



## From the Ground Up: Current Construction Methods and Materials

### Course Guide

#### **Course Objective:**

Most residential builders' knowledge of how to build comes from on-the-job experience in the industry and training from either family members or mentor/apprentice relationships, whether formal or informal. The result of this situation has been a form of traditionalism in methods and the selection of materials.

While traditions insure the preservation and continuance of tried and true ways and means of building, traditionalism can result in a narrow conservatism that excludes new and improved methods and materials not known or available in the past.

The purpose of this course is to survey some of the methods and materials that have proven themselves over the history of building in the US, as well as an introduction to some recent advances in the building sciences.

The course will include lectures enhanced with visual slides (PowerPoint®) as well as demonstrations of actual products. The avoidance of brand names will be the rule, except where a particular product is only represented by a single manufacturer. Opportunities for class participants to share individual experiences will also be part of the classroom experience.

#### Learning Objectives:

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

1. Recall the history of building methods and materials as they relate to foundations, framing, and roofing.
2. Identify the best building method for their project based on current and proven data.
3. Select the best building materials for their project based on current and proven data.
4. Reevaluate their current building methods and materials selection by asking themselves "Is what I have been doing, and the way I have been doing it, the best way that I should be doing it in the future?" Students will be provided with the knowledge and resources needed to answer this question.

## **Narrative of the Substantive Information:**

To begin the course, the instructor will introduce him or herself, as well as the course topic: a review of traditional construction methods and materials, an analysis of more modern methods and materials, and how to choose what will work best for a given project. The instructor will ask the question: How do contractors learn to build? This will lead to a discussion of traditions vs traditionalism and its impact on reverting to old methods and a reluctance to embrace new ones.

The instructor will then begin a deeper dive into foundations. He/she will begin with a quick look at “famous foundation failures” in order to remind students of the importance of a solid foundation and the dire consequences of a poorly planned and executed foundation. This will lead to an opportunity for students to share their own “foundation failures” with an emphasis on what went wrong and how to prevent it in the future. Next, the instructor will review traditional foundations. This will include: poured concrete footings, masonry foundation walls, reinforced cast-in-place concrete, and ivany block. During this time, the instructor will stress the importance of properly ventilating crawlspaces, referencing the IRC. The instructor will then move on to discuss non-traditional foundations. These will include: precast concrete foundations, insulated concrete forms, autoclaved aerated concrete, and treated wood foundations. Afterward, the instructor will discuss open foundations. He/she will refer to the history of open foundations, referencing Venice in particular. He/she will then discuss the pier and beam open foundations students will be more familiar with. Finally, the instructor will include the foundations portion of the course by reviewing radon abatement. Successful techniques for limiting radon exposure will be presented.

Now the instructor will begin discussing framing. There will be a quick overview of the three main types of Western wood framing that will lead into a more in-depth discussion of OVE: Optimum Value Engineering. Next, flooring systems will be presented by first reviewing the importance of a mudsill. Then, the invention if I-joists and their importance to the structure as a whole will be reviewed. Additionally, the class will discuss the alternative to dimensional lumber and I-joists: floor trusses. The instructor will present the unique advantages of each method as well as their disadvantages.

After floor systems have been covered, the instructor will move on to discuss walls. The instructor will emphasize the unique challenges presented by walls that humans have faced for thousands of years. He/she will reference ancient architecture from England, Greece, and Germany. The instructor will then review the essential purposes of a wall and how the students, as contractors, can best meet each of these purposes. These being: creating control layers for water, air, vapor, and thermal factors. Different materials and their specific advantages and disadvantages for the control layers will be discussed. Specifically, there will be a heavy emphasis on different types of insulation. To wrap up the section on walls, Dr. Joseph Lstiburek's "Perfect Wall" will be presented to the students. The instructor will show students how the concept behind the "Perfect Wall" can be applied to their day-to-day construction projects.

Lastly, the instructor will review roofing and attic spaces. This portion will focus on the importance of these spaces for regulating temperature and ventilation for the structure as a whole. Specific examples of heat and moisture problems will be presented. Special emphasis will also be placed on the importance of soffit vents and improvements in ridge vents.

To conclude the course, the instructor will leave enough time for students to answer the question: "Is what I have been doing and the way I have been doing it the best way I should be doing it in the future?" The instructor will be sure to guide the discussion to emphasize construction methods and materials discussed in the course and how students plan to use them in future construction projects.

## Timed Outline

1. Introduction
  - a. Instructor and topic introduction 4 min
  - b. How do most contractors learn to build? 2 min
  - c. Traditions vs Traditionalism 2 min
  
2. Foundations
  - a. Importance of a solid foundation 2 min
  - b. Famous foundation failures
    - i. South Padre Island Ocean Tower 4 min
    - ii. Millennial Towers 2 min
    - iii. Leaning Tower of Pisa 2 min
    - iv. Personal Failure Stories 2 min
  - c. Traditional foundations 2 min
    - i. Poured concrete footings 2 min
    - ii. Masonry foundation walls 2 min
    - iii. IRC requirements for ventilations 2 min
    - iv. Encapsulated crawlspaces 4 min
    - v. Reinforced cast-in-place concrete 4 min
    - vi. Ivany Block 2 min
  - d. Non-traditional foundations
    - i. Precast concrete foundations 4 min
    - ii. Insulated concrete forms (ICFs) 4 min
    - iii. Autoclaved aerated concrete 4 min
    - iv. Treated wood foundation 4 min
  - e. Monolithic slab 2 min
  - f. Open foundations 4 min
    - i. Pier and beam foundation 6 min
  - g. Waterproofing 8 min
    - i. Perimeter drain 8 min
  - h. Radon Abatement 2 min
    - i. Gravel layer 2 min
    - ii. Vapor retarder 2 min
    - iii. Vent pipe 2 min
    - iv. Sealing and Caulking 2 min
    - v. Junction Box 2 min

3. Framing	
a. Platform	1 min
b. Balloon	1 min
c. Braced	2 min
d. Advanced framing (OVE: optimum value engineering)	4 min
e. Mudsill	2 min
f. Floor systems	2 min
i. I-joists	4 min
ii. Floor trusses	8 min
1. Caveat on trusses	4 min
iii. Subfloor	4 min
g. Walls	6 min
i. Support, strength, stability	2 min
ii. Enclosure	4 min
1. Water, air, vapor, thermal	6 min
2. Moisture resistant sheathing	2 min
3. Provision for drainage	2 min
4. Thermal barrier	10 min
iii. The Perfect Wall	
1. Control layers	8 min
2. Exterior cladding	4 min
3. Structural insulated panels (SIPs)	4 min
h. Roofs and attics	2 min
i. Temperature control	4 min
ii. Ventilation	8 min
4. Traditionalism	2 min
a. What's wrong with this picture? (Open discussion)	2 min
b. Is what I have been doing, and the way I have been doing it, the best way that I should be doing it in the future? (Open discussion)	4 min
c. Question and Answer Session	4 min

**Total Course Time:**

**200 min**



## **Instructional Methods/Aids to Be Employed**

The instructor will use the following instructional methods and aids:

1. Lecture with PowerPoint Presentation (The PowerPoint Presentation has been included as a PDF.)
2. Review Questions with Group Discussion (Questions presented throughout the PowerPoint Presentation. Questions are included in the PDF.)
3. Question and Answer Session at the end of the lecture.

## **Teaching tools to be used for delivery**

The instructor will use the following teaching tools:

1. PowerPoint Presentation
2. Laptop, Projector, and Screen
3. Microphone and Audio Equipment