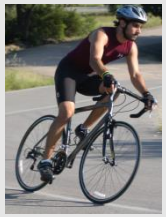
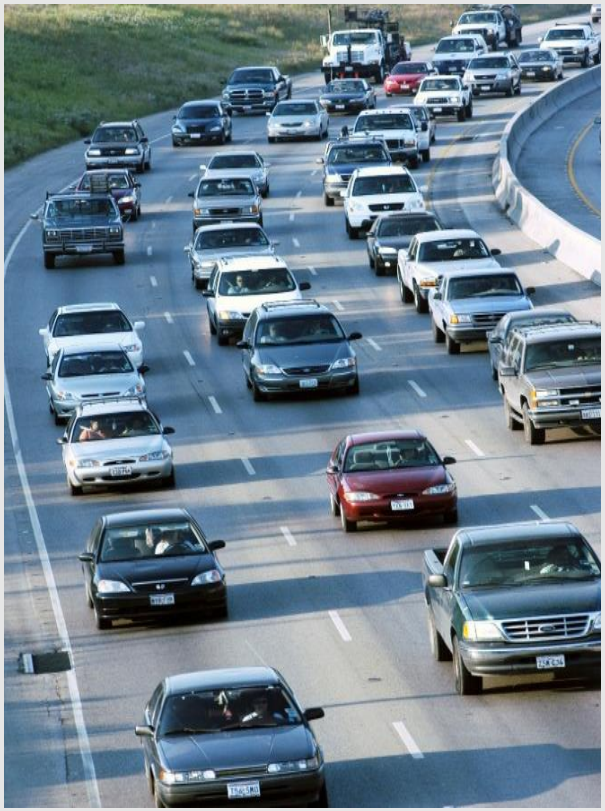


HISTORY OF CONCRETE BRIDGES IN TEXAS

Gregg Freeby, P.E.



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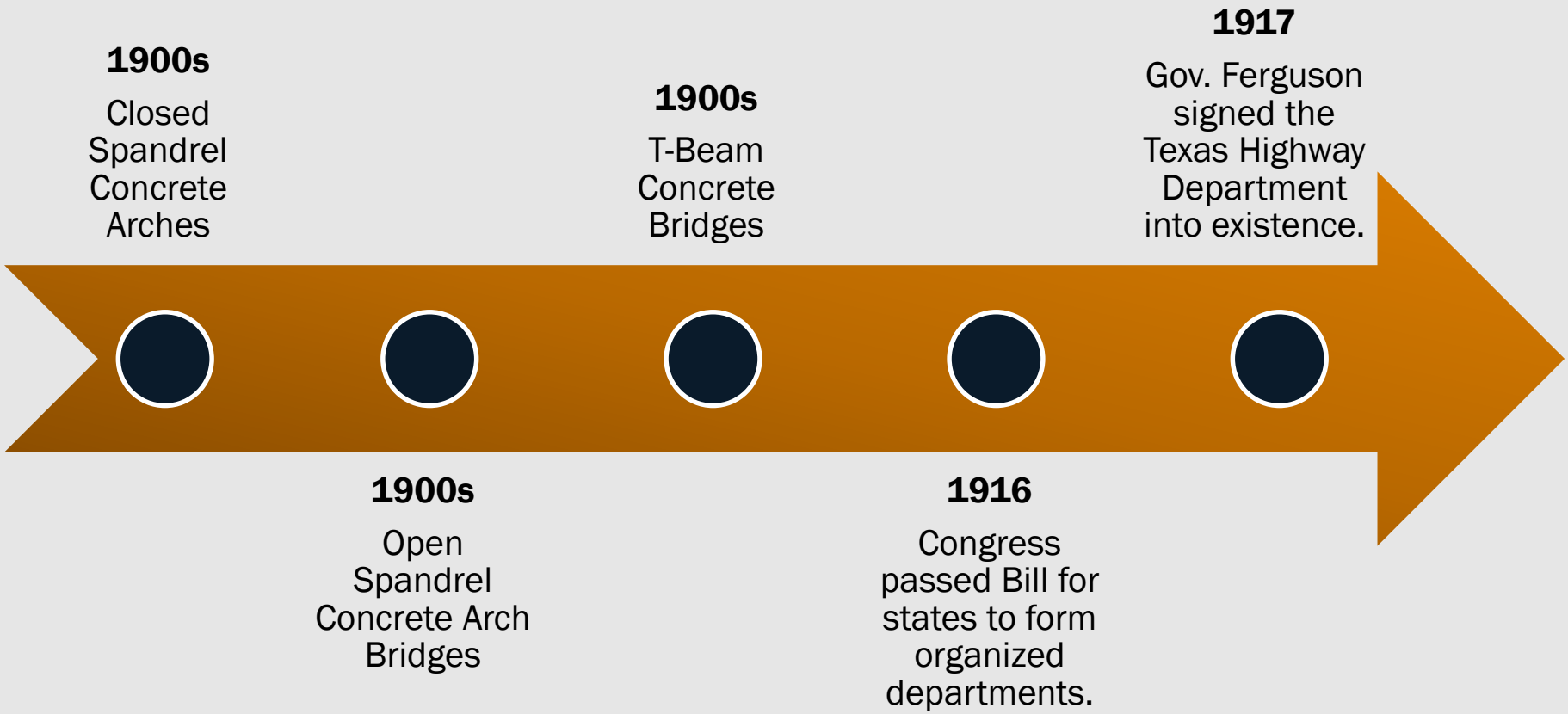
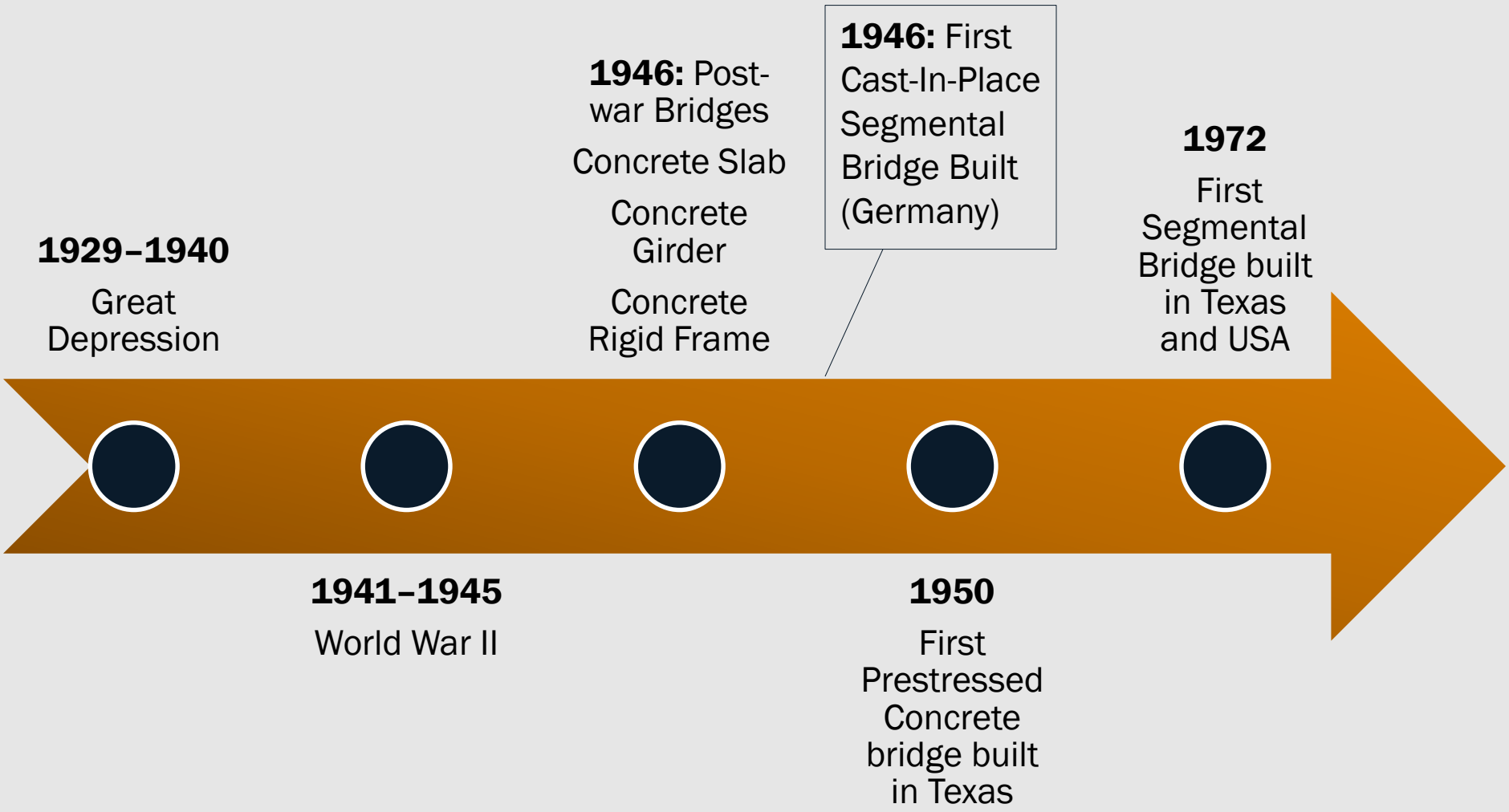
Timeline


1900s
Closed Spandrel Concrete Arches
1900s
Open Spandrel Concrete Arch Bridges
1900s
T-Beam Concrete Bridges
1916
Congress passed Bill for states to form organized departments.
1917
Gov. Ferguson signed the Texas Highway Department into existence.

Timeline


1929–1940
Great Depression
1941–1945
World War II
1946: Post-war Bridges
Concrete Slab
Concrete Girder
Concrete Rigid Frame
1946: First Cast-In-Place Segmental Bridge Built (Germany)
1950
First Prestressed Concrete bridge built in Texas
1972
First Segmental Bridge built in Texas and USA

REINFORCED CONCRETE BRIDGES

Reinforced Concrete Bridges in Texas

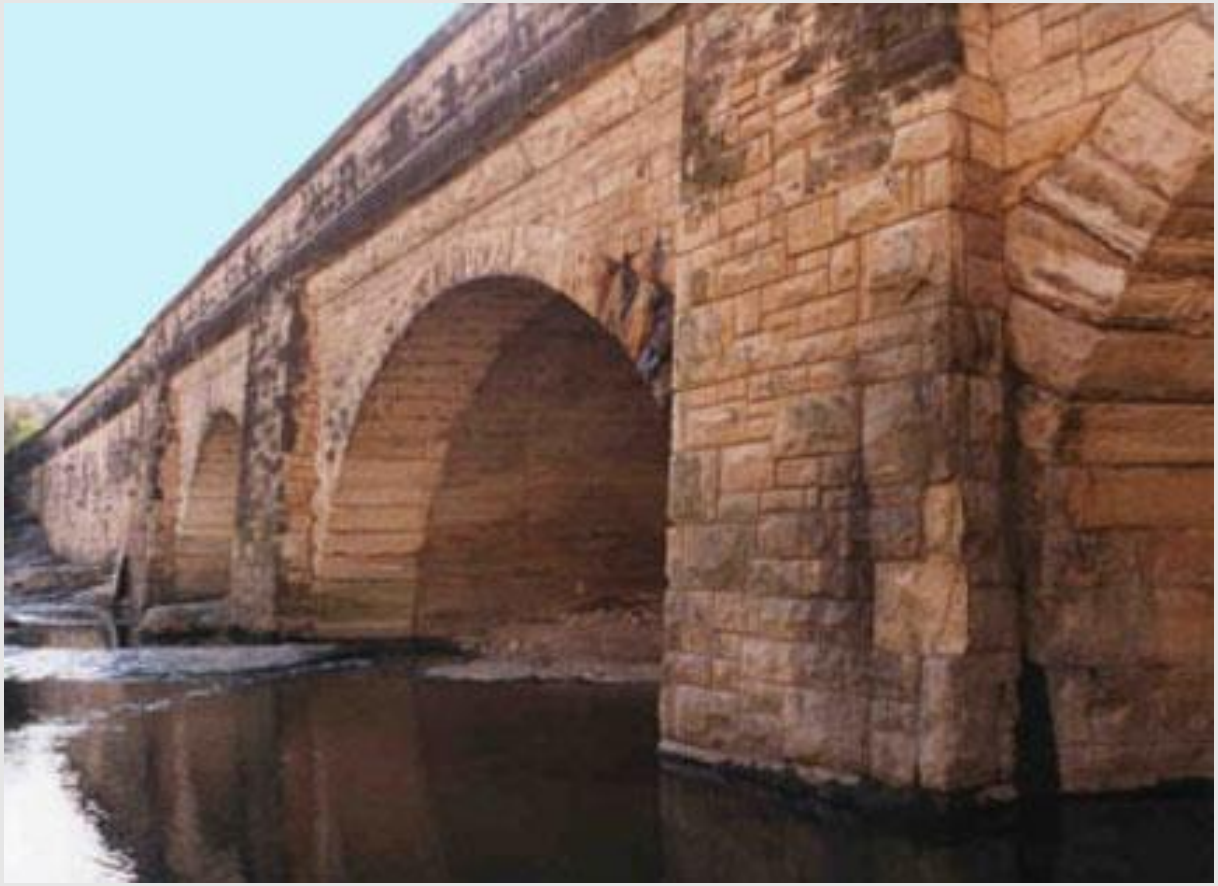
Early Concrete Bridges

- Invented in the 1840s but not widely used until 1900s
- Result of Good Roads Movement and establishment of the Texas Highway Department in 1917

Reinforced Concrete Bridges in Texas

1900s – Reinforced Concrete Arch Bridges

Reinforced Concrete Bridges in Texas



1900s - Closed Spandrel Arches

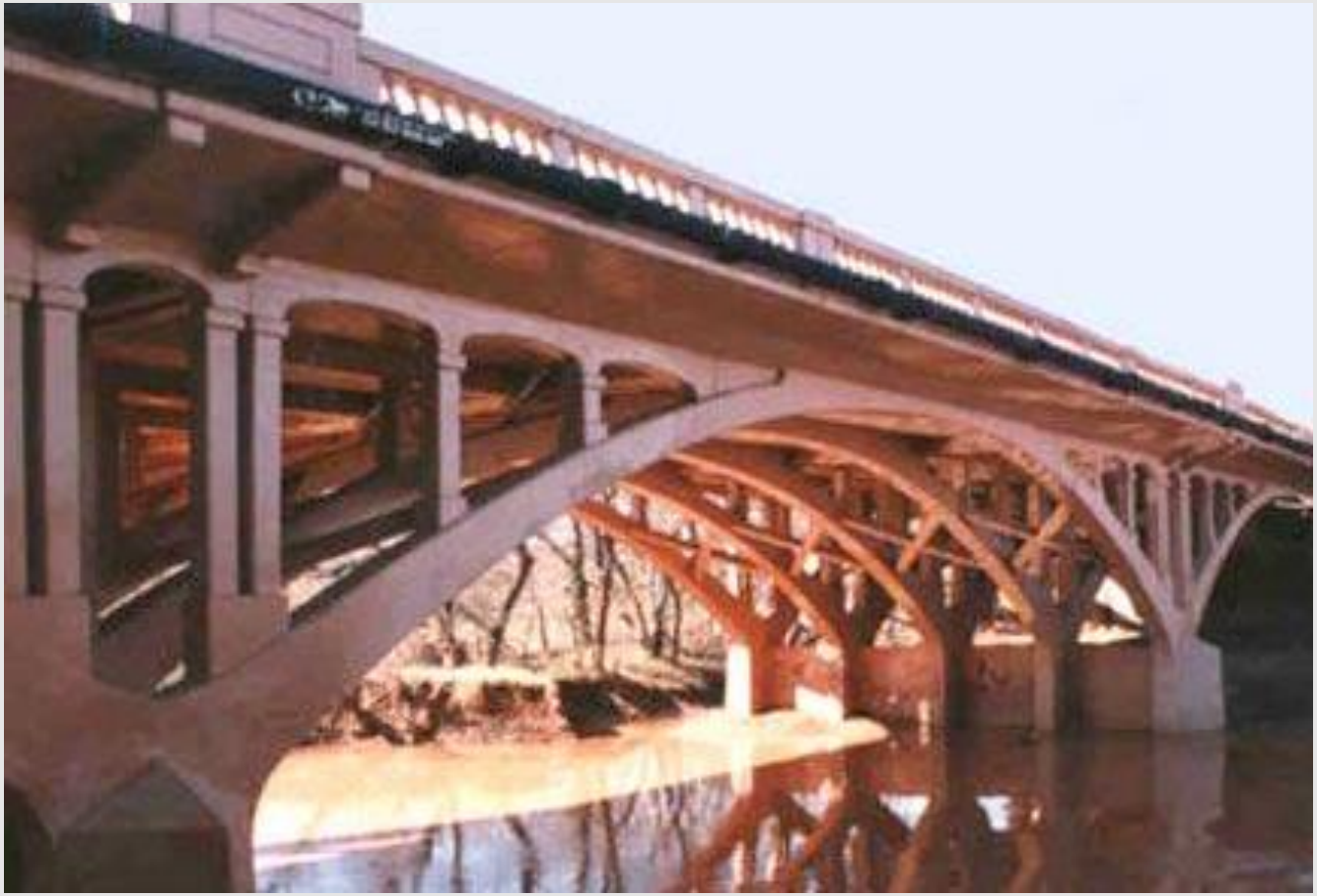
Reinforced Concrete Bridges in Texas

1900s - Closed Spandrel Arches

1900s - Open Spandrel Arches

Dallas Oak Cliff Viaduct

Reinforced Concrete Bridges in Texas

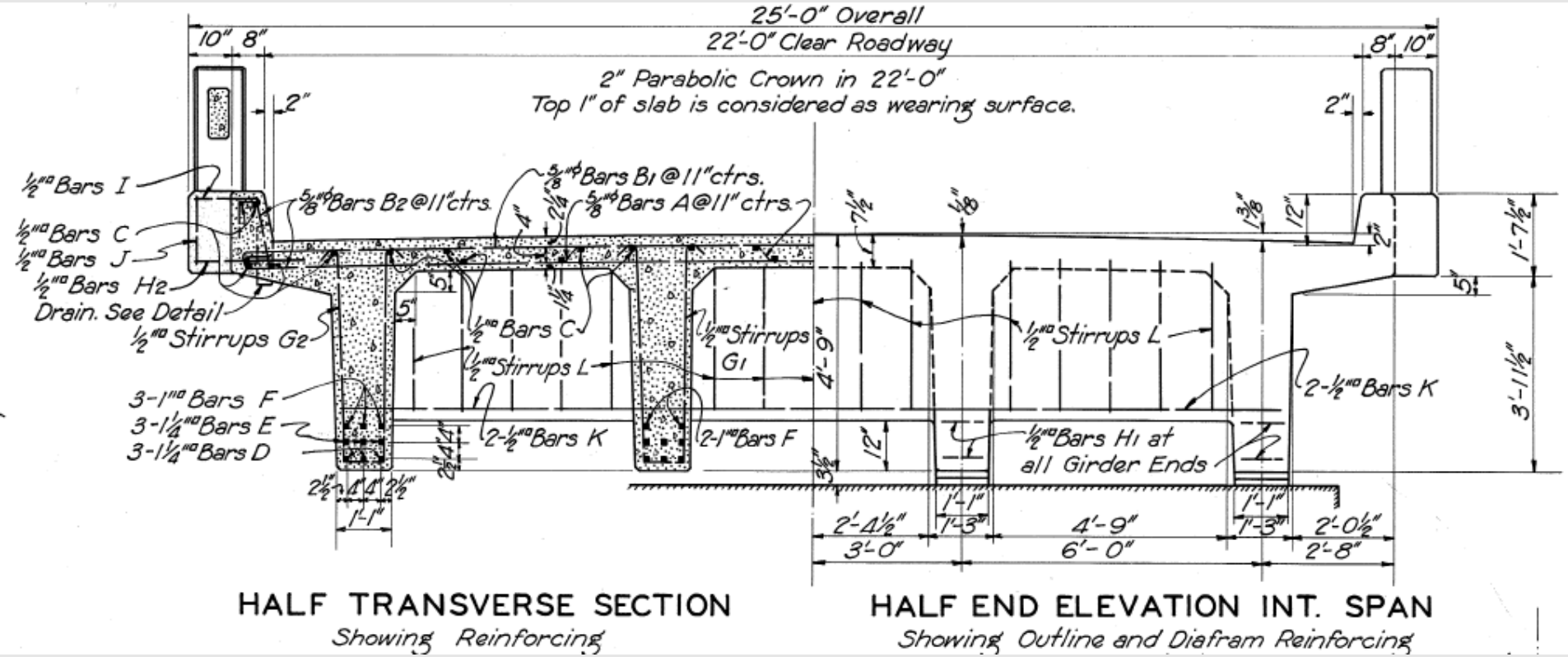


1900s - Open Spandrel Arches

Reinforced Concrete Bridges in Texas

1900s - T Beam Bridges

Reinforced Concrete Bridges in Texas



1900s – T Beam Bridges

Reinforced Concrete Bridges in Texas

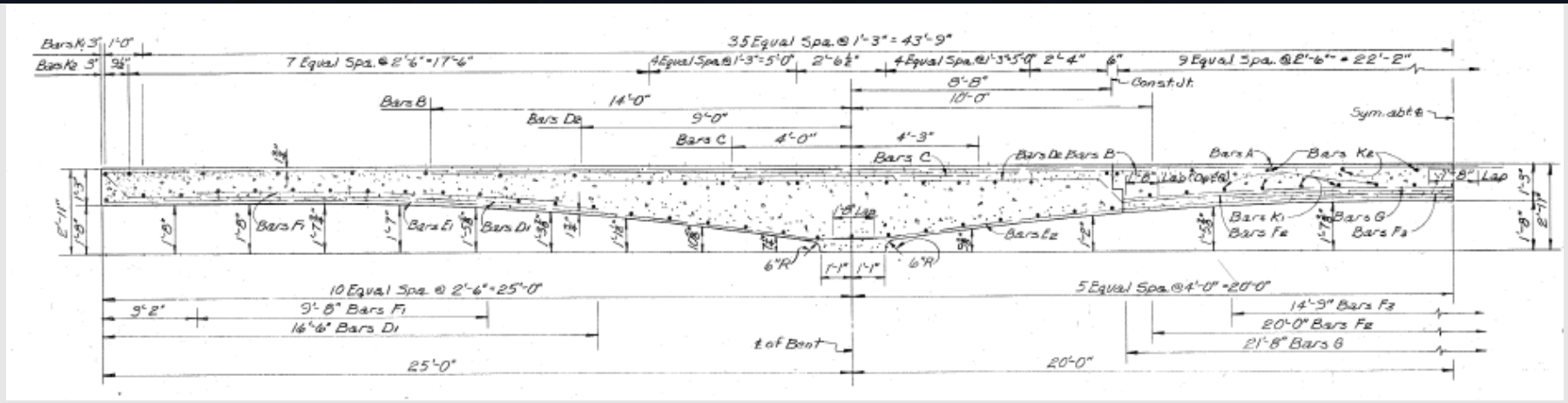
Post-war Bridges (after 1944)

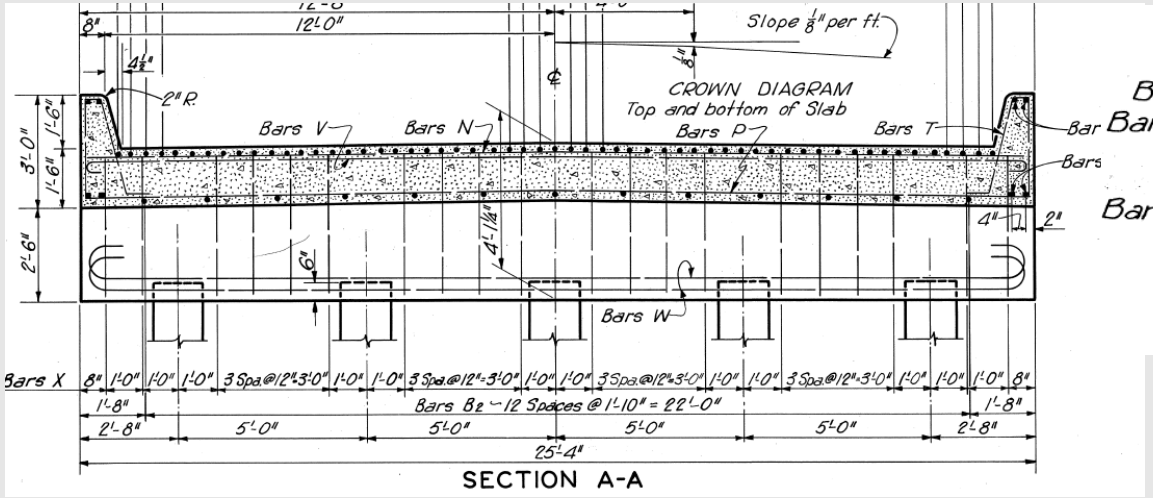
- Texas Highway Department made advancements in bridge design
- Innovations included:
  - Transition from rivets to high-tensile bolts
  - Welding
  - Standardized plans
- 3 common types of Post-war bridges:
  - Concrete slab
  - Concrete girder
  - Concrete rigid frame

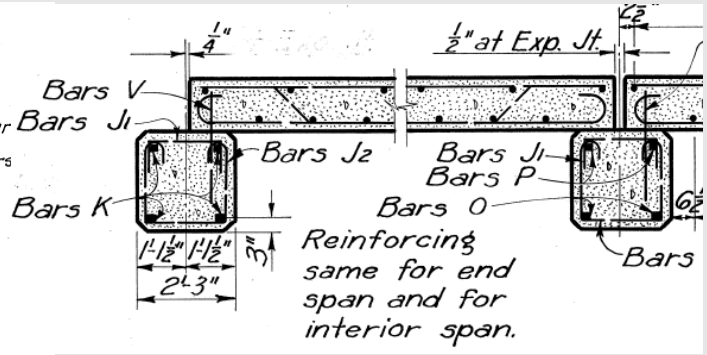
Reinforced Concrete Bridges in Texas

After 1944 – Concrete Slab Bridges

Reinforced Concrete Bridges in Texas





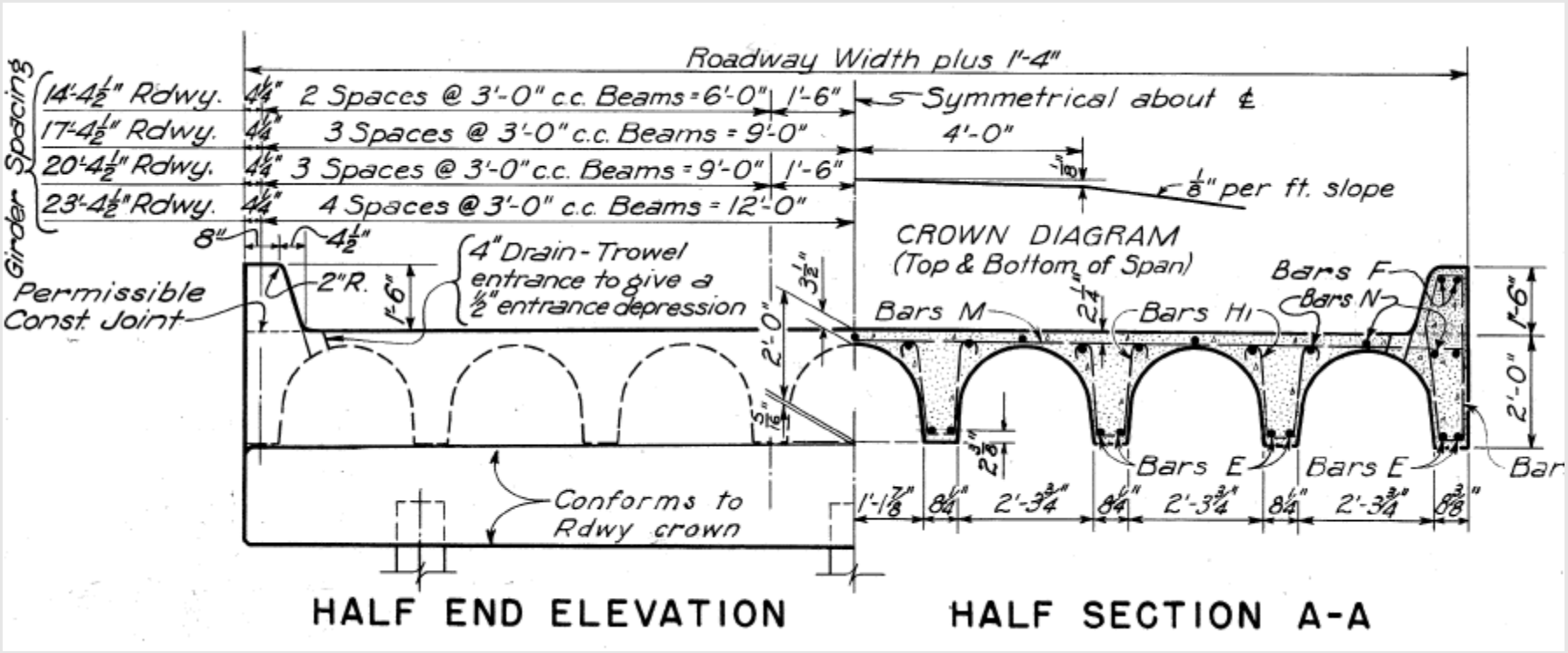


After 1944 – Concrete Slab Bridges

Reinforced Concrete Bridges in Texas

After 1944 – Concrete Girder Bridges

Reinforced Concrete Bridges in Texas



After 1944 – Concrete Girder Bridges

Reinforced Concrete Bridges in Texas

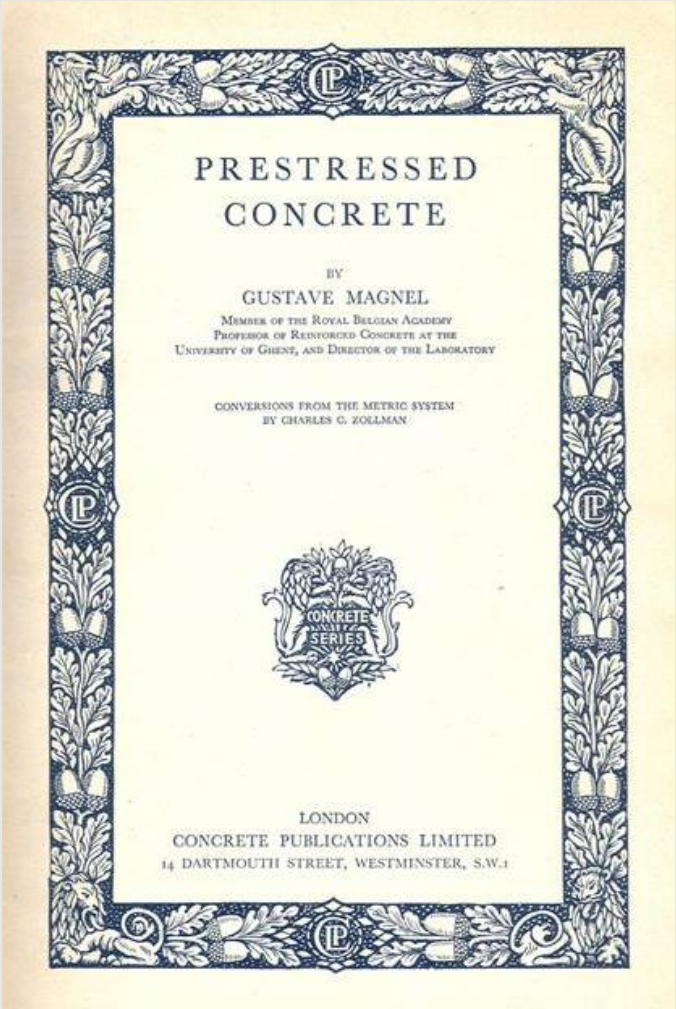
After 1944 – Concrete Rigid Frame Bridges

PRESTRESSED CONCRETE BRIDGES

Prestressed Concrete in the United States

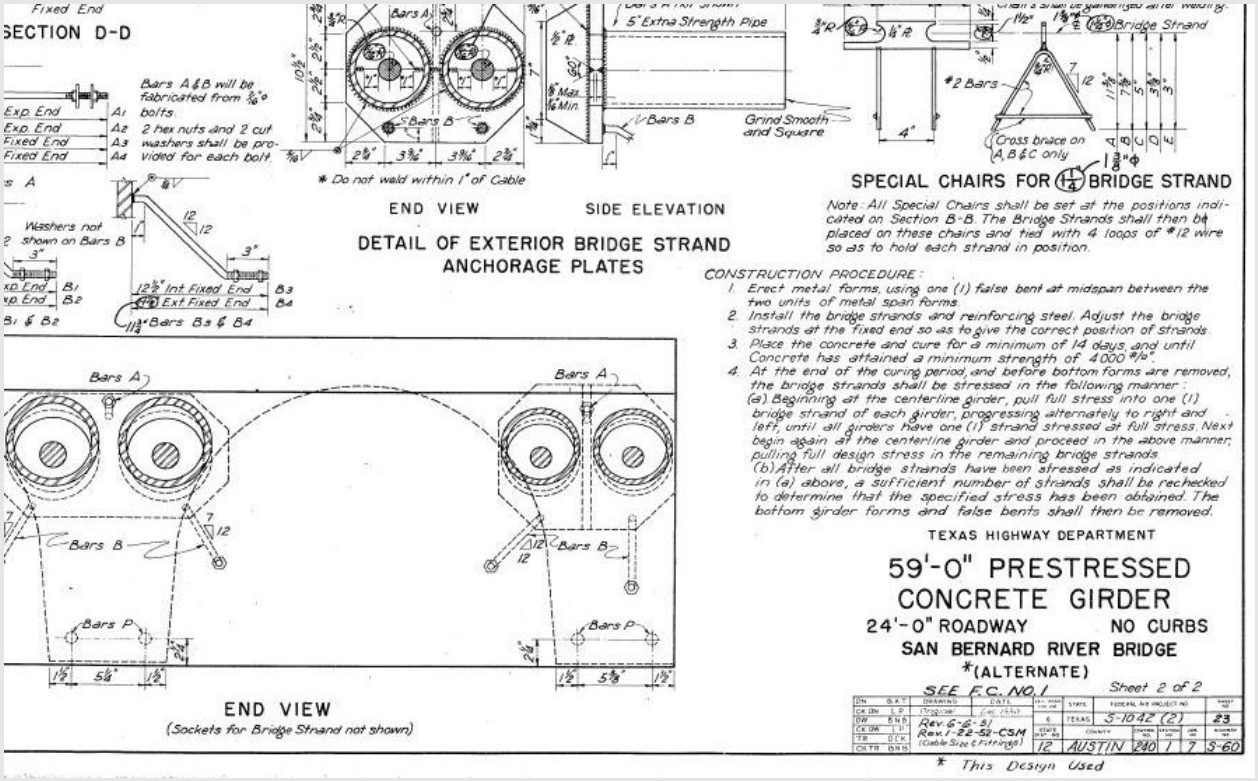
Fig. 5. Professor Magnel, the lecturer, on his American tour.

1946



1948

Prestressed Concrete in Texas



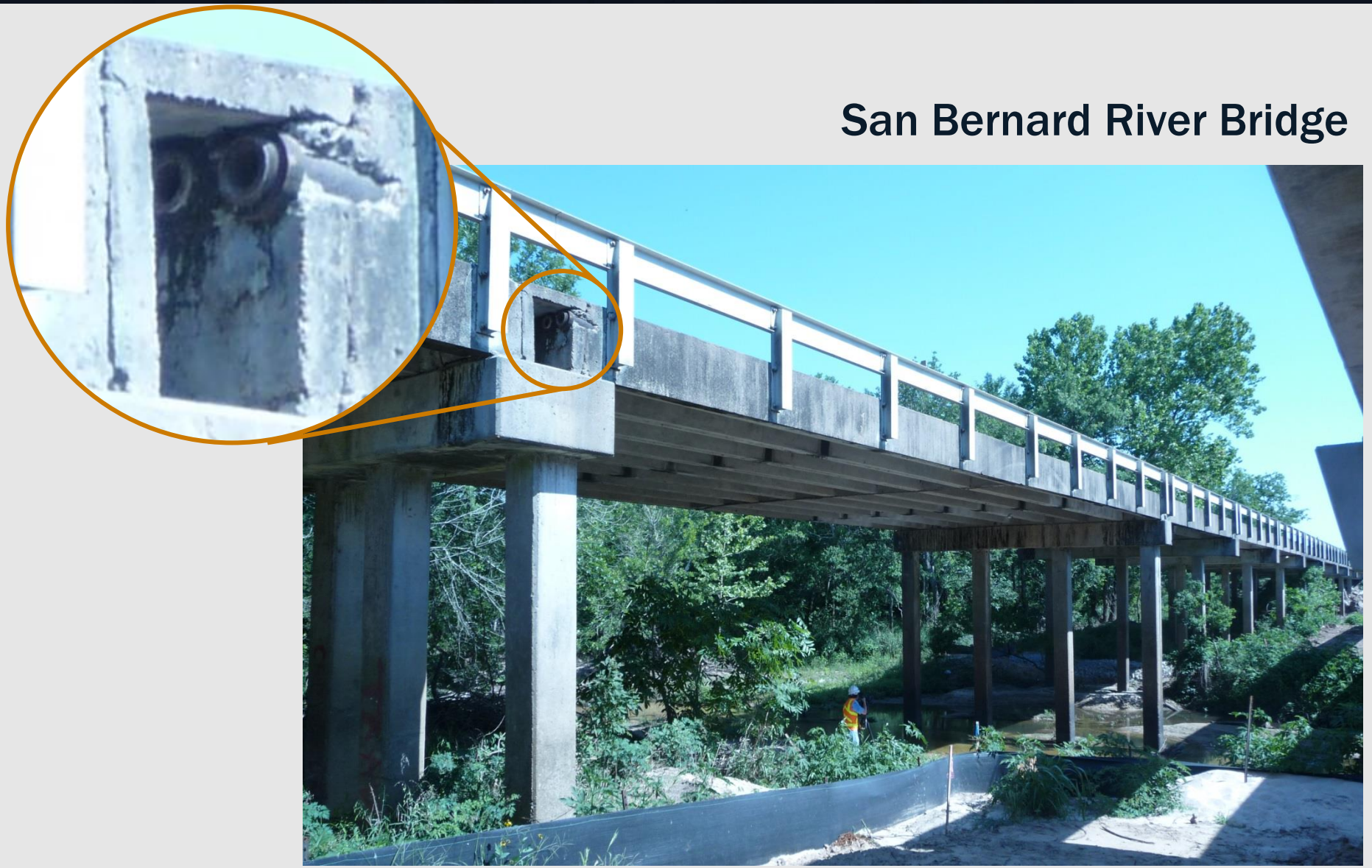
December 1950 – San Bernard River Bridge

Let July 17,1951 • Opened June 5, 1952

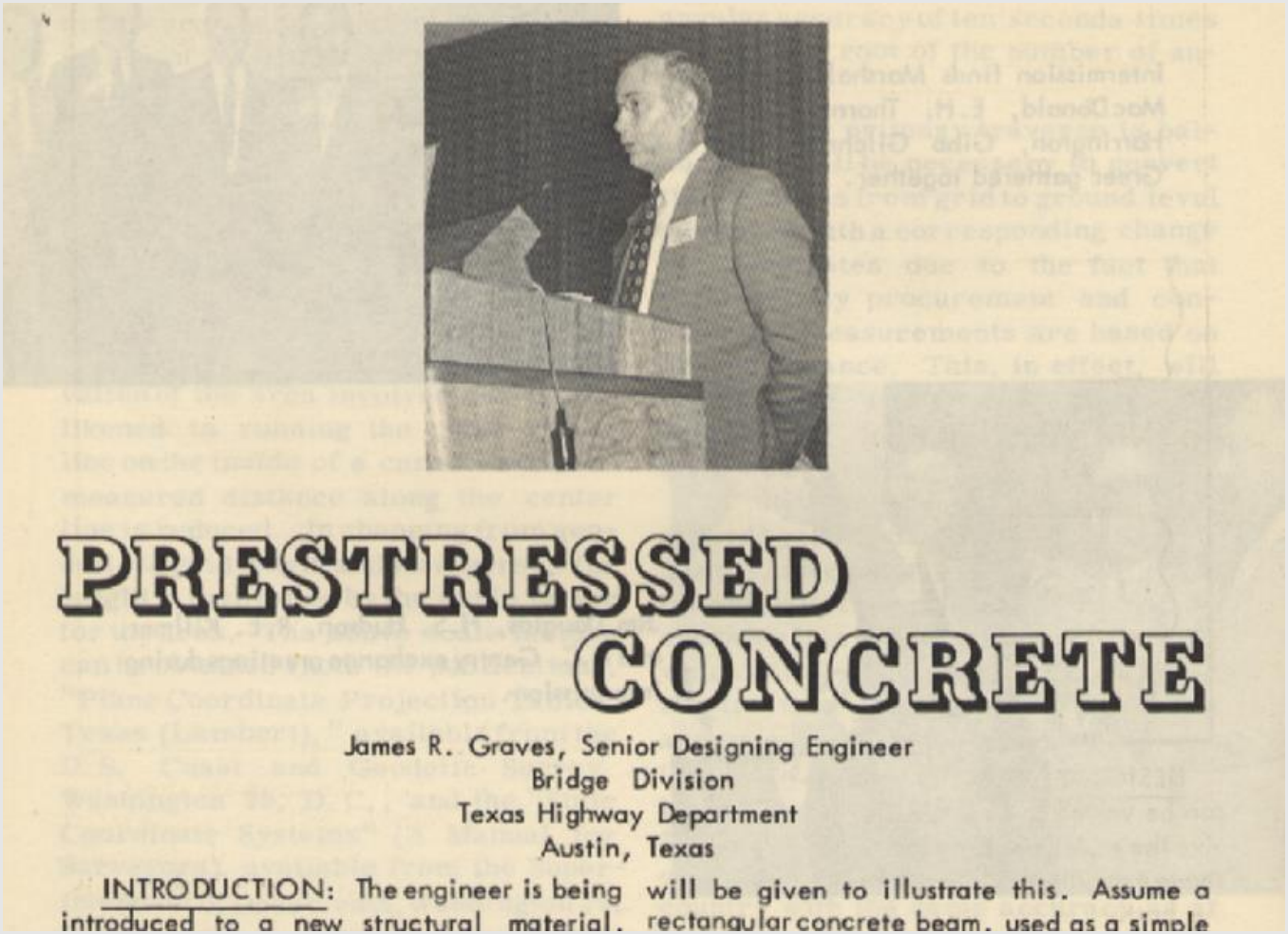
Bernard A. Trice ⊡James R. Graves • Charles S. Matlock

Prestressed Concrete in Texas

San Bernard River Bridge



Prestressed Concrete in Texas



PRESTRESSED CONCRETE

James R. Graves, Senior Designing Engineer
Bridge Division
Texas Highway Department
Austin, Texas

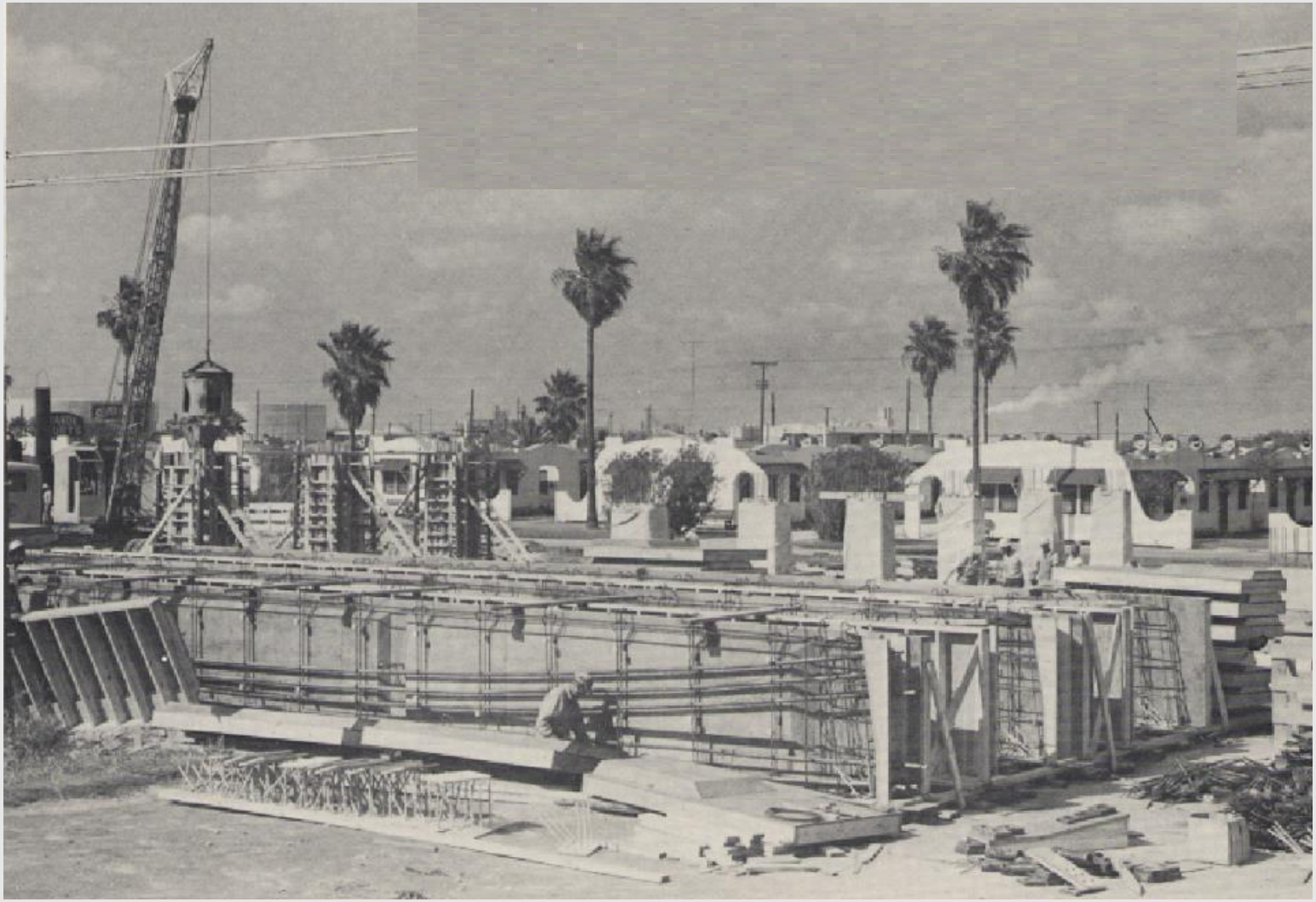
INTRODUCTION: The engineer is being introduced to a new structural material. will be given to illustrate this. Assume a rectangular concrete beam, used as a simple

October 1953 – Transportation Short Course

Prestressed Concrete in Texas

Design of the Corpus Christi High Bridge – August 1954

Prestressed Concrete in Texas

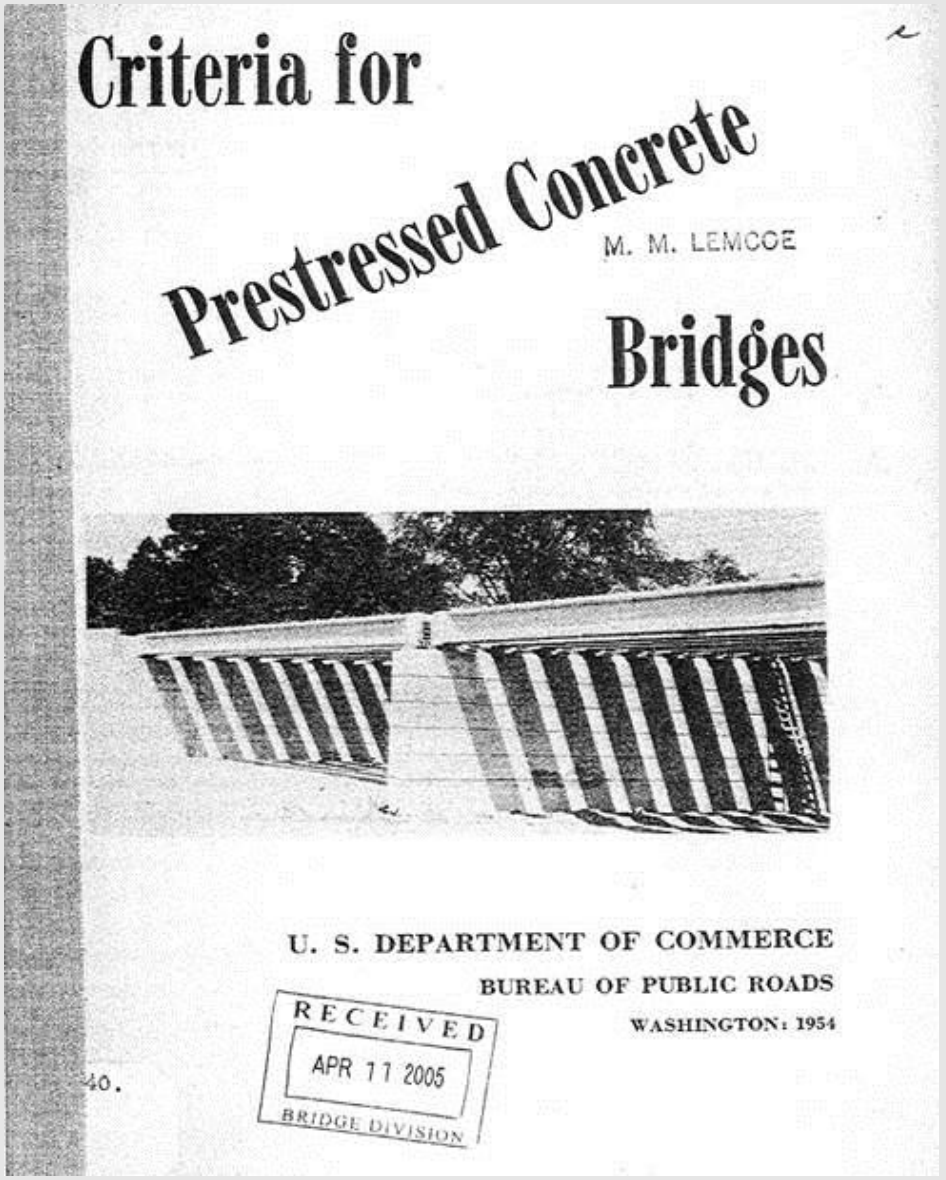


Prestressed Concrete in Texas

Prestressed Concrete in Texas

Eric L. Erickson

1954



Prestressed Concrete in Texas

Prestressed Concrete in Texas

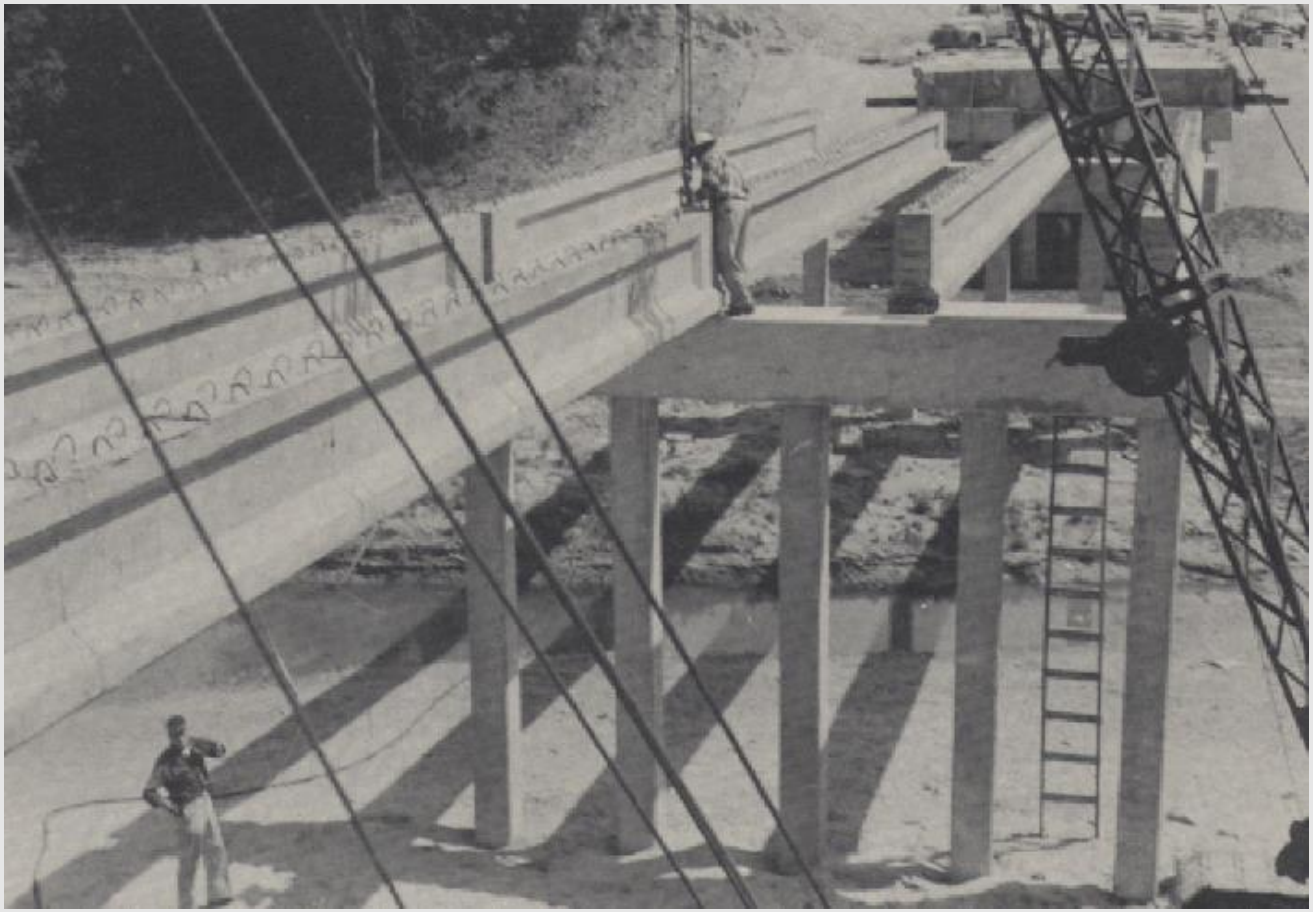
T&NO Railroad Overpass, Karnes County

Let November 1956 • Completed June 20, 1957

Prestressed Concrete in Texas

T & NO Railroad Overpass

Prestressed Concrete in Texas



Coleto Creek @ FM 237 – Victoria Co.

First use of neoprene pads with precast beams in the United States

Prestressed Concrete in Texas

Bob Carr, Texas Concrete
(with T. Y. Lin)

James R. Graves
SHD Bridge Division

Prestressed Concrete in Texas

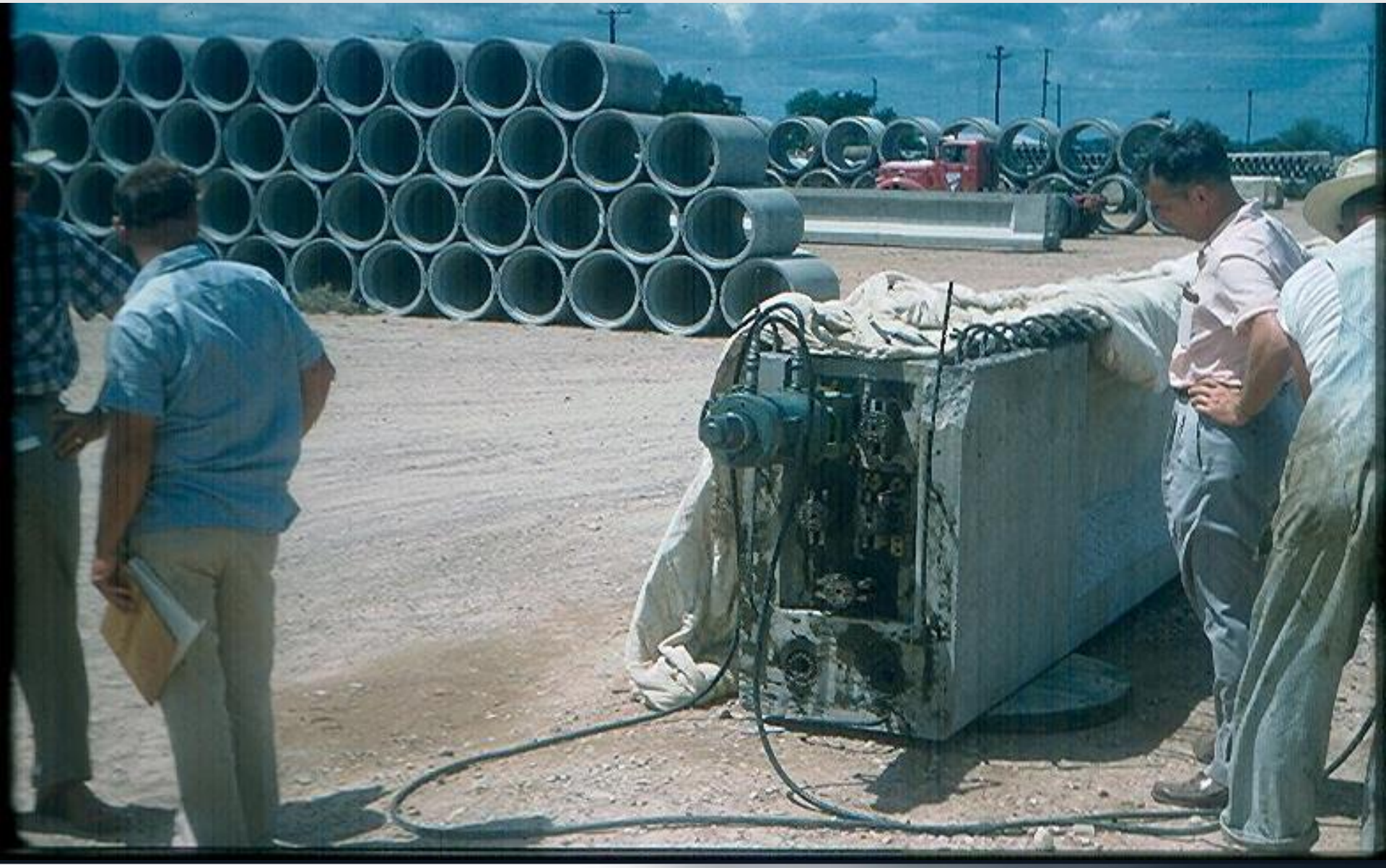
June 1956
Eisenhower signs Federal Aid Highway Act of 1956

- Development of Interstate Highway System
- Provided over $25 Billion over 12 year period

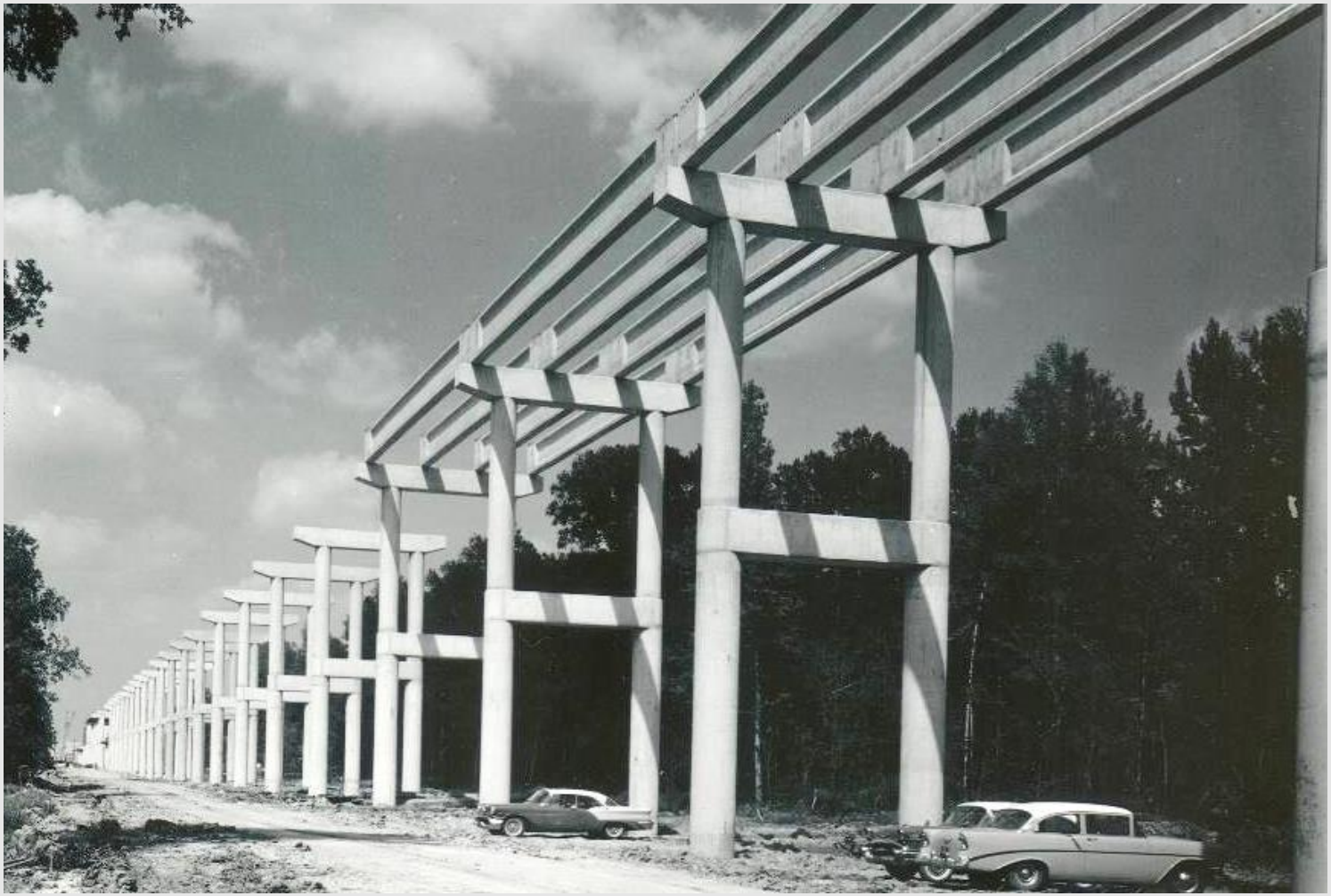
Prestressed Concrete in Texas

San Antonio Urban Expressway, 1958

Prestressed Concrete in Texas



Prestressed Concrete in Texas



Angelina River Bridge construction, SH 147, 1958

Prestressed Concrete in Texas

Prestressed concrete plant operations, Lufkin

Prestressed Concrete in Texas

Full scale pretensioned beam tests, 1959

Prestressed Concrete in Texas

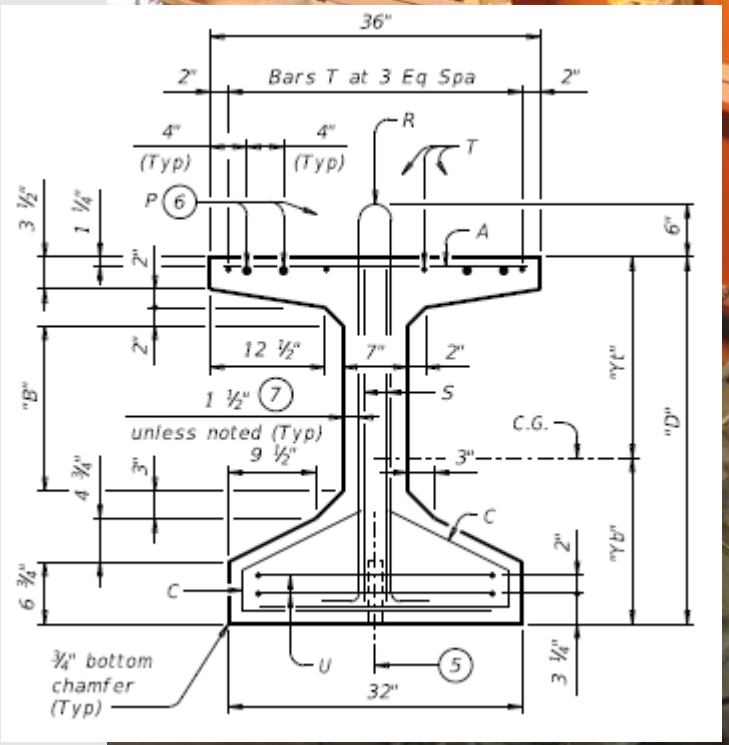
UT Austin – Ferguson Structural Engineering Lab, 1984

Prestressed Concrete in Texas

UT Austin – Ferguson Structural Engineering Lab, 1984

Prestressed Concrete in Texas

Prestressed Concrete in Texas



Prestressed Concrete in Texas

Prestressed Concrete in Texas

Prestressed Concrete in Texas

Prestressed Concrete in Texas

Prestressed Concrete in Texas

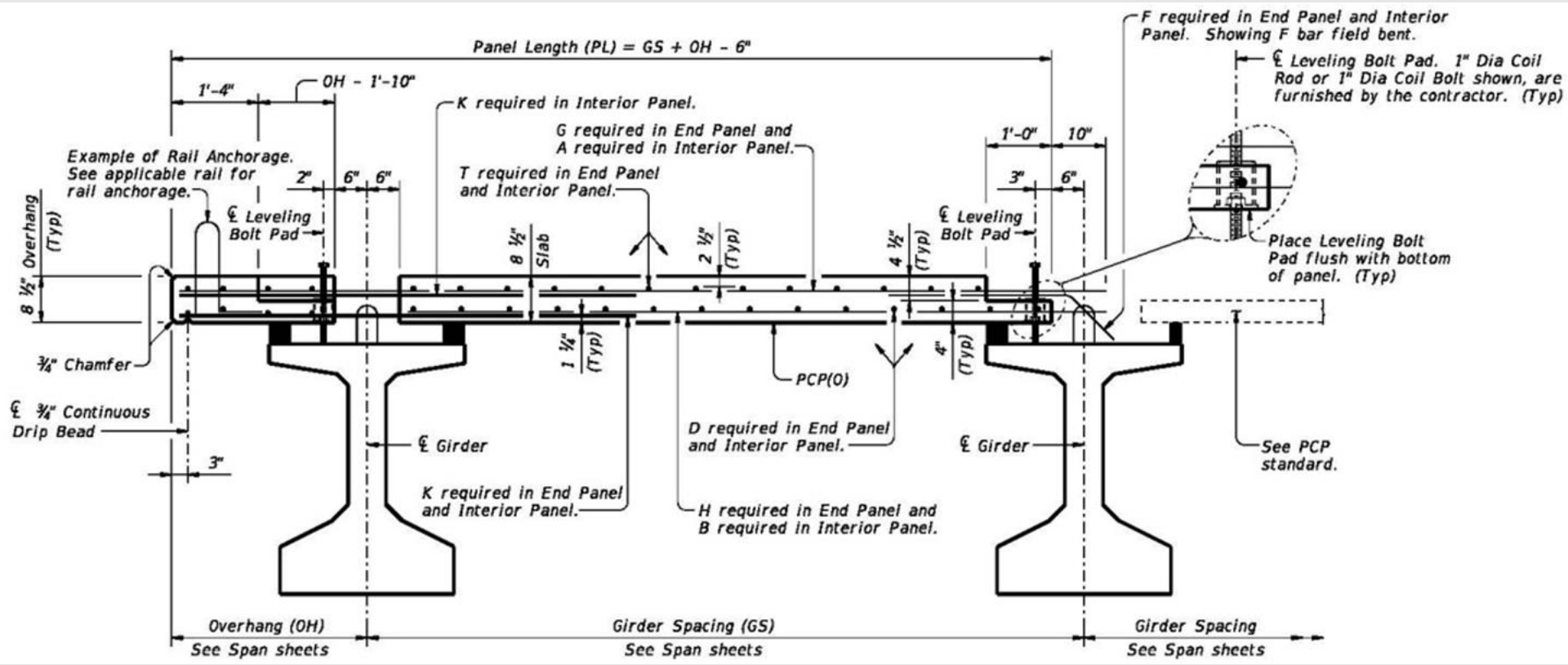
Prestressed Concrete in Texas

Photo courtesy of Texas Concrete Co.

Prestressed Concrete in Texas

Precast Concrete Panels

Prestressed Concrete in Texas



Precast Bridge Deck Overhang Panels

Prestressed Concrete in Texas

Prestressed Concrete in Texas

Precast Bridge Deck Overhang Panels

Precast Concrete Panels to the Ends of the Unit

Prestressed Concrete in Texas

Precast Full-depth and Full-width Deck Panels

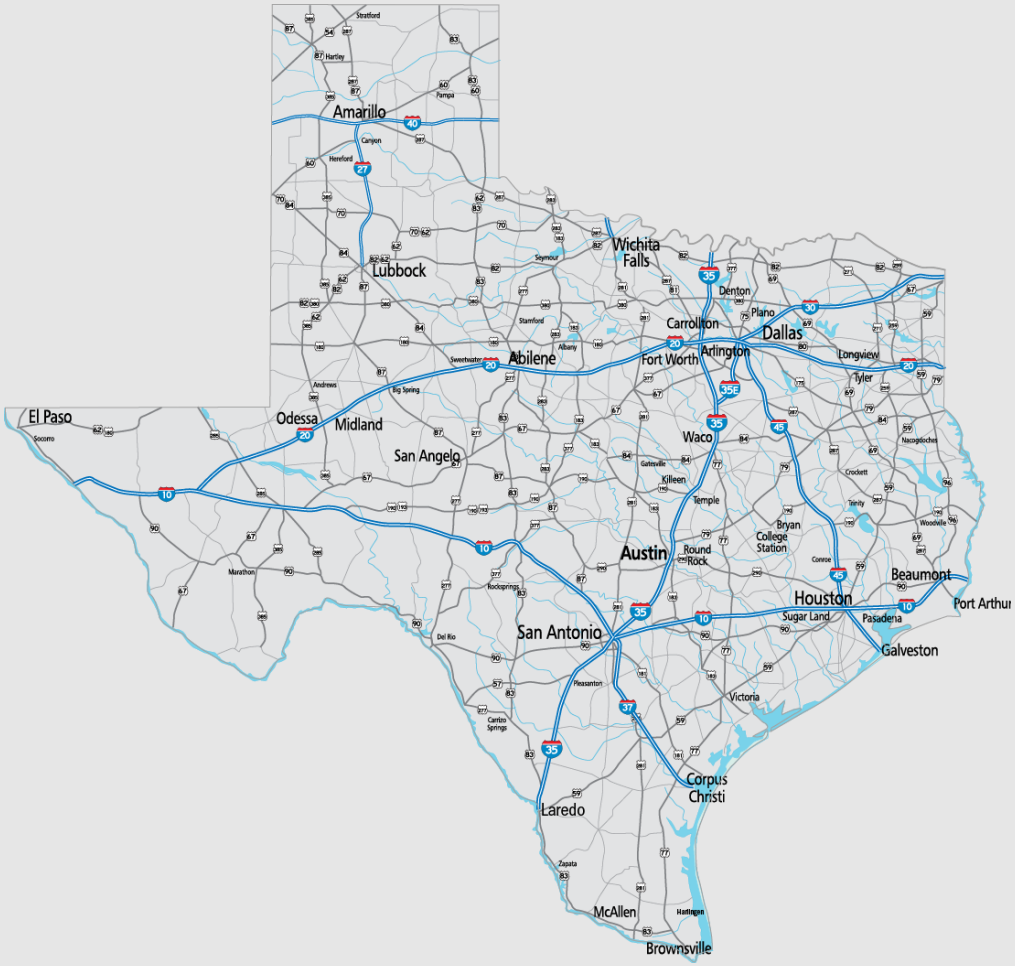
Prestressed Concrete in Texas

Prestressed Concrete in Texas

SEGMENTAL CONCRETE BRIDGES

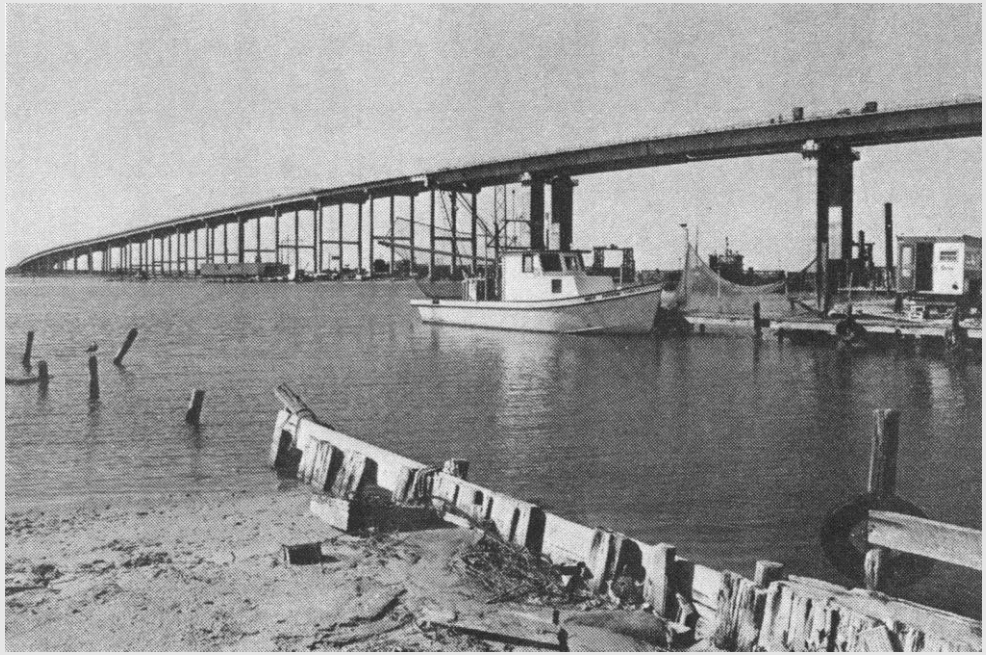
Segmental Concrete Bridges

- TxDOT started looking into Segmental Bridge construction in the late 1960's
  - Identified a need for a viable concrete alternate for spans in the 130 ft to 350 ft range
  - Sponsored Research Project 121 "Design Procedures for Long-Span Prestressed Concrete Bridges of Segmental Construction" (1969)
  - Currently there are 61 segmental bridges in Texas (60 on-system and 1 off-system)



Segmental Concrete Bridges

- First Precast Segmental Bridge in the USA



Dr. Jack Breen

Alan Matejowsky

UT Cent

Bridge Won't Fa

Take the heaviest trailer-trucks that are allowed on Texas highways and place them bumper - to - bumper across all four lanes of the new bridge being constructed across the intracoastal canal near Corpus Christi.

Then stack seven layers of trucks on top of them.

The bridge might crack, but don't expect it to fall.

That's what University of Texas engineers discovered after five hours of testing a scale model of the bridge.

The Corpus Christi bridge represents a revolutionary concept in long-span bridge building which has been used in several other countries but has never been tried in the United States. Consequently, the Texas Highway Department and the Federal Highway Administration, joint sponsors of the ambitious project,

enlisted the aid of UT Au Balcones Research Center Center for Highway Resea test the proposed concept.

"The bridge project is o several public service con undertaken by the Depar of Civil Engineering," Prof. John Breen, direct the Center for Hig Research.

"This type of applied res is aimed at benefitting graduate student as well a public," he added.

In all, about 15 gra students have worked on bridge project in its four history. Students designed forms, researched and prep a computer program to an each stage of the construc predicted performance of completed structure and fi built the one-sixth scale m which was tested to failure week.

Doctoral candidate Sa

JFK Memorial Causeway, Corpus Christi

Segmental Concrete Bridges

JFK Memorial Causeway, Corpus Christi

Segmental Concrete Bridges

- Texas Turnpike Authority
- 375 ft – 750 ft – 375 ft Unit
- CIP Variable Depth Balanced Cantilever
- Record Concrete Bridge Span
- Likely Would Be Cable-stayed Now

Beltway 8 Toll Bridge over Houston Ship Channel (1979-1982)

Segmental Concrete Bridges

Photo Credit: Houston Freeways

Segmental Concrete Bridges

Veteran's Memorial Bridge - 1991, Port Arthur

Segmental Concrete Bridges

Veteran's Memorial Bridge - 1991, Port Arthur

Segmental Concrete Bridges

GIWW at Matagorda Bridge – 2009

Segmental Concrete Bridges

Lake Marble Falls Bridge – 2014

Segmental Concrete Bridges

Lake Marble Falls Bridge – 2014

Segmental Concrete Bridges - Future

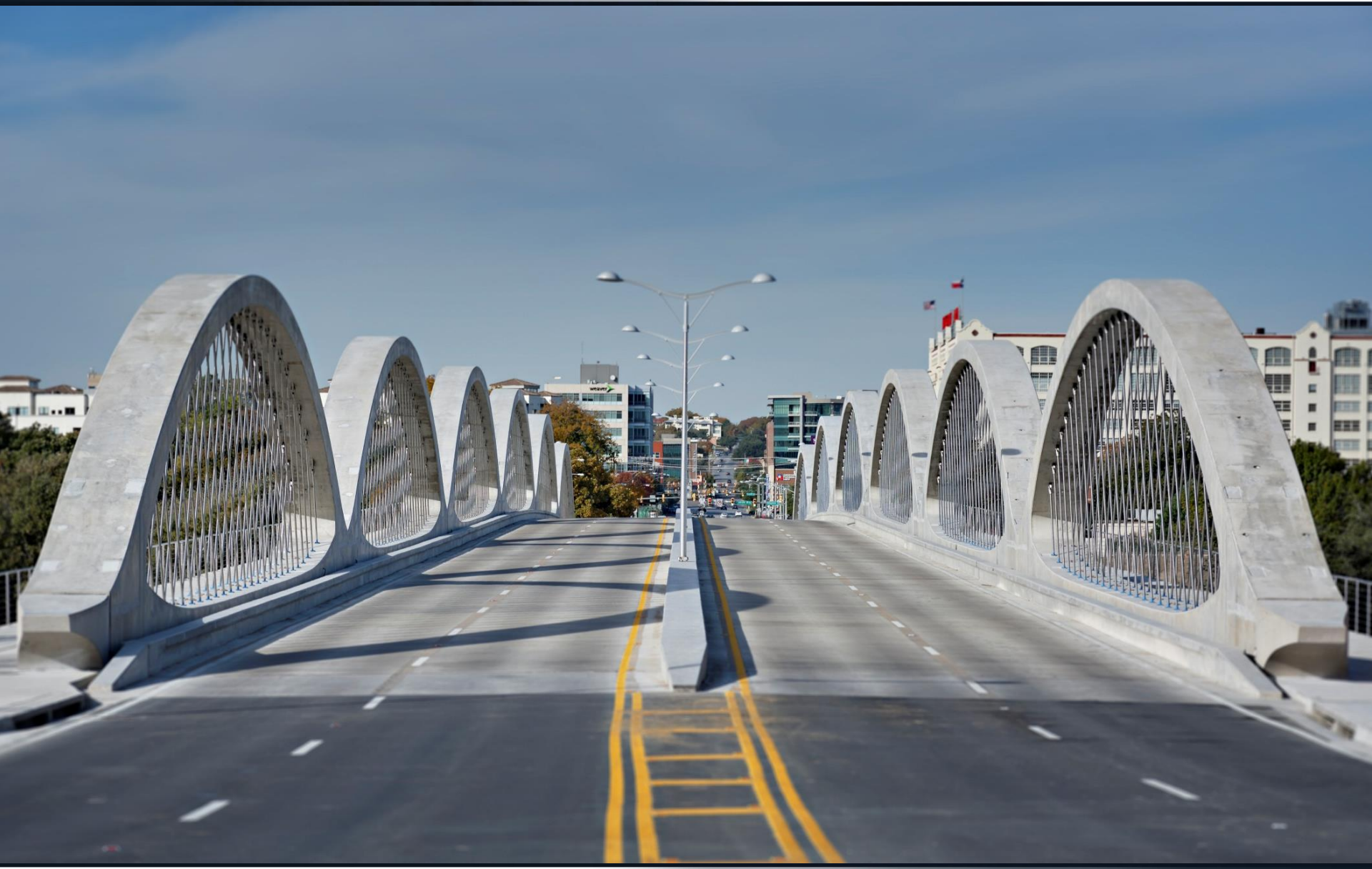
PRECAST CONCRETE NETWORK ARCH

Precast Network Arch

West 7th Street Bridge, Fort Worth – 2013


LIEBHERR
LIEBHERR 101
LIEBHERR 101
LIEBHERR 101

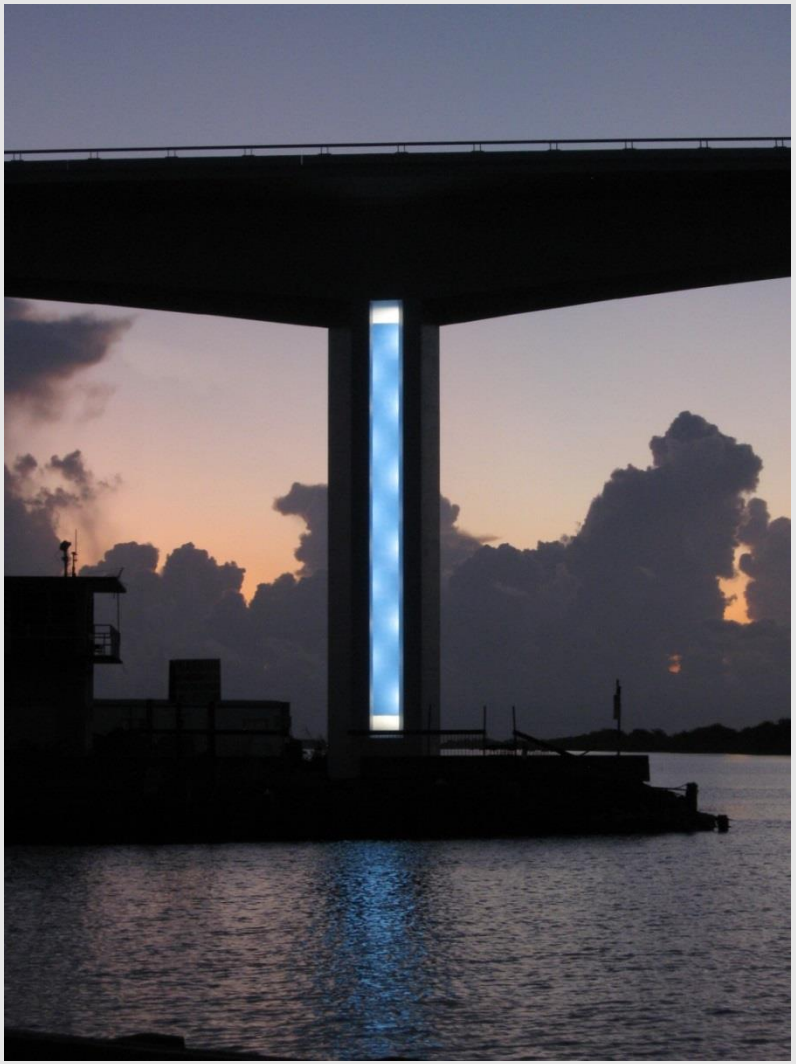

SUNSTATE



Acknowledgements

- Consultant Designers and Erection Engineers
- Contractors
- Concrete Industry
- TxDOT Researchers
- Charles Walker, Walter P. Moore
- Mike Hyzak, TxDOT Bridge Division
- Andrew Lee, TxDOT Beaumont District

Questions?



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