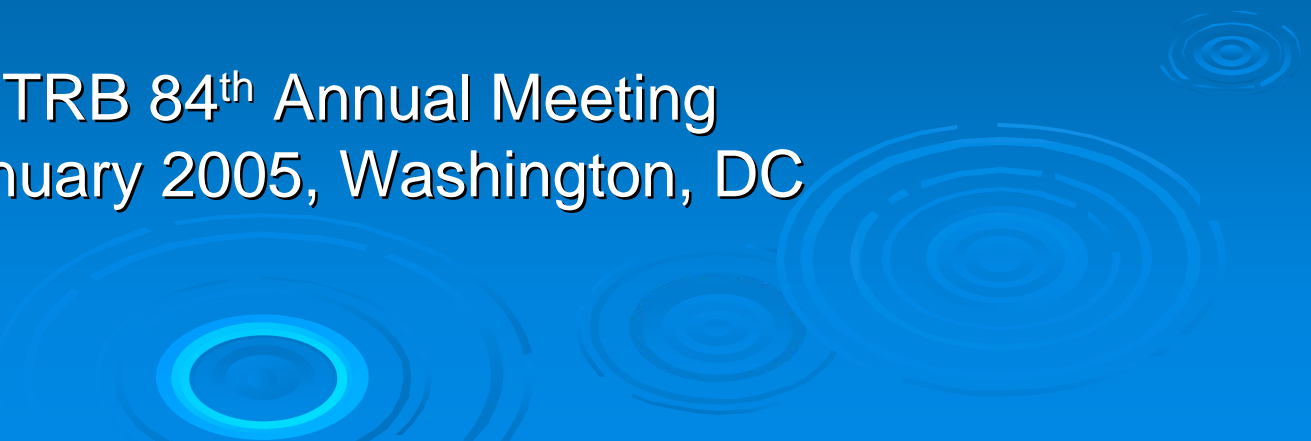# Scenario Development Tools and The Logic of Scenario Development

TRB Human Factors Workshop on
Development of Standardized Descriptions of Driving Simulator Scenarios: Human Factors Considerations

TRB 84th Annual Meeting
January 2005, Washington, DC

Overview

- ➢ **Scenario Design Process**

- ➢ **Process Elements**

- ➢ **Measurement Paradigms**

- ➢ **Scenario Development Demonstration**

Overall Objective in Scenario Design:

Full control over <u>independent</u> and <u>dependent</u> variables

General Driving Scenario Development Process

➢ **Establish Requirements in Conjunction with Subject Matter Experts**

➢ **'Program' Scenario(s)**

➢ **Review with Subject Matter Experts and Refine**

Scenario Design and Development Process

- Identify Goals and Objectives
- Scenario Definition (Outline, Storyboard Timeline)
- Prepare Scenario Models
- Identify Performance Measures
- Program Scenario
- Run and Refine Scenario

Scenario Development Steps

➢ **Prepare Static and Animated Models**

➢ **Setup Critical Events**

➢ **Layout Roadway**

➢ **Add Critical Events to Roadway**

➢ **Add Background and Tune Up Look and Feel**

➢ **Run and Refine**

Procedural Methods

- Visual/auditory data bases defined with instruction list, tiling, etc.
- Compiled to give complete scenario at run time
- Can be easily composed and modified
- Important for defining experimental designs and training procedures

Typical Critical Events

- **Roadway Curvature**

- **Traffic Control Devices**

- **Limited Site Distance**

- **Controlled Lateral and Longitudinal Vehicle Movements**
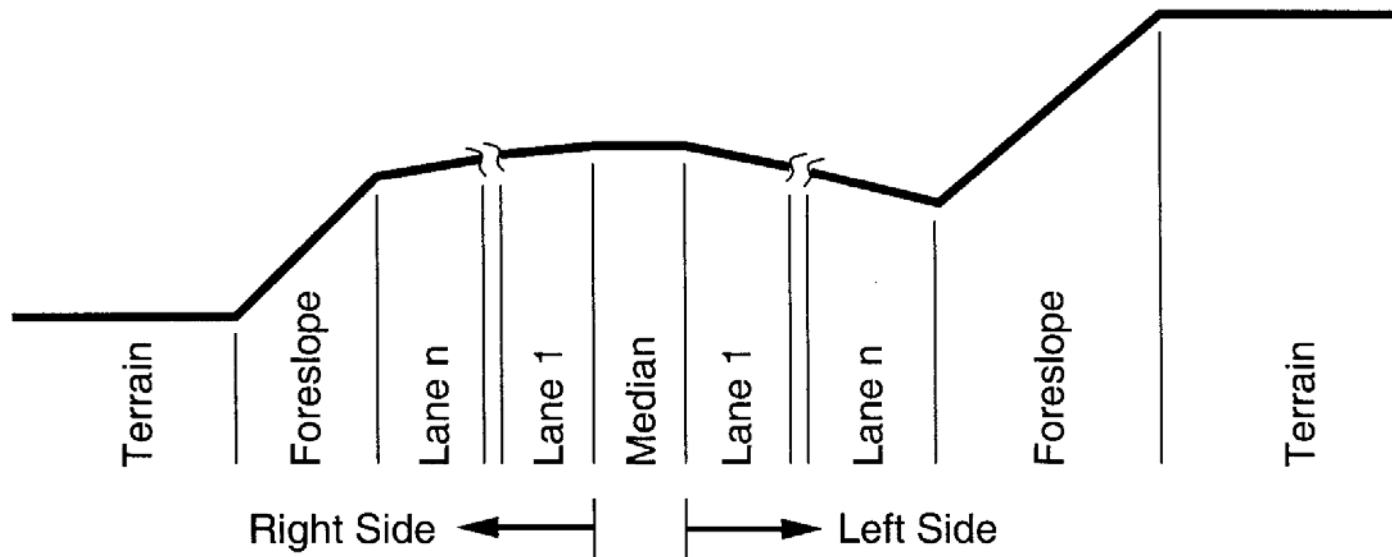
- **Controlled Pedestrian Movements**

Driving Scenario Design Variables

CATEGORY	INDEPENDENT VARIABLES	DEPENDENT VARIABLES
Roadway Layout and Geometry	Curvature	Speed
		Lateral g's
	Grade	Speed
		Shifting
		Brake Temperature
	Sight Distance	Perception/RT
Interactive Traff. & Peds	Time-to-Impact	Steering/Braking Time to Collision
TCD's	Placement, Format, Content	Detection/Recognition
Roadside Elements	Sight Distance, Distraction	Perception/RT

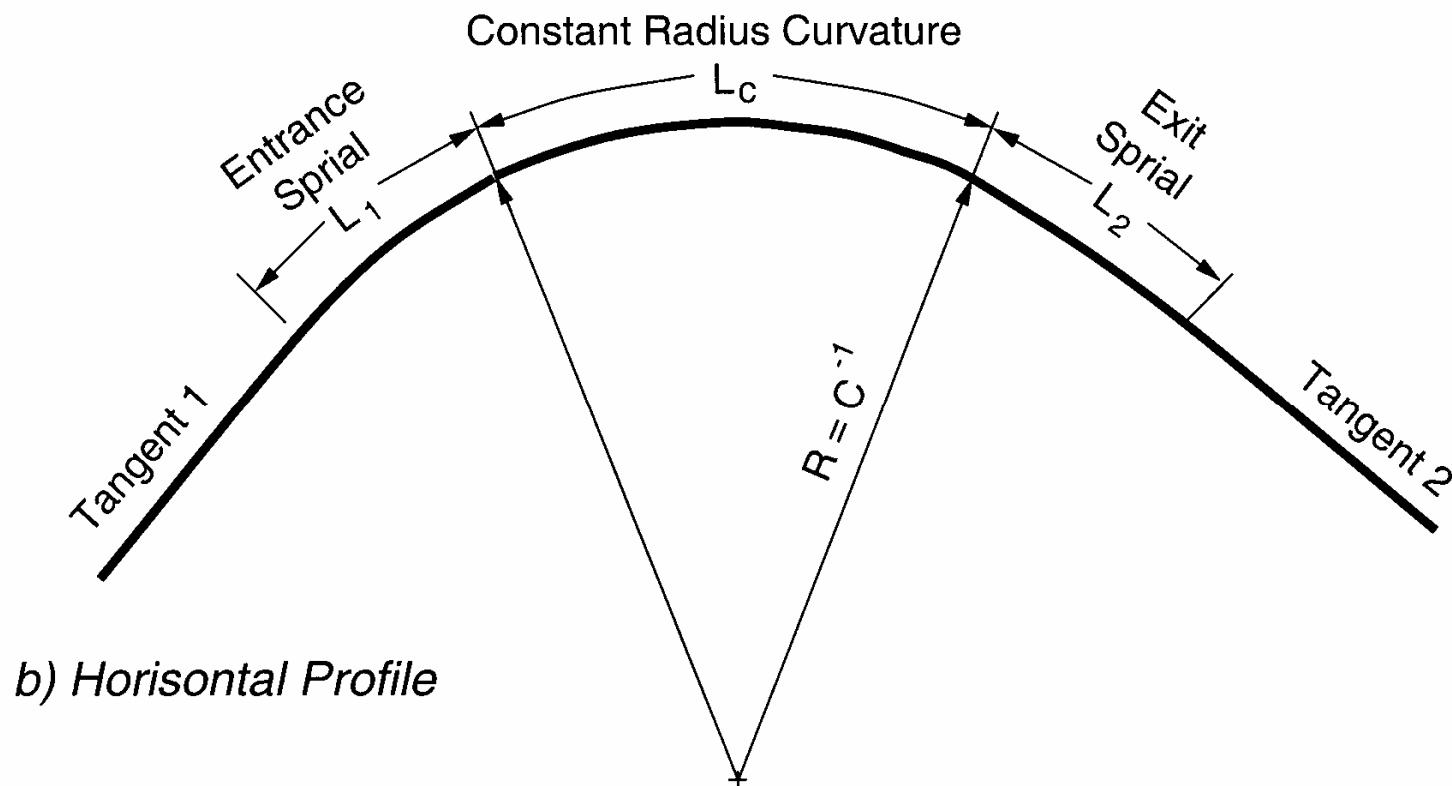# Scenario Design Elements (Independent Variables)

- ➤ **Roadway Layout and Geometry**
- ➤ **Interactive Traffic and Pedestrians**
- ➤ **Traffic Control Devices (TCDs)**
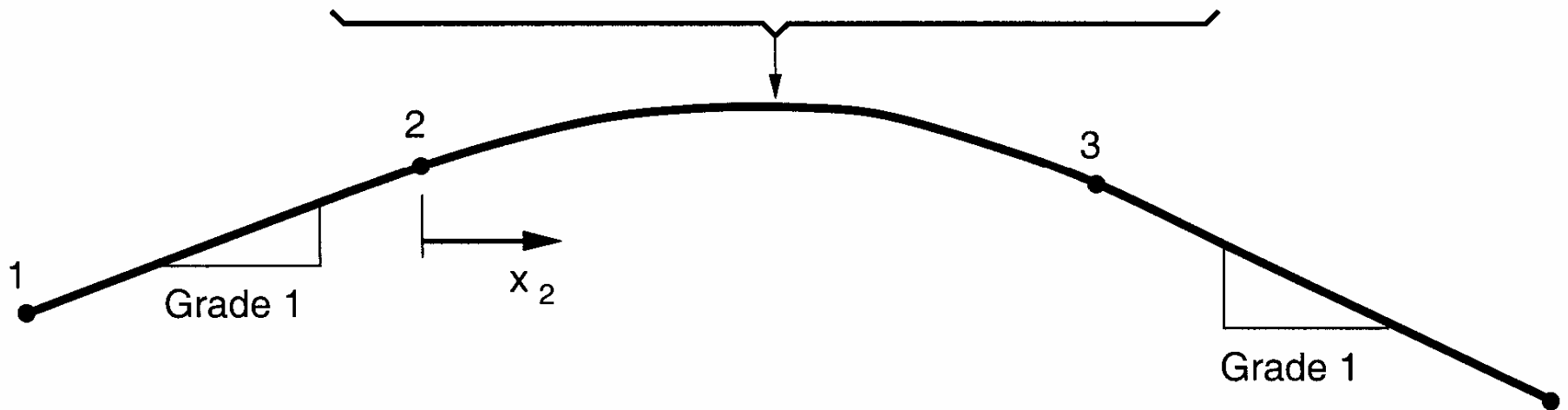- ➤ **Roadside Elements**

Roadway Cross Section

a) Crossection

Roadway Horizontal Profile

b) Horisontal Profile

Roadway Vertical Profile

$$z(x) = z(2) - \frac{\text{Grade 1}}{100} x_2 - \frac{\text{Grade}(1) - \text{Grade}(2)}{2 \cdot 100} x_2^2$$

2

3

1

Grade 1

x_2

Grade 1

c) Vertical Profile

Limited Site Distance