

Part C:

Selection of

- **Case Study Bridge**
- **Suitable Commercially Available Software to Link to**



Selection of a Case Study Bridge



Selection Criteria: Steel or Concrete Suitable

- Recently designed, existing bridge that reflects current practice and has full contract plans and sets of shop drawings available.
- Two lanes of traffic in each direction, typical of many new bridges and Shoulder on each side
- Deck: 72 ft wide, approx., 8" or so thick
- Barrier- same for both, e.g. NJ
- 7-9 girders (8.5 – 11.33 ft spacing)



Selection Criteria: Steel or Concrete Suitable, cont'd

- 1.5 inch asphalt wearing surface
- Non-zero skew
- Span lengths: approx. 100-140-100 ft, i.e., both structures as identical as possible (same span lengths, pier locations, etc) – Realistic span lengths for both steel and concrete alternatives.
- Composite, deck placed in a continuous pour
- Integral abutments



Selection Criteria: Steel or Concrete Suitable, cont'd

- Elastomeric bearings at pier supports
- Empirical deck design for interior bays
- Same collision loads for deck cantilevers
- Deck reinforcement: grade 60, epoxy coated
- Deck concrete $f'_c = 4000$ psi.
- Seismic zone 2, so additional work or detailing is not much and the bulk of the country is covered
- Substructures CIP, as is traditional practice



Selected Bridge: Quincy Ave over I-25

Selection Rationale:

- One of 3 candidates considered in detail
- It was the most “irregular” of the three with different support lines at different skew angles and unequal length spans.
- Other options: one had a highly unusual post-tensioned pier bent cap beam and while another was quite narrow.



Quincy Ave As-Built

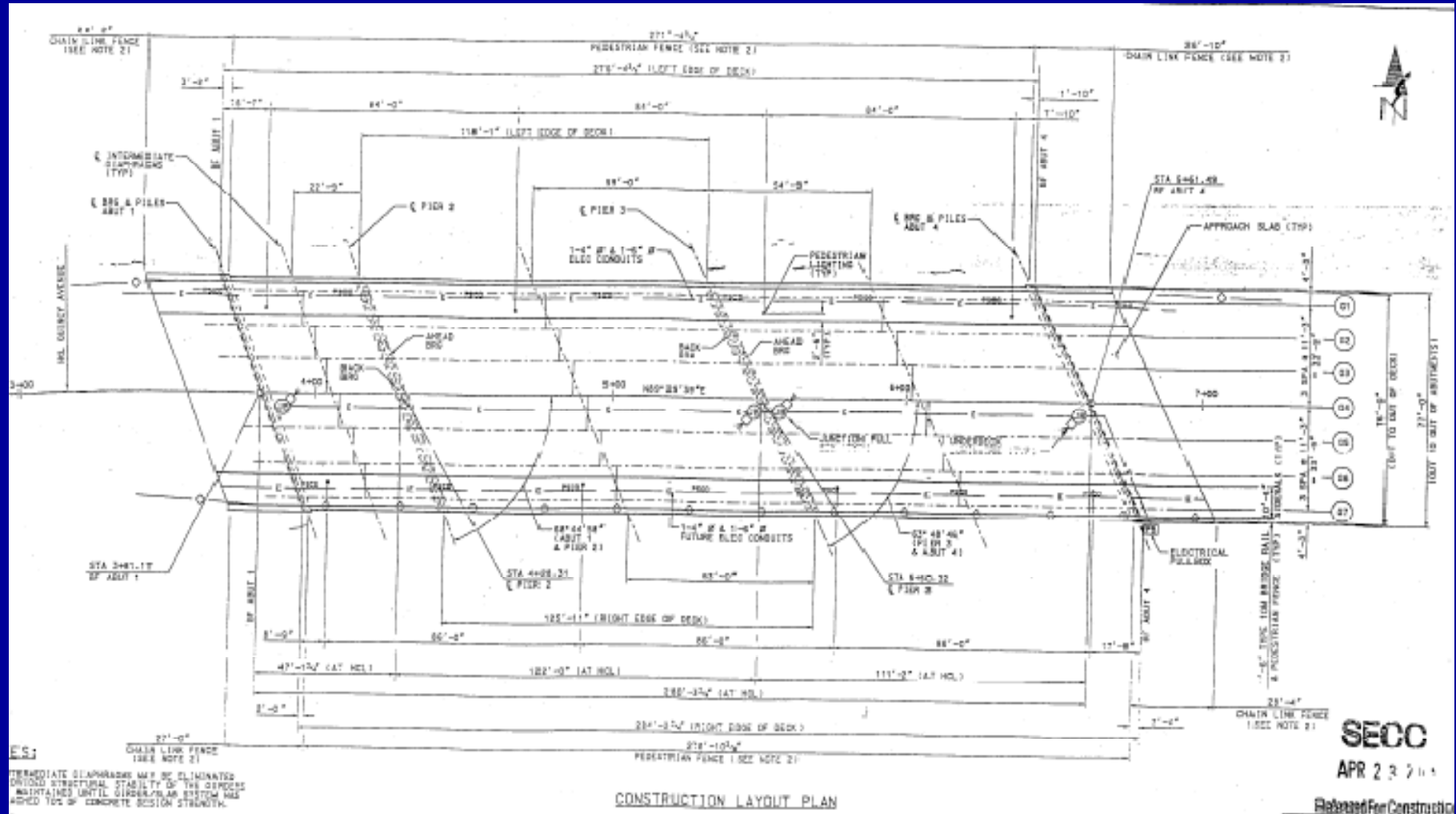


Features of Selected Bridge

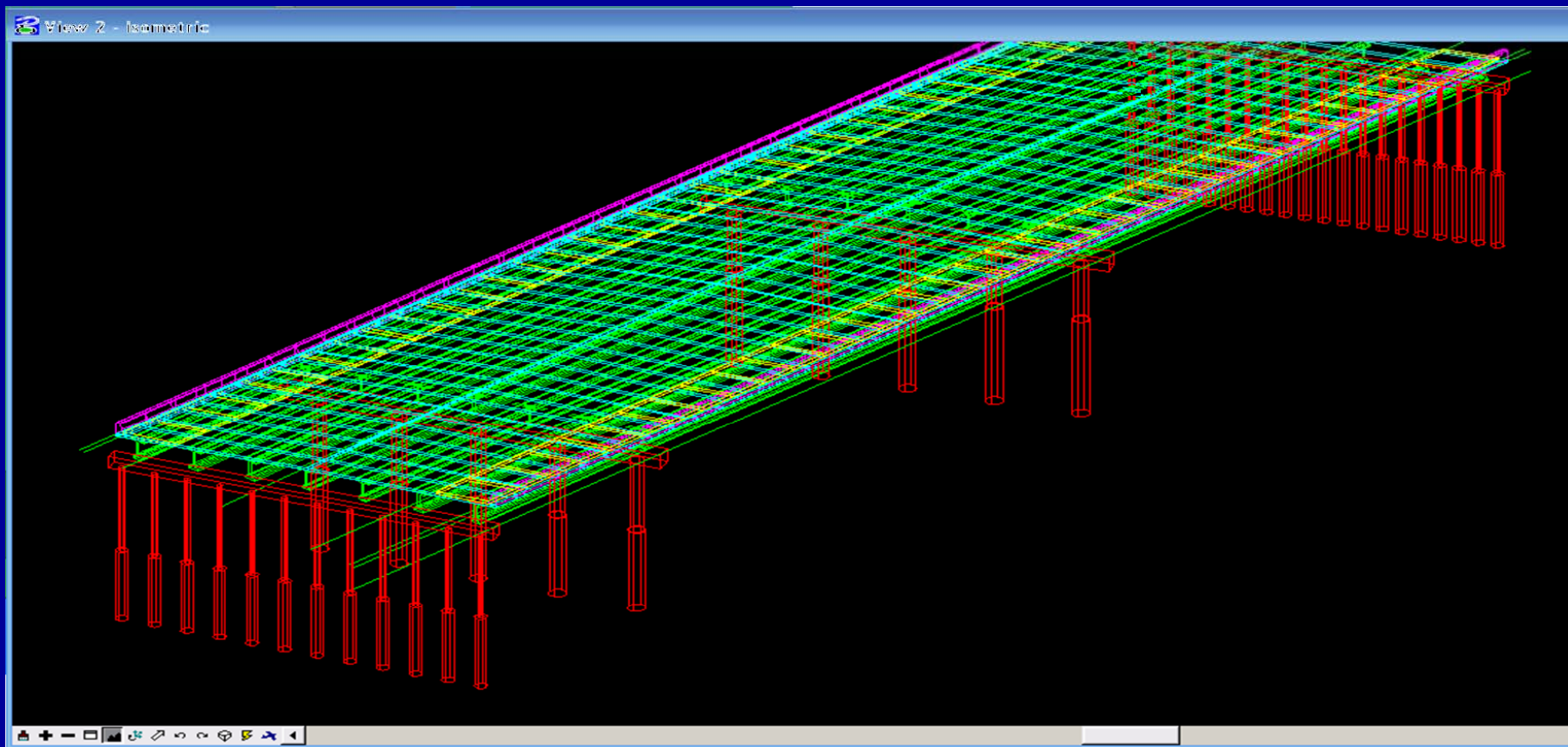
- 3 – span continuous
- Unequal length spans
- Two different skew angles
- 2 lanes ea. way + sidewalks
- Over busy interstate



Quincy Ave Bridge: Plan



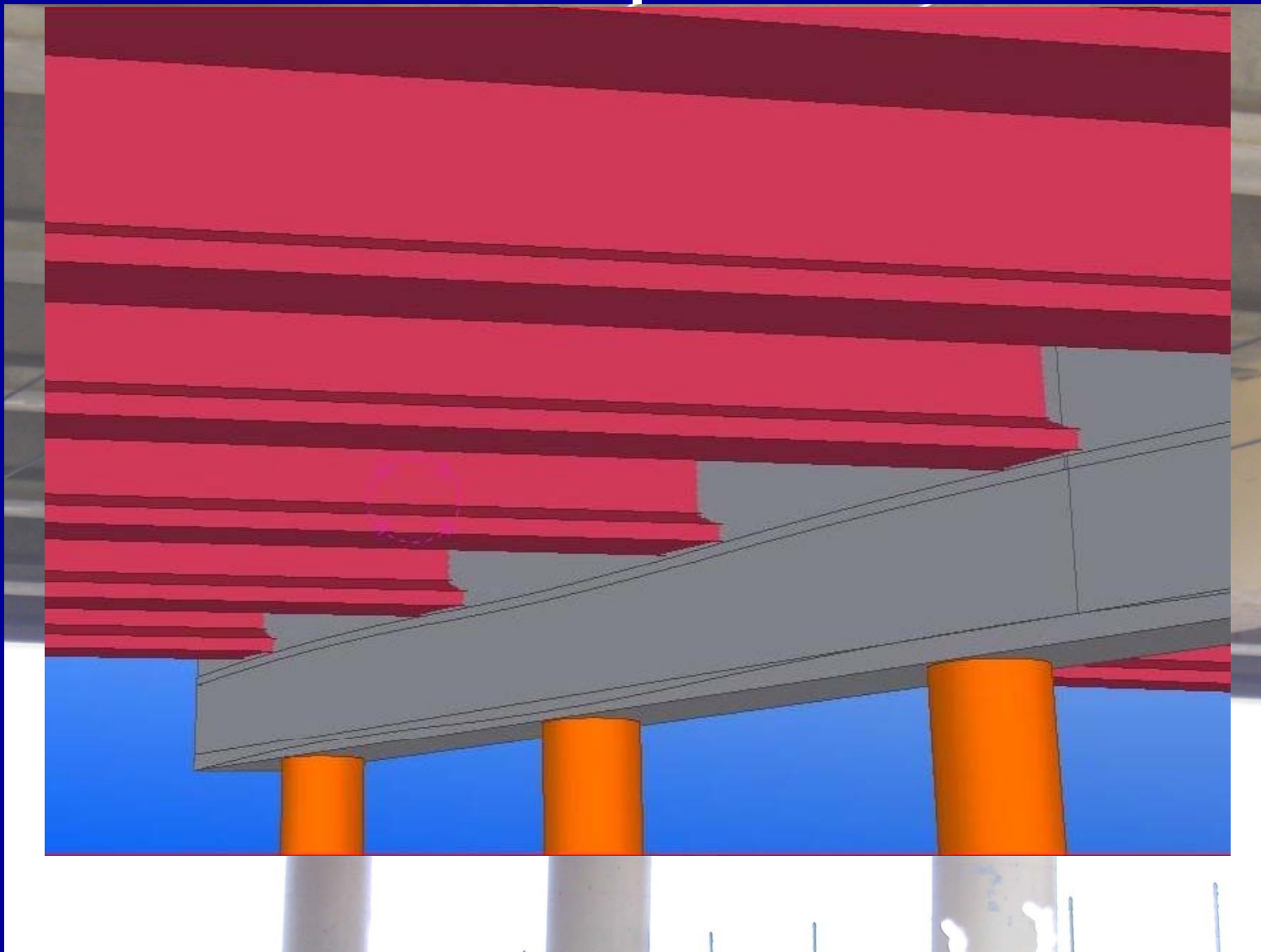
Model Developed: Concrete



Model Developed: Concrete



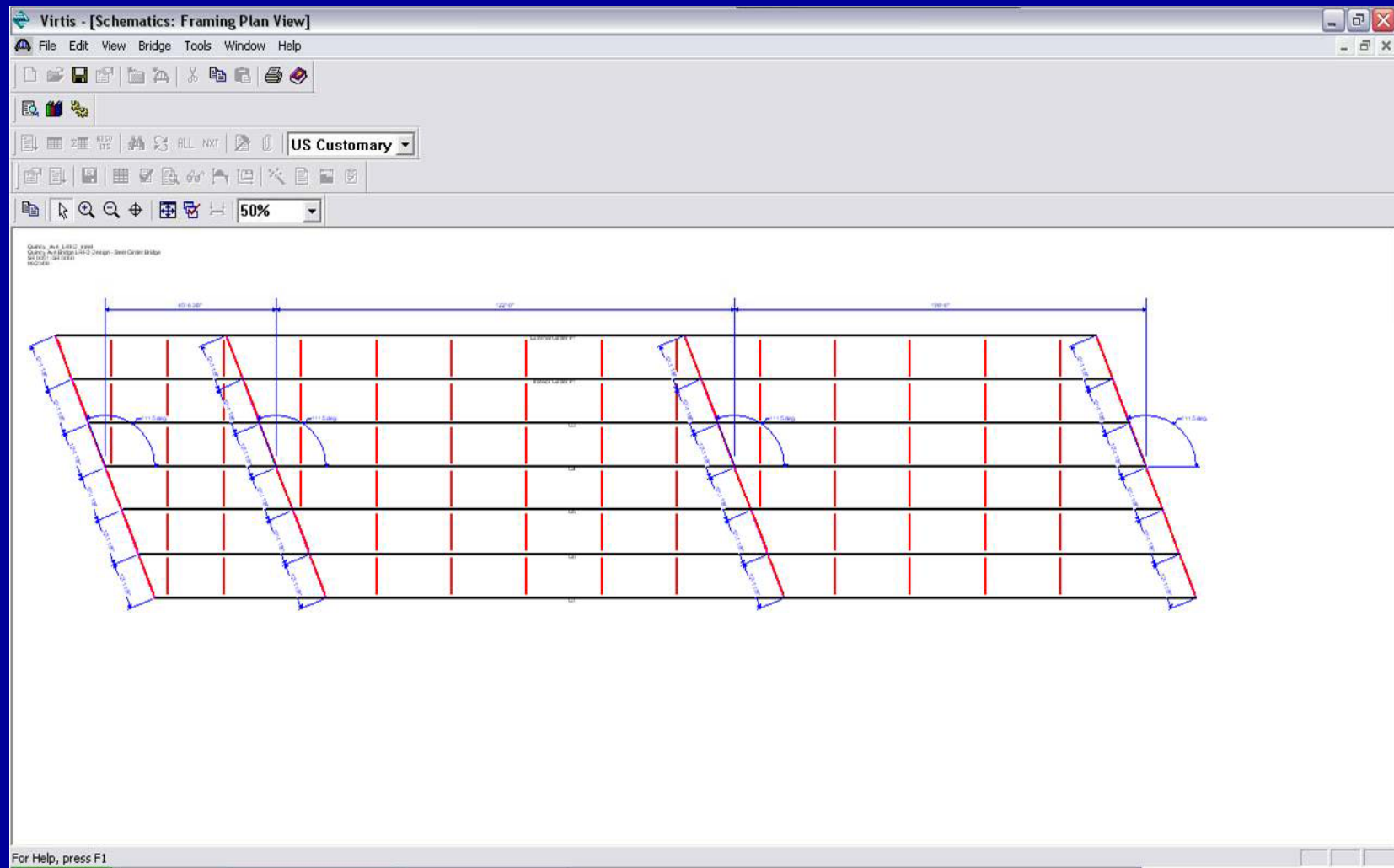
Model Developed: Concrete



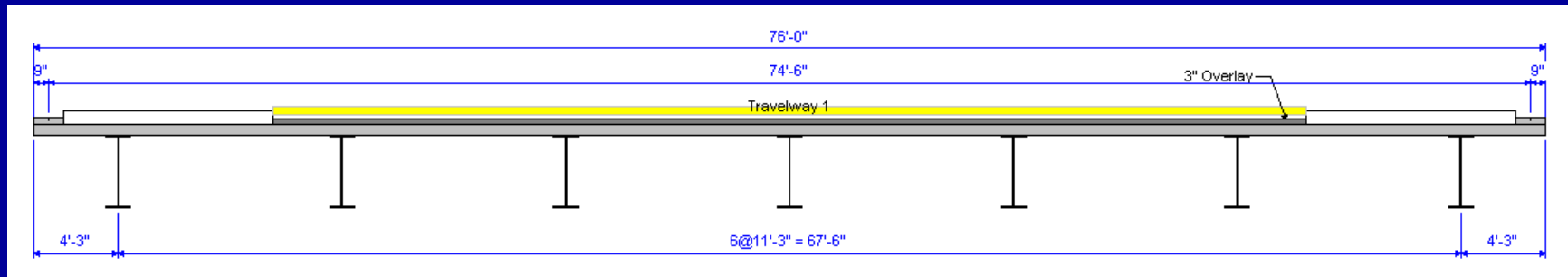
Model Developed: Steel Alternate



Model Developed: Steel Alternate (from AASHTOWare)



Model Developed: Steel Alternate (cont'd)



Selection of Suitable Commercially Available Software to Link to



Selection Criteria: Working Guidelines for Commercial Software Selection

- Use fewer, rather than more, applications or approaches. (The ideal case is to use only one if possible, although that is not the case.)
- Use fewer, rather than more, software developers/vendors
- When multiple developers are unavoidable, select those having cooperative relationships
- Use software that has been well evaluated, for example, via wide use
- Use software having a well-developed API



Commercial Software: Linkage Approaches

- DLLs (e.g. *WSFL – QCONBRIDGE*)
- VBA (e.g. *Bentley, MS Office (Excel)*)
- C#/.NET/API (e.g. *Tekla, BridgeWare CSI/SAP2000, Bentley BrIM Apps*)
- C/MDL (e.g. *Bentley*)
- CIS/2 (e.g. *Fabtrol*)
- XML (e.g. *Access, MathCad, LEAP, AASHTOWare Opis/Virtis/Pontis*)
- IFC (e.g. *Timberline Estimating*)
- Direct (e.g. *SAP – Tekla, EstimatingLink – MSProject, etc.*)



Linkage Approaches (e.g.)

Task	Application	Interface
Superstructure Design	QconBridge	DLL
Visualization	Tekla Structures	C++ Programming
	MicroStation	Visual Basic



Linkage Approaches (e.g.) cont'd

Task	Application	Interface
Elastic Dynamic Analysis	SAP 2000	File input/output
Design Check	MathCad	ODBC interface
Rating: Bridge Management	Virtis	XML/ Bridgeware DB
	Pontis	XML/ Bridgeware DB



Commercially Available Software Reviewed: Sample

	IBS (LEAP)			Tekla Structures			MS VBA etc.		
	partial	good	very good	partial	good	very good	partial	good	very good
Single data Entry			X	X					X
Parameterization			X	X					X
Inter-operability		X		Being developed					X
Reinforcing detailing		X				X		X	
Fabrication & construction drawing generation		X				X			X

