



Roadway Cross-Sections I

Course Number: CE-03-906

PDH: 3

Approved for: AK, AL, AR, DC, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NH, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WI, WV, and WY

State Board Approvals

Florida Provider # 0009553 License #868

Indiana Continuing Education Provider #CE21800088

Maryland Approved Provider of Continuing Professional Competency

New Jersey Professional Competency Approval #24GP00025600

North Carolina Approved Sponsor #S-0695

NYSED Sponsor #274

Course Author: Greg Taylor

How Our Written Courses Work

This document is the course text. You may review this material at your leisure before or after you purchase the course.

After the course has been purchased, review the technical material and then complete the quiz at your convenience.

A Certificate of Completion is available once you pass the exam (70% or greater).

If a passing grade is not obtained, you may take the quiz as many times as necessary until a passing grade is obtained).

If you have any questions or technical difficulties, please call (508) 298-4787 or email us at admin@PDH Pro.com.





INTRODUCTION

The AASHTO “Green Book” defines a **roadway cross-section** as *“a vertical section of the ground and roadway at right angles to the centerline of the roadway, including all elements of a highway or street from right-of-way line”*. Along with the vertical alignment (grades and vertical curves) and horizontal alignment (tangents and curves), the roadway cross-section (lanes and shoulders, curbs, medians, roadside slopes and ditches, sidewalks) helps to present a three-dimensional roadway model. Its ultimate goal is to provide a safe, smooth-flowing facility that is crash-free.

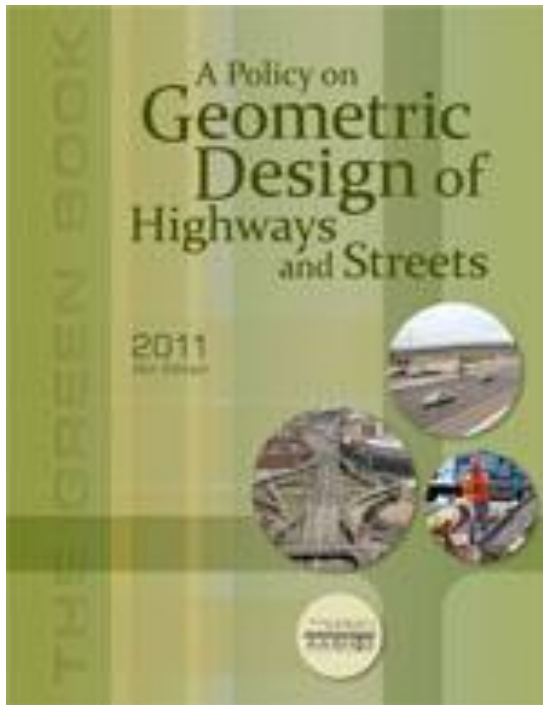
This course is the first of two in this series that focuses on the geometric design of cross-sections for modern roads and highways. Its contents are intended to serve as guidance and not as an absolute standard or rule.

Upon course completion, you should be familiar with the general design concepts for roadway cross-sections. The course objective is to give engineers and designers an in-depth look at the principles to be considered when selecting and designing a roadway.

Subjects covered include:

- Design guidelines**
- Traveled way**
- Lane width**
- Shoulders**
- Rumble strips**
- Roadside design**
- Curbs**
- Drainage channels & sideslopes**
- Traffic barriers**

A Policy on Geometric Design of Highways and Streets (also known as the “Green Book”) published by the *American Association of State Highway and Transportation Officials (AASHTO)* is considered to be the primary guidance for U.S. roadway design. For this course, **Chapter 4 - Cross-Section Elements** (Sections 4.1 through 4.10) will be used exclusively for fundamental roadway geometric design principles.



BACKGROUND

Roadway geometric design consists of the following fundamental three-dimensional features:

Vertical alignment - grades and vertical curves (“profile”)

Horizontal alignment - tangents and horizontal curves (“centerline”)

Cross section - lanes and shoulders, curbs, medians, roadside slopes and ditches, sidewalks

Combined, these elements contribute to the roadway’s operational quality and safety by striving to provide a smooth-flowing, crash-free facility.



Roadway geometric design will always be a dynamic process with a multitude of considerations, such as

driver age and abilities
vehicle fleet variety and types
construction costs
maintenance requirements
environmental sensitivity
land use
aesthetics

and most importantly *societal values*.

Engineers must understand how all of the roadway elements contribute to overall safety and operation. Applying design standards and criteria to ‘solve’ a problem is not enough.

The fundamental objective of good geometric design will remain as it has always been – **to produce a roadway that is safe, efficient, reasonably economic and sensitive to conflicting concerns.**



DESIGN GUIDELINES

In today's world, designers need to understand how all elements of the roadway affect its safety and operation – *horizontal and vertical alignment, cross section, intersections, and interchanges*. Each location presents its own unique set of design challenges.

A designer's ability to make reasonable, cost-effective, and site-specific choices will be dependent on their understanding of the functional rationale behind their design guidelines. Design criteria reflect the research and experience which consider local site conditions, needs of space, and other transportation factors. Their use provides a measure of consistency and quality for roads designed by different individuals.

Design Criteria

- Safety
- Operational quality
- Cost-effectiveness
- Maintenance needs

Roadways are designed in conjunction with design guidelines and standards that take into account speed, vehicle type, road grade (slope), view obstructions, and stopping distance. Using these guidelines along with good engineering judgment will help produce a comfortable, safe, and aesthetically pleasing roadway.

AASHTO

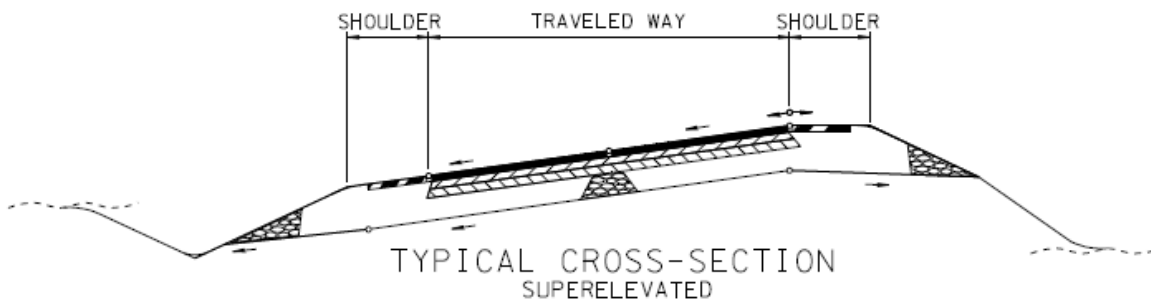
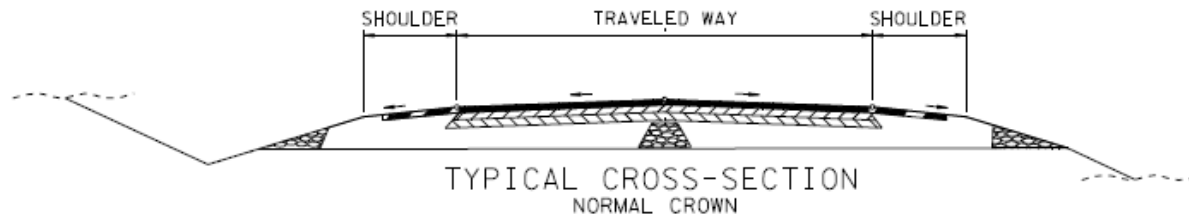
The *American Association of State Highway and Transportation Officials (AASHTO)* publishes and approves information on geometric roadway design for use by individual state transportation agencies. The majority of today's geometric design research is sponsored and directed by AASHTO and the Federal Highway Administration (FHWA) through the National Cooperative Highway Research Program (NCHRP). The FHWA has adopted many of AASHTO's policies for the design and construction of federal-aid highway projects.

Individual transportation agencies adopt or develop their own design criteria, referencing approved AASHTO policies. Most states usually adopt major portions of the AASHTO design values or adopt the AASHTO policy completely as their design criteria.

CROSS-SECTION

TRAVELED WAY

AASHTO defines the roadway's traveled way as *"the portion of the roadway for the movement of vehicles, exclusive of shoulders and bicycle lanes"*. This area usually contains two or more lanes for roadway traffic.



Surface Type Criteria

Initial cost	Traffic volume & composition
Soil characteristics	Climate
Maintenance cost	Pavement performance
Availability of materials	Energy conservation
Service-life cost	

Important geometric design considerations include the effect on driver behavior, surface resiliency, drainage ability, and skid resistance. The *AASHTO Mechanistic-Empirical Pavement Design Guide* provides additional detailed information about the structural design of pavements.



Purchase this course to
see the remainder of
the technical materials.