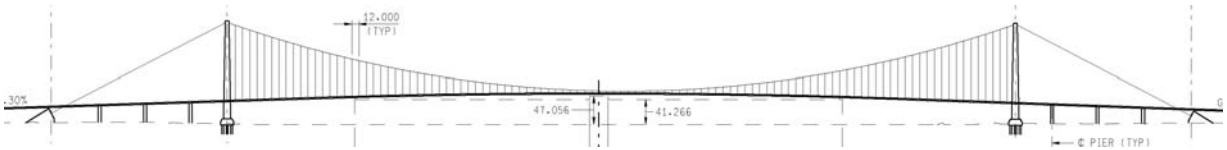
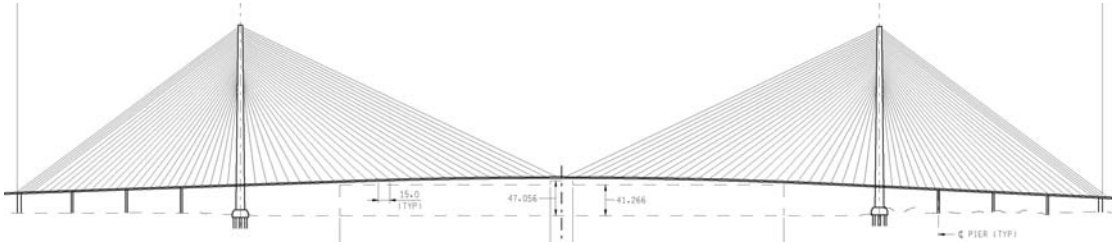
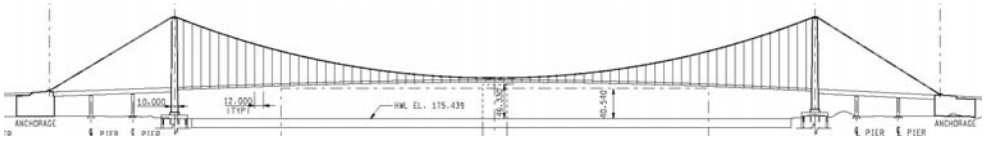
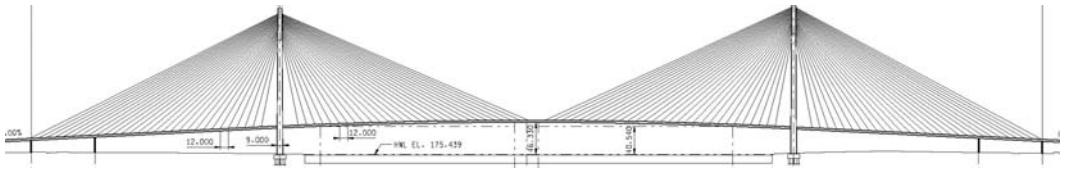
Draft

Bridge Conceptual Engineering Report

November 2007

Type Study Recommended Options (Land Piers)

Type Study Option Elevation	Type Study Option
X10(A)	
	Option 1
X10(B)	
	Option 4
	Option 7
X11(C)	
	Option 9
	Option 10

Conceptual Engineering Steps

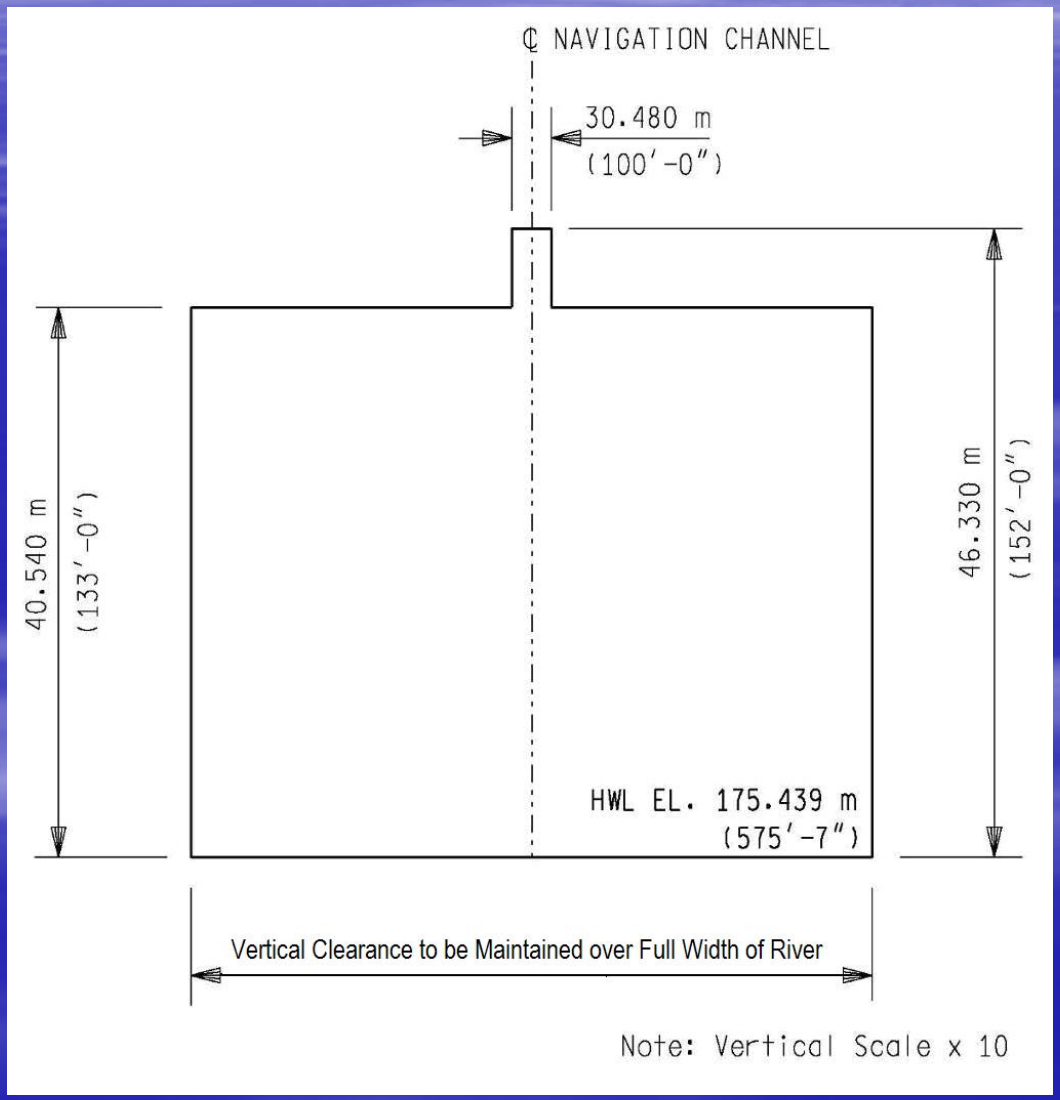
- Additional Engineering Detail
- Refined Cost Estimates/Schedules
- Coordination with Context Sensitive Solutions

Critical Design Criteria

- Navigation Envelope
- Cross-Section

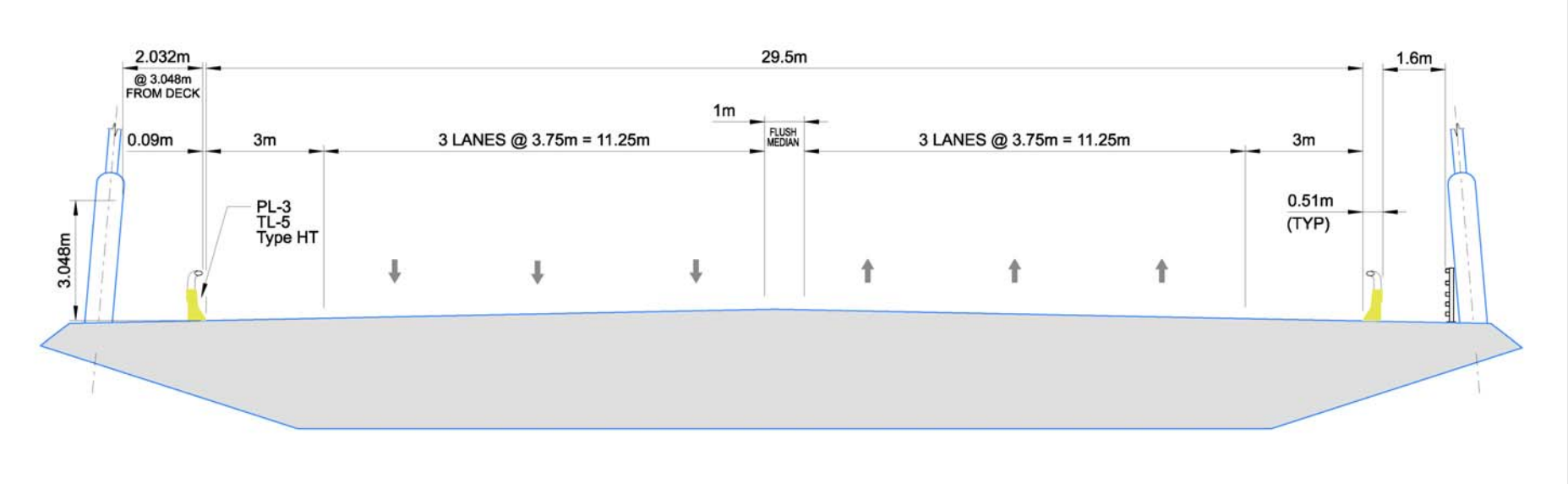
Design Criteria

– Navigation Envelope



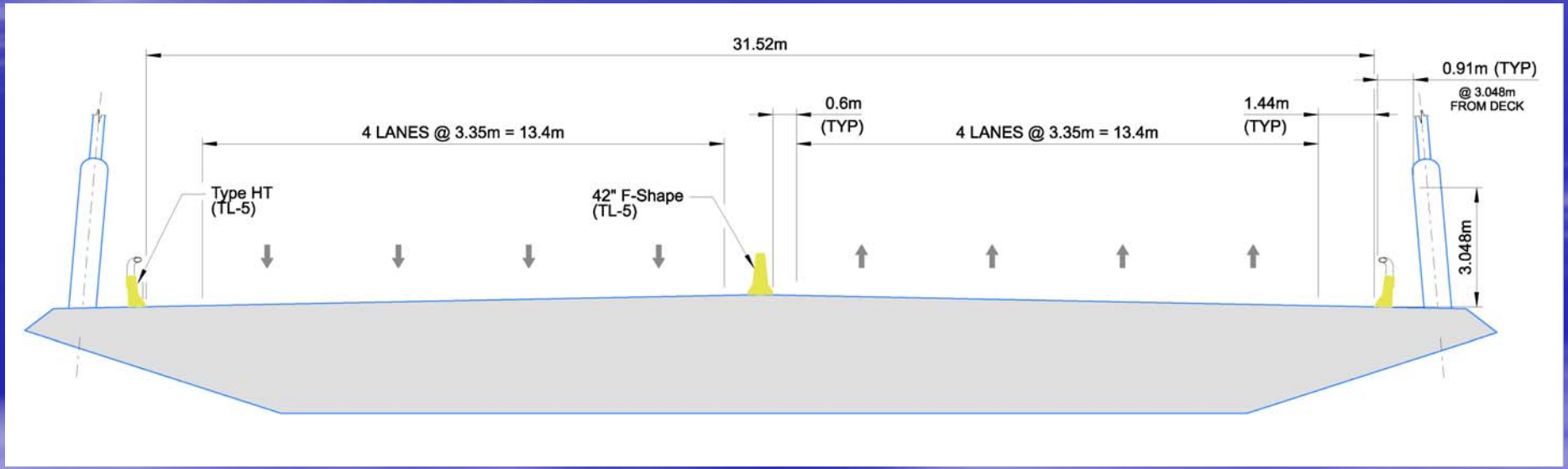
Design Criteria

– Proposed Cross Section

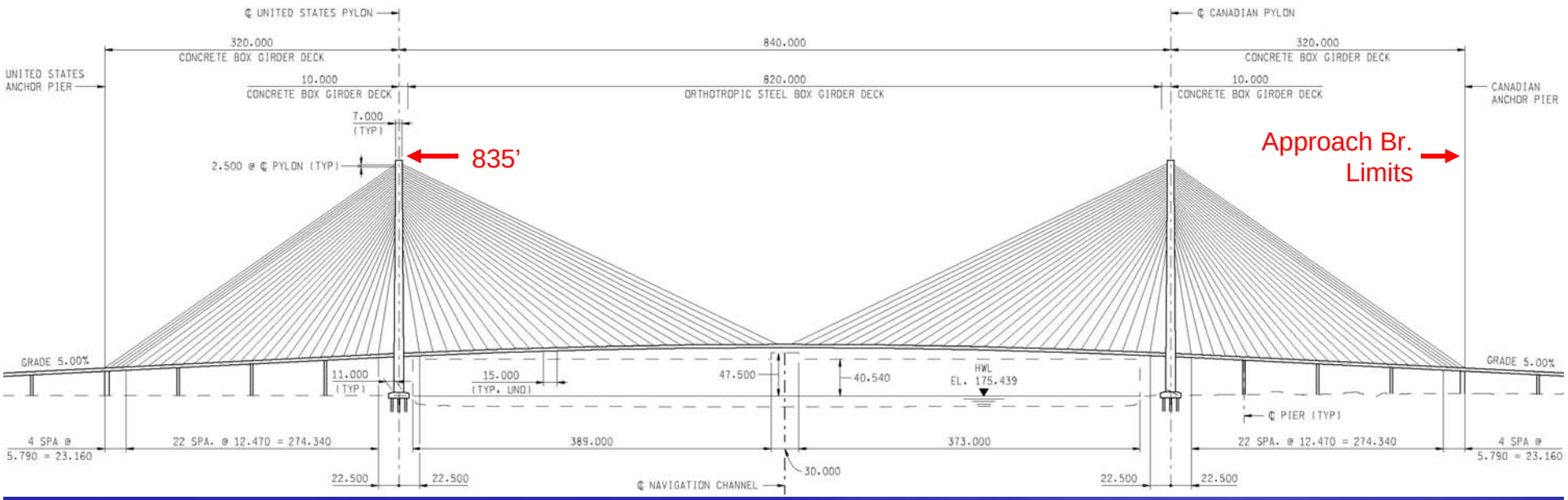


Design Criteria

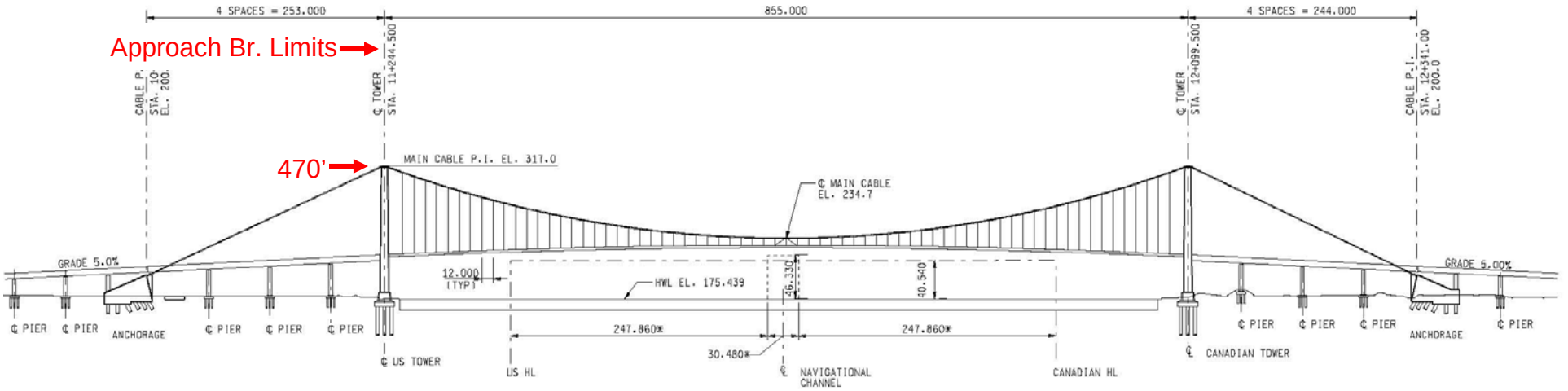
– Future Design Allowance Cross Section



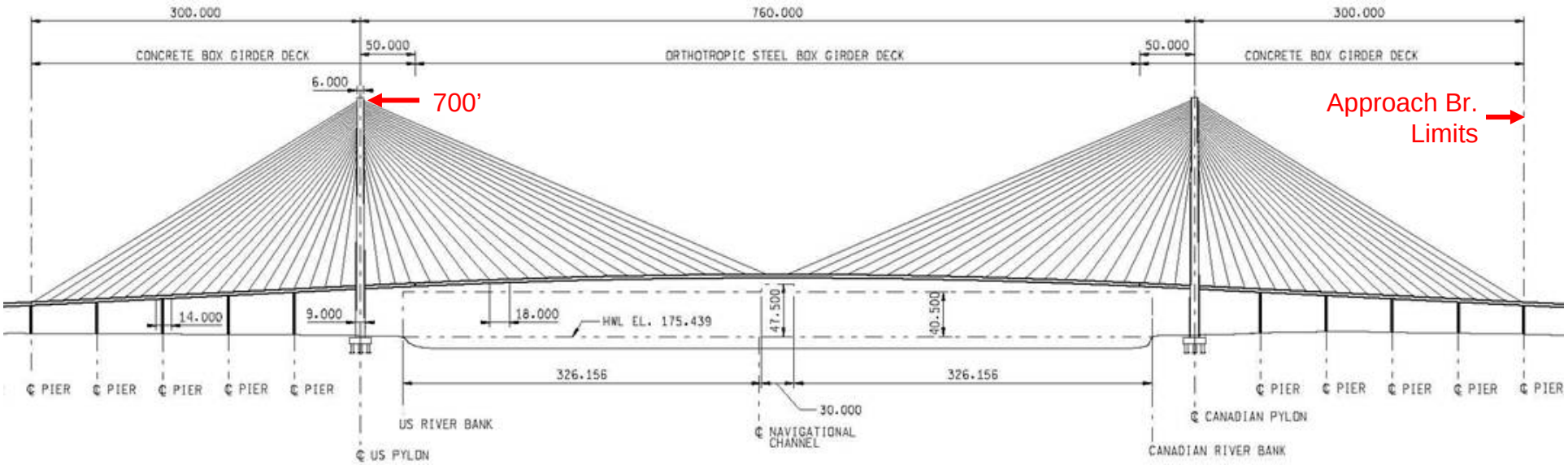
X-10(B): Option 4



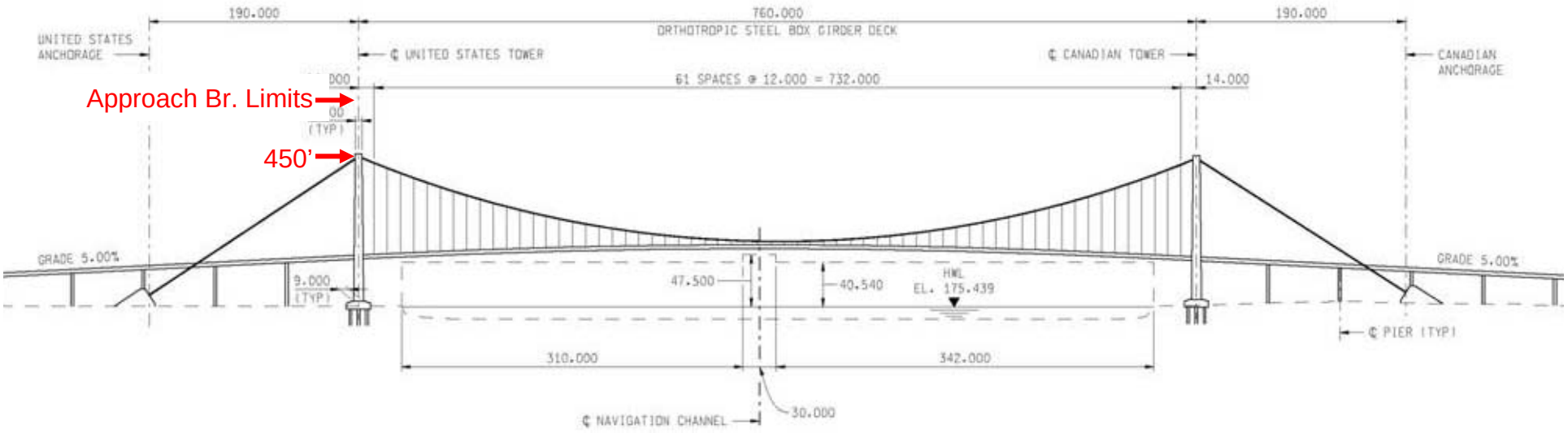
X-10(B): Option 7



X-11(C): Option 9



X-11(C): Option 10



Cost Estimate Basis

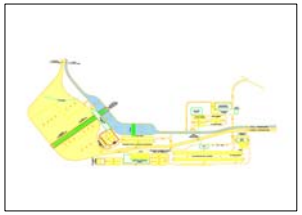
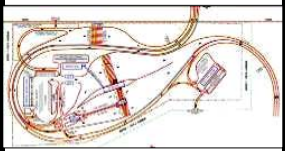
- Based on engineering of major components
- Based on quantities calculate from engineered components
- Unit prices from historical records and quotes from suppliers for major items
- Steel prices from North American suppliers

Total Bridge Cost

	X-10(B)		X-11(C)	
Option:	**4**	**7**	**9**	**10**
Main Bridge				
Bridge Construction Subtotal	319	336	272	300
Mobilization (5%)	16	17	14	15
Design Contingency (10%)	34	0	29	0
Construction Contingency (20%)	74	81	63	73
Subtotal	***442***	***487***	***377***	***435***
Approach Bridge				
Bridge Construction Subtotal	72	121	99	146
Mobilization (5%)	4	6	5	7
Design Contingency (25%)	19	32	26	38
Construction Contingency (20%)	19	32	26	38
Subtotal	***114***	***191***	***156***	***230***
Grand Total (Rounded)	**560**	**680**	**530**	**670**

- 2007 US$
- Canadian Plaza B/B1

Cost Division

Type Study Option	US Cost (millions)	Canadian Cost (millions)	Total[2] (millions)	US Plaza	Canadian Plaza
X10(B)					
Option 4 - Cable-Stayed Bridge				**P-a**	**B1**
Approaches	61	53	114		
Main Bridge	221	221	442		
Total	***282***	***274***	***560***		
Option 7 - Suspension Bridge					
Approaches	101	90	191		
Main Bridge	244	244	487		
Total	***344***	***334***	***680***		
X11(C)					
Option 9 - Cable-Stayed Bridge				**P-c**	**B**
Approaches	55	101	156		
Main Bridge	189	188.5	377		
Total	***243***	***290***	***530***		
Option 10 - Suspension Bridge					
Approaches	92	138	230		
Main Bridge	218	218	435		
Total	***309***	***356***	***670***		

Main Bridge Cost Issues

Cost Estimate (2007 US$)		4	7	9	10
Main Bridge		Cable-Stayed	Suspension (UB)	Cable-Stayed	Suspension (UB)
Superstructure					
Deck	Steel $ →	152,900,000	99,000,000	135,000,000	99,200,000
Suspension System		51,700,000	→ 85,300,000	37,000,000	60,200,000
Miscellaneous Appurtenances		22,200,000	14,400,000	20,300,000	12,700,000
subtotal		*226,800,000*	*198,700,000*	*192,300,000*	*172,100,000*
Substructure					
Tower/Pylon	→	54,500,000	23,800,000	48,500,000	27,200,000
Tower/Pylon Foundation		20,800,000	21,900,000	19,900,000	19,900,000
Anchorages/Anchor Piers	Anchorage	17,000,000	→ 91,300,000	11,100,000	→ 80,700,000
subtotal		*92,300,000*	*137,000,000*	*79,500,000*	*127,800,000*
Quantities Subtotal (rounded)		*319,000,000*	*336,000,000*	*272,000,000*	*300,000,000*
Mobilization	5%	16,000,000	16,800,000	13,600,000	15,000,000
Design Contingency[1]	10%	33,500,000	-	28,600,000	-
Design Contingency[1]	15%	-	52,900,000	-	47,300,000
Construction Contingency[2]	20%	73,700,000	81,100,000	62,800,000	72,500,000
Main Bridge Total (rounded)		**442,000,000**	**487,000,000**	**377,000,000**	**435,000,000**

- Buy America clause: potential savings $$ millions

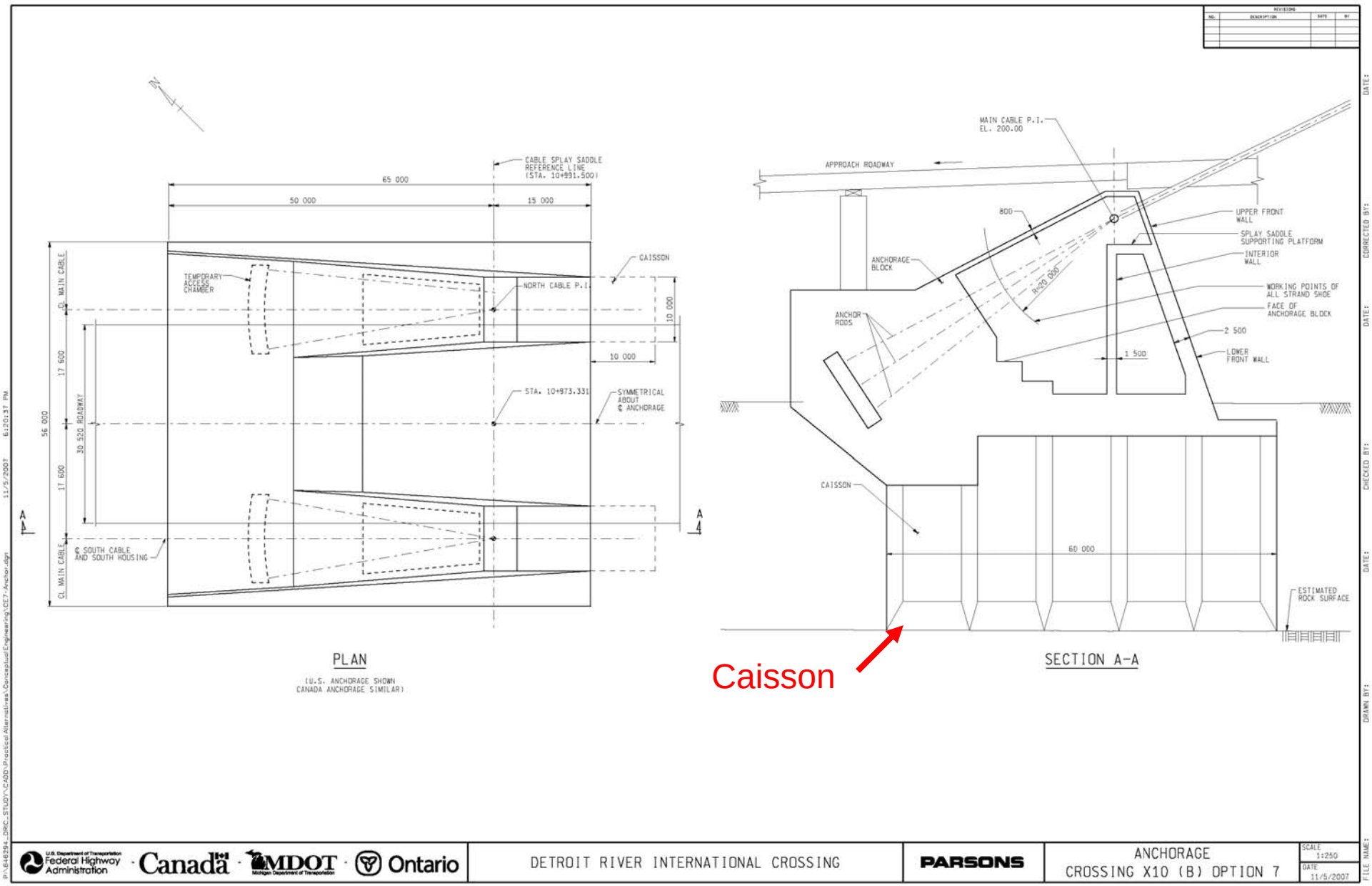
Schedule

- Crossing X-10(B)
  - Option 4 CS: 42
  - Option 7 Suspension: 46 months
- Crossing X-11(C)
  - Option 9 CS: 41
  - Option 10 Suspension: 44

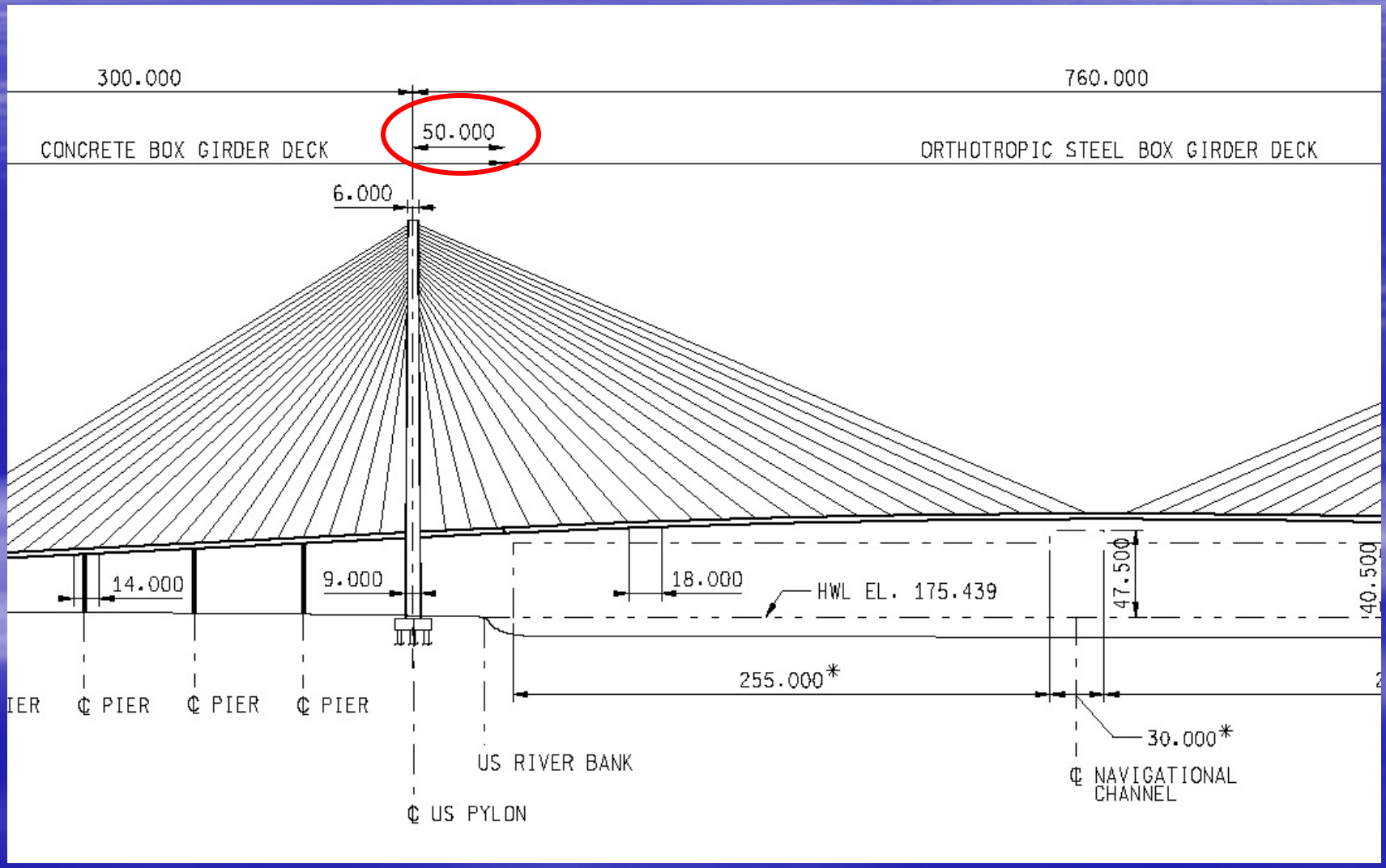
Engineering Issues

- General
  - Design criteria: Service life/Design life
- Suspension Bridge
  - Anchorage foundation design and construction
- Cable-Stayed Bridge
  - Transition from concrete to steel superstructure
  - Main Pylon foundation construction

Anchorage Design



Superstructure Transition



CE Report Conclusions

- Both structure types are still valid at each crossing
- The significant differentiator between corridors is cost
  - Differentiators require additional analysis

Preferred Alternative Next Steps

Investigation

- Geotechnical subsurface investigation

Analysis

- Anchorage/Pylon foundation
- Cost sensitivity to unit price volatility
- Superstructure investigation (CS)
  - Launching
  - Conc./steel transition
- Durability
- Security & Hardening