Introduction

Why are we here today?

Début of the “Guidelines for the Seismic Retrofitting of Steel Truss Highway Bridges” a document contracted by the Multidisciplinary Center for Earthquake Engineering Research (MCEER) and sponsored by the Federal Highway Administration (FHWA)
Introduction

1. INTRODUCTION
2. RETROFITTING PHILOSOPHY AND PROCESS
3. SCREENING AND PRIORITIZATION
4. ANALYSIS
5. DESIGN PARAMETERS
6. EVALUATION OF MEMBERS, CONNECTIONS, AND SUBSYSTEMS
7. RETROFIT MEASURES, APPROACH, AND STRATEGY
8. REFERENCES AND BIBLIOGRAPHY
9. CASE STUDIES
10. GLOSSARY

Guidelines for the Seismic Retrofitting of Steel Truss Highway Bridges

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U.S. Department of Transportation
Federal Highway Administration
## Introduction

<table>
<thead>
<tr>
<th>Time</th>
<th>Lecturer</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 - 9:00</td>
<td>T. Ho</td>
<td>Introduction</td>
</tr>
<tr>
<td>9:15 - 10:30</td>
<td>R. Donikian</td>
<td>Seismic Retrofit Philosophy and Process for Steel Truss Highway Bridges</td>
</tr>
<tr>
<td>10:45 - 12:00</td>
<td>R. Donikian</td>
<td>Screening and Prioritization</td>
</tr>
<tr>
<td>12:00 - 1:00</td>
<td></td>
<td>Lunch Break</td>
</tr>
<tr>
<td>1:00 - 2:30</td>
<td>R. Donikian</td>
<td>Analysis</td>
</tr>
<tr>
<td>2:45 - 3:45</td>
<td>T. Ingham</td>
<td>Design Parameters</td>
</tr>
<tr>
<td>4:00 - 5:00</td>
<td>T. Ingham</td>
<td>Evaluation of Members, Connections and Subsystems</td>
</tr>
</tbody>
</table>

### DAY 1

#### 12/12/2005
- **Monday**
  - **8:00 - 9:00**: Introduction (T. Ho)
  - **9:15 - 10:30**: Seismic Retrofit Philosophy and Process for Steel Truss Highway Bridges (R. Donikian)
  - **10:45 - 12:00**: Screening and Prioritization (R. Donikian)
  - **12:00 - 1:00**: Lunch Break
  - **1:00 - 2:30**: Analysis (R. Donikian)
  - **2:45 - 3:45**: Design Parameters (T. Ingham)
  - **4:00 - 5:00**: Evaluation of Members, Connections and Subsystems (T. Ingham)

### DAY 2

#### 12/13/2005
- **Tuesday**
  - **8:00 - 9:30**: Retrofit Measures, Approach and Strategy (T. Ho/Chuck Seim)
  - **12:00 - 1:00**: Lunch Break
  - **1:00 - 2:30**: Case History: Aurora Bridge (T. Ingham)
  - **3:00 - 5:00**: Case History: Million Dollar Bridge (T. Ingham)

### DAY 3

#### 12/15/2005
- **Wednesday**
  - **8:00 - 9:15**: Case History: Richmond San Rafael Bridge 1 (R. Donikian)
  - **9:30 - 10:45**: Case History: Richmond San Rafael Bridge 2 (R. Donikian)
  - **11:00 - 12:00**: Open Discussion
Introduction

Historical Background

AASHTO Standard Specification for Highway Bridges & AASHTO LRFD Bridge Design Specifications apply to the design of “new” and generally “ordinary” highway bridges.

Pre-1971 AASHTO seismic provision: static equivalent lateral force.

1973 Caltrans issued new seismic design criterion.

1977 AASHTO adopted Caltrans’ seismic design criterion.

Introduction

1978 Applied Technology Council (ATC) developed new guidelines and in 1981 published “ATC-6 Seismic Design Guidelines for Highway Bridges”.

2001 NCHRP published “Recommended LRFD Guidelines for the Seismic Design of Highway Bridges”.
Introduction


1987 FHWA published “Seismic Design and Retrofit Manual for Highway Bridges”.

1995 FHWA published “Seismic Retrofitting Manual for Highway Bridges”.


Introduction

These Guidelines are supplementary to:

“Seismic Retrofitting Manual for Highway Structures: Part 1 – Bridges”

Other relevant documents:

◆ Foundation Design for Special Bridges

◆ Manual for Base Isolation
Introduction

Why Steel Truss Highway Bridges?

- Large number of them in our highway system today
- Many of them are long span bridges and important structures
- Most of them were designed before modern seismic codes were available
- Few of them were retrofitted so far
- Many of them are in need of rehabilitation because of age and condition

Manual vs. Guideline

Manual has step by step instructions and numerical examples.

Steel Truss Highway Bridges are all different and too complex. It is difficult to offer a “cookbook” style manual for the seismic retrofitting of this structure type.

These Guidelines listed about 200 articles and 7 case studies for references.
Introduction

What is a steel truss?
A framework of straight steel components forming triangular patterns that are connected together to form a primary load supporting system of axially loaded members.

Center of mass of superstructure well above the bearing

Members usually have riveted lacing bars on one or two sides
Introduction

Truss Types:

Position of deck:
- Through Truss
- Half-through Truss
- Deck Truss
- Double Deck Truss
Introduction

Number of Spans:

- Simple Span Truss
- Continuous Span Truss
- Gerber Truss
Introduction

**Erection Method:**
- Cantilever Truss
- Suspended Span
Introduction

Type of Design:

- Howe Truss
- Pratt Truss
- Warren Truss
- Whipple Truss
- Baltimore Truss
- K-Truss
Introduction
Introduction
Introduction

**Structural Characteristics of existing Truss Bridges**

- Key lateral force resisting elements are horizontal lateral bracing systems within the planes of the upper and lower chords.
- Most of the lateral bracing system in these bridges were designed to carry wind loads.
- The mass of the concrete decks and their supporting systems contribute inertia demand but little lateral resisting capacity.
Introduction

Thank you