Heat pumps
D. Boilers

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Answer 40

Refrigerants are mainly used in what building systems? (choose 2)

A. Fire suppression systems
B. Chillers

Answer – A, B Ref Guide pg 145 - 150

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Questions?

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