

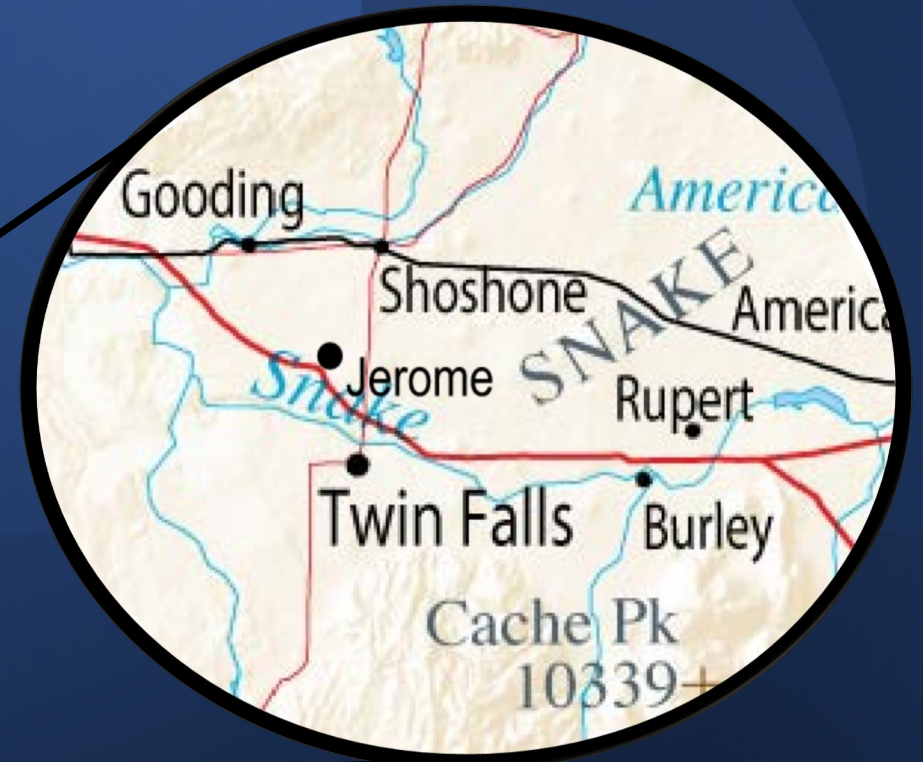
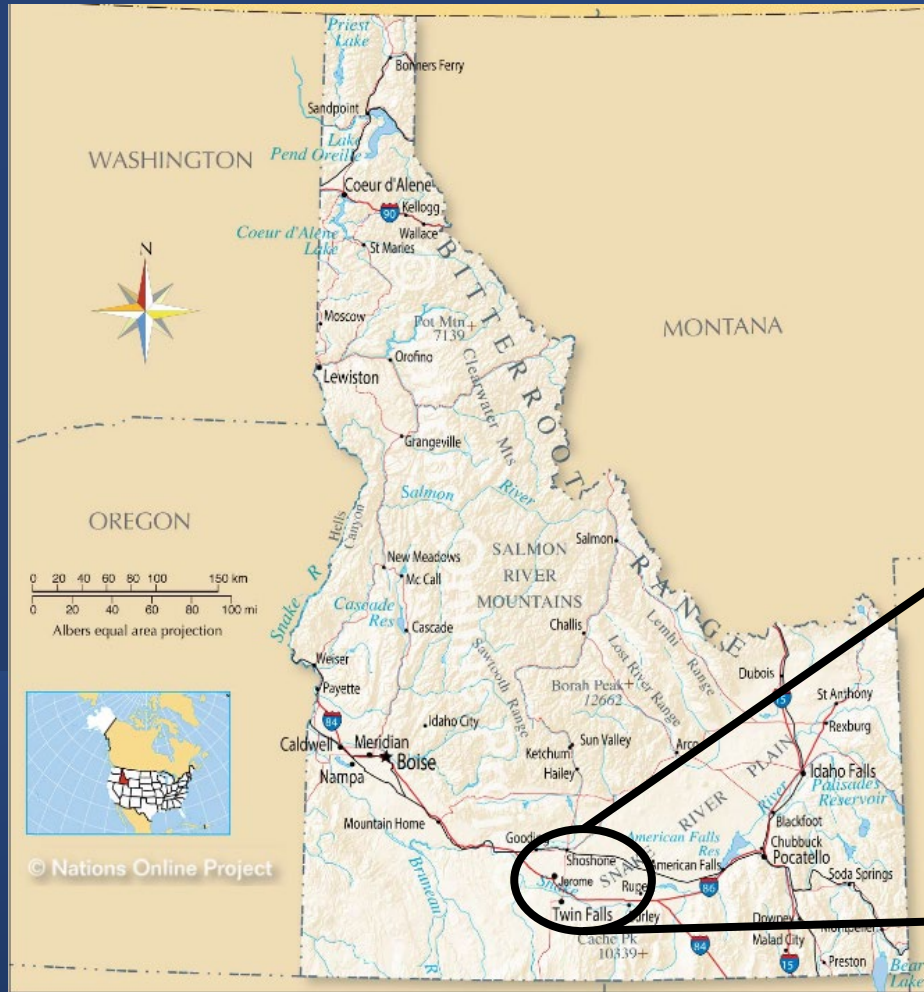


South Jerome Interchange: When Two Bridges are Better Than One



YOUR Safety ●●●▶ **YOUR Mobility** ●●●▶ **YOUR Economic Opportunity**

Project Location:



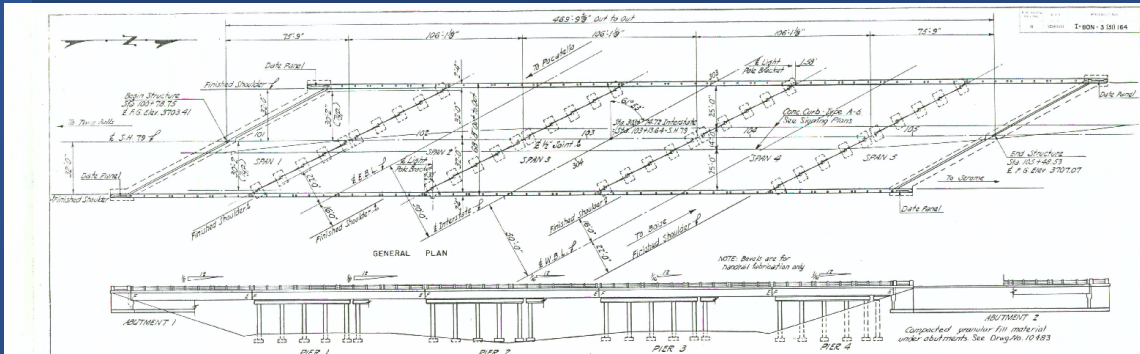
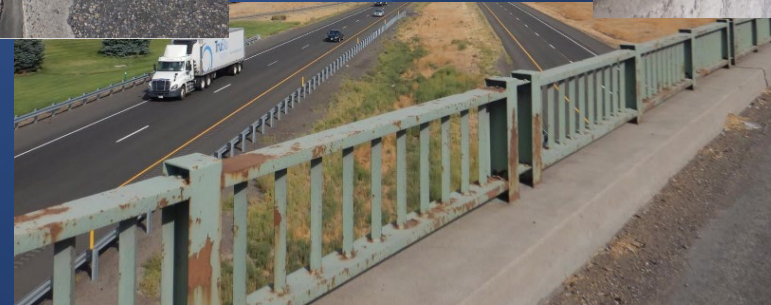
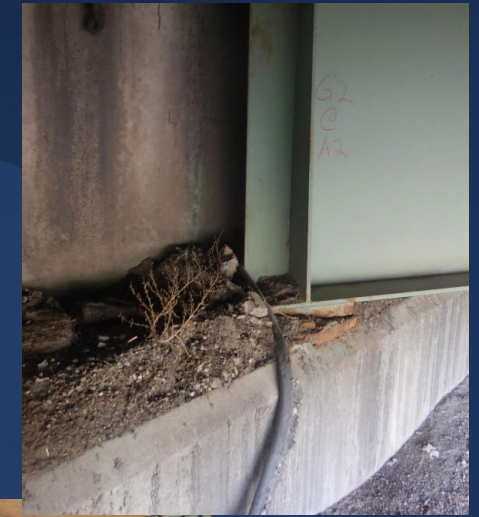
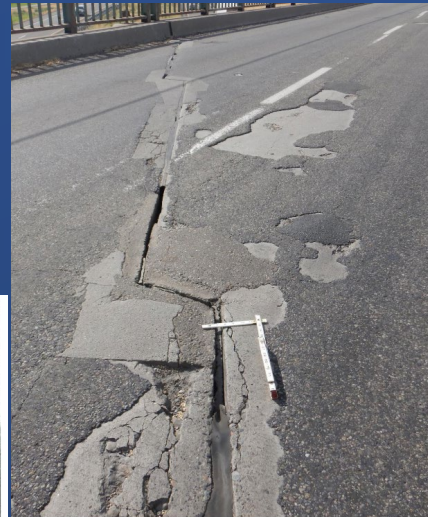
YOUR Safety ••• YOUR Mobility ••• YOUR Economic Opportunity

Project Location:



YOUR Safety ● ● ● ▶ **YOUR Mobility** ● ● ● ▶ **YOUR Economic Opportunity**

Existing Bridge:



DESIGN NOTES
Structure design in accordance with AASHTO Specification of 1989 & T-77(2).
Use Class 402.5B-4 or Alternate Loading for Analysis and Floor sections with spans under 40' see notes at Deck Spans with each sub-assembly being analyzed. Minimize impact.
Design with velocity 100 miles per hour.
Abutment and piers with design for a 3' live load surcharge.
Maximum loading for spans: Abutments 4000 psf, Piers 5000 psf.
Deck Slabs: Concrete Class A, 6, 3000 psi in Bridge, 4, 1700 psi in Retaining Walls, 3000 psi.
Structural Steel: A 36, 5, 20,000 psi, A 441, 5, 20,000 psi for 8" and under, A 441, 5, 20,000 psi for plates over 4" to 16" inclusive.

GENERAL NOTES
Use Idaho Department of Highways Standard Specifications, Edition of 1981, unless otherwise noted.
Changes in color (pines for spans 2, 3 & 4 shall be high strength bimodular structural steel (ASTM A 514)) all other structural steel shall be ASTM A 572-50.
The cost of bolting and painting high strength bolts shall be included in the unit price bid for item 0144 "Steel Bridge".
Bolt for field connections shall be high tensile strength bolts (ASTM A 325).
All concrete to be Class A No. 2 concrete aggregate, except concrete Class C may be required under pier footings.
Anchoring shall have a 4" covering outside of bars unless otherwise noted. Dimensions refer to outside of bars.
The cost of formwork and striking body cast steel, prepared inserts and sketched eye bolts shall be included in the unit price bid for item 0144 "Concrete Class A".
Concrete will be ready-mixed material and shall be placed with primary spread. Readings of slump test shall be obtained on similar methods.
Shall not use gravel materials in encasement, encasement on one side before having encasement and backfill with primary borrow.
Encasement shall be individually cast and shall have a diverter installed at top.
Fabrication and erection of steel bridge shall be in accordance with AASHTO Specifications of 1989.
The top surface of the top flanges of girders and surfaces to be field connected shall not be painted.

QUANTITIES

206-B	Dimension for Structures, Schedule No. 1	870	CY
213	Mechanical Bolting	2350	LBS
208-A1	Concrete, Class A, Schedule No. 1	582	CY
208-A2	Concrete, Class A, Schedule No. 2	782	CY
208-C	Concrete, Class C	40	CY
207-A	Steel Reinforcement, Schedule No. 1	67,542	LBS
207-B	Steel Reinforcement, Schedule No. 2	68,512	LBS
208-D	Steel Bridge Components, Item 01, 200	4.5	LS
209-D	Structural Steel Members for Concrete Structures	531.44	LBS
209-E	Self Lubricating Bronze Bearing Plate	4.5	

DRAWINGS

General Plan, Elevation, Area & Quantities	Eng. M. 1070
Deck Plan - Section A, Span 1 & 2	1071
Deck Plan - Section B, Spans 1 & 2 & Section Diagram for Structural Steel	1072
Deck Plan - Section C - Span 1 & 2 of Deck Details	1073
Deck Plan - Section D - Span 1 & 2 of Deck Details	1074
Deck Plan - Section E - Span 1 & 2 of Deck Details	1075
Deck Plan - Section F - Span 1 & 2 of Deck Details	1076
Deck Plan - Section G - Span 1 & 2 of Deck Details	1077
Deck Plan - Section H - Span 1 & 2 of Deck Details	1078
Deck Plan - Section I - Span 1 & 2 of Deck Details	1079
Deck Plan - Section J - Span 1 & 2 of Deck Details	1080
Deck Plan - Section K - Span 1 & 2 of Deck Details	1081
Deck Plan - Section L - Span 1 & 2 of Deck Details	1082
Deck Plan - Section M - Span 1 & 2 of Deck Details	1083
Deck Plan - Section N - Span 1 & 2 of Deck Details	1084
Deck Plan - Section O - Span 1 & 2 of Deck Details	1085
Deck Plan - Section P - Span 1 & 2 of Deck Details	1086
Deck Plan - Section Q - Span 1 & 2 of Deck Details	1087
Deck Plan - Section R - Span 1 & 2 of Deck Details	1088
Deck Plan - Section S - Span 1 & 2 of Deck Details	1089
Deck Plan - Section T - Span 1 & 2 of Deck Details	1090
Deck Plan - Section U - Span 1 & 2 of Deck Details	1091
Deck Plan - Section V - Span 1 & 2 of Deck Details	1092
Deck Plan - Section W - Span 1 & 2 of Deck Details	1093
Deck Plan - Section X - Span 1 & 2 of Deck Details	1094
Deck Plan - Section Y - Span 1 & 2 of Deck Details	1095
Deck Plan - Section Z - Span 1 & 2 of Deck Details	1096

470 STEEL & CONCRETE UNDERPASS
INTERCHANGE NO. 2
STA. 303+74.72
ESBONE CO.
STATE OF IDAHO
DEPARTMENT OF HIGHWAYS
DATE: 7-18-63
BY: H. H. ...
SCALE: 1/8" = 1'-0"
NO. 1333
DATE: 10, 470

Revised 7-31-63

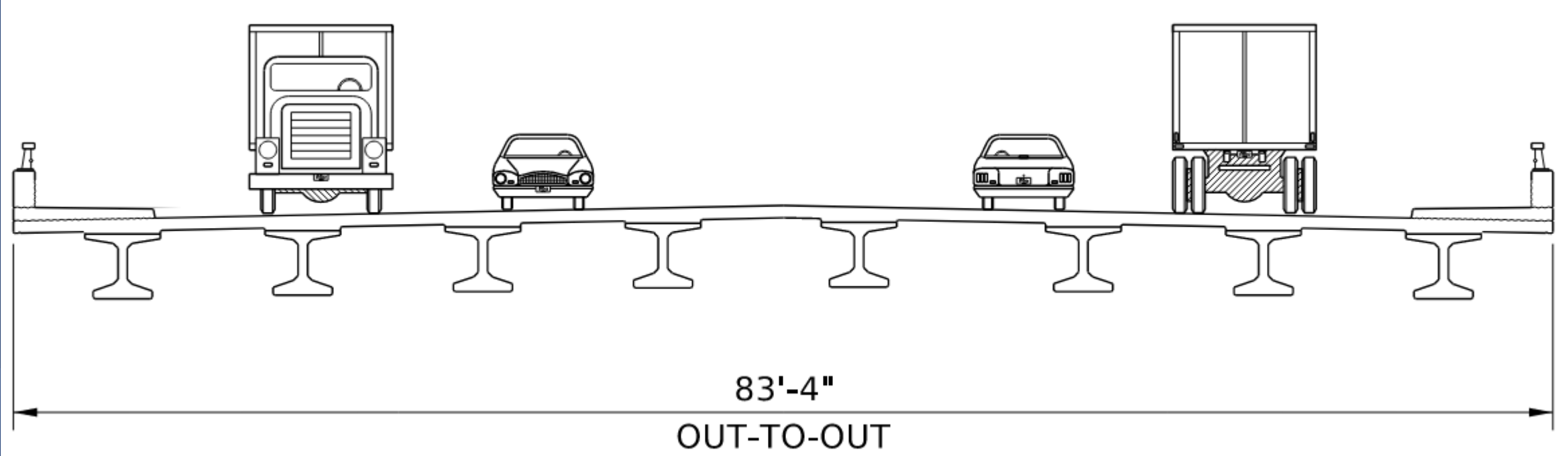


Bridge Replacement Requirements:

- 4 – 12' Lanes
- 1 – Center Turn Lane
- 3' Shoulders
- 2 – 6.5' Bike/Ped Path
- MASH Rated Pedestrian Rails
- Skew < 45 deg *preferred*



Bridge Typical Section:



VE Study:

IDEA NO.	DESCRIPTION	DESIGN OPTION*
1	Realign Bob Barton to the south to align with east frontage road south.	X
2	Alt. 3 Same alignment, reduce abutment and pier skews	
3	Use Alt. 10 and modify Alt 10 (DPL) to split southbound off-ramp	
4	Take the frontage road north (i.e. towards Walmart)	X
5	Take eastbound off-ramp exits into frontage road	X
6	Approach county & city for funding (frontage road realignment)	X
7	Construct I-84 over Lincoln Avenue (raising the main line)	
8	Take westbound off-ramp into east frontage road	X
9	A true No-Build Alternative	
10	No bridge rebuild with this project, utilize existing bridge and construct other improvements	
11	Left hand exit on both (westbound & eastbound) with three signals	
12	Alternative 3 plus new idea 1, plus take frontage road behind Walmart.	
13	Add Eastbound & westbound flyovers and put SPUI on north side (Alt 14)	
14	Alternative 14 add west bound fly-over intersect with eastbound off-ramp north of new bridge	
15	Diverging diamond (would require moving frontage roads)	
16	Reduce I-84 median (to shorten span), remove or re-align interstate	
17	Bridge cross section	X
18	Adjust shoulder s/w widths within standards	X
19	Use vertical abutments instead of 2:1 slopes	X
20	Dog-bone interchange	
21	Retaining wall optimization (fill vs wall)	X
22	Lincoln split diamond	
23	Lincoln square-a-bout	
24	Lincoln rotary with underpass	
25	Lincoln rotary with signals	
26	Yakima/Lincoln split diamond (variation of Alternative 7)	
27	Alternative 9 with City Comp Plan Alt. #2 (partial clover)	
28	Incorporate City Comp Plan Alt #1	
29	Utilize City Comp Plan Alt #2 with replacing bridge and leaving ramps in same location	
30	Flip Alternative 14, with uniform signal spacing	
31	Use One-lane on ramps	X

*The team identified some ideas as Design Options that could work with any alternative.



IDEA NO.	DESCRIPTION	DESIGN OPTION*
1	Realign Bob Barton to the south to align with east frontage road south.	X
3	Use Alt. 10 and modify Alt 10 (DPL) to split southbound off-ramp	
10	No bridge rebuild with this project, utilize existing bridge and construct other improvements	
14	Alternative 14 add west bound fly-over intersect with eastbound off-ramp north of new bridge	
25	Lincoln rotary with signals	



VE Alternatives:

Three Bridge Alternatives:

1. Single, 2-Span Bridge on Same Alignment
2. Single, 2-Span Bridge with Slight Alignment Adjustment
3. Two Twin Bridges, 2-Span Bridges on New Alignment



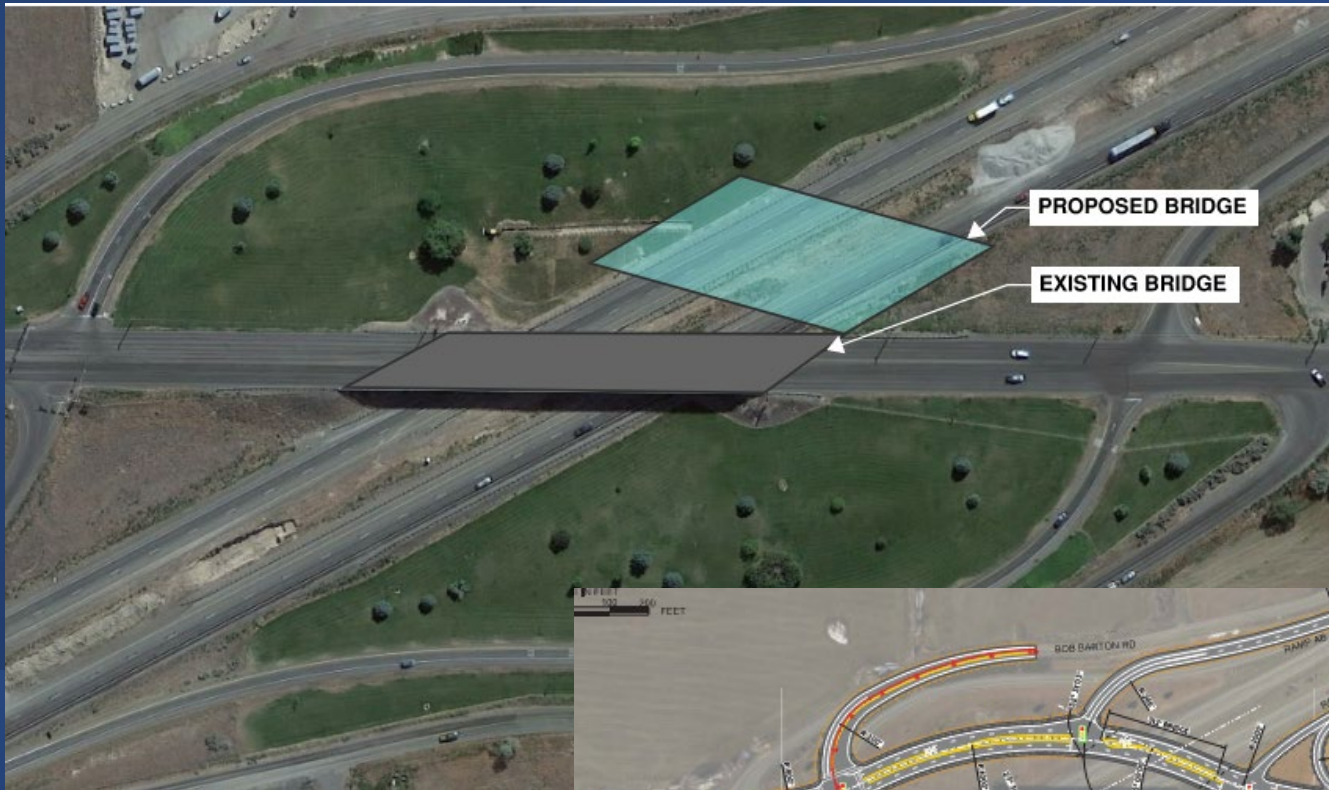
Bridge Alternative 1:



- 62 deg skew
- 83'-4" wide
- 2 Spans at 240'
- 480' Total Length
- \$17.2M



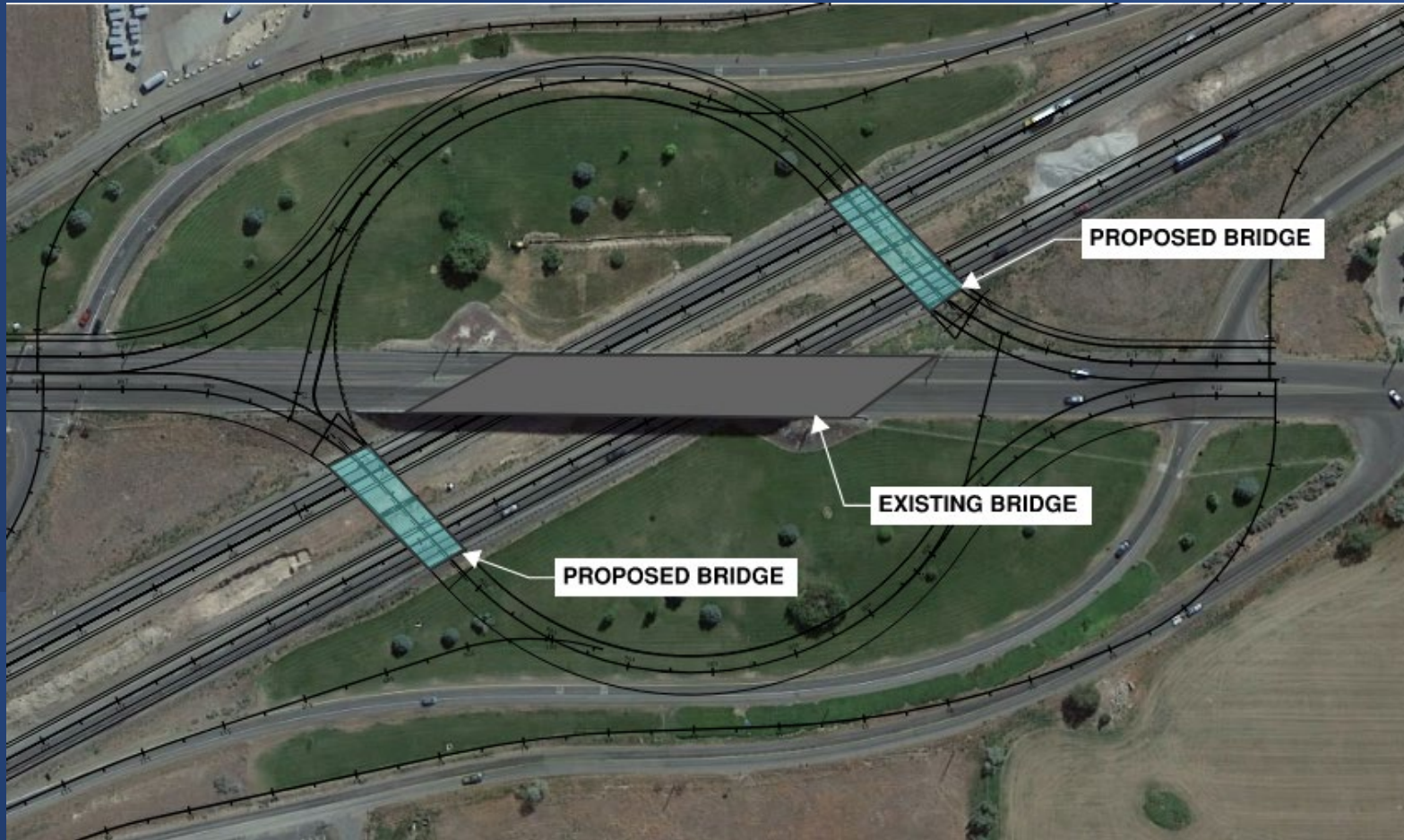
Bridge Alternative 2:



- 45 deg skew
- 83'-4" wide
- 2 Spans at 160'
- 320' Total Length
- \$11.5M



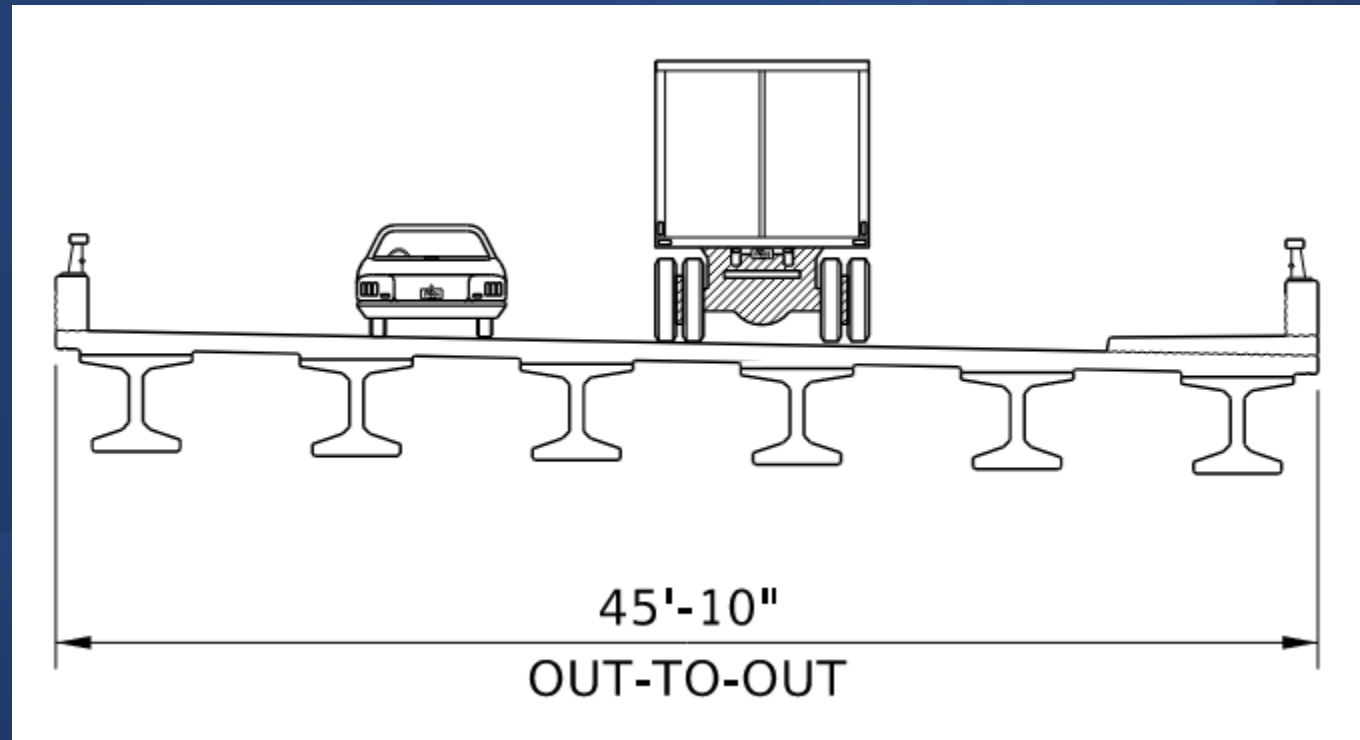
Bridge Alternative 3:



- 15 deg skew
- 2 – Twin Bridges
- 45'-10" wide
- 2 Spans at 84'
- 169' Total Length
- \$5.6M



Bridge Alternative 3: Typical Section



Advantages & Disadvantages:

	Total Project Cost	Operations				Construction		Bridge			
		Accommodates I-84 Widening	Bike/Pedestrian Facilities	Center Turn Lane	Addresses Traffic Flow Issues	Minimize Const. Staging Impacts	Simplified Construction	Reduces Skew to < 45 deg	Simplified Design	Reduce Maintenance	No Grade Raise
Bridge Only	\$17M	X	X	X							
Alternative 1	\$36M	X	X	X							
Alternative 2	\$32M	X	X	x		X		X			
Alternative 3	\$32M	X	X	N/A	X	X	X	X	X	X	X



Advantages & Disadvantages:

Reduced Skew

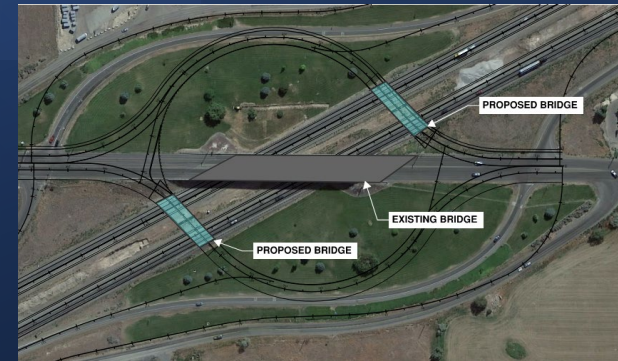
- Simplify Design – Standard ITD bridge design
 - WF42G girders with CIP Deck
 - Integral abutments
 - 3 ~ 4' Dia Column on 6' Dia Drilled Shafts
- Simplify Construction
 - Longer span steel girders
 - High skew construction complications
 - Contractors more familiar with this type of bridge
 - Construction Staging
- Reduced Maintenance
 - Integral abutment
 - Simplify Inspection



Advantages & Disadvantages:

Reduced Skew:

- Bridge Only - 62°
- Alternative 1 - 62°
- Alternative 2 - 45°
- Alternative 3 - 15°



Advantages & Disadvantages:

Simplified Design:

- Steel Girder With High Skew
 - NCHRP 725
 - AASHTO Eq. 4.6.3.3.2-2

$$I_S = \frac{w_g \tan \theta}{L_s}$$

Table 3-1. Matrix for recommended level of analysis—I-girder bridges.

Response	Geometry	Worst-Case Scores		Mode of Scores	
		Traditional 2D-Grid	1D-Line Girder	Traditional 2D-Grid	1D-Line Girder
Major-Axis Bending Stresses	C ($I_C \leq 1$)	B	B	A	B
	C ($I_C > 1$)	D	C	B	C
	S ($I_S < 0.30$)	B	B	A	A
	S ($0.30 \leq I_S < 0.65$)	B	C	B	B
	S ($I_S \geq 0.65$)	D	D	C	C
Vertical Displacements	C&S ($I_C > 0.5$ & $I_S > 0.1$)	D	F	B	C
	C ($I_C \leq 1$)	B	C	A	B
	C ($I_C > 1$)	F	D	F	C
	S ($I_S < 0.30$)	B	A	A	A
	S ($0.30 \leq I_S < 0.65$)	B	B	A	B
Cross-Frame Forces	S ($I_S \geq 0.65$)	D	D	C	C
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	F	F	F	C
	C ($I_C \leq 1$)	C	C	B	B
	C ($I_C > 1$)	F	D	C	C
	S ($I_S < 0.30$)	NA ^a	NA ^a	NA ^a	NA ^a
Flange Lateral Bending Stresses	S ($0.30 \leq I_S < 0.65$)	F ^b	F ^c	F ^b	F ^c
	S ($I_S \geq 0.65$)	F ^b	F ^c	F ^b	F ^c
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	F ^b	F ^c	F ^b	F ^c
	C ($I_C \leq 1$)	C	C	B	B
	C ($I_C > 1$)	F	D	C	C
Girder Layover at Bearings	S ($I_S < 0.30$)	NA ^d	NA ^d	NA ^d	NA ^d
	S ($0.30 \leq I_S < 0.65$)	F ^b	F ^c	F ^b	F ^c
	S ($I_S \geq 0.65$)	F ^b	F ^c	F ^b	F ^c
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	F ^b	F ^c	F ^b	F ^c
	C ($I_C \leq 1$)	NA ^e	NA ^e	NA ^e	NA ^e
Girder Layover at Bearings	C ($I_C > 1$)	NA ^e	NA ^e	NA ^e	NA ^e
	S ($I_S < 0.30$)	B	A	A	A
	S ($0.30 \leq I_S < 0.65$)	B	B	A	B
	S ($I_S \geq 0.65$)	D	D	C	C
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	F	F	F	C



Advantages & Disadvantages:

Simplified Design:

- Steel Girder With High Skew
 - NCHRP 725
 - AASHTO Eq. 4.6.3.3.2-2

$$I_S = \frac{w_g \tan \theta}{L_s}$$

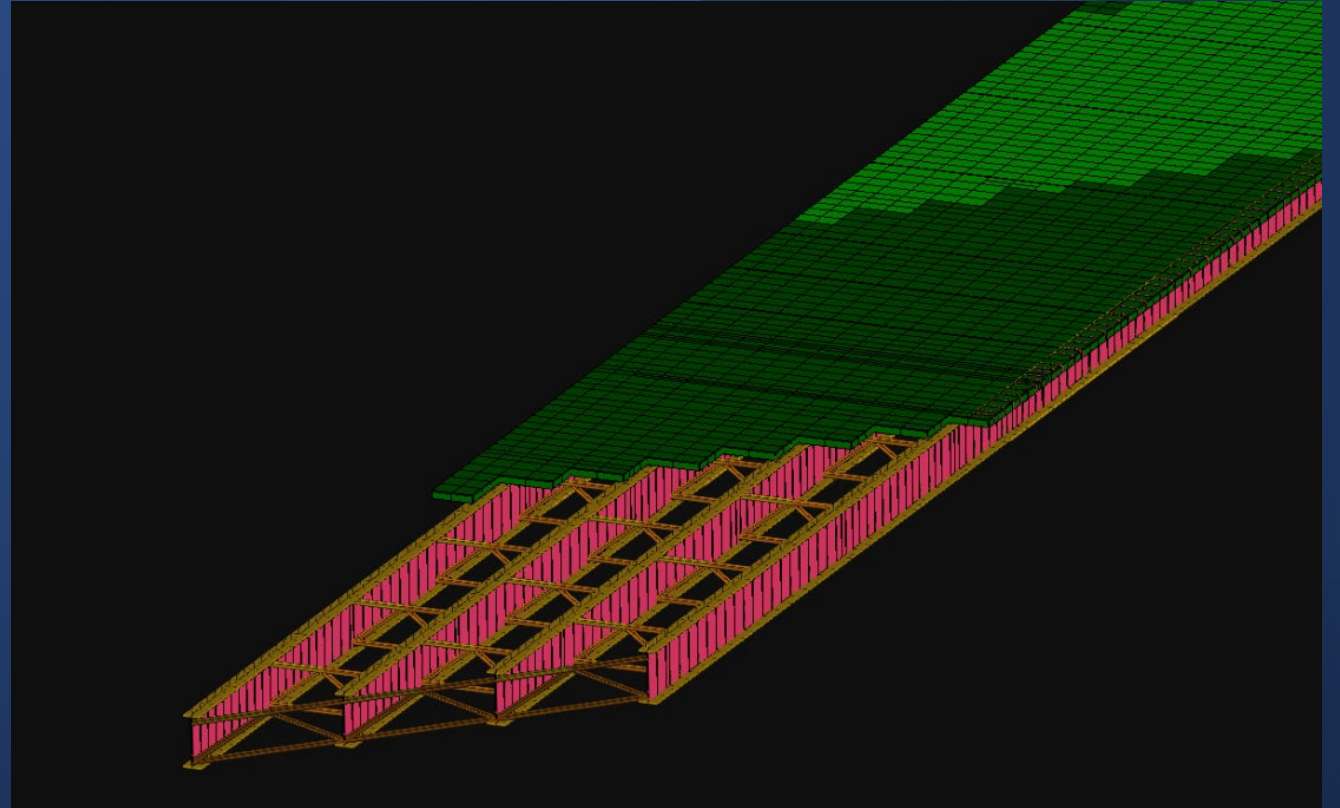
Response	Geometry	Worst-Case Scores		Mode of Scores	
		Traditional 2D-Grid	1D-Line Girder	Traditional 2D-Grid	1D-Line Girder
Major-Axis Bending Stresses	C ($I_c \leq 1$)	B	B	A	B
	C ($I_c > 1$)	D	C	B	C
	S ($I_s < 0.30$)	B	B	A	A
	S ($0.30 < I_s < 0.65$)	B	C	B	B
	S ($I_s \geq 0.65$)	D	D	C	C
	C&S ($I_c > 0.5$ & $I_s > 0.1$)	D	F	B	C
Cross-Frame Forces	C ($I_c \leq 1$)	C	C	B	B
	C ($I_c > 1$)	F	D	C	C
	S ($I_s < 0.30$)	NA ^a	NA ^a	NA ^a	NA ^a
	S ($0.30 < I_s < 0.65$)	F ^b	F ^c	F ^b	F ^c
	S ($I_s \geq 0.65$)	F ^b	F ^c	F ^b	F ^c
	C&S ($I_c > 0.5$ & $I_s > 0.1$)	F ^b	F ^c	F ^b	F ^c



Advantages & Disadvantages:

Simplified Design:

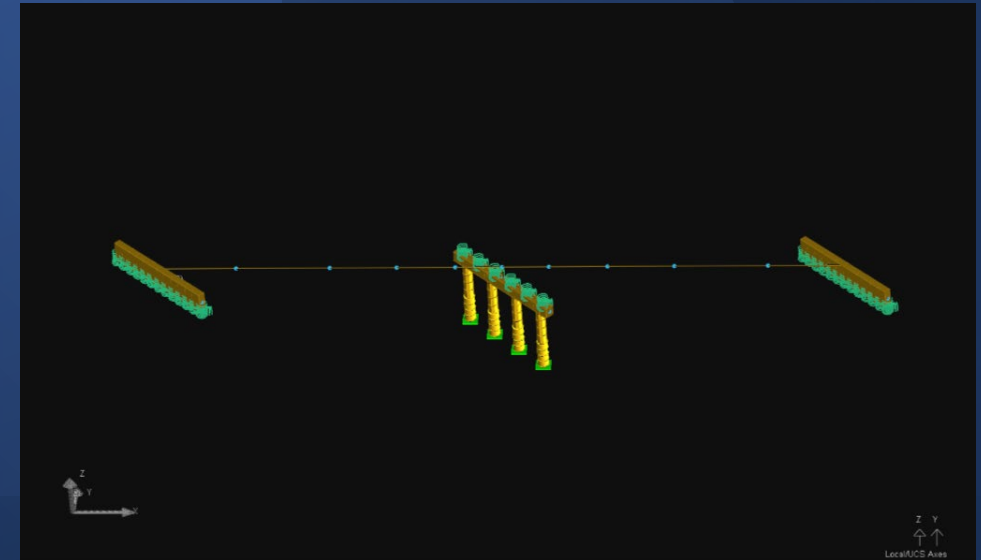
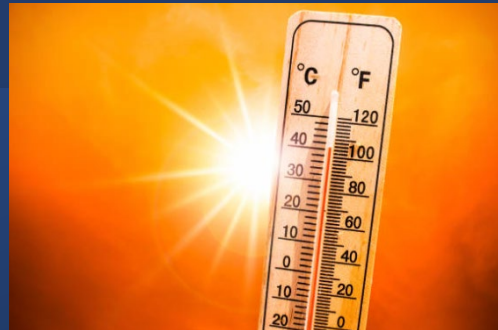
- Steel Girder With High Skew
 - NCHRP 725
 - AASHTO Eq. 4.6.3.3.2-2



Advantages & Disadvantages:

Simplified Design:

- Steel Girder With High Skew
 - NCHRP 725
 - AASHTO Eq. 4.6.3.3.2-2
- Temperature Acting The Skewed Structure



Advantages & Disadvantages:

Simplified Design:

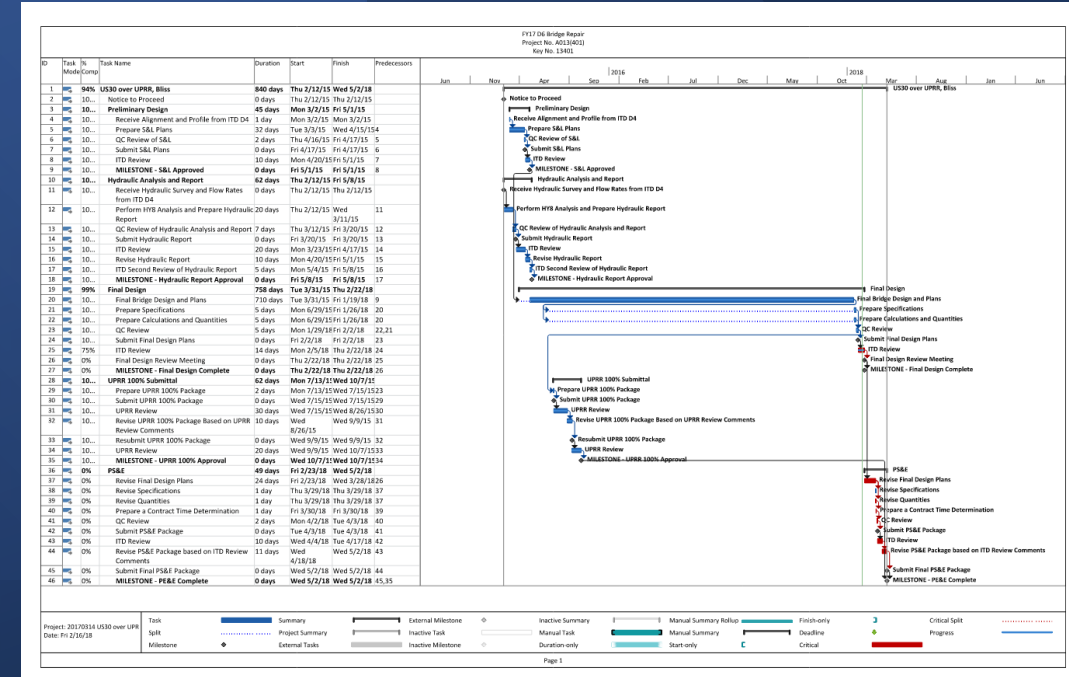
- Steel Girder With High Skew
 - NCHRP 725
 - AASHTO Eq. 4.6.3.3.2-2
- Temperature Acting The Skewed Structure
- Integral Abutments



Advantages & Disadvantages:

Simplified Design:

- Steel Girder With High Skew
 - NCHRP 725
 - AASHTO Eq. 4.6.3.3.2-2
- Temperature Acting The Skewed Structure
- Integral Abutments
- Able To Meet An Accelerated Design Schedule



Advantages & Disadvantages:

Simplified Construction:

- Standard Bridge
- Inspection Staff Familiarity
- Local Contractor Experience
- Simplicity Means Lower Cost



Advantages & Disadvantages:

Reduced Maintenance:

- Integral Abutments
 - NO JOINTS
- Locked In Stress In Steel Girders
- Serviceability Due To Temperature



Advantages & Disadvantages:

Reduced Maintenance:

- Integral Abutments
 - NO JOINTS
- Locked In Stress In Steel Girders
- Serviceability Due To Temperature



Selected Alternative



YOUR Safety ● ● ● ▶ **YOUR Mobility** ● ● ● ▶ **YOUR Economic Opportunity**

Selected Alternative

- WF42G PS Girders with CIP Deck
- Integral Abutments
- 3 - 4' dia. Column on 6' dia. Drilled Shafts





YOUR Safety ● ● ● ▶ **YOUR Mobility** ● ● ● ▶ **YOUR Economic Opportunity**



YOUR Safety •••▶ **YOUR Mobility** •••▶ **YOUR Economic Opportunity**



QUESTIONS ??



YOUR Safety ●●●▶ **YOUR Mobility** ●●●▶ **YOUR Economic Opportunity**