2004 Prefabricated Bridges Scan Implementation Update

Rapid Bridge Replacement with Self-Propelled Modular Transporters (SPMTs)

by Scan Team Members:

William Nickas, P.E., Florida DOT
Mary Lou Ralls, P.E., prev. Texas DOT

General Session of HSCOBS Annual Meeting
May 23, 2006

2004 Prefab Scan Mission

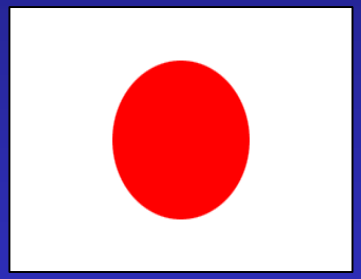
To investigate and document the applications and experience with prefabricated bridges in Japan and selected European countries, with emphasis on:

- Routine highway and railroad bridges with spans 20 ft – 140 ft
- Innovative systems
- Replacement and new construction
- Emergency work
- Including seismic considerations

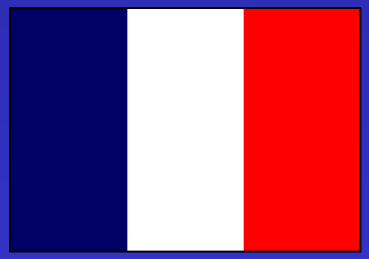
Prefab Scan Host Countries

2. Netherlands

3. Belgium



1. Japan



5. France

4. Germany

Self-Propelled Modular Transporters

The Netherlands
Mammoet

Belgium
Sarens

One-Man Operator

SPMTs

Crab Steering

Top Implementation Recommendation

Self-Propelled Modular Transporters (SPMTs)

IH-10 Bridge over Escambia Bay, Florida following Hurricane Ivan - 2004

IH-10 Bridge over Escambia Bay, Florida – 2004

Used barges and Barnhart modular transporters to realign bridge spans

$250,000/day Phase I incentive/disincentive:

- Contract completed 7 days early
- Contractor received $1.75M incentive

January 11, 2006

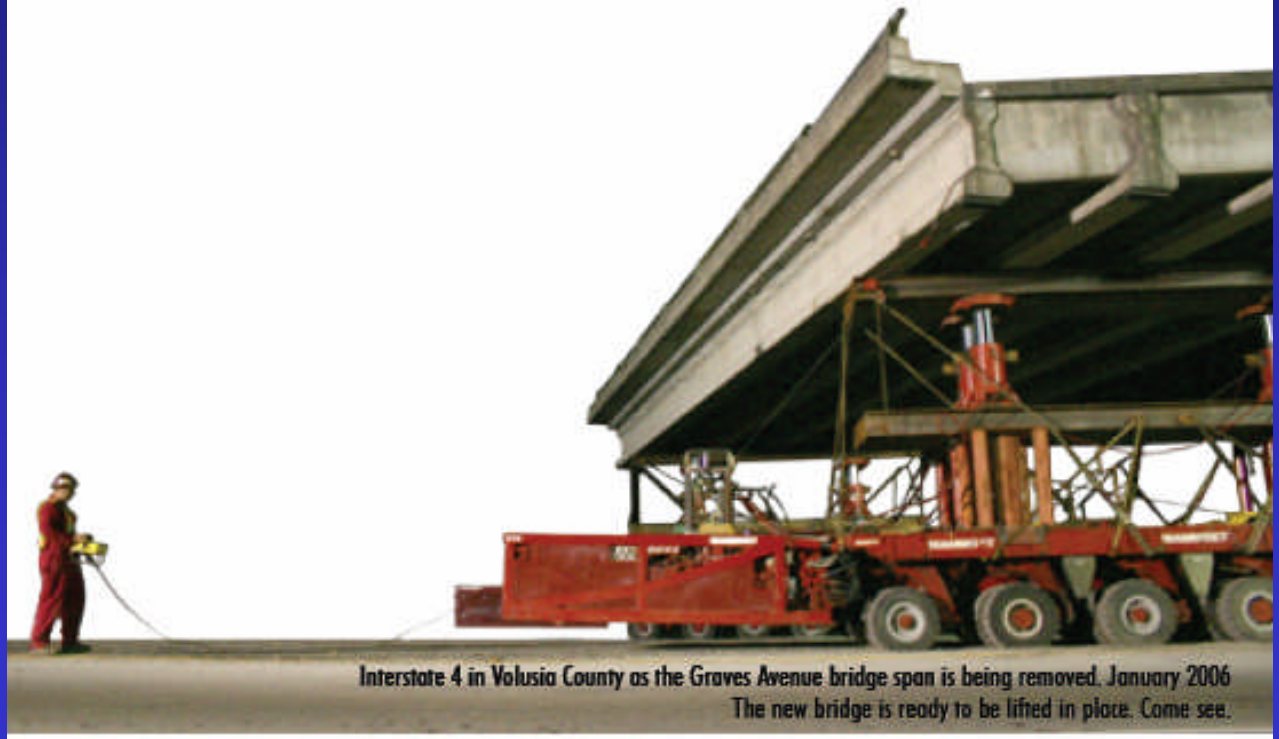
Used Mammoet SPMTs to remove Graves Avenue superstructure over I-4 West (January 9 removal over I-4 East)

YOU'RE INVITED

SPMTs: RAISING THE SPEED OF BRIDGE CONSTRUCTION IN THE U.S

Self-Propelled Modular Transporters are changing the art of bridge building

June 9 afternoon – Demonstration Workshop
June 10 midnight – Superstructure Installation



Interstate 4 in Volusia County as the Graves Avenue bridge span is being removed. January 2006
The new bridge is ready to be lifted in place. Come see.

U.S.Department of Transportation
Federal Highway Administration

HIGHWAYS FOR LIFE
Accelerating Innovation for the American Driving Experience.

A Florida Department of Transportation Project
Jeb Bush, Governor
Denver J. Stutler, Jr., Secretary
Visit www.dot.state.fl.us

TRANS4MATION

U.S. Department of Transportation
Federal Highway Administration

SPMTs: RAISING THE SPEED OF BRIDGE CONSTRUCTION IN THE U.S.

The Florida Department of Transportation, in cooperation with FHWA-AASHTO-NCHRP, invites you to be a part of a first-ever event for interstate bridge construction in America. Come participate in a weekend of events for this FHWA Showcase project.

- On Friday, project participants will make presentations and take part in a panel discussion where your questions will be answered. Then participants will be bused to the Graves Avenue bridge project site to see the setup for the installation.
- On Saturday night, participants will be picked up at the Holiday Inn in DeLand and bused to the Graves Avenue bridge being installed over I-4 to see the Self Propelled Modular Transporters lift the bridge span into place.

To RSVP for the Friday afternoon seminar and/or the Saturday evening/Sunday morning site visit, please e-mail Summer Baisley of Global-5, Inc. at summerbaisley@global-5.com or call 407-571-6782. Also call this number for updated project/event information.

Bridge Installation:
Graves Avenue bridge over I-4 in Volusia County, FL (Mile Marker 113)

Seminar & Bridge Installation Dates:
Friday - Sunday, June 9-11, 2006

Seminar Time & Date:
Friday, June 9, 1 pm to 6 pm
Presentation and a panel discussion. After the panel, participants will be bused to the project site for a daytime tour.

Installation Date & Time:
Saturday - Sunday, June 10-11 from 10 pm to 4 am. Transportation from the Holiday Inn will be provided as no project site parking will be available.

Seminar Address & Hotel Accommodations:
Holiday Inn
350 E. International Speedway Blvd.
DeLand, FL 32724

Call the Holiday Inn DeLand reservations desk at (386) 738-5200. 70 rooms have been reserved for June 9 and June 10.

Please provide the following group title when making reservations to receive the discounted Government rate:

"FDOT District 5 Graves Avenue Bridge Conference"

HIGHWAYS FOR LIFE
Accelerating innovation for the American Driving Experience.

From Daytona Beach International Airport
Approximate Drive Time: 24 minutes

1. Take US-92 West to DeLand
2. Holiday Inn is located on the left

From Orlando International Airport
Approximate Drive Time: 1 hour

1. Take the SR-528-TOLL East exit 1A to Cocoa/Kennedy Space Center
2. Merge into SR-528 East
3. Take the SR-417-TOLL exit 16 to Tampa/Orlando
4. Merge into SR-417 N
5. Take the I-4 East exit 55A to Daytona Beach
6. Take the SR-44 exit 118 West to DeLand
7. Turn right at Kepler Rd
8. Turn left at US-92
9. Holiday Inn is located on the left, approximately. 1 mile

RSVP Deadline: Friday, May 26

Visit the I-4 Public Information Web site at www.trans4mation.org for additional project information and photos and real-time camera views.

Subscribe to free periodic updates via e-mail at the Trans4mation Web site and call 1-888-454-4884 for all other additional information.

Coming Soon!

"How-to" manual sponsored by FHWA/AASHTO/NCHRP/FDOT on use of self-propelled modular transporters to move bridges. Manual will include:

- Benefits and Costs
- Planning
- Design
- Contracting Issues
- Specifications
- Lessons Learned
- Case Studies

January 2006 Bridge Moves

- ✓ FDOT Removal of Graves Avenue Bridge over Interstate 4 northeast of Orlando
- ✓ LaDOTD Removal and Installation of Interstate 10 Bridge over LA 35 at Rayne near Lafayette

Acknowledgments

- Florida DOT (FDOT)
- Louisiana Department of Transportation and Development (LaDOTD)
- Mammoet

January 2006 Bridge Moves

➔ FDOT Removal of Graves Avenue Bridge over Interstate 4 northeast of Orlando

✓ LaDOTD Removal and Installation of Interstate 10 Bridge over LA 35 at Rayne near Lafayette

FDOT Graves Avenue / I-4

- Removal of Graves Avenue Bridge over Interstate 4:
  - Over I-4 E – Night of January 9, 2006
  - Over I-4 W – Night of January 11, 2006
- June 3 & 10, 2006 – Installation of longer & wider Graves Avenue Bridge

Ref. FDOT

THE TRADITIONAL METHOD

Close Bridge → Demolish Bridge → Build Substructure → Build Superstructure → Open to Traffic




THE NEW METHOD

Build Superstructure Near Site → Close Bridge → Remove Bridge (Then Demo) → Build Substructure → Install Bridge → Open to Traffic




FDOT Graves Avenue / I-4 E & W Bridge Replacement

MOTIVATION FOR NEW METHOD

- New technology
- Reduced construction time
- Reduced impacts to the public

January 2006 Graves Avenue / I-4 E & W Bridge Removals

GETTING READY

- Removed end spans of 4-span bridge
  - Used conventional method
- Spans over Interstate 4
  - 70’-6” long, 30’ wide, 250 tons

January 2006 Graves Avenue / I-4 E & W Bridge Removals

MAINTENANCE OF TRAFFIC

- 1-lane closure from 10 pm to midnight
- 20-minute rolling roadblock at midnight

Day of Move
January 9, 2006

Pre-positioning of one 6-axle SPMT in median

Day of Move

January 9, 2006

Looking from opposite side, close-up of pre-positioned 6-axle SPMT

Night of Move

January 9, 2006

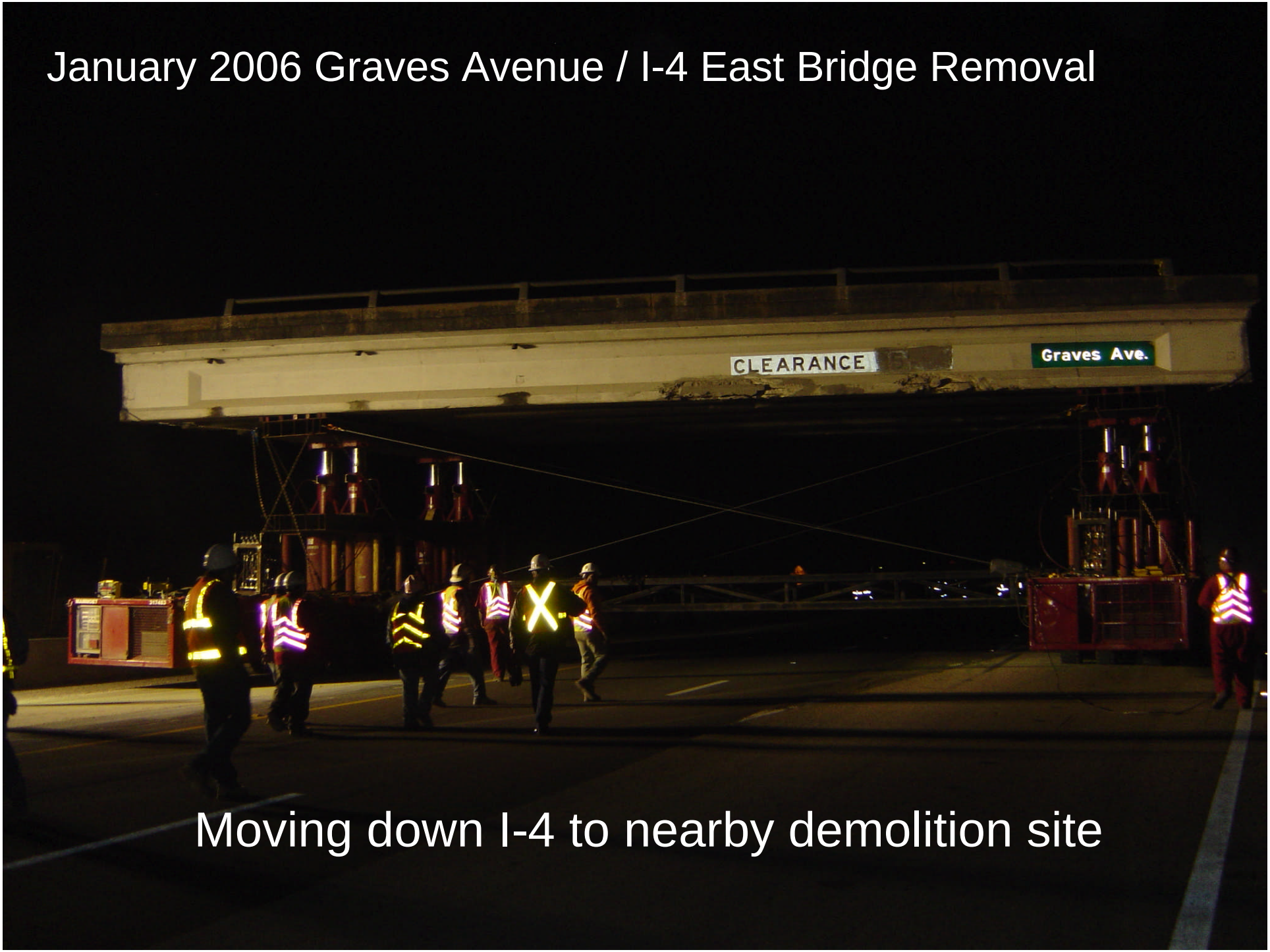
10 pm to midnight:

- **1-lane closure to position 2nd 6-axle SPMT**

Midnight:

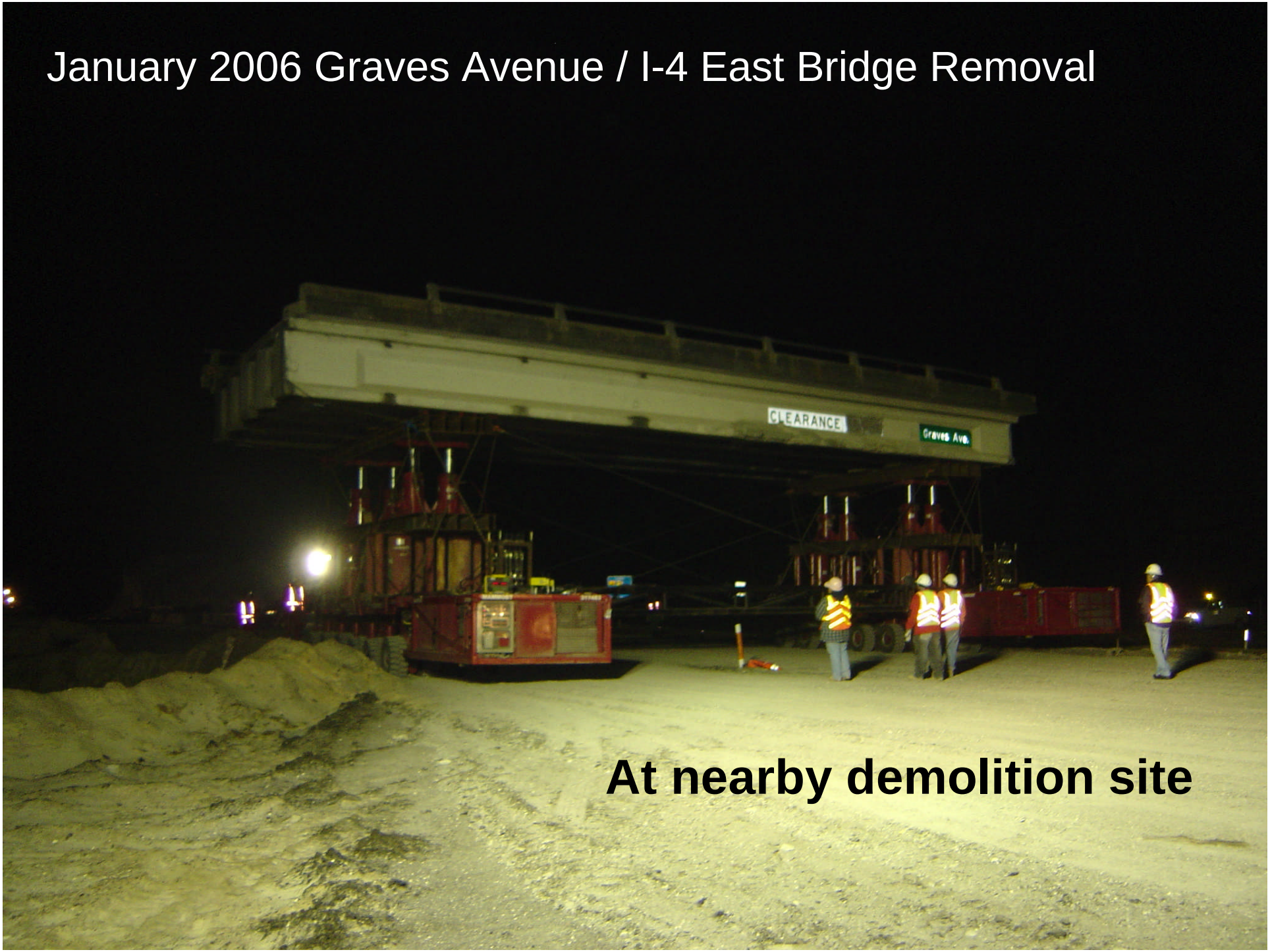
- **20-minute rolling roadblock to connect cross-frame and remove span**

January 2006 Graves Avenue / I-4 East Bridge Removal



Moving down I-4 to nearby demolition site

January 2006 Graves Avenue / I-4 East Bridge Removal



At nearby demolition site

AFTER THE REMOVAL


January 11, 2006
Same process for removal
of Graves Avenue over I-4 West

FDOT Graves Avenue / I-4 E & W Bridge Replacement

CHALLENGES OF NEW METHOD

- "This is the way we've always done it."
- Adding new methods to an existing contract
- Justification of added costs
- Finding the funding
- Contractor's concerns

January 2006 Graves Avenue / I-4 E & W Bridge Removals

Conventional Bridge Removals

12 Anticipated Nights of Work for Removal of 2 Spans

Bridge Removals With SPMTs

2 Actual Nights of Work for Removal of 2 Spans

January 2006 Graves Avenue / I-4 E & W Bridge Removals

SAVINGS SEEN TO DATE

- **12 anticipated nights of work for demolition**
  - **2 actual nights of work**
- **6 anticipated rolling roadblocks for beam picks**
  - **3 actual rolling roadblocks**
- **Savings**
  - **Off-duty law enforcement officer hours**
  - **Maintenance of traffic setups**
  - **Switching manpower from day to night**
  - **Transporting old beams**

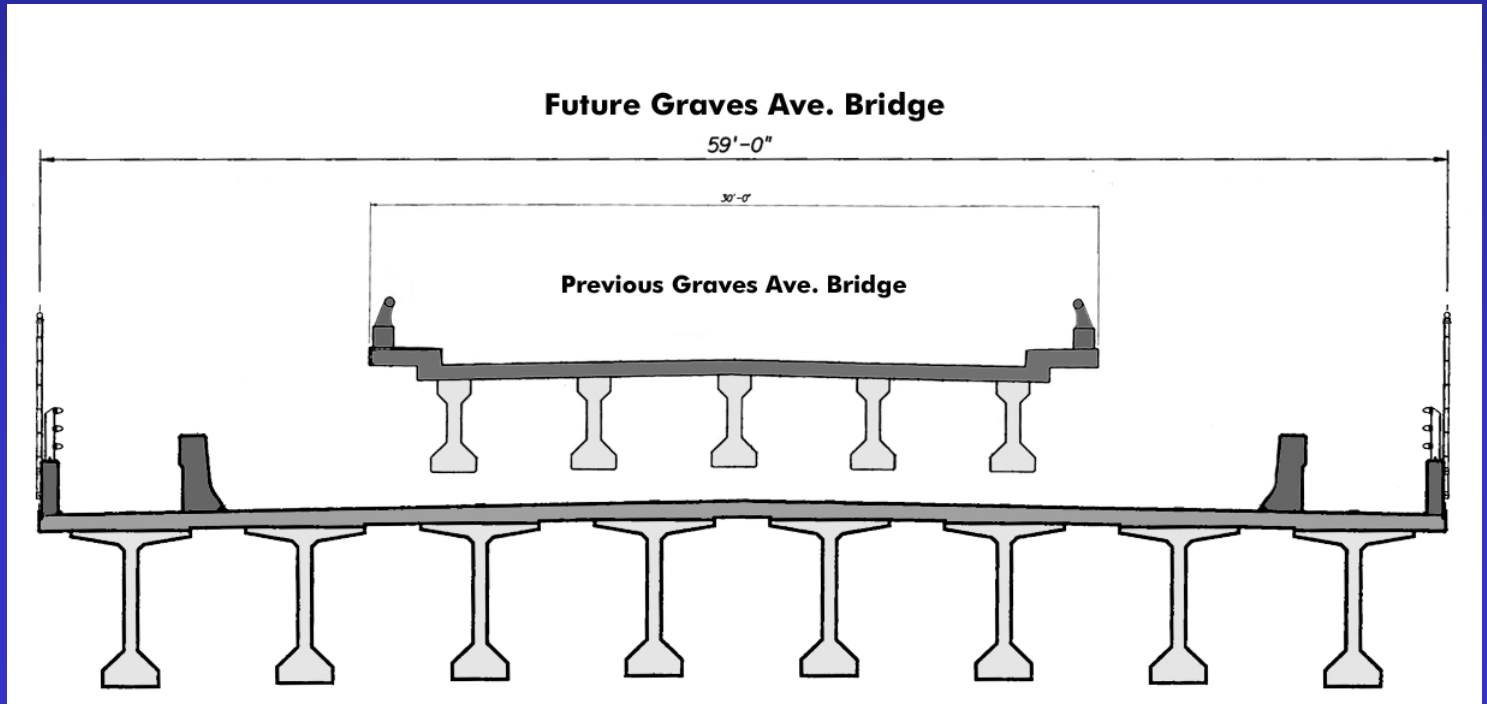
FDOT Graves Avenue / I-4 E & W Bridge Replacement

SAFETY ASPECTS

- Significantly reduced time in traffic
- Supported versus suspended load

COMPARISON OF BRIDGES

- Existing spans:
  - 70’-6” long, 30’ wide, 250 tons
- New spans:
  - 143’ long, 59’ wide, 1300 tons



FDOT Graves Avenue / I-4 E & W Bridge Replacement

CRITICAL NEEDS

- Properly aligned temporary supports
- Superstructure tolerances within limits
- High degree of quality control

FDOT Graves Avenue / I-4 E & W Bridge Replacement

FABRICATION OF NEW BRIDGES

FDOT Graves Avenue / I-4 E & W Bridge Replacement

JUNE 3 & 10, 2006 INSTALLATIONS

- Old spans required 2 SPMTs
- New spans will require 8 SPMTs

FDOT Graves Avenue / I-4 E & W Bridge Replacement

DEMONSTRATION WORKSHOP

- Friday afternoon, June 9, 2006, in conjunction with bridge installation
- See flyer for more information or contact:

Jeff Ger, FHWA

Phone: (850) 942-9650, ext. 3039

Email: Jeffrey.ger@fhwa.dot.gov

January 2006 Bridge Moves

- ✓ FDOT Removal of Graves Avenue Bridge over Interstate 4 northeast of Orlando
- ➔ LaDOTD Removal and Installation of Interstate 10 Bridge over LA 35 at Rayne near Lafayette

LaDOTD I-10 / LA 35

- Removal of existing damaged bridge spans & installation of new spans:
  - I-10 East – Night of January 24, 2006
  - I-10 West – Night of January 26, 2006

January 24, 2006 – LaDOTD I-10 East / LA 35 Bridge Span Removal

I-10 East over LA 35
Span Removal

January 24, 2006

32 minutes from moving in SPMTs for removal to final setting of new span

I-10 East over LA 35
Span Installation

I-10 West over LA 35
Span Removal

January 26, 2006

Same process two days later for I-10 West removal & installation

I-10 West over LA 35
Span Installation


January 2006 LaDOTD I-10 over LA 35
Emergency Bridge Replacement
For each night, maximum time of traffic detour to on- & off-ramps = 10 hours
www.mammoet.com

Benefits of This Technology

- ✓ Effective and efficient solution for bridge replacements on high-volume roads:
  - ✓ Significantly reduced traffic disruption
  - ✓ Increased safety due to significantly reduced onsite construction time
- ✓ Savings due to reduced onsite construction time:
  - ✓ Personnel
  - ✓ Maintenance of traffic

Manual on Use of Self-Propelled Modular Transporters to Move Bridges

Need for "how-to" manual was first identified in 2004 Prefabricated Bridge Elements & Systems **Scan Team Implementation Plan (STIP):**

- Develop Project Planning Guide for owners including project selection criteria for use of SPMTs and emphasizing the necessity for early project planning, and adequate Right-of-Way needs for construction.
- Prepare draft specifications based on sample project specifications provided to the Scanning Team for states to consider in their projects. The intent is to detail the required qualifications for lifting contractors and reasonable tolerances for placement and distortions of the structure being moved.

Ref.: Prefab Scan STIP

Manual on Use of Self-Propelled Modular Transporters to Move Bridges

William Nickas, with Dan Dorgan and Ben Tang, requested a "how-to" manual for bridge owners:

- To document the critical components required to effectively use SPMTs to remove and install bridges
- To include draft specifications for owners to consider for their projects
- To be written in conjunction with FDOT's I-4 / Graves Avenue bridge installation

Manual on Use of SPMTs to Move Bridges

Outline

- Introduction
  - Project selection criteria / decision-making framework
  - Description of Equipment
- Benefits & Costs
- Planning
  - Traffic Considerations
  - Site Requirements
  - Efficient Use of SPMTs
  - Project Staffing Requirements

Manual on Use of SPMTs to Move Bridges

Outline, continued

- Design
  - Possible Design Efficiencies
  - Single-Span versus Multi-Span Movements
  - Design Assumptions
  - Allowable Temporary Stresses and Deflections
  - Tolerances for Lifting and Positioning
  - Ground Pressure Distribution
  - Allowance for Placement / Fit-Up
  - Decks

Manual on Use of SPMTs to Move Bridges

Outline, continued

- Contracting Issues
  - Construction Scheme
  - On-Site / Near-Site Staging Area
  - Traffic Control Plans
  - SPMT Equipment Payment Strategies
  - Contracting Methods
  - Incentives / Disincentives
  - Qualifications of SPMT Subcontractor
  - Performance/ Delineation of Responsibilities

Manual on Use of SPMTs to Move Bridges

Outline, continued

- Specifications
  - Temporary Shoring Requirements
  - Moving Equipment Requirements
  - Geotechnical Assessment
  - Geometrical Controls during Move
  - Motion Diagram
  - Construction Tolerances
  - Staffing Requirements
  - Submittal Requirements
  - Example Specifications

Manual on Use of SPMTs to Move Bridges

Outline, continued

- Lessons Learned
- Case Studies
  - I-4 / Graves Avenue, FDOT
  - I-10 / LA 35, LaDOTD
  - Others …

Draft Manual will be submitted for review by early August 2006.

SPMT Availability

- Mammoet – 2004 Prefab Scan Host
  - 1,100 axle lines of SPMTs
- Sarens – 2004 Prefab Scan Host
  - 500 axle lines of SPMTs
- Barnhart Crane & Rigging
  - 108 new axle lines of SPMTs
- Bigge Crane & Rigging (?)
- Fagioli Group
- Jim Parkinson Ltd.
- Abnormal Load Engineering Limited (ALE)

Thank You

Bridge Replacements in Minutes !