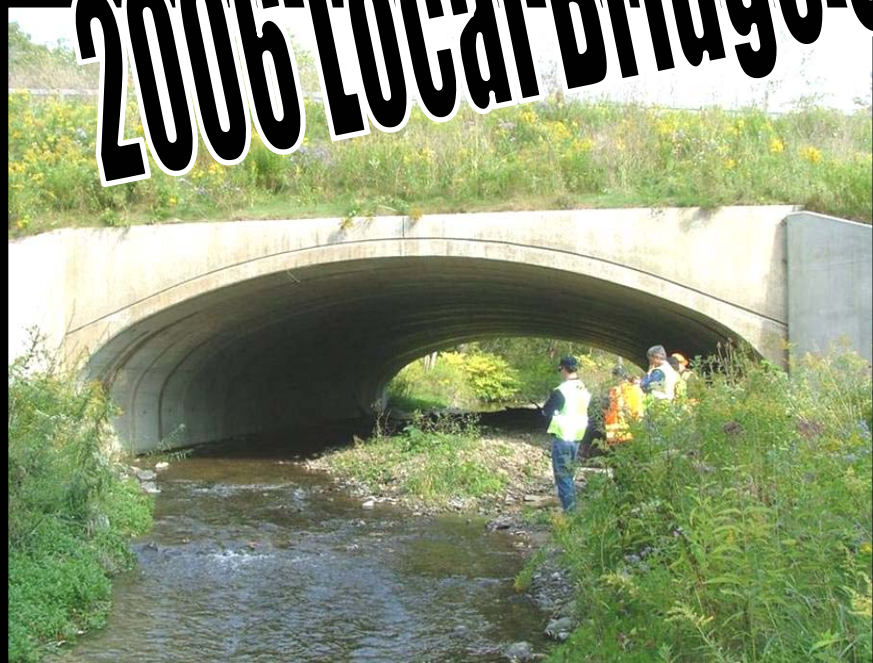


# 2006 Local Bridge Scanning Tour of NY



# The Local Bridge Scanning Tour (LBST)

## Why, How, Who, and Where

### Why

- International and domestic bridge scans across the county
- A means to find other economical, fast construction, proven, durable, and safe
- Expand the list of approved bridge types/details for the local bridge inventory
- Mn/DOT's involvement in the international bridge scanning tour





# The Local Bridge Scanning Tour (LBST)

## Why, How, Who, and Where

### How

- Support of the County Engineer's Bridge Committee
- SALT and the State Bridge Engineer
- MN FHWA
- Local Bridge Consultants



# **The Local Bridge Scanning Tour (LBST)**

## **Why, How, Who, and Where**

### **Who**

- **Romeo Garcia, Patti Simmons, Alan Forsberg, Gary Bruggeman, Ron Benson, Kent Rohr, Larry Erickson, and Dave Conkel**



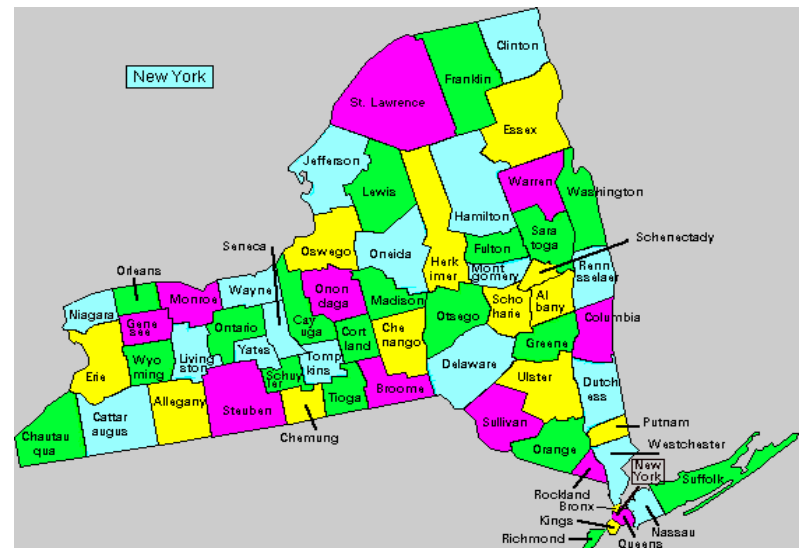
### **Where**

- **The team decided to invite industry experts bridge design and construction**
- **John Dick, Jim Wacker, Ken Johnson, and Calvin Schrage,**



# State of New York

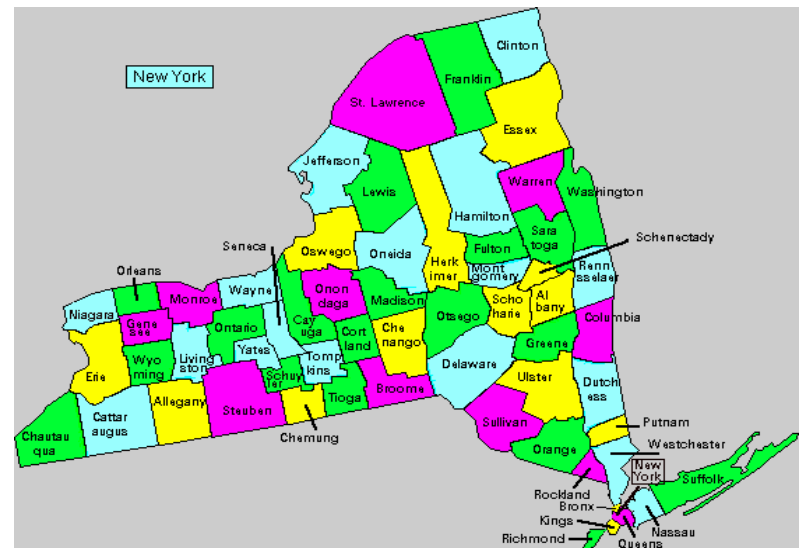
- **The team decided on the Buffalo NY region**
- **Similar weather and environments to Minnesota**
- **Erie, Cattaraugus, Allegany, and Steuben County.**



# State of New York

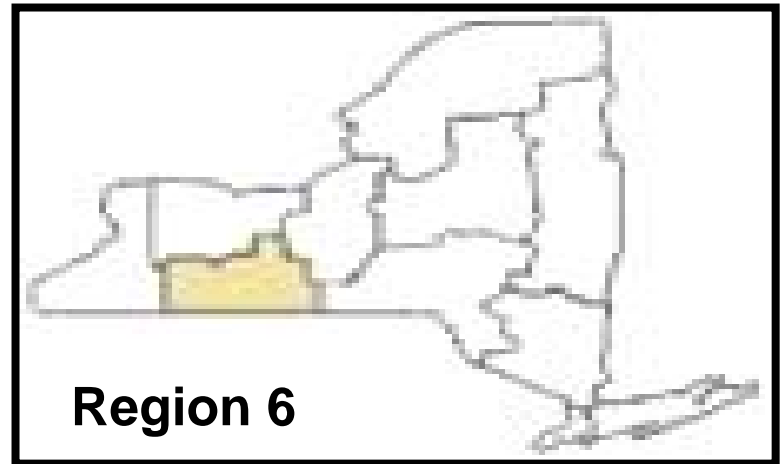
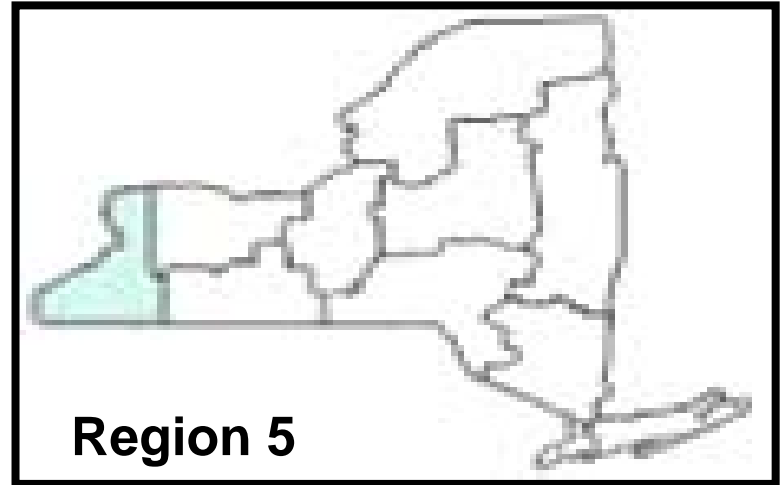
## NY General Information

- 3rd in population to California and Texas
- Millions of acres of farms and scenic lands
- largest waterfall by volume
- Jamestown was Lucille Ball's home town



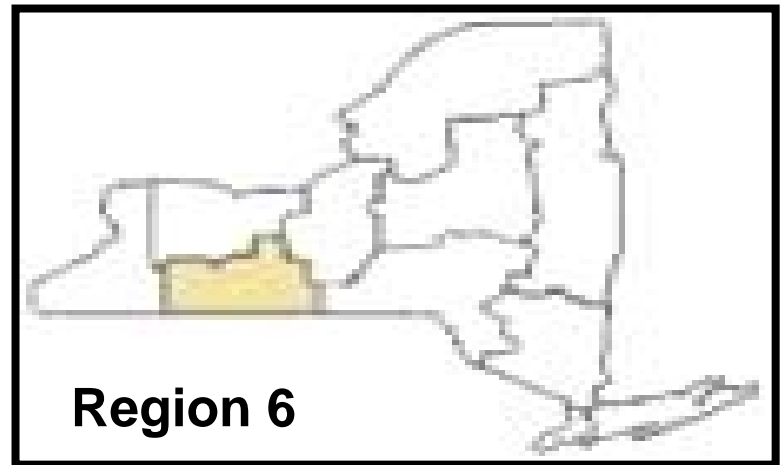
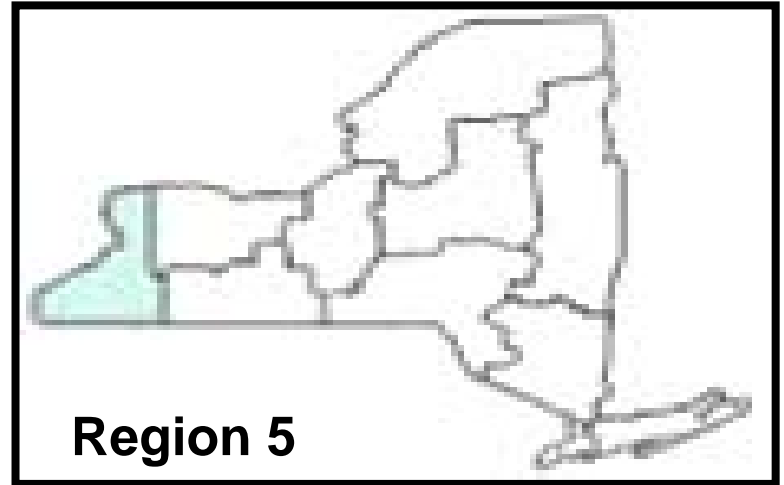
# NYSDOT

- **NYSDOT Region 5**
- **Headquarters located in downtown Buffalo, NY**
- **Region is comprised of four western New York counties:**
- **Serving Cattaraugus, Chautauqua, Erie and Niagara.**
- **2,300 total bridges in the region**



# NYSDOT

- **NY/DOT Region 6**
- Located in Hornell, NY
- Serving Allegany, Chemung, Schuyler, Steuben, Tioga, and Yates





# Fiber Reinforced Polymer (FRP) Bridge Superstructures

## Advantages

- Very light weight,
- Resistance to de-icing salts
- Fast installation
- Fatigue resistance
- Long service life



***FRP Bridge, Erie County***



# Fiber Reinforced Polymer (FRP) Bridge Superstructures

## Disadvantages

- Higher initial costs
- Deflection driven design
- Material behavior requires a finite element model to analyze system
- FRP material properties degrade over time
- Limited FRP availability in construction industry
- FRP load test to confirm the finite element model.



*FRP Bridge, Erie County*



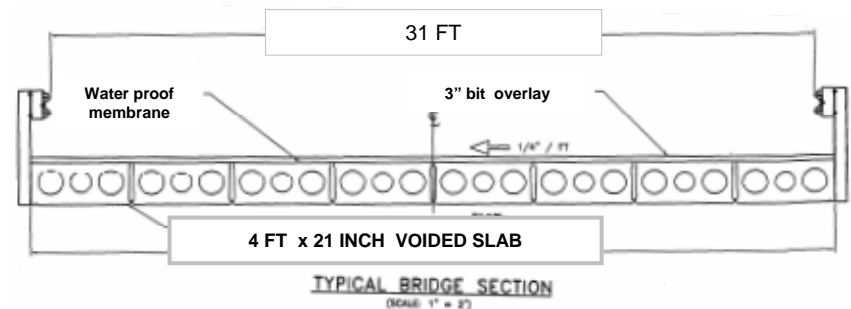
# Adjacent Prestressed Concrete Beam (PCB) Units

## General

- Most common bridge type in the short to medium spans
- solid slab, voided slab and voided box beam.
- 4 foot wide, depths from 12 inches to 54 inches. Span range 25 feet to over 100 feet



Non Composite PCB Units, Steuben County





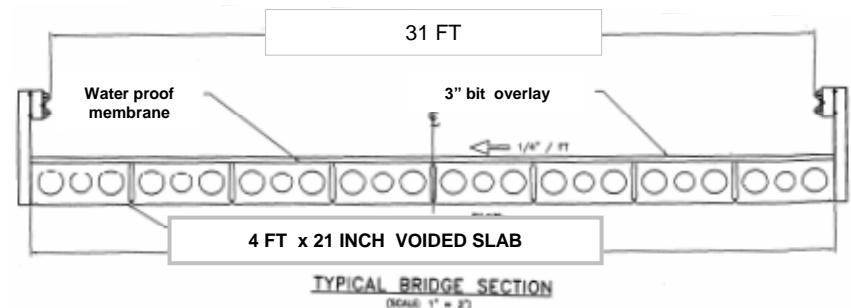
# Adjacent Prestressed Concrete Beam (PCB) Units

## General

- Use adjacent beams with a 6 inch composite concrete deck
- Use adjacent beams with non composite bit overlay
- The units are transverse post tensioned
- The counties we visited enjoy them on their system



Non Composite PCB Units, Steuben County



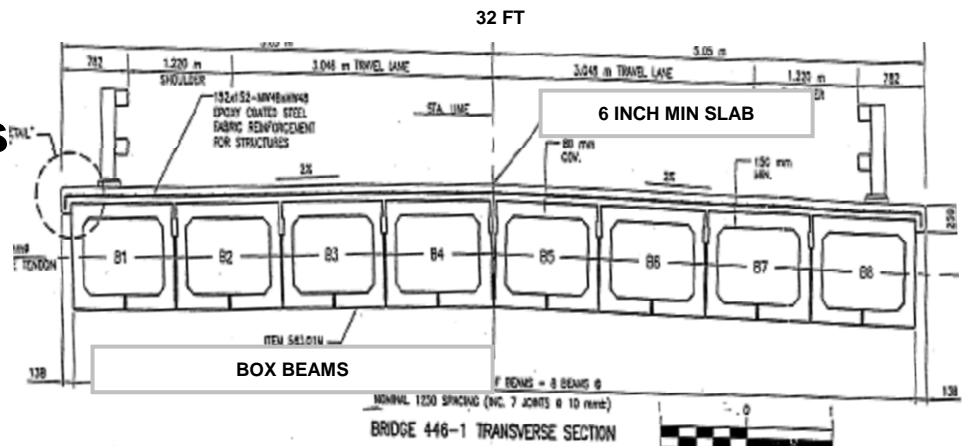
# Adjacent Prestressed Concrete Beam (PCB) Units

## Advantages

- Continuous flat surface along the bottom
- Shallow depth
- No heavy false work
- Fast erection
- The adjacent beam system has been around since the early 1950's
- Relatively simple fabrication



Composite PCB Units, Erie County





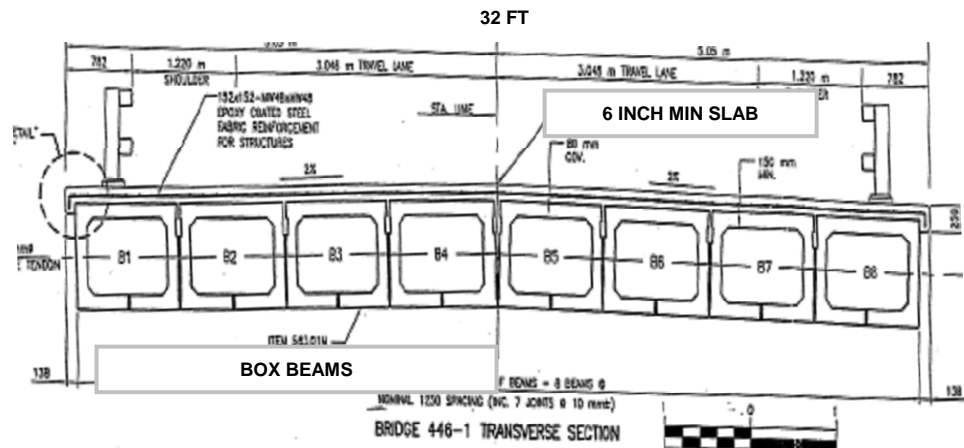
# Adjacent Prestressed Concrete Beam (PCB) Units

## Disadvantages/Initial Considerations

- **Local precasters fabricating adjacent bridge beam sections.**
- **May not be the initial low cost bridge type.**
- **System often results in a wider superstructure**
- **Economy is found in bridges with little or no skew**
- **Stage construction requires additional care in construction**



## Composite PCB Units, Erie County



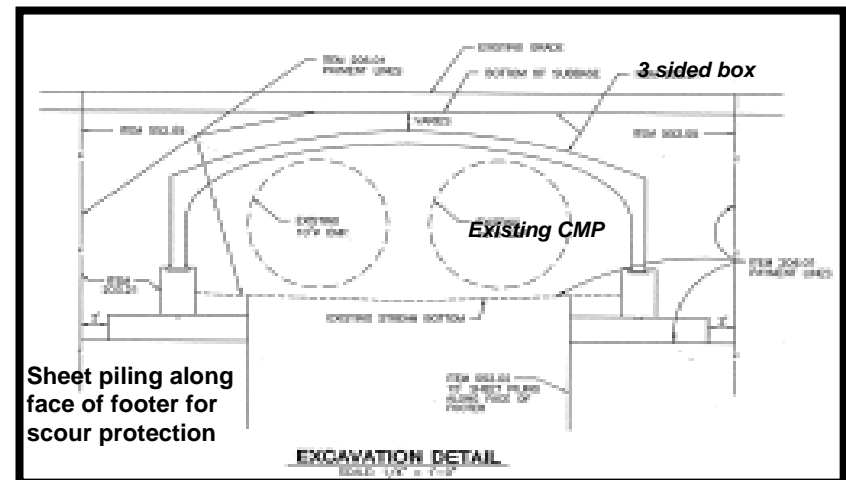
# Precast Concrete 3-Sided Boxes

## General

- The 3-sided box structure local bridge of choice in NY
- Technical memorandum on the use of 3 sided boxes
- The 3-sided boxs founded on spread footings
- 3-sided box units supplied in 8-10 foot heights



*3 Sided Box, Cattaraugus County*



# Precast Concrete 3-Sided Boxes

## Advantages

- No walls typical with multi cell adjacent units
- Fast construction
- At least 5 different proprietary system available
- No bridge deck, and no bridge joints to maintain.
- The headwall can be formed with architectural relief
- Competitive with a bridge if on a spread footing



3 Sided Box, Cattaraugus County





# Precast Concrete 3-Sided Boxes

## Disadvantages

- 40 ft with fill heights less 2 ft “arch shaped” not feasible
- 40 ft with fill heights less 2 ft “flat top” are inefficient
- Difficult to use if stage construction is required.
- Difficult to use if skew is greater than 10 degrees.
- Not an initial low cost bridge if on a pile foundation



3 Sided Box, Cattaraugus County



# Steel Sheet Pile Wall as a Bridge Abutment

## General

- Use sheet pile wall as abutments on low volume rdwys.
- Sheet pile wall as abutments good for spans up to 75 ft



*Sheet Pile Abutment, Cattaraugus County*



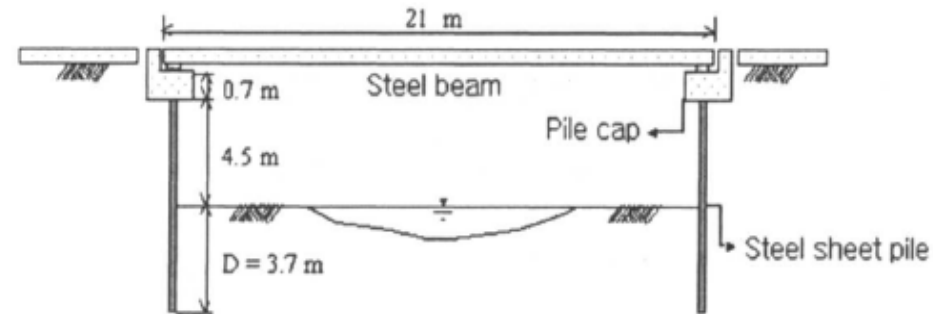
*Sheet Pile Abutment, Steuben County*



# Steel Sheet Pile Wall as a Bridge Abutment

## Advantages

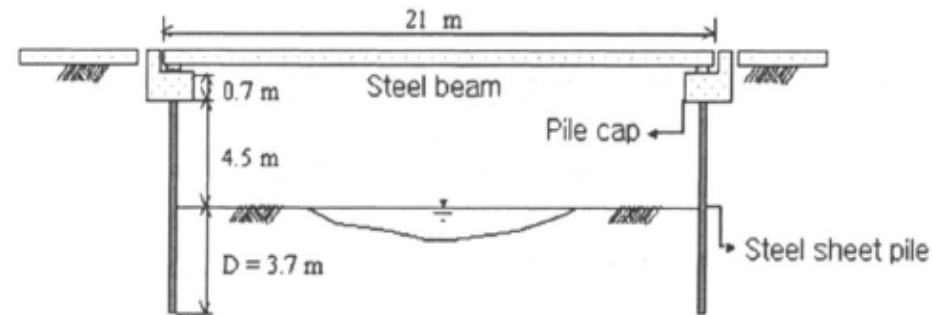
- If favorable will have the initial low cost.
- Installed by local bridge crews or bridge contractor
- Reduce construction time
- It's a proven system on low volume roads in NY
- Sheet pile wall embedment for scour protection



# Steel Sheet Pile Wall as a Bridge Abutment

## Disadvantages

- Sheet walls must have suitable foundation soils
- Service life of a sheet wall abutment will be less
- No recognizable nationally accepted design procedures
- Initial low cost vs. life cycle cost



*Sheet Pile Abutment, Cattaraugus County* 20

# Large Span Precast Concrete Culverts

- The NY counties enjoy the precast concrete culvert.
- Top photo in the foreground is Mark Burr
- Action shot of Gary Bruggeman
- NYSDOT uses a standard box design program
- Culverts with spans up to 24 feet in 5' to 8' long sections
- NY counties build their own precast concrete culverts



20 ft Span Culvert, Cattaraugus County



Precast Conc. Apron Walls, Cattaraugus Co. 21



## Plan details of NY culvert apron with flared wingwalls



# Precast Concrete

- Kistner precast concrete plant in Lockport NY.
- NYSDOT allows culverts up to 20' maximum span
- Plant exclusively uses self consolidating concrete
- Fabricates the Conspan 3 sided box structure
- Primary differences from Minnesota fabricators



*3 Sided Box Fabricated at Kistner*



*Culverts Fabricated at Kistner*



# Prestressed Concrete

- **LC Whitford precast concrete plant in Wellsville NY.**
- **Pre-stressed slab beams, pre-stressed box beams**
- **Minimum 28 day pre-stressed concrete strength of 10,000 psi**
- **Primary differences from Minnesota fabricators**



**Voided Slab Fabricated at LC Whitford**



**Composite Voided Slab at LC Whitford** 24

# Metal Railings Systems

## Advantages

- **Allows deck drainage off the bridge without scuppers or floor drains**
- **Open railing increases visibility of traffic from intersecting roadways**
- **Helps reduce snow accumulation on bridge shoulders**
- **Aesthetics, allows the view of scenic under features**
- **Sight distance improved on a curved bridge alignment**
- **Current NY/DOT standards**
- **TL-2, and TL-4 railing**



4-Rail Unit, Erie County



2-Rail Unit, Cattaraugus County

# Metal Railings Systems

## Disadvantages

- No known steel railings capable of a Test level 5 (high speed, high traffic volume).
- Higher maintenance costs.
- Lower durability
- Maybe high cost rail. However in NY the 2 and 4 metal rail systems are cheaper than the concrete barrier.



4-Rail Unit, Erie County



2-Rail Unit, Cattaraugus County



# Stay-In-Place Forms (SIP Forms)

## General

- The NY DOT permits the forming of deck slabs with metal form units
- Nationally SIP forms in concrete bridge construction are increasing

## Advantages

- Saves labor costs over conventional removable plywood form work
- Possible saving in overall project duration

## Disadvantages

- SIP metal forms will add dead load to the superstructure
- SIP forms prevent inspection of the underside of the concrete deck.



*Metal SIP Forms Steel Beams*



*Metal SIP Forms PCB's*

# Timber Bridge Systems

- **Guy James of Allegany County**
- **Award winning glued laminated timber arch**
- **Nail laminated timber slab span on concrete abutments**
- **Timber decking composite with concrete overlays**



**Glulam Timber Arch, Allegany County**



**Nail Laminated Timber Deck, Steuben Co**



# Timber Bridge Systems

- Other interesting information on bridges of Allegany
  - Timber bridges comprise 50% of the bridge inventory
  - Preservative treatments creosote, CCA and penta
  - 75% of their timber bridges are being treated with penta
  - Use timber decking on steel or concrete beams



Glulam Timber Arch, Allegany County



Nail Laminated Timber Deck, Steuben Co

# Other NY Local Bridge Systems

- **Side by side voided slab composite with deck**
  - **Pre-cast 6 inch concrete plank deck with steel beams**
- **Strength**
  - **Speed**
  - **Efficient**



**Composite Voided Slab, Cattaraugus County**



**Composite Precast Conc. Deck Panels on Steel Beams, Cattaraugus County**



# NY Steel Box Beam Approach Guard Railing

## General

- Cable, corrugated metal, box beam, and concrete barrier
- Selection governed by safety and secondarily by costs
- Smaller distance of shielded object, less maintenance
- More expensive than



Steel Box Beam Rail, Erie County



Steel Box Beam Rail, Erie County



# Summary of Observations

- Side by side PCB beam units with composite deck
- Long span 3 sided box on spread footings
- Larger 4 sided box culvert systems
- Abutments and wingwalls that use sheet piling
- Price NY standard 2 and 4 metal bridge rail
- NY counties have more flexibility in bridge design



LBST Team in Cattaraugus County, NY



LBST Team in Cattaraugus County, NY

# ***NY Local Bridge Scanning Tour Credits***

**Romeo Garcia, MN FHWA, Finance Director, and LBST Team Member**

**Earl Dubin, NY FHWA, Tour Coordinator**

**Mike Marracino, NYSDOT Region 5, Tour Guide**

**Ron Mauro, NYSDOT Region 6, Tour Guide**

**Carl Dimmig and Staff, Erie County**

**Mark Burr and Staff, Cattaraugus County**

**Bill Fox, Chautauqua County**

**Kevin Obrien, Niagara County**

**Steve Catherman, and Staff Stueben County**

**Guy James, Allegany County**

**Dan Whitford and Bob Skulds, LC Whitford**

**Mike J, Kistner, Kistner Concrete Products, Inc.**

**Ken Johnson, Wheeler Lumber, LCC**

**John Dick, Precast/Prestressed Concrete Institute**

**Jim Wacker, Forest Products Laboratory**

**Calvin Schrage, National Steel Bridge Alliance**

**SRF Consulting Group, Inc**

**WSN Consulting Engineers**

**Erickson Engineering**

**Blue Earth County, Minnesota**

**Steele County, Minnesota**

**The LBST Team Members**



**LBST Team at the Cattaraugus County Hwy. Dept.**



**LBST Team in Erie County, NY**

# Consensus of the LBSTT & the Mn/DOT Bridge Office

- Side by side PCB Units



- Larger 4 sided culverts



- 3 Sided boxes on spread footings



- Metal traffic railing





# Consensus of the LBSTT & the Mn/DOT Bridge Office

- Box beam guard rail



- SCC



- Culvert apron with flared wing-walls



- Composite concrete deck panels



- Sheet pile abutments



- SIP metal deck forms



# Scenery of Western NY by Patti & Gary



**Trout Stream**



**Trout Stream**



**Trout Stream**



**Trout Stream**



# Minnesota Viking Darren Sharper

