

# Future Highway



## Introduction

Illinois ranks third in the nation, behind Texas and California, in the number of interstate miles, has over 15,000 miles of highways, includes more than 26,000 bridges as well as seven scenic byways. Illinois roadways play an important part in transportation across the country. Whether it is around the southern tip of Lake Michigan or across many rivers, including the Ohio, Illinois, and Mississippi Rivers, Illinois has major north south and east west roadways. The Illinois Tollway Association is responsible for construction and maintenance of many miles of these important roads.

Future Highway, produced in cooperation with the Illinois Tollway, provides hands-on experiences for students to explore this system. The activities integrate science, technology, engineering, and mathematics. Themes explore the construction and maintenance of highways as well as their interactions with communities and the environment.

## Alignment to Standards

Each Theme within the module is aligned to the Next Generation Science Standards (NGSS) as well as the Common Core Standards of Mathematics for 7<sup>th</sup> grade. In these Themes, students may encounter skills and concepts that are new to them. Pre-teaching is not recommended. As students arrive at unfamiliar ideas, take *that* opportunity to bring them up-to-speed.

Although aligned to 7<sup>th</sup>-grade standards, Future Highway is intended as enrichment, not a replacement for state approved math or science curricula.

## Organization

Future Highway contains 20 activities. Each activity can be done in 40 minutes, unless otherwise indicated. Some could continue for several class periods if you chose to pursue optional extensions. Within each of the five Themes, activities should be done in the order presented. The five Themes themselves, however, may be done in any order.

### Theme 1: Structures and Processes

- Build it Strong! - Design and build a reinforced concrete deck slab.
- PB&J Project - Use Gantt charts to manage a project efficiently.
- Build it Fast! - Experiment with Accelerated Bridge Construction (ABC) methods to minimize the impacts of construction.
- Testing - Create and apply test plans for evaluating designs and processes.

### Theme 2: Around Town

- Adela's Valley Highway –Design a highway route that minimizes impact on culture and the environment.

- Cost Analysis - geometry to calculate the monetary cost of highway construction. Compare and evaluate competing construction plans.
- Navigation - Model the calculations performed by navigational devices that predict travel times.
- High Visibility Signs - Design and implement a test to evaluate the visibility and legibility of highway signs.
- Slow Down, Curves Ahead - Determine the roles of speed and banking on a car's ability to safely negotiate a curve.

### **Theme 3: Traffic Management**

- Traffic Jam – Explore factors that impact traffic flow.
- Anger Management – Examine factors that may cause changes in driving habits and review potential driver positive responses to changes in road conditions.
- Traffic Management – Use if-then statements and models to solve real-life traffic problems
- Information Board - Explain and interpret data tables and graphs and find the corresponding data description.

### **Theme 4: Please Pass the Salt**

- Cooler Than Me - Conduct investigations to explore how various materials affect the freezing point of water.
- A Little Bit Salty - Explore how temperature and salt can impact lake stratification and turnover and freshwater organisms.
- Rooting for You - Perform experiments to determine how salt can impact plant germination and growth.
- Green Winterization - Design and test methods for monitoring and mitigating environmental impacts of materials used for deicing.

### **Theme 5: Why Did the Chicken Cross the Road?**

- A Day in the Life - Identify why animals attempt to cross highways.
- Just Passing Through - Design an animal passage that reduces collisions between animals and vehicles.
- Warning - Apply the engineering and design cycle to evaluate and improve an animal passage

## **Materials**

**All materials will be provided by IMSA for those schools participating in the Future Highway Grant Program. Schools which are not selected can participate in the professional development, but will need to purchase their own materials.**

Each activity includes a list of required materials. A Master Material List is also provided below. Teachers may use that as a shopping list. In addition a list of Typical Classroom Materials is included. These are things that are typically already available to teachers,

but scanning the list is a good idea in case any of these items might need to be ordered as well.