



GPRO FUNDAMENTALS OF BUILDING GREEN

INSTRUCTORS GUIDELINES

Dear Instructors,

Thank you for offering your expertise and passion for sustainability to prepare your students to meet the growing demand for healthier, environmentally sustainable, and energy-efficient buildings.

GPRO is a series of courses and exams developed by Urban Green Council in conjunction with North American Building Construction Trade Unions, contractors, building owners, managers and operators throughout the U.S. and Canada. GPRO teaches trade-specific green construction knowledge to the people who build, renovate and maintain buildings. Our goal is to teach the people who directly affect building energy how to use resources more efficiently, create more resilient buildings, and make buildings healthier for occupants.

We don't expect you to be an expert on every green building topic – each slide has detailed notes and background information and we have included resources where appropriate to add to your knowledge base. The course follows a narrative summarized in these Guidelines, along with approximate pacing. However, the more of your own personal passion, experience and examples you can inject into the course, the better your students' experiences will be. For more insight, please see GPRO's core educational principles in the Appendix to these Guidelines.

Use the View/Notes view of PowerPoint to access detailed information for each slide and classroom exercise.

Thank you for your commitment to green building and for training the next generation of leaders. Please don't hesitate to contact us with questions or feedback about the program at gpro@urbangreencouncil.org.

We look forward to working with you!

Sincerely,

A handwritten signature in black ink, appearing to read "Ellen Honigstock", with a stylized, flowing script.

Ellen Honigstock
Director, Education
Urban Green Council

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Introduction

Buildings are major consumers of natural resources in the U.S., accounting for 40 percent of energy and 13 percent of water use. So, it's not surprising that green building techniques are increasingly important for construction and facilities staff across the country, as well as for the people who design these structures.

The audience for *Fundamentals of Building Green* is a wide range of stakeholders involved in developing, designing, building, managing and operating buildings. These professionals can have a profound effect on the amount of energy a building uses over its lifetime. This course is meant to help them recognize the strong connection between building performance and limiting the effects of climate change, see buildings in a more systemic way and discover strategies that will improve the health and efficiency of their buildings.

Course Objectives:

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

- Explain how reducing building energy will reduce the effects of climate change.
- Describe the basic elements of green, high-performance construction and building operations.
- Explain the role of trades on high-performance job sites.
- Recognize energy-consuming building systems and describe some strategies to reduce building energy use.

GPRO is meant to bridge the gap between conventional and sustainable practices. Although *Fundamentals* is an introductory course, we assume that participants already know the basics of their trades. You should take full advantage of students' pre-existing knowledge and experiences to help you draw out the main takeaways, which may be slightly different for each class you teach.

We have designed these materials to cover a broad spectrum of climates, building types and systems.

Updates in Fundamentals Version 3.5

Urban Green Council is proud to bring you the newest version of *Fundamentals of Building Green*. We want to call your attention to specific changes listed below.

Content:

- **Connection between buildings and climate change:**
 - The course opens with a statement recognizing the high stakes that carbon reduction will play over the coming decades and the role that people who with buildings will play.
 - The relationship between building energy and carbon is then clearly laid out, emphasizing the role of energy, without minimizing the concept of sustainability.
- **Definition of high-performance buildings:**
 - We shift language from “green” to high-performance” throughout the text.
 - The definition of “high-performance” building is clarified from four points to three, as listed below, to make it more accessible and easier to recall.
 - **Efficient:** Uses less energy and water
 - **Healthy:** Improves the health and productivity of workers and occupants
 - **Environmentally responsible:** Durable, uses materials that don't damage the environment, low impact on community and surrounding areas
 - A 6-minute engaging video about The House at Cornell Tech is included. It features a range of stakeholders discussing various innovations related to designing and building the first Passive House high-rise tower; many of the speakers mention specific technologies, all of which are included in this course. The speakers also emphasize the necessary role that training plays in getting their teams up to speed.
- **Systems thinking:**
 - Systems thinking is the core competency needed by practitioners of high-performance buildings. To that end, throughout the entire course, we incorporated many opportunities to highlight situations where changes in one system can affect another system.
- **Climate Change:**
 - We updated information as necessary and added more opportunities to “show, not tell.” For example, we included some additional images showing the effects of climate change that are already happening. These images are compelling and are meant to be presented rather quickly. We still believe that fear is not a good motivator for behavior change but we do want to emphasize the ever more urgent need to take action.
 - We also included is some information taken directly from the IPCC *Special Report: Global Warming of 1.5°C* (2018) that emphasizes the need to not only take action, but to act as soon as possible.

Workbook & Study Resources

Workbook:

We phased out the old 100-page manual. In its place, we developed a new (much shorter) workbook that is intended to be used as an in-class companion to the course, so students can more easily follow along and use it for review to pass the exam. We hope it will also be a useful resource back at the job.

There are some classroom exercises in the presentation that corresponds with space in the workbook for students to write their own answers.

Please encourage students to use the workbook during class.

Study tools:

The following resources are available for students to ensure that they can pass the GPRO certificate exam:

- *Test Yourself Questions:*
 - Questions are printed in the back of the Workbook. These can be answered in small groups and reported out in class. Instructions are as follows:
 - Group students into pairs or triples
 - Divide the questions among the groups
 - Give groups 5 minutes to answer questions and go around the room having groups answer questions.
 - Step in and correct responses as needed.
- *Interactive TYQ Flash Cards:*
 - Questions, with answers are also presented online as flash cards for students to study at home.
 - These work best on a desktop at home but could be used on a mobile device as well. There is one set of flash cards for the course, and there are five different ways that they can be used:
 - Match
 - Learn
 - Test
 - Flashcards
 - Spell
- Self-paced *Practice Exam*
 - Students can take this *Practice Exam* online, including on their mobile devices.

Links:

- Student review tools can be found at: www.gpro.org/tyq-fund
- Please visit the Instructor Portal on **GPRO.org** for practice tests and additional resources

Course Narrative & Learning Objectives

Course Objectives: After your students complete this course, they will be able to:

- Explain how reducing building energy will reduce the effects of climate change.
- Describe the basic elements of, green, high-performance construction and building operations.
- Describe the role of trades on high-performance job sites.
- Describe energy-consuming building systems and strategies to reduce building energy use.

The course has two main sections. The first, *Part A: Sustainability*, describes why high-performance buildings are necessary. *Part B: Green Building Practices*, identifies the strategies used by teams to design, build and operate high-performance buildings.

Below are section-by-section objectives for each chapter of the course.

Part A: Sustainability

Chapter 1: Connection Between Buildings and Climate Change

- Explain the connection between buildings and climate change
- Define site energy and source energy and explain the difference
- Explain what sustainability is and provide a definition

Chapter 2: What are High-Performance Buildings?

- Define high-performance buildings
- Explain what systems thinking is and how it applies to green building
- Define *Whole Building Approach* and *Integrated Project Delivery*

Chapter 3: Causes and Effects of Climate Change

- Explain how climate change works
- Explain the effects of climate change
- Explain the limits of global warming and consequences of not taking immediate action
- Note that *Fundamentals* includes an explanation of climate change. This content may be antithetical to some of your students' prior beliefs. Please explain that this portion of the course is meant to provide accurate, scientifically-based facts about important global issues.

Chapter 4: Working Towards Solutions

- Recall environmental solutions that the U.S. and partner countries have implemented to achieve success.
- Identify the difference in mitigation and adaptation as responses to climate change.
- Name at least one mitigation and adaptation strategy

Chapter 5: Value of High-Performance Buildings

- Explain how building performance affects first costs and operational costs
- Describe the value proposition for green buildings.
- Give at least two examples of how green building will create future jobs

Part B: Green Building Practices

Chapter 6: Small Changes, Huge Impact

- Explain how buildings use energy
- Describe the strategies that will lead to better performing buildings

Chapter 7: Tight Building Envelope

- Explain how the building envelope plays an important role in the energy consumption of buildings.
- Describe how heat flows in a building.
- Explain how continuous thermal barrier and air barrier conserve a building's energy use.
- Describe the criteria of properly installed insulation.

Chapter 8: Right-Sized HVAC

- Explain the relationship between the quality of the building envelope and the size of the heating and cooling loads.
- Describe the energy cost from ventilation
- Explain how an energy recovery ventilator (ERV) works and how it saves energy

Chapter 9: Water Conservation

- Explain the relationship between water waste and energy waste (water-energy nexus)
- Explain how much water can be conserved by using ENERGY STAR and WaterRx appliances and fixtures.
- Describe how water reuse & alternative wastewater systems conserve potable water
- Describe one way that renewable energy can be used to heat water.

Chapter 10: Efficient Lighting and Electrical Systems

- Explain what drives the amount of energy that lighting systems use
- Explain several ways reduce lighting energy
- Describe what a net zero energy building is and how to achieve one
- List several sources of renewable energy

Chapter 11: Healthy Indoor Environments

- Explain why healthy indoor air is an important component of green building
- Describe how green construction and operations processes contribute to the health of the people working on or in the building.
- Explain what a CIAQ plan is and what it includes

Chapter 12: Environmentally-Friendly Materials

- Explain the concept of embodied energy
- Explain what life cycle assessment is and how it applies to buildings
- Describe the 3Rs and why their order is important
- Explain what CWM is and how it applies to construction work

Chapter 13: Codes and Commissioning

- Explain what commissioning is and why it is important to commission high-performing buildings
- Describe the difference between a code and standard
- Describe the trends of energy codes over time and how that effects buildings
- Describe LEED

Chapter 14: Optimizing Existing Buildings

- Explain the importance of building operators as related to the performance of the building
- Describe the process of Existing Building Commissioning
- Explain some of the processes and benefits of green cleaning

Course Pacing

Note the timings below are approximate. The course takes approximately 4 hours to teach.

Basic assumptions:

- Regular slides: 1:00 minutes to 2:00 minutes each
- Discussion slides: 5:00 minutes each

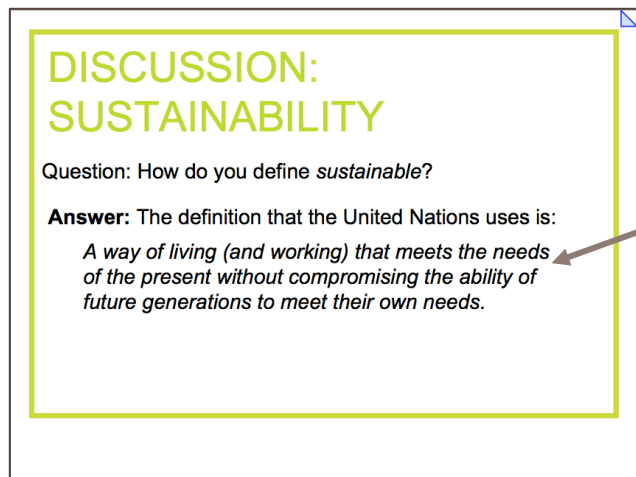
Chapter	Chapter Title	Time (min)	# of Slides
Part A: Sustainability		120	83
Front Matter	Introductions, agenda etc...	20	5
1	Connection Between Buildings and Climate Change	18	10
2	What are High-Performance Buildings? • Includes 6-minute video	22	10
3	Causes and Effects of Climate Change • Includes 8 slides (45-52) that should be presented quickly	36	36
4	Working Towards Solutions	12	11
5	Value of High-Performance Buildings	12	11
Part B: Green Building Practices		120	91
6	Small Changes, Huge Impact	9	5
7	Tight Building Envelope	28	26
8	Right-Sized HVAC	12	8
9	Water Conservation	14	8
10	Efficient Lighting and Electrical Systems	14	10
11	Healthy Indoor Environments	13	10
12	Environmentally-Friendly Materials	11	9
13	Healthy Indoor Environments	9	8
14	Environmentally-Friendly Materials	9	7
Subtotal		240 min	174
		4 hours	
	Exam Session	75 min	

Instructor Prompts:



This symbol  in the top corner of a slide indicates the slide has animation. The notes will help walk you through the narrative.

A green box around the slide indicates built-in discussion points such as assessment questions or pop quizzes



In the Instructor Notes, each **[click]** means to click once to advance the animation on the slide. In this example, the initial slide contains only the question, after one click, the answer appears. Some slides have more than one animation.

Appendix: GPRO Core educational principles

Following are Urban Green Council's core educational principles:

- All content is fact-based and provable.
- Students are professionals who already know their jobs (we're not teaching someone to be a green plumber if they aren't already a plumber).
- GPRO bridges the gap between conventional and sustainable practices.
- Sustainable practices are already known, we are trying to make them common practice across the real estate, construction and facilities industries.
- We express educational content in narrative form because students learn better through narratives and can more easily share these lessons outside the classroom. Topics are clearly explained and presented in an order that creates a coherent story. Instructors are expected to follow the basic structure of the narrative we have created.
- Peer-to-peer teaching brings the credibility of experienced professionals to students.
- GPRO shows how transitioning to sustainability benefits each individual as well as the economy and society at large.
- GPRO is an entry point into sustainability. Certificate Holders are actively encouraged to further their education about high performance building practices.