## Modified Florida Double T Bridge for Accelerated Bridge Construction

FACERS Annual Meeting Tampa, FL July 1, 2010

Eugene Calvert, PE, PTOE Collier County Transportation Engineering Prefabricated Bridge Elements and Systems (PBES) In ABC

Reduces onsite construction time
Reduces Traffic and Environmental impact
Lowers First and Life-Cycle Costs
Improves Safety and
Enhance Quality

### Accelerated Bridge Construction includes:

Building the bridge first before you set cones. Then quickly move it into place – like in a weekend!



## What is driving the change for Collier County

- The infrastructure is aging
- Goal: A minimum 75- yr service life
- Currently:
  - 1. Average bridge life is 42 years
  - 2. Average bridge deck life is 20-25 year
  - Load requirements for HS20/HL93 or FL 120
  - Prefabricated standard superstructure for spans up to 80 ft.
  - Deck:
    - 1. Width for 2 and 4 lane highways
    - 2. No false work

# "County-Scale" Solutions

- Various solutions are deployed by counties to accelerate construction
  - Prefabricated arches (Bebo / ConSpan)
  - County-built flat slab segments
  - Short span double-T w/o topping
  - Inverted T beams
  - Pre-engineered trusses
  - Inverset steel beams
  - Various sawn or manufactured timber products
  - Slab bridges or deck panels

## Precast Abutments





### Precast Piers





SHOWING CONNECTION REINFORCING



## Retaining Walls

Mechanically Stabilized Earth Walls
Precast Gravity Walls
Precast Cantilever



## **Total Bridge Prefabrication**



### **Construction Considerations**

- Plan for space in the staging area for all required equipment
- Provide space for demolition of the existing structural elements



## **Construction Considerations**

- Activities sequenced/scheduled appropriately to optimize time and accelerate construction
- Contractor to be familiar with new technologies or materials being used
  - It may effect scheduling of activities
- Adequate upfront time allowed
  - Shop drawings
  - Shop drawing approval
  - Fabrication
  - Full curing of all precast elements

### Pilot Prefabricated System

- Design precast double T section
- Up to 12 foot width & 85 feet in length
- Utilize precast elements for sub-structure and super structure
- Off the shelf purchase (similar to a box culvert)
- Stockpile until ready to install for bridge



## White Boulevard Bridge Replacement



2-lane undivided four span prestressed concrete slab

### **Project Location**

- White Boulevard Bridge Replacement
- Construction of new Bridge at 23<sup>rd</sup> Street SW















LONGITUDINAL DECK JOINT

- Q. BENT 3" DIA. BLOCKOUT AB DOWEL O 4'-0" LONG EMBED. 2'-0" INTO BENT 1" DIA. THREADED 2" DM. BLOCKOUT 2" DIA. BLOCKOUT-HEAVY DUTY HEX NUT WELDED TO BOTTOM OF EMBEDDED PLATE 2,-0. STEEL PLATE SEE NOTE 4 Ħ 10" STEEL BEARING PLATE Ħ 'n 1'-0" 2'-0" EMBED. FILL WITH NON-SHRINK GROUT 3″ 3\* LEVELING BOLT SECTION A-A



#### Step 1 - Pile Installation



#### Step 2 - Pile Cap Installation



#### Step 3 – Erect Beams



#### Step 4 - Install Approach Slabs and Backfill



#### Step 5 – Cast Closure Pours



#### Step 6 - Set Parapet in grout bed



#### Step 7 - Cast Sidewalks



#### Step 8 - Waterproofing, Paving and Railings



#### **Final Bridge**



#### Estimated Construction Time for White Blvd.

Demolition	14 days
Foundations	21 days
Beams	7 days
Railing and sidewalks	14 days
Paving	2 days
Misc. work & approaches	32 days
Total	90 days

 Versus 1+ year construction using conventional methods while maintaining traffic





### Final Bridge



### **BENEFITS OF USING ABC**

COSTS savings

Reduced ECONOMIC and business impacts

Reduced CONSTRUCTION time

Reduced ENVIRONMENTAL impacts

# BENEFITS OF USING ABC

Reduce TRAFFIC impacts

Improve SAFETY to workers and public

Improve QUALITY of constructed product

### PBES - Vision

State-Wide Acceptance of PBES
 – Highway Agencies

- Contractors
- Industry
- Predesigned Superstructure
  - Off the shelf specifications
  - State of the Practice (Box culverts, RCP, etc.)

### Modified Florida Double T Bridge Project

Project Manager: Marlene Messam, PE Design Engineer: Bryan Busch, CME Associates