



Land Development: An Engineer's Guide

An Online Continuing Education Course for Engineers

Course Number: C-3038

Credit: 3 Hours / 3 PDH / 3 CPD

Land Development: An Engineer's Guide

David E. McKee, P.E.

Table of Contents

I. Introduction

II. Project Organization

- A. Engineer/Developer Relationship
- B. Development Team Members

III. Preliminary Investigations and Due Diligence

- A. Initial Permitting and Approval Activities
- B. Site Planning
- C. Regulatory Input
- D. Initial Due Diligence Determination

IV. Project Development Considerations

- A. Federal and State Regulations
- B. Local Approvals: Legislative vs. Administrative
- C. Physical Site Limitations
- D. Technical and Design Standard Limitations
- E. Utilities and Emergency Services Availability
- F. Other Economic Factors
- G. Final Feasibility Determination

V. Legislative Approvals/Land Use and Zoning

- A. Land Use/Comprehensive Plan
- B. Zoning Classifications/Uses

- C. Variances and Deviations

VI. Design Activities & Administrative Permitting/Approvals

- A. Technical Standards
- B. Plan Preparation
- C. Permitting
- D. Time Frames

VII. Activities During Construction

- A. Preconstruction Activities
- B. Inspections, Testing, and Compliance
- C. Plan Changes and Permit Modifications

VIII. Close-Out Activities/Final Approvals

IX. Summary

I. Introduction

Engineers who participate in land development, site design, and construction projects often find themselves engaging in a wide range of activities beyond the actual design. This is particularly true of consulting Engineers who specialize in these fields, as well as engineers employed by developers or site contractors undertaking design-construction contracts. Additionally, engineers retained by the same client for multiple projects often find themselves functioning as part of a close-knit project team. Even municipal clients that develop public facilities within their communities retain Engineers for this type of work as federal and state regulations may come into play that require specialized engineering assistance in addition to the actual site design. The myriad of tasks, permitting activities, project approvals, design requirements, responsibilities during construction, and project close-out can be extensive. This course discusses these activities to assist the Engineer in better completing the required work needed for a successful project.

The information contained within this course assumes that the developer, client, contractor, municipality, or similar entity starts with an undeveloped parcel of land and carries it through permitting, design approval, and site construction completion as it relates to the site improvements aspects of the project. While building design and architectural elements are important and play a role in the site development, actual building design and permitting are not covered in this course.

The course looks at land use and zoning regulations that can affect the type and size of a project developed, preliminary planning activities, physical and technical site limitations that affect project feasibility and design, the availability of public utilities and emergency services and their impact on development, economic factors, project design requirements, permitting criteria, activities during construction and project close-out.

No one course can provide an analysis of all activities that might be encountered in all fifty states. Almost every municipality in the United States, regardless of size or location, has a unique set of requirements related to land development, permitting, site design, and construction. Information presented herein is generally based on development activities within the State of Florida, where the course author has spent a significant amount of time as a consulting Engineer specializing in these fields. While no municipality in Florida has the same set of regulations, there are many similarities, and most communities follow the same general procedures. Other states where the author has practiced have relatively similar land development, site design, and construction parameters. This course provides a brief overview of federal regulatory issues, as they are fairly uniform nationwide, but does not offer specific references on the requirements of any particular state or local entity. The intent is to provide a general narrative of the land development, permitting, site design, and construction process.

II. Project Organization

A. Engineer/Developer Relationship

The working relationship between the Engineer and developer/client can vary widely. The definition of developer can include a municipality or governmental entity in addition to what is referred to as "private sector" entities. This course concentrates on the private side of development, but many of the topics covered are applicable to the municipal side, and design and permitting activities are similar. The primary difference between the two categories is that government work often utilizes an RFQ/RFP process selection for Engineers and provides a much more defined scope of services. Cost and economic feasibility are rarely a condition for development in the majority of municipal projects, as they are built to meet public needs. A new library, a transit repair shop, or an expansion of a water treatment plant would be typical examples.

Engineers hired for private sector projects are retained due to their reputation, past work on similar projects, local knowledge of regulations, and established working relationships with permitting entities. Engineers encounter a wide range of developers and an even wider range of attitudes. Many developers view the Engineer as part of a close-knit project development team, involved in all aspects of the project. In contrast, others view the Engineer as a necessary evil that incurs costs. Those types of developers will often hire based on a bid or quote, request additional work, and then be reluctant to pay for the extra services. Some developers have reasonable patience and understand how lengthy and complicated the process can be. At the same time, some pick up the phone every day and complain to the Engineer about "delays" and "overruns" that are well outside the Engineer's control. Developers also have wide-ranging attitudes toward the feasibility of a project. Some are willing to grind through a project and take risks, while others bail out of a potential project at the first concern that arises.

In some cases, the Engineer and a developer who has a constant stream of projects in a given area will develop a long-term relationship that benefits both parties. Decades-long working relationships spanning dozens of projects are not uncommon. Each side understands its specific tasks and responsibilities in order to complete a project successfully. Participating in past projects provides a solid foundation and valuable experience to draw on for future projects. This provides the Engineer with a steady base load of work, while the developer has a trusted source of information that they can access with a quick phone call, ensuring they are at the top of the Engineer's list if and when a problem arises.

Developers who have completed a significant number of projects and/or have multiple projects underway often possess the necessary personal expertise and/or in-house project teams to carry out many of the required activities, thereby limiting the Engineer's participation to the preparation of signed and sealed documents, drawings, and plans. Some developers employ registered engineers on a full-time basis. Still, detailed permitting and design activities are more often carried out by Engineers who have experience in the municipality where the work is conducted. The local experience of these Engineers eliminates the "learning curve" that a staff Engineer would incur. This reduces both time and expense to complete the work and helps to eliminate the possibility of overlooking required permitting and approval activities.

This course assumes the Engineer takes the role of a key team member and generally functions as a project manager working alongside the developer. All team members coordinate directly with the Engineer. This enables the Engineer to integrate and coordinate all necessary design and permitting activities, manage the required team members, and provide them with the necessary information to complete their work and properly sequence the events.

A detailed understanding of the developer's needs and requirements is essential for a successful project. Some developers pursue a very specific project, such as a sixty-seat sit-down fast food restaurant with a drive-through, for example. They have an exact building footprint that must be used and fit on the site without any changes. Other developers come to an Engineer and hand them a Realtor's sales brochure that shows a two-acre parcel of land, asking how big a strip center can be built on the land and how many different types of tenants they can rent to under the land use and zoning categories applicable to the site. Still others come with large parcels of land under contract and want to know how many single-family homes they can build, how long permitting might take, and what it will cost to design, permit, and construct the project.

B. Development Team Members

The level of complexity of a project and the associated need for specific team members are determined by several factors: the extent of regulations governing the project, the project's size, the number and type of permits required to obtain approval for construction, and any physical limitations associated with the site. These factors are discussed in the future sections of this course. Specialty fields of engineering, as well as other land development-related fields of expertise, are often needed to participate with the Engineer and include Architect, Contractor/Builder/Construction Manager, Environmental Consultant, Fire Protection Engineer, Land Surveyor, Landscape Architect, Land Use Attorney, Lighting Engineer, Realtor, Soils Consultant/Geotechnical Engineer/Hydro-geologist and Traffic Consultant/Engineer.

Architects normally function as an independent and parallel design and permitting firm for the actual structure or building. For most projects, their responsibility is to provide a building footprint and general site layout that makes the building functional, allowing the Engineer to incorporate this information into an overall site development plan that complies with all other design and permitting parameters. In some instances, when a developer is constructing a "spec project," the Architect and Engineer collaborate to determine the maximum building footprint that a site can support, considering all the site development requirements that must be met. Then, the Architect creates the building design. The Architect can sometimes be the lead member of a project team, but general responsibilities and procedures remain the same.

Some of the areas of expertise the project team is required to have can be part of a developer's ongoing project team. Still, many are hired locally due to their familiarity with local requirements and regulations. Local Consulting Engineering firms sometimes carry a multi-disciplined staff that has these services available in-house. Still, generally, multiple entities or companies are involved in completing a

land development and site construction project. The areas of project development, design, and permitting in which team members can participate are presented in future sections of this course.

III. Preliminary Investigations and Due Diligence

A. Initial Permitting and Approval Activities

Project development activities discussed in this Section are expanded upon in future sections. A brief introduction is provided here to introduce the various land development components that can be encountered and how they fit into an initial site evaluation and due diligence effort. Most developers do not want to waste time and money if the prospects for developing a parcel of land are minimal. This requires the Engineer and the project team to be familiar with both the development rules and regulations, as well as the local conditions related to the land itself, to minimize evaluation time and initial expenditures.

The number of permitting activities will vary significantly based on the project. Some projects that have input into the project. The number of permits and approvals from various agencies can begin.

The questions summarized as follows: development are

Architect: Can the development style and size to accommodate the project?

Contractor/Builder: Can the development be constructed within the budgetary constraints?

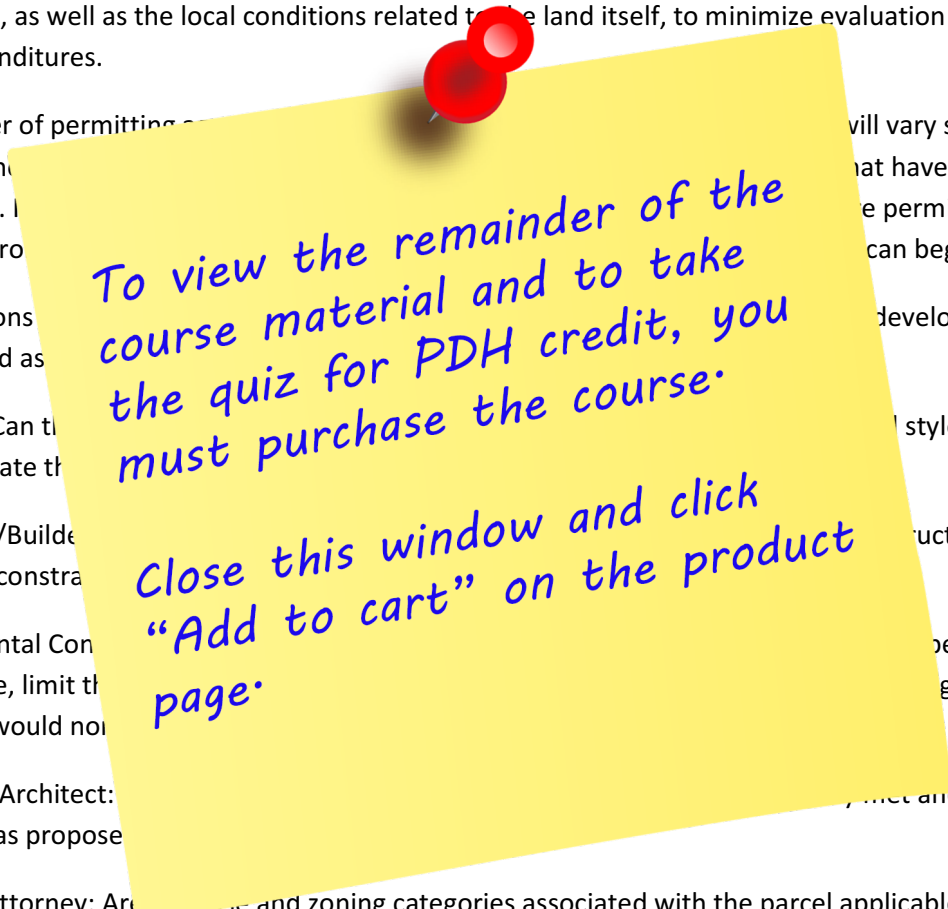
Environmental Consultant: Can the development be constructed on property that is environmentally sensitive? Will the development trigger permitting requirements?

Landscape Architect: Can the development be designed to meet and still develop the parcel as proposed?

Land Use Attorney: Are the use and zoning categories associated with the parcel applicable to the proposed development? If not, what is the possibility that the needed changes can be approved?

Lighting Engineer: Can the required or desired project lighting be approved on-site?

Soil Consultant: Are the soil conditions on site adequate to support the proposed structure? Can soil excavated for stormwater management facilities be used as fill material, or will the developer incur additional costs for disposing of such material and importing acceptable fill material?



To view the remainder of the course material and to take the quiz for PDH credit, you must purchase the course.

Close this window and click "Add to cart" on the product page.