INDOT Design and Construction of Post-Tensioned Bridges

Presented to:
Indiana Road School
March 31, 2005

Purpose of Project

When I-70 Fast Track was conceived, the alignment of I-70 cut through airport property such that airport development along the existing south runway was hindered, and property south of the interstate was inaccessible for future runways.
Project Overview

Existing I-70 (Closed in Oct. 2002)

I-70 30’ Depressed Section

New Airport Interchange (Opens with Terminal)

Existing I-70 (Closed in Oct. 2002)

New Six Points Road Interchange (Opened in 2004)

Relocate Streams

High School Road (Bridge widened 2003)

Existing Six Points Road (Closed in 2004)

Project Completion - December 2004

Construction Schedule

1. Early Grading Contract - $26.9m
   Letting Date: Oct. 8, 2002

2. Critical Structures Contract - $26.9m
   Letting Date: May 20, 2003

3. I-70 Paving Contract (Part 1) - $29.7m
   Letting Date: June 17, 2003

4. Non-Critical Structures Contract - $8.7m
   Letting Date: June 17, 2003

5. Six Points Road & Intch. Contract - $13.8m
   Letting Date: July 15, 2003

6. High School Road Contract - $4.6m
   Letting Date: July 15, 2003

7. I-70 Paving Contract (Part 2) - $31.9m
   Letting Date: Sept. 16, 2003
Awarded May 20, 2003 to Walsh Construction
completed Sept. 2004

Aesthetically pleasing structures complement the new terminal.

The use of special structural elements reduced project cost.

Concurrent approach featured concurrent design and construction.

353’ Long CIP Conc. Box
803’ Long CIP Conc. Box
1338’ Long CIP Conc. Box

Parsons Brinckerhoff, Inc.
Indianapolis, Indiana
New Airport Terminal Project

I-70 Interchange
Interchange Bridge Layout

Interchange Bridge Aesthetic Requirements

- Interchange structures need to announce entrance to airport = landmark
- Bridge needs to be compatible with new terminal building = element of overall composition
- Bridges are a platform to view Indiana landscape / new terminal entrance axis = de-emphasize barriers
- Arc of alignment is dynamic = suggestion of movement, flight
- High skew from alignment results in long spans. Emphasize span and bridge lengths = horizontal nature of landscape
Landmark Bridges

Columbus Gateway Arch Bridge - Columbus, Indiana
J Muller International

Runway Clear Zone
Bridge Types

Baseline: Steel Plate Girders
Steel Plate Girders With Integral Pier Caps
Variable Depth Steel Plate Girders
Precast Concrete Arches

Concrete Box Girders
Selected by Owner’s Architect
Collaboration With Architect

Collaboration With Architect
Context Sensitive Design

Superstructure Cross Section

- Deck projection past face of barrier
- Wide overhangs
- Highly sloped webs
- Sculpted column
Post Tensioning Versus Reinforced Concrete

Reinforced Concrete

Prestressed Concrete

Continuous Frames

Integral Joint

Continuous Frame
Post Tensioning Layout
Support of Bridge During Construction

Anchorage Areas
Transverse Tendon Layout

Frame Articulation
Standard Column Form

Standard Column Form

Standard Column Form
Frame Shortening

Elastic Shortening,
Creep + Shrinkage,
Temperature Drop

Longitudinal Movements on Short Frame
Expansion Joints

Intermediate Hinge
Intermediate Hinge Details

Abutment Bearings
Abutment Concepts

Final Abutment Scheme
MSE Wall Panels

Typical Wall Elevation - Front View

Bridge Rail
Design Team

- Owner: Indianapolis Airport Authority
- Owner’s Architect: HOK
- Client: Indiana Dept. of Transportation
- Bridge Engineer: Parsons Brinckerhoff