MITIGATION OF EMBANKMENT SETTLEMENT AT BRIDGES USING PILE-SUPPORTED APPROACH SLABS

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New Orleans International Airport

LOUIS ARMSTRONG
NEW ORLEANS INTERNATIONAL AIRPORT

NASA, Earth Observatory, Natural Hazards.

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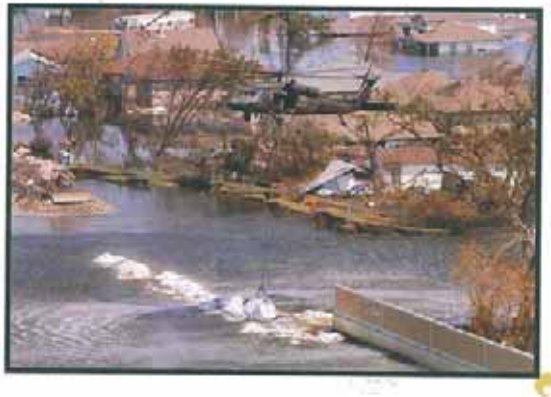
New Orleans International Airport

August 29, 2005

Changes the Lives of Many …Forever!



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* **5:45 Monday - Aug. 29** - Katrina makes landfall.

* **Tuesday August 30** - **Levee breach** -
  - First Coast Guard helicopter arrives at Fire House with evacuees.
  - The Airport becomes the delivery location for storm victims
  - Triage Immediately Implemented
  - Stranded doctors & nurses assist with triage
  - Runway 1-19 Opened
  - American Airlines arrives with supplies

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Armstrong International Airport & Hurricane Katrina

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Runway Completed In Time

PRIMARY RUNWAY COMPLETED 3 MONTHS EARLY

* The Primary Runway is completed August 26, three days before Katrina. Original deadline was Nov. 15.

* Completion was the most important factor in the successful evacuation of evacuees. A financial incentive for early completion was paid per the contract agreement.

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Armstrong International Airport - Played a Vital Role

* Storm Shelter
* Evacuee Drop Zone
* Air Evacuation Center
* Relief Supply Depot
* Triage Center
* Hospital & Maternity Ward
* Hospice & Morgue
* Red Cross Site
* Relief Barracks & Mess
* Animal Rescue Shelter
* Command Center
* Military Base
* Police Station
* Ambulance Dispatch
* Tent City
* Parish Debris Dump Site
* Commercial & General Aviation Airport
* FEMA Trailer Park Site

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RUNWAY 10-28

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LANOIA - 1947

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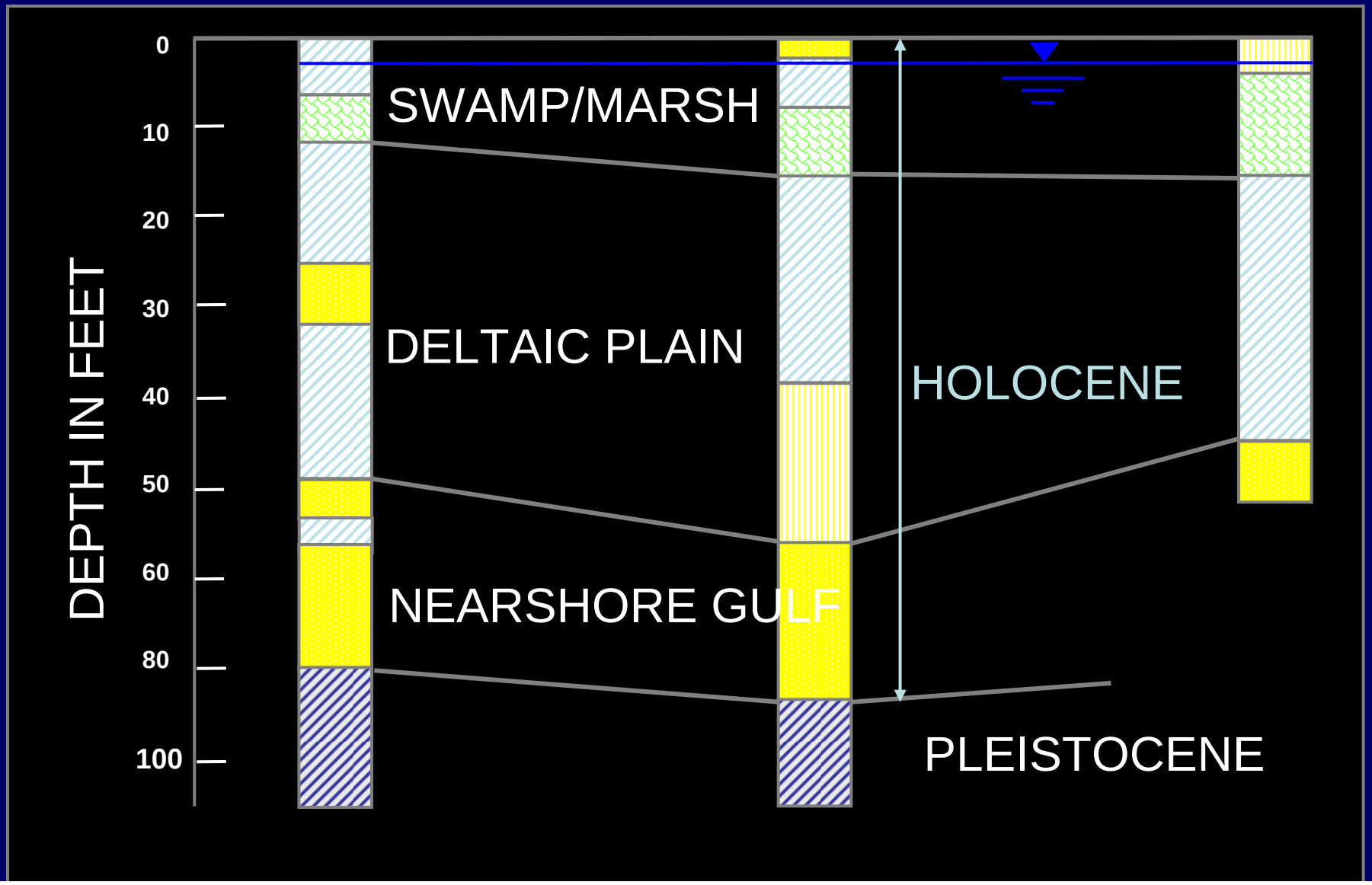
SOUTH LOUISIANA GEOLOGY



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DOTD-KENNER TUNNEL

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DOTD-KENNER TUNNEL

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DOTD-KENNER TUNNEL

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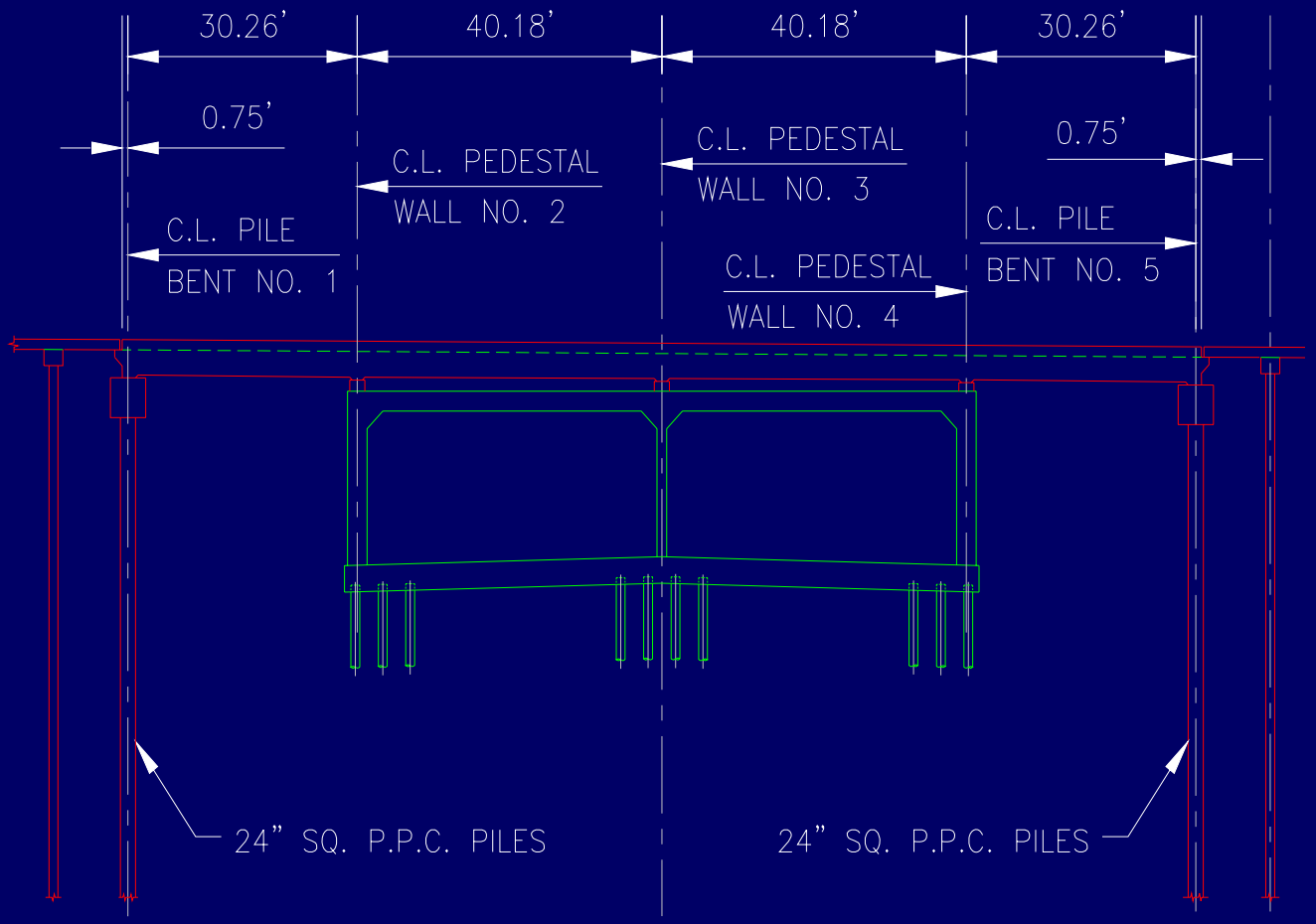
BRIDGE AT DOTD-KENNER TUNNEL



SECTION ALONG C.L. RUNWAY 10-28

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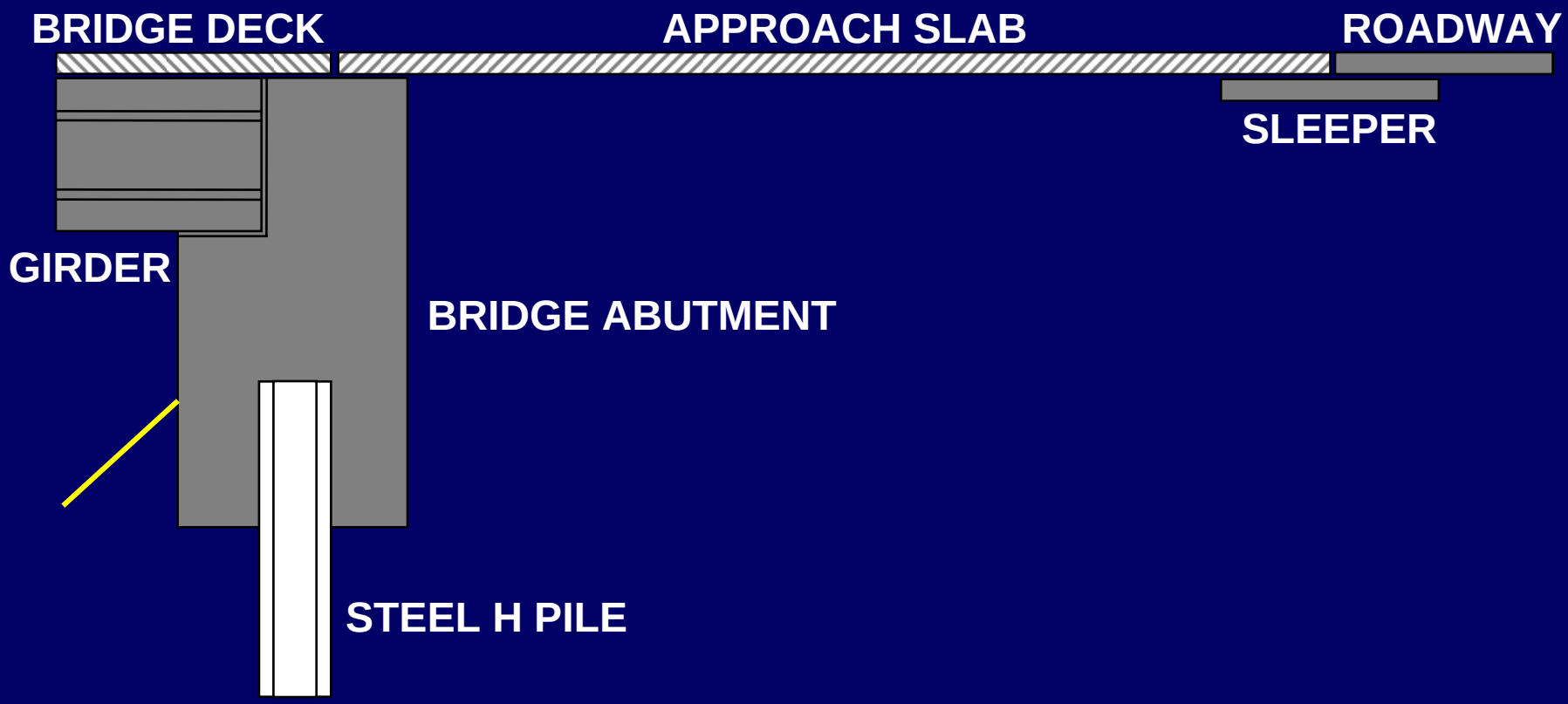
BRIDGE APPROACH SLAB



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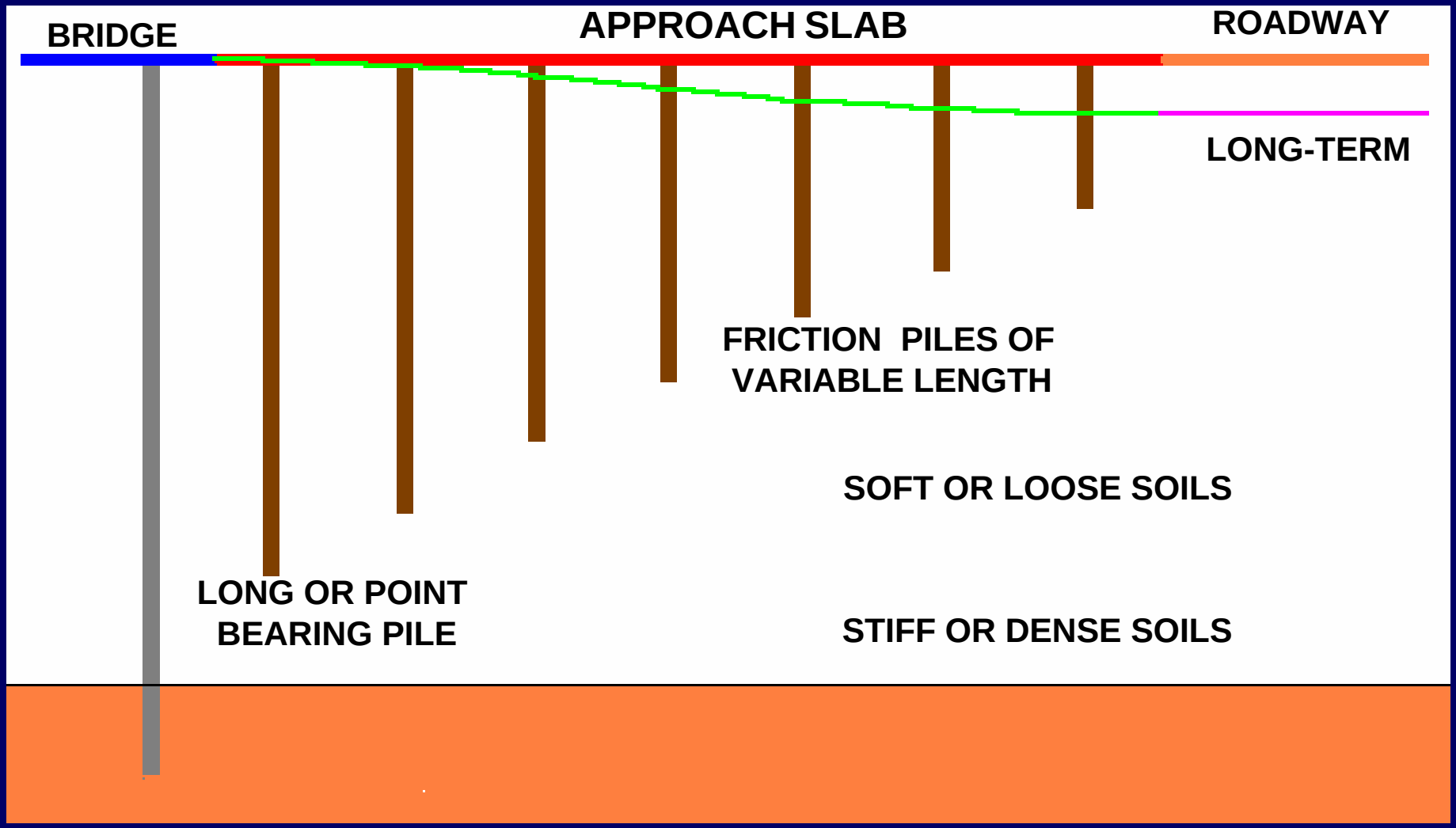
PILE SUPPORTED APPROACH SLAB



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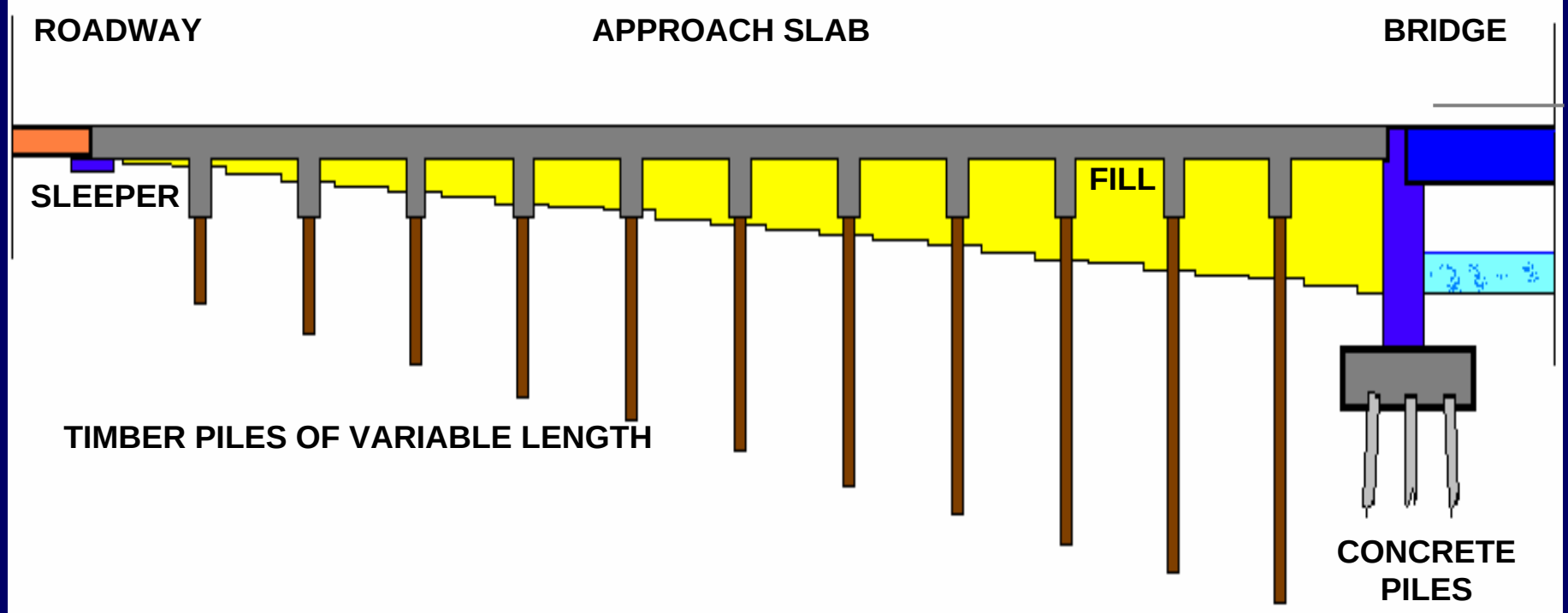
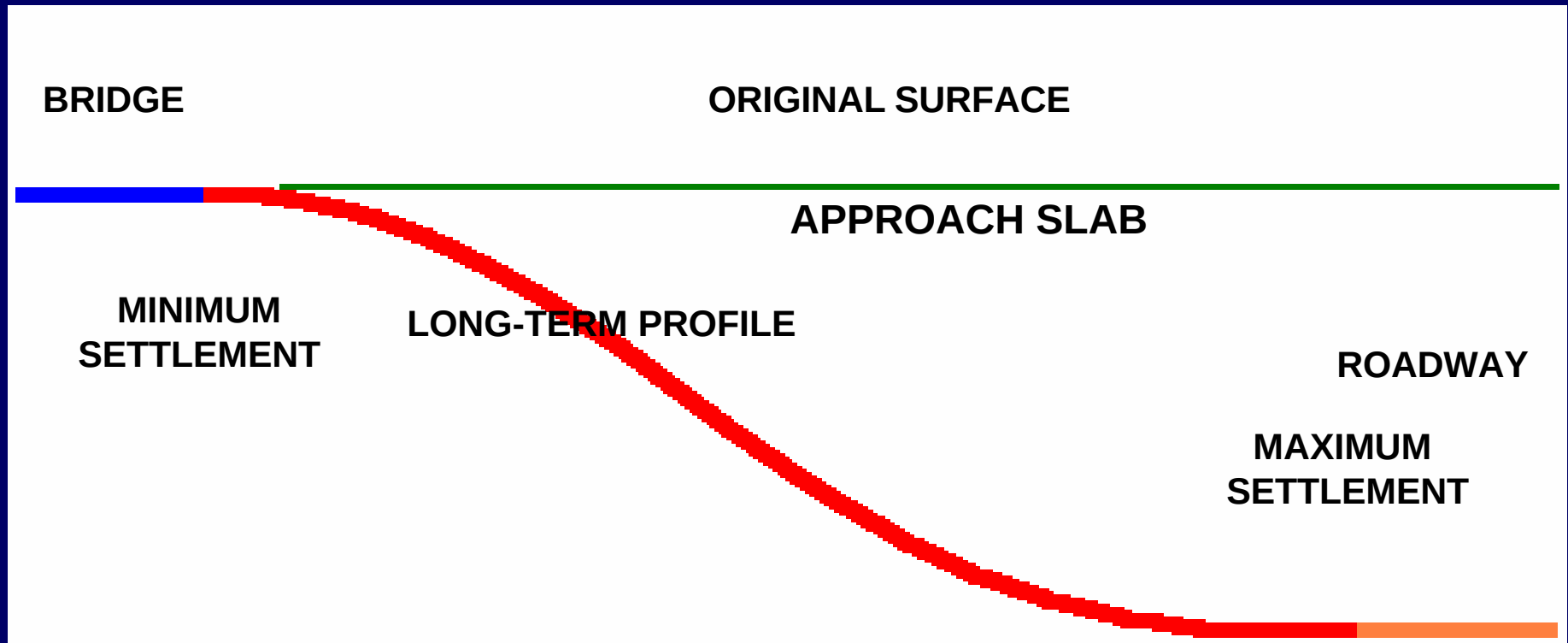
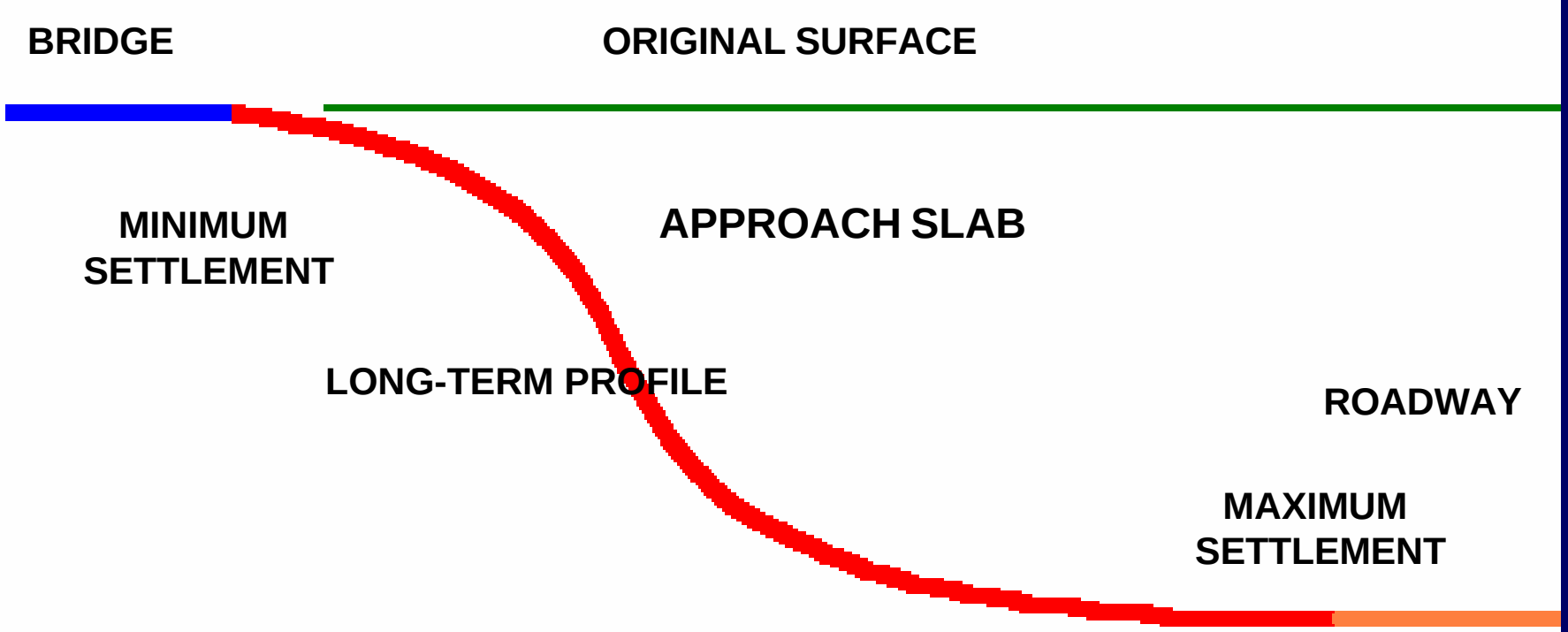
TYPICAL PILE-SUPPORTED APPROACH SLAB



IDEAL LONG-TERM PROFILE



POOR LONG-TERM PROFILE



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APPROACH SLAB ON US 90 (LAFOURCHE PAR.)

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APPROACH SLAB ON US 90 (LAFOURCHE PAR.)

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APPROACH SLAB AT LA 3139 (EARHART EX'WAY)

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APPROACH SLAB ON US 90 (TERREBONNE PAR.)

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APPROACH SLAB ON US 90 (TERREBONNE PAR.)

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APPROACH SLAB ON US 90 (TERREBONNE PAR.)

LTRC – TULANE STUDY

TASKS

- DEVELOP A SIMPLIFIED SOIL/STRUCTURE INTERACTION ANALYTICAL DESIGN ALGORITHIM FOR PILE-SUPPORTED APPROACH SLABS

LTRC – TULANE STUDY

ANALYTICAL METHOD

- ESTIMATE LONGITUDINAL SETTLEMENT PROFILE OF THE APPROACH SLAB BASED ON CURRENT SLAB DESIGN AND ESTIMATED PILE LOAD AND SETTLEMENT

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LTRC – TULANE STUDY

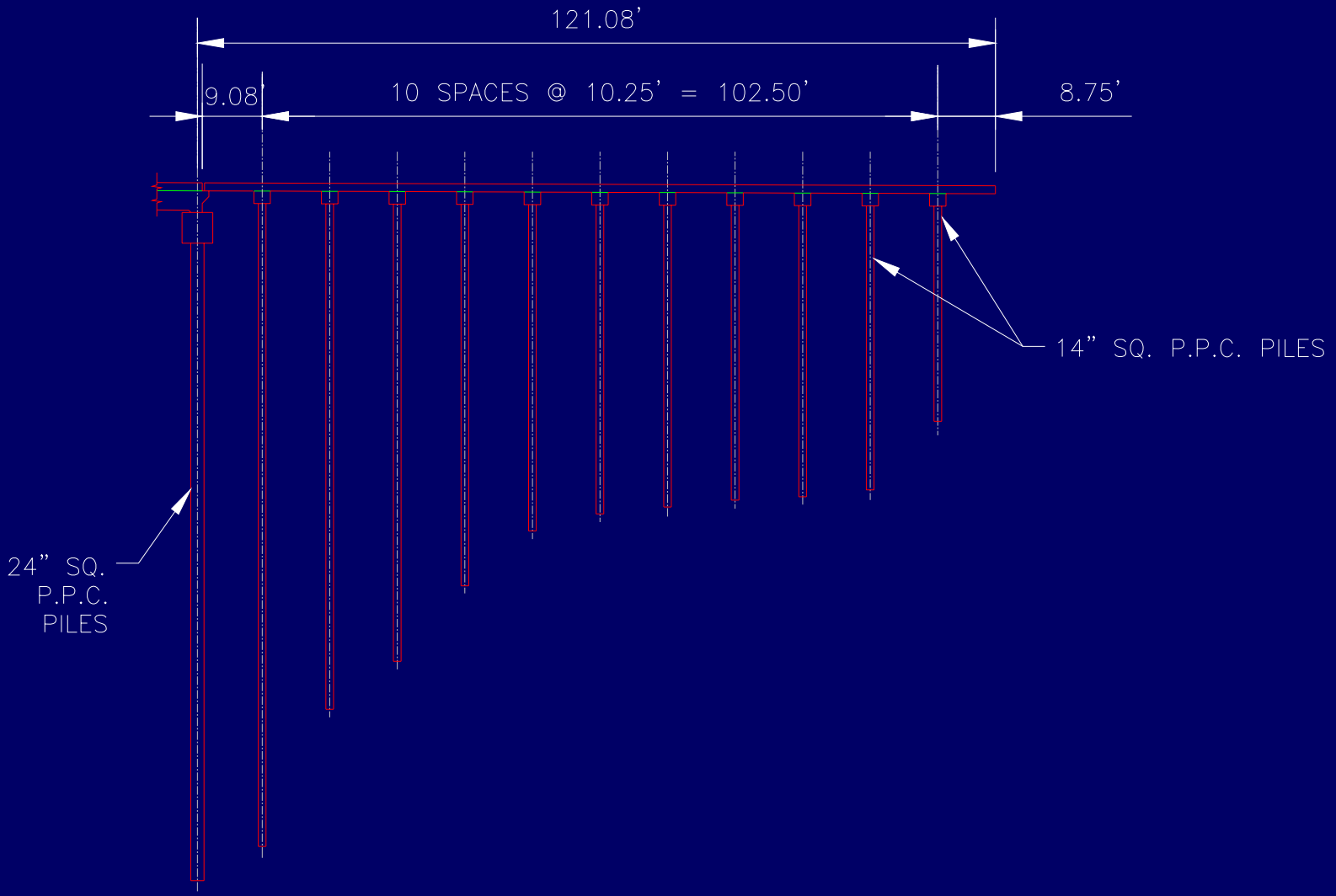
ANALYTICAL METHOD

- COMPARE APPROACH SLAB SETTLEMENT PROFILE TO AN “IDEAL” SETTLEMENT PROFILE
- REPEAT THE FOREGOING STEPS UNTIL AN ACCEPTABLE SETTLEMENT PROFILE IS REACHED

TU-DRAG

- AN INTERACTIVE SPREADSHEET IN MS EXCEL AND VISUAL BASIC
- ITERACTIVE PROCESS BASED ON FINDING PILE LENGTHS ALONG APPROACH SLAB NEEDED TO DEVELOP AN ACCEPTABLE SETTLEMENT PROFILE

AS-DESIGNED PILE LENGTHS



ELEVATION - PILE-SUPPORTED APPROACH SLAB

BRIDGE AT DOTD - KENNER TUNNEL

DESIGN CRITERIA

- DESIGN AIRCRAFT: BOEING 747-400 WITH MAXIMUM TAXIWEIGHT OF 877,000 LBS.
- DESIGN METHOD: AASHTO LOAD FACTOR DESIGN METHOD (STRENGTH DESIGN)

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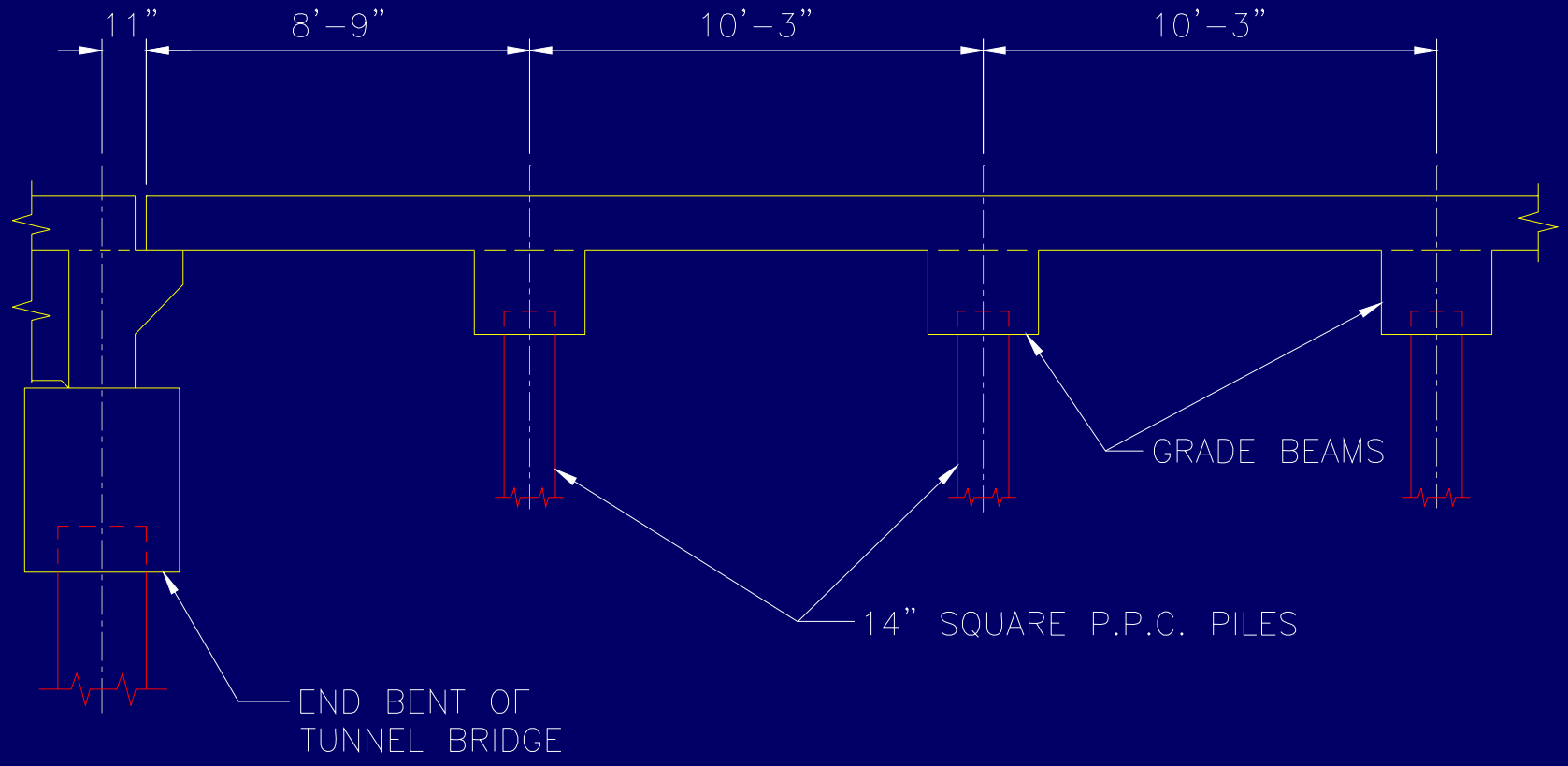
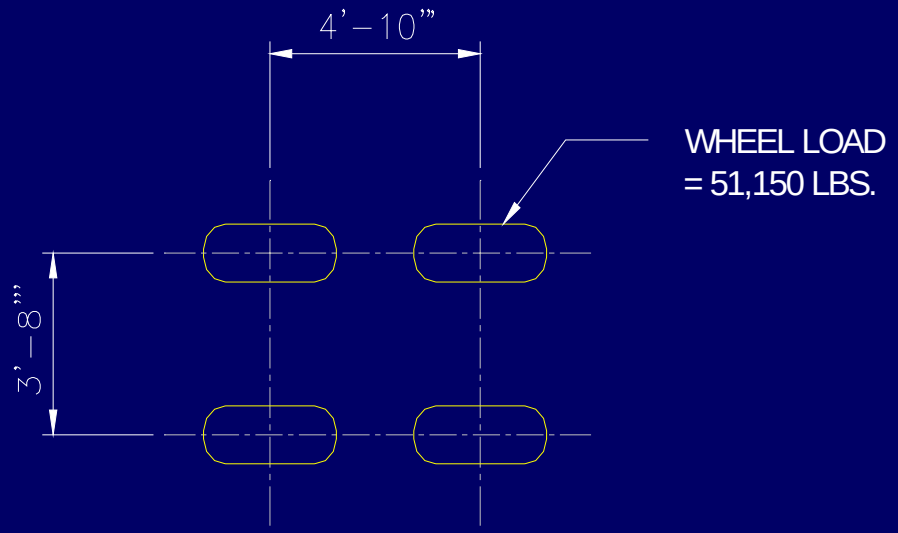
STRUCTURAL DESIGN



PARTIAL ELEVATION - PILE-SUPPORTED APPROACH SLAB

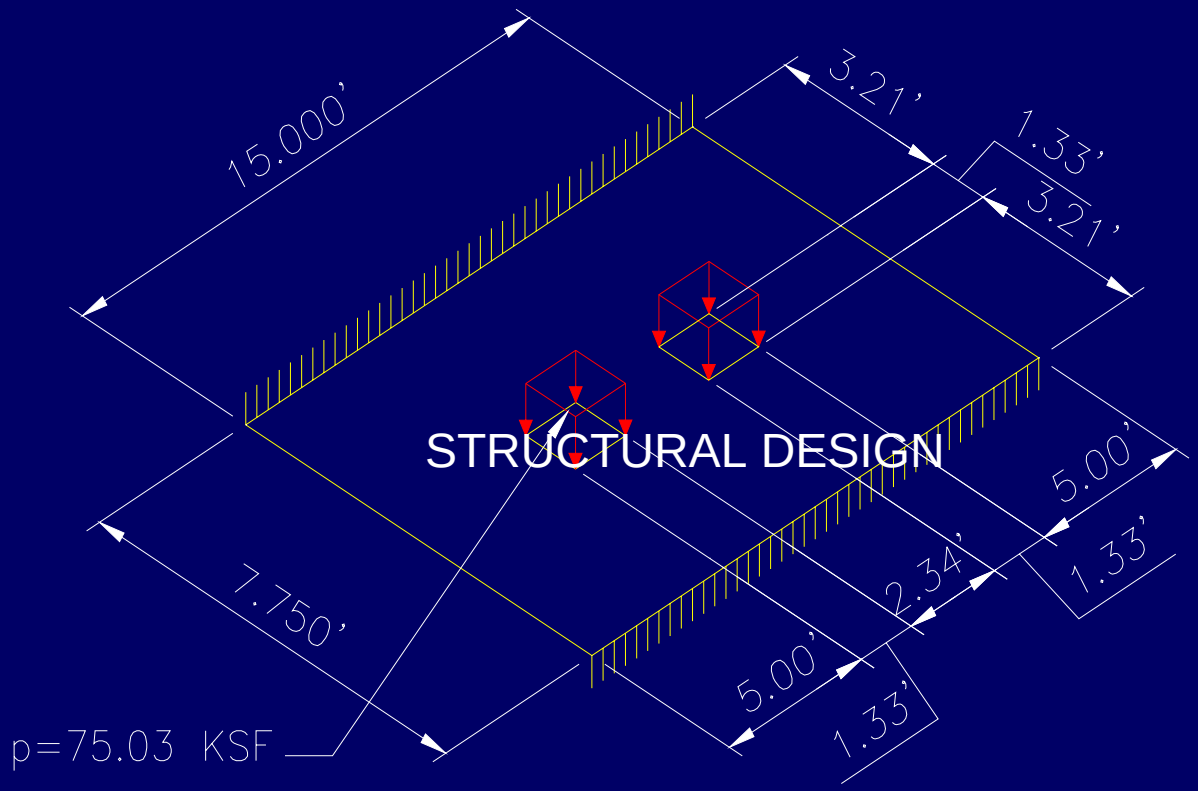
STRUCTURAL DESIGN



MAXIMUM LOAD PER STRUT = 204,600 LBS.

BOEING 747 MAIN LANDING GEAR CONFIGURATION

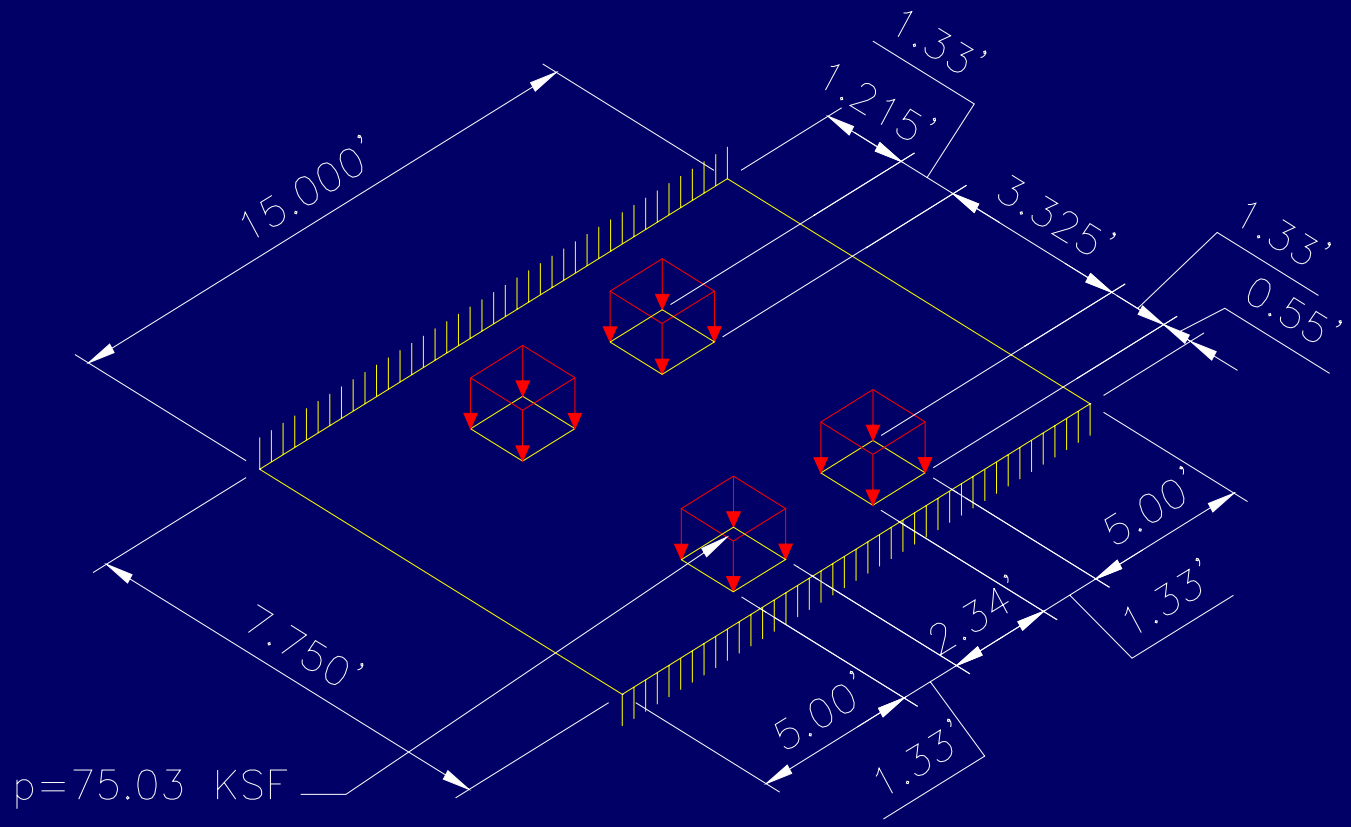
STRUCTURAL DESIGN



LOAD CASE I

SLAB DESIGN - STAAD-PRO MODEL

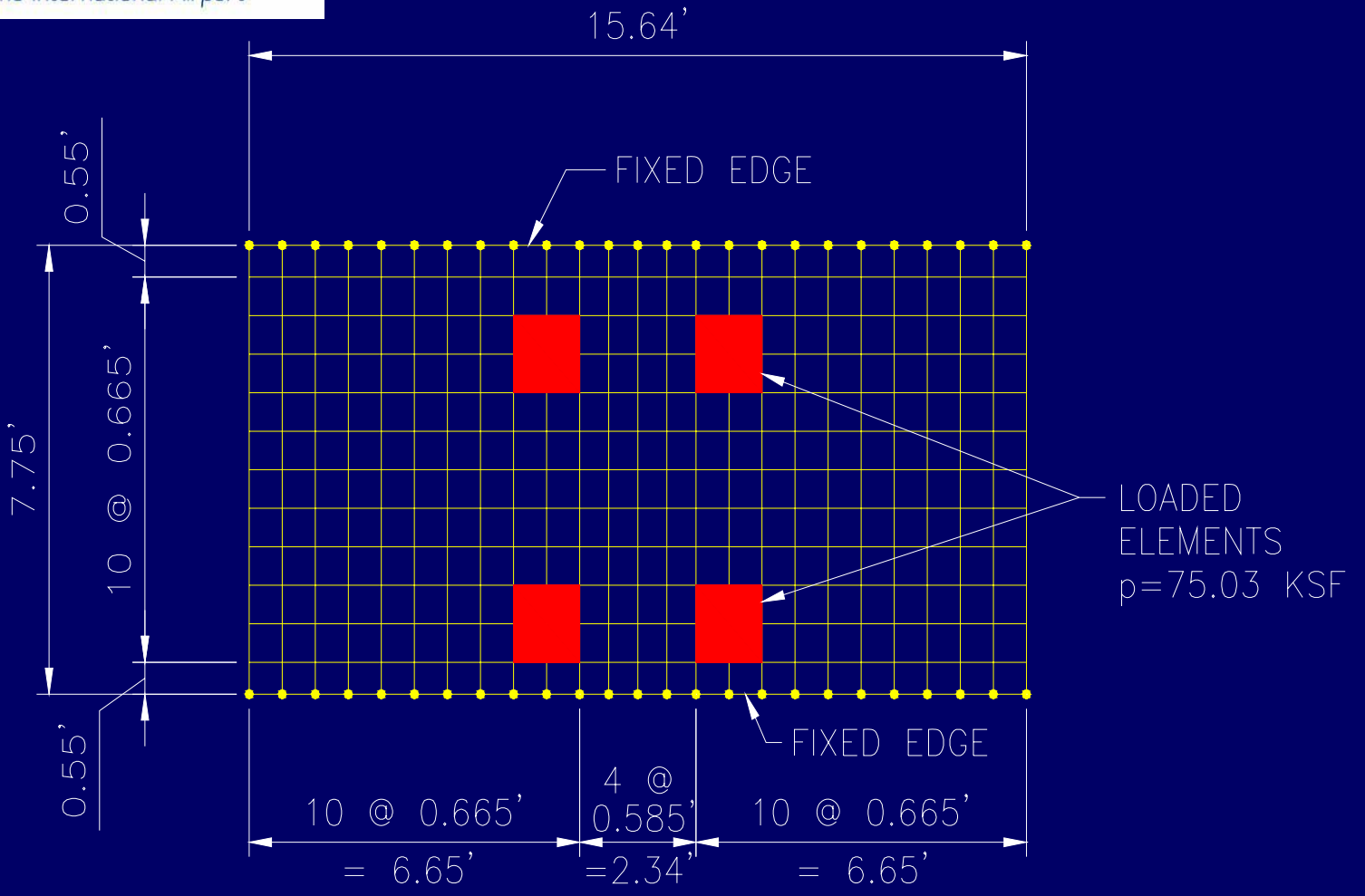
STRUCTURAL DESIGN



LOAD CASE II

SLAB DESIGN - STAAD-PRO MODEL

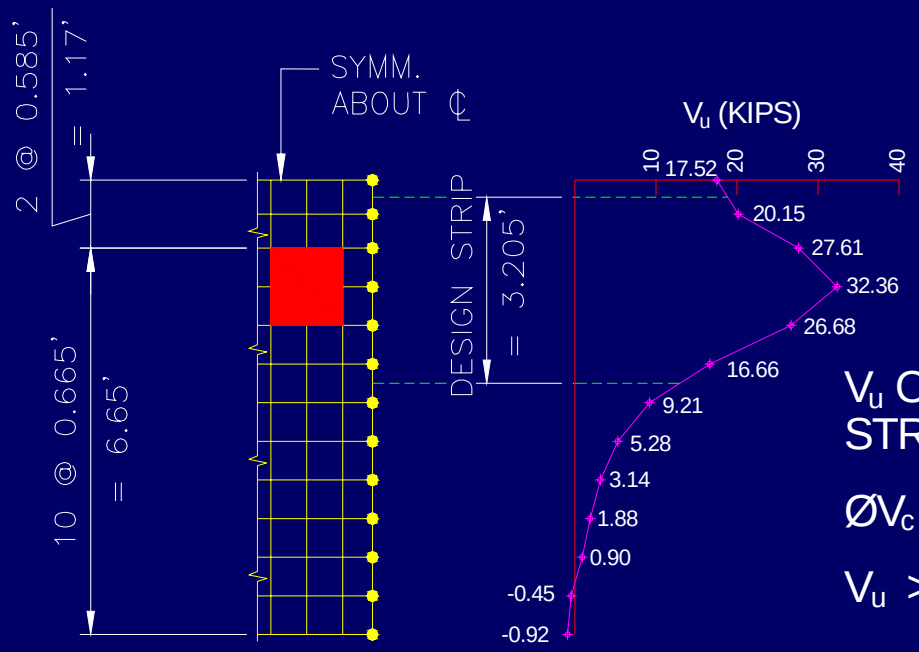
STRUCTURAL DESIGN



LOAD CASE II

SLAB DESIGN - FINITE ELEMENT MODEL

STRUCTURAL DESIGN



V_u ON DESIGN STRIP = 123.5 KIPS

$\emptyset V_c$ = 48.7 KIPS

$V_u > \emptyset V_c$

THEREFORE SHEAR REINFORCEMENT IS REQUIRED IN SLAB

LOAD CASE II

SLAB DESIGN - FINITE ELEMENT MODEL

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RUNWAY 10-28
SEPTEMBER, 2005

THANK YOU!

VOLKERT