



# GACP Exam Content Overview 1/1/17

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## Introduction

The Green Advantage Certified Practitioner (GACP) Exam has 60 items (questions, problems, or exercises). These are drawn from material presented in the GACP Study Guide. The Study Guide is approved by the GA International Green Builder Certification Board. The outline of the Study Guide below gives readers a more detailed idea of the topics that make up the GACP Exam. The GACP Study Guide is provided to those who register to take the GACP Exam.

## A. CONTENT FEATURES

The Study Guide is organized and written to enhance the knowledge, skills, and abilities of commercial and residential construction field personnel. The information it contains is:

- Applicable across building trades
- Compatible with multiple green building rating systems, standards, and codes
- Evidence-based and rigorously sourced
- Results-oriented, promoting achievement of:
  - ✓ Environmental goals.
  - ✓ Health, safety and productivity goals.
  - ✓ Successful delivery of green buildings and accompanying infrastructure technologies, methods, and best practices.
  - ✓ Enhanced quality of the production, installation, and operation of construction-related products.
  - ✓ Disaster resistance/resilience.
  - ✓ Building security and blast resistance.
  - ✓ Problem-spotting in the field.
  - ✓ Insurance and financial claim reductions.
  - ✓ Cost containment goals and reduced callbacks.
  - ✓ Reduction of building operational and maintenance costs.
  - ✓ Enhanced work communication, coordination, collaboration, and efficiency within and among trades.

## B. CONTENT ORGANIZATION

Green building is a holistic approach to construction. Hence, descriptions of the field often run into problems common to web-like, holistic systems - namely, the idea that *everything relates to everything*. Efforts to carve up the field into categories can yield great overlap and duplication. To address this, Green Advantage has broadly organized the Study Guide relative to the widely accepted thematic categories that appear in the following:

- ASHRAE 189.1. (American Society of Heating, Refrigerating, and Air Conditioning Engineers)
- Green Globes® Rating System, Green Building Initiative.
- "High Performance Buildings Database," U.S. Department of Energy.
- International Green Construction Code (IgCC), International Code Council.
- LEED® Green Building Rating Systems, U.S. Green Building Council.
- National Green Building Standard®, International Code Council/National Association of Home Builders.

The resulting broad topics are: Sites, Water, Energy, Materials, and Indoor Environmental Quality. Assigning content to categories is a difficult task. We do not assume that there is one way to outline green building. We

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assigned content to minimize duplication and cross-referencing. We also sought to make material easy for exam candidates to access.

In order to make the Study Guide more approachable for exam candidates, it is divided into two large parts. Part A describes environmental and human health problems related to conventional building approaches. This part summarizes the compelling case for green building, including the perspectives of planetary and human health. These are two of the three dimensions of the “Triple Bottom Line” of Sustainability. The triple bottom line includes Environmental, Social/Human Health, and Economic considerations. **Part A offers valuable information to the GACP Exam Candidate, but this material is NOT INCLUDED in the GACP Exam.**

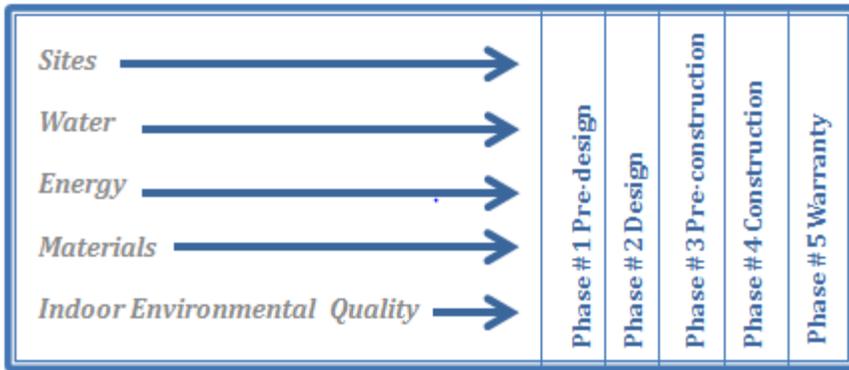
Part B of the Study Guide presents green building approaches. **Part B provides the basis for the GACP Exam.** Part B is divided into topic areas. Topics include Sites, Water, Energy, Materials, and Indoor Environmental Quality. Each of these topic areas, in turn, is divided into subsections as follows:

- 1) ***Definitions, Measurements & Standards*** presents common green building vocabulary and significant measurements and standards. These apply to information presented in the category. For example, “graywater” is a defined term in the Water section. “Gallons per minute” is a measurement that is presented in the Water section. Many terms are also defined within the text, and not listed separately in the Definitions section.
- 2) ***Green Building Approaches & Best Practices with Associated Construction Phasing*** presents information about green alternatives. These serve to counter conventional approaches. The general format lists features and types of specific green building approaches and their advantages. Green approaches generally apply to residential and commercial buildings.

GA believes that superior green buildings result from robust cross-disciplinary approaches. Thus, the Study Guide features “best practices.” Best practices demonstrate how and when to apply green building approaches. They provide examples and underline the importance of content previously presented in green building approaches. Best practices should be known and understood by all building personnel involved in a green construction project. Best practices include a list of construction phases (#1-#5 below) in which these practices can be enacted. There are over 600 best practices listed in the GACP Study Guide. These best practices are applicable to construction supervisory personnel and/or construction trade personnel.

Construction phases are applied across the five major topics as represented in the diagram below. While the major topics reflect how designers “think,” construction phasing reflects how contractors approach their work over the course of a project.

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In addition to the five major topics that deal with construction deliverables, GA has created: *Green Building Context* and *Green Building Process*. *Green Building Context* focuses on the broad Financial Rationale for green building. This is the third dimension of a Triple Bottom Line approach. It answers the question, “why Green Building?” from the basic perspective of dollars and cents.

*Green Building Process* focuses on the operations of construction activity. *Green Building Process* also presents construction phasing information. This section conveys information that has emerged from years of green building experience. Green construction projects do not always fulfill their promise. And in fact, they can represent special risks to construction companies and construction workers. Knowing this, companies and workers can take proper precautions to protect themselves.

### C. CONTENT RENEWAL

GA plans to update this document triennially. It will do this with the expert assistance of the GA International Green Builder Certification Board, trainers who use the document to devise training materials, and individuals who use it to prepare for a GA Certification Exam®. All comments are welcome.

### D. SAMPLE EXAM ITEMS

**GACP EXAM ITEMS COME FROM PART B OF THE STUDY GUIDE.** Sample items can help candidates understand the typical difficulty of items on the exam. Answers are located in the Answer Key below.

- 1) Which statement most accurately describes green building?
  - A. The capital cost of green building is usually lower than a conventional code compliant building
  - B. The financial benefits of high performance buildings include reduced operating costs
  - C. Green building rental value, marketability, and resale value are lower than conventional building
  - D. In the U.S., green building codes have been widely used in most states since 1950
- 2) Smart Growth calls for:
  - A. Compact towns and cities characterized by tightly clustered buildings
  - B. Development of undeveloped (raw) land including farmland, forest, grassland, and wetlands
  - C. Avoidance of brownfield development such as former chemical plants, dry cleaners, or gas stations
  - D. Avoidance of remediation measures that address contaminated soil and groundwater
- 3) Invasive plants are:
  - A. Rare in pristine, remote landscapes
  - B. Should be removed with chemical herbicides
  - C. Commonly sold in retail garden stores
  - D. Complementary to the native ecosystem
- 4) Site development best practices include:

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- A. Installing high albedo paving materials
  - B. Using impervious paving materials
  - C. Designing, installing, and maintaining living roofs on high sloped roofs
  - D. Installing mulch volcanoes around the base of trees
- 5) Which green building water conservation approach is desirable?
- A. Use offsite potable water for water features and irrigation
  - B. Install one hidden water meter for a given building
  - C. Give preference to offsite sources of water
  - D. Use non-potable water for water closets, urinals, and cooling towers
- 6) A photovoltaic system is going to be installed onsite. Identify the associated best practice.
- A. Use ground mounted solar arrays if roof surface is unavailable
  - B. Call for net-metering in order to increase solar energy output
  - C. Install hydronic tubing in order to use hot water from photovoltaic system
  - D. Purchase renewable energy credits (RECs) to reduce site energy needs
- 7) Bioclimatic design principles recommend:
- A. Facing the long side of the building south; elongating east-west
  - B. Facing the long side of the building east; elongating north-south
  - C. Exposing thermal mass to sunlight during summer months
  - D. Shading thermal mass from sunlight during winter months
- 8) Moisture and heat transfer performance testing is needed for the building envelope. Which test should be used?
- A. Blower door test
  - B. Hygrothermal test
  - C. Duct pressurization test
  - D. Air pressure test
- 9) A geothermal system can supply heating, cooling, and \_\_\_\_\_?
- A. Electricity generation
  - B. Wastewater discharge
  - C. Hot water
  - D. Solar desiccant humidification
- 10) Which is the least energy efficient lamp type?
- A. LED
  - B. Tubular fluorescent
  - C. CFL
  - D. Incandescent
- 11) If a/an \_\_\_\_\_ appliance is selected, make sure it is vented to the outdoors.
- A. Electric
  - B. Gas
  - C. Solar
  - D. Water-efficient
- 12) Which statement correctly describes natural linoleum?
- A. Once installed, wax-filled seams separate
  - B. Contains approximately as much vinyl as conventional linoleum
  - C. Most products have strong odor that decreases over time
  - D. Non-toxic and naturally anti-bacterial
- 13) High Intensity Discharge (HID) lamps for temporary lighting can be hazardous to workers. Which statement is a best practice that helps prevent injuries to workers?
- A. Place HID lamps close to work surfaces to reduce shadowing

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- B. Field-modify HID lamps to improve performance
  - C. Turn on HID lamps when workers are in an elevated position near them
  - D. Use HID lamps that automatically extinguish when broken
- 14) A staging area and material storage plan should:
- A. Identify and assign each trade its own staging area
  - B. Fence and prepare areas after construction begins
  - C. Minimize land disturbance and prevent moisture damage
  - D. Ensure that all staging and storage areas are indoors
- 15) Identify the correct construction best practice for site preparation, excavation, and grading:
- A. Spray regularly with water to control dust
  - B. Transplant native, noninvasive plants from staging areas
  - C. Cover soils with non-biodegradable tarps and mats to suppress dust
  - D. Only excavate immediately following heavy rains
- 16) The owner wishes to use an eco-friendly alternative to PVC for drain piping. Identify two options.
- A. AAV and ABS
  - B. Cast Iron and SIPs
  - C. HDPE and ABS
  - D. ICFs and HDPE
- 17) \_\_\_\_\_ exposure can be reduced through location and shielding strategies. Use a gauss meter for measurement.
- A. EMF
  - B. Radon
  - C. Lead
  - D. VOC
- 18) Bentonite is an effective waterproofing. What is another feature of this product?
- A. It is synthetic, but has no VOCs
  - B. It becomes rigid soon after application
  - C. It expands when exposed to moisture
  - D. It contains asbestos

Answer Key: 1-B; 2-A; 3-C; 4-A; 5-D; 6-A; 7-A; 8-B; 9-C; 10-D; 11-B; 12-D; 13-D; 14-C; 15-B; 16-C; 17-A; 18-C

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### PART B. GREEN BUILDING APPROACHES

**(EXAM ITEMS ARE DRAWN FROM THIS SECTION, NOT PART A)**

- I. **GREEN BUILDING CONTEXT – constitutes approximately 5% of GACP Exam Items**
  - A. Definitions, measurements, & standards
  - B. Green building financial rationale
    - 1. Building capital cost
    - 2. Building operating cost
    - 3. Building value
    - 4. Green building codes, standards, and rating systems
- II. **SITES – constitutes approximately 8% of GACP Exam Items**

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## A. Site selection

1. Definitions, measurements, & standards
2. Green building approaches & best practices with associated construction phasing
  - a. Smart Growth
    1. Features of Smart Growth
    2. Advantages of Smart Growth
  - b. Brownfield development
    1. Features of brownfield development
    2. Advantages of brownfield development

## B. Site development

1. Definitions, measurements, & standards
2. Green building approaches & best practices with associated construction phasing
  - a. Ecological landscaping
    1. Site features that reduce heat island effect and support beneficial microclimates surrounding a building
    2. Building exterior features that reduce heat island effect
    3. Features of an ecologically sustainable vegetative landscape
    4. Advantages of an ecologically sustainable vegetative landscape
  - b. Stormwater as a long-term resource
    1. Overall features of environmentally friendly stormwater management
    2. Types and features of long-term, environmentally friendly stormwater management
    3. Advantages of conserving water onsite
  - c. Dark sky
    1. Features of environmentally friendly exterior lighting
    2. Advantages of environmentally friendly exterior lighting

## III. **WATER – constitutes approximately 5% of GACP Exam Items**

### A. Water conservation

1. Definitions, measurements, & standards
2. Green building approaches & best practices with associated construction phasing
  - a. Matching sources with uses
    1. Features of matching sources with uses

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2. Advantages of matching water sources with uses
- b. Using municipal reclaimed water
  1. Features of municipal reclaimed water (purple pipe water)
  2. Advantages of using municipal reclaimed water
- c. Rainwater harvesting
  1. Overall features of rainwater harvesting (rainwater catchment)
  2. Specific features of a functional catchment system
  3. Advantages of rainwater harvesting
- d. Low water use devices & waterless technologies
  1. Features of low water use devices
  2. Types of low water use appliances
  3. Types and features of waterless technologies
  4. Advantages of waterless technologies

### B. Ecological water discharge

1. Definitions, measurements, & standards
2. Green building approaches & best practices with associated construction phasing
  - a. Ecological water treatment
    1. Features of ecological water treatment
    2. Types of ecological water treatment systems
    3. Advantages of ecological water treatment systems
  - b. Onsite advanced "wastewater" treatment systems
    1. Features of onsite advanced water treatment systems
    2. Advantages of onsite advanced water treatment systems

## IV. ENERGY – constitutes approximately 25% of GACP Exam Items

### A. Energy sources and impacts of source selections

1. Definitions, measurements, & standards
2. Green building approaches & best practices with associated construction phasing
  - a. Energy sourcing
    1. Possibilities
    2. Widely used strategies for energy sourcing

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3. Overall advantages of onsite renewable energy production
  4. Options for onsite renewable energy
  - b. Financial mechanisms that support onsite renewables
  - c. Mechanisms that support localized offsite energy production
- B. Limiting energy demand through building envelope design & construction
1. Definitions, measurements, & standards
  2. Green building approaches & best practices with associated construction phasing
    - a. Bioclimatic Design (Climate-Responsive Design; Passive Solar Design)
      1. Overall features of Bioclimatic Design
      2. Specific features of Bioclimatic Design
      3. Advantages of Bioclimatic Design
    - b. Preservation of solar access
      1. Features of solar access preservation
      2. Advantages of solar access preservation
    - c. High quality construction and energy performance testing
      1. Features of high quality air sealing of the building envelope
      2. Features of high quality building envelope insulation
      3. Types and features of energy performance tests (used during and after construction to ensure energy performance requirements are met)
      4. Advantages of high quality construction and energy performance testing
- C. Meeting residual energy demand for building conditioning with HVAC
1. Definitions, measurements, & standards
  2. Green building approaches & best practices with associated construction phasing
    - a. Environmentally friendly HVAC systems (overview)
      1. Overall features of an environmentally friendly HVAC system
      2. Overall advantages of an environmentally friendly HVAC system
    - b. Environmentally friendly heating systems
      1. Types and features of an environmentally friendly heating system
      2. Advantages of an environmentally friendly heating system
    - c. Environmentally friendly ventilation systems
      1. Types and features of an environmentally-friendly ventilation system

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- 2. Advantages of an environmentally friendly ventilation system
- d. Environmentally friendly air cooling & dehumidification systems
  - 1. Types and features of environmentally friendly approach to air cooling and dehumidification
  - 2. Advantages of environmentally friendly air cooling and dehumidification:
- e. Environmentally friendly conditioning distribution & control systems
  - 1. Types and features of an environmentally friendly conditioning distribution and control systems
  - 2. Advantages of an environmentally friendly conditioning distribution and control system
- f. HVAC equipment testing
  - 1. Features of HVAC equipment testing
  - 2. Types of HVAC equipment tests:
  - 3. Advantages of HVAC equipment testing

### D. Meeting user needs through building equipment

- 1. Definitions, measurements, & standards
- 2. Green building approaches & best practices with associated construction phasing
  - a. Water heating & hot water distribution systems
    - 1. Types and features of environmentally friendly water heating
    - 2. Types of environmentally friendly hot water distribution systems
    - 3. Advantages of environmentally friendly water heating and hot water distribution systems
  - b. Artificial lighting
    - 1. Features of environmentally friendly artificial lighting
    - 2. Features and advantages of environmentally friendly artificial lighting controls
  - c. Appliances
    - 1. Types and features of environmentally friendly appliances

### V. **MATERIALS – constitutes approximately 30% of GACP Exam Items**

#### A. Long life building approach

- 1. Definitions, measurements, & standards
- 2. Green building approaches & best practices with associated construction phasing
  - a. Long life building

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1. Features of long life building
2. Advantages of long life building approach
- B. Environmentally friendly materials selection criteria
  1. Definitions, measurements, & standards
  2. Green building approaches & best practices with associated construction phasing
    - a. Life Cycle Assessment (LCA)
      1. Features of an LCA
      2. Balancing selection criteria
    - b. Green building product rating
      1. Overall features of green building product rating systems
      2. Types and features of prominent green building product rating systems
    - c. Construction product purchasing guidance
      1. Types and features of construction product purchasing guidance
- C. Commonly used building materials
  1. Definitions, measurements, & standards
  2. Green building approaches & best practices with associated construction phasing
    - a. Concrete
    - b. Masonry
    - c. Metals
    - d. Wood, plastics, and composites
    - e. Thermal & moisture protection
    - f. Openings
    - g. Finishes
    - h. Cabinets, casework, and countertops
    - i. Paints and stains
    - j. Adhesives and sealants
    - k. Fire suppression
    - l. Plumbing
    - m. Electrical

### VI. INDOOR ENVIRONMENTAL QUALITY (IEQ) – constitutes approximately 6% of GACP Exam Items

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1. Definitions, measurements, & standards
2. Green building approaches & best practices with associated construction phasing
  - a. Indoor air quality
    1. Strategies to avoid introduction of outdoor toxins
    2. Strategies to avoid generation of indoor toxins
    3. Types and features of environmentally friendly air purification strategies and devices
    4. Types and features of air quality monitoring approaches
  - b. Indoor visual quality
    1. Overall features and advantages of daylighting
    2. Types and features of daylighting strategies
    3. Features of an environmentally friendly approach to color
  - c. Indoor water quality
    1. Overall strategies for environmentally friendly water testing and filtering
    2. Environmentally friendly filtering options
  - d. Indoor acoustical quality
    1. Types and features of an environmentally friendly approach to acoustics
  - e. Indoor navigation
    1. Types, features, and advantages of environmentally friendly indoor navigation strategies

### **VII. GREEN BUILDING PROCESS – constitutes approximately 19% of GACP Exam Items**

- A. Reducing the business risks of green building
  1. Definitions, measurements, & standards
  2. Green building approaches & best practices with associated construction phasing
    - a. Reducing business risks of green building through preparation of personnel
    - b. Reducing business risks of green building through collaboration across trades
    - c. Reducing business risks of green building through involving the builder in design decisions
    - d. Reducing business risks of green building through administrative tools to improve results, increase efficiencies, & increase profits
    - e. Reducing business risks of green building through legal protections
    - f. Reducing business risks of green building through owner & occupant education
- B. Protecting the health & safety of green builders
  1. Green building approaches & best practices with associated construction phasing

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- a. Types of green builder hazards and related risk reduction approaches
- C. Lightening the environmental impacts of the construction process
  - 1. Definitions, measurements, & standards
  - 2. Green building approaches & best practices with associated construction phasing
    - a. Lightening environmental impacts of the construction process through managing staging & storage
    - b. Lightening environmental impacts of the construction process through managing waste
    - c. Lightening environmental impacts of the construction process through site preparation, excavation, & grading
    - d. Lightening environmental impacts of the construction process through managing transportation during construction
    - e. Lightening environmental impacts of the construction process through environmentally friendly site lighting during construction
    - f. Lightening environmental impacts of the construction process through managing stormwater during construction
    - g. Lightening environmental impacts of the construction process through eco-friendly temporary sanitation facilities
    - h. Lightening environmental impacts of the construction process through green cleaning during construction
- D. Reducing the risks of infection and other risks in health care facilities
- E. Reducing the risks related to building security and blasts