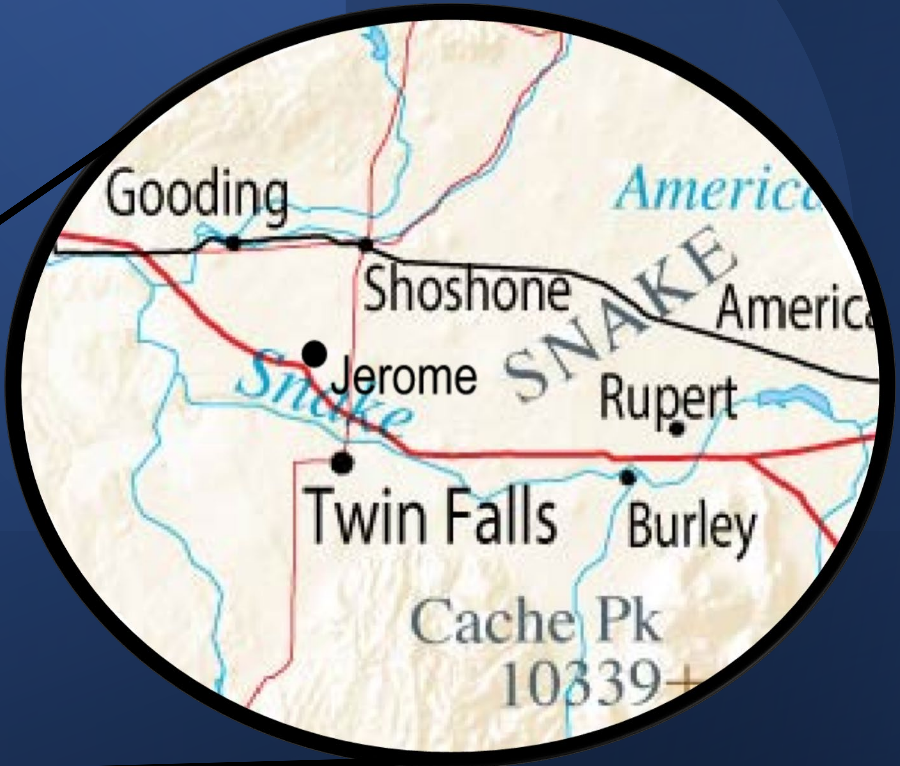
South Jerome Interchange:
When Two Bridges are Better Than One

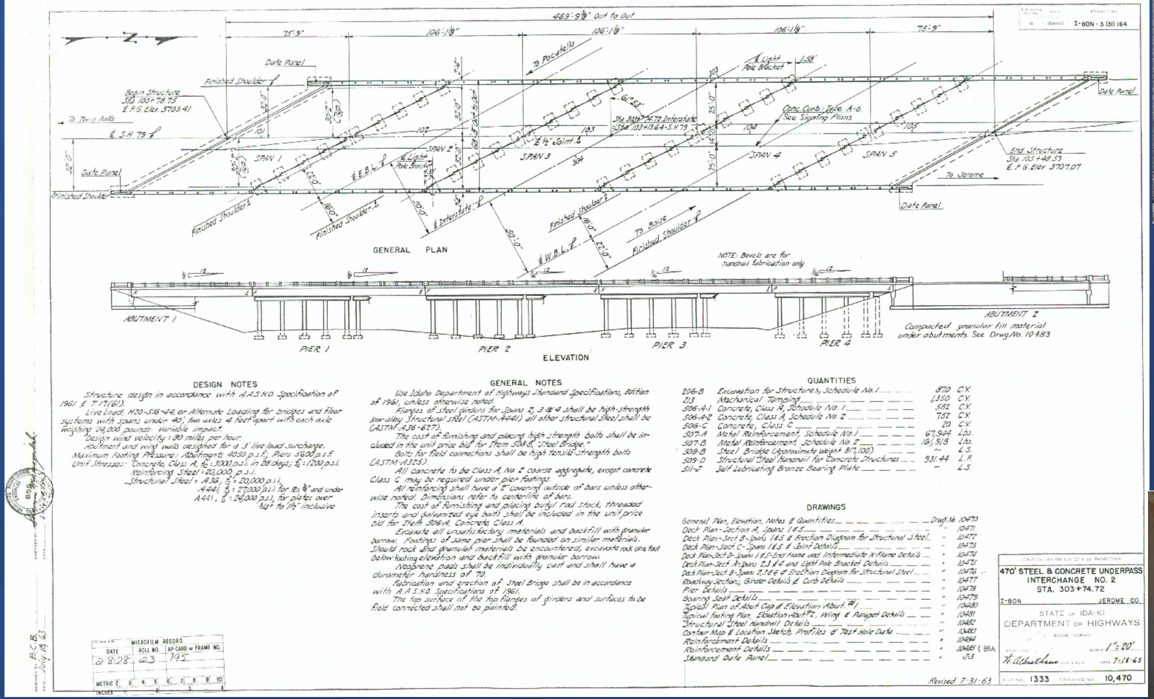
YOUR *Safety* • • • ▶ YOUR *Mobility* • • • ▶ YOUR *Economic Opportunity*

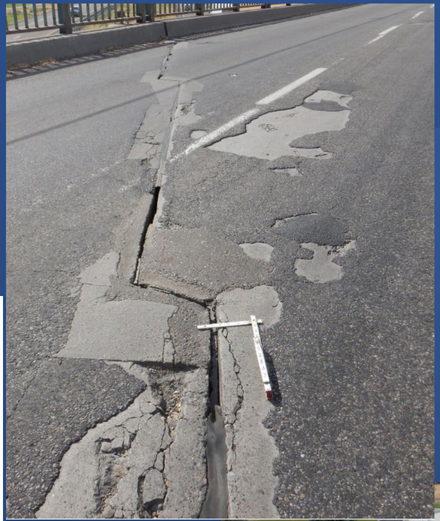
Project Location:



Project Location:

Existing Bridge:

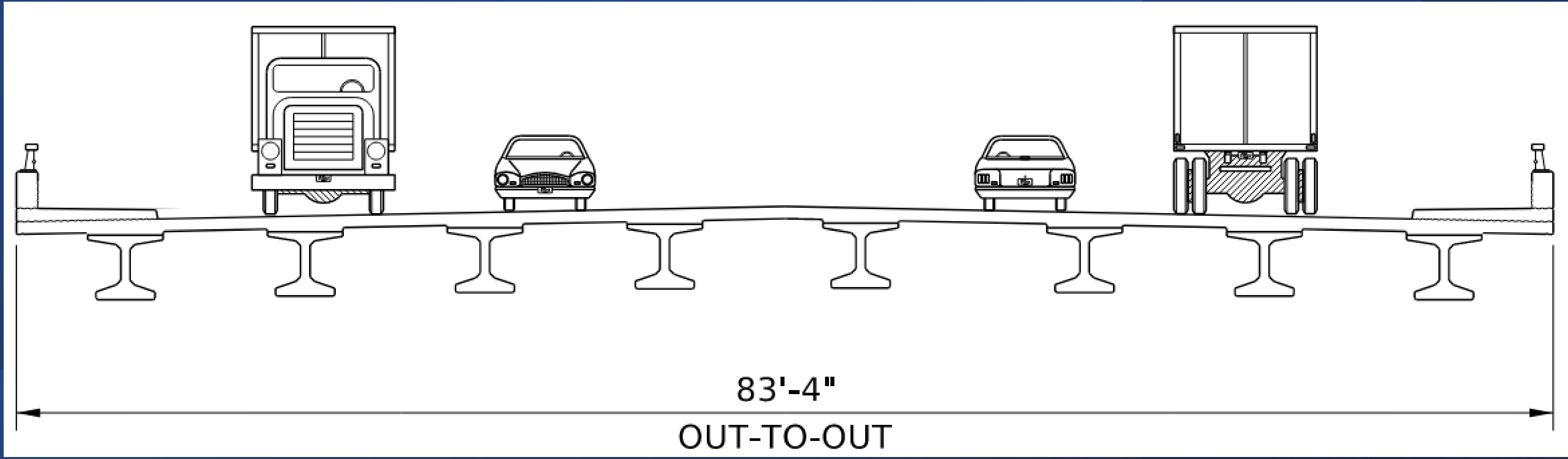




Bridge Replacement Requirements:

- 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.*

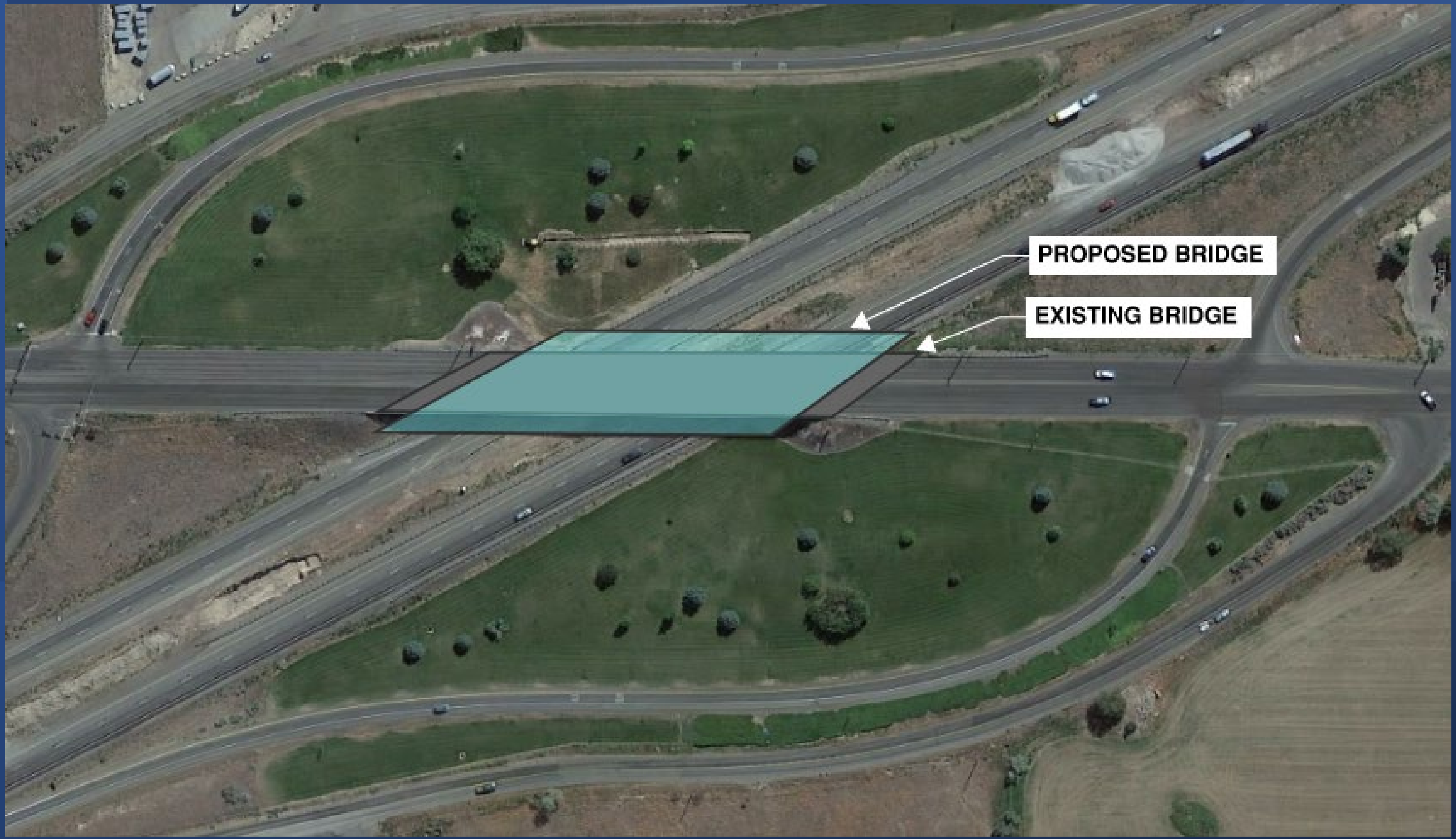
IDEA NO.	DESCRIPTION	DESIGN OPTION*
1	Realign Bob Barton to the south to align with east frontage road south.	X
3	Use Alt. 10 and modify Alt 10 (DPL) to split southbound off-ramp	
10	No bridge rebuild with this project, utilize existing bridge and construct other improvements	
14	Alternative 14 add west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

VE Alternatives:

Three Bridge Alternatives:

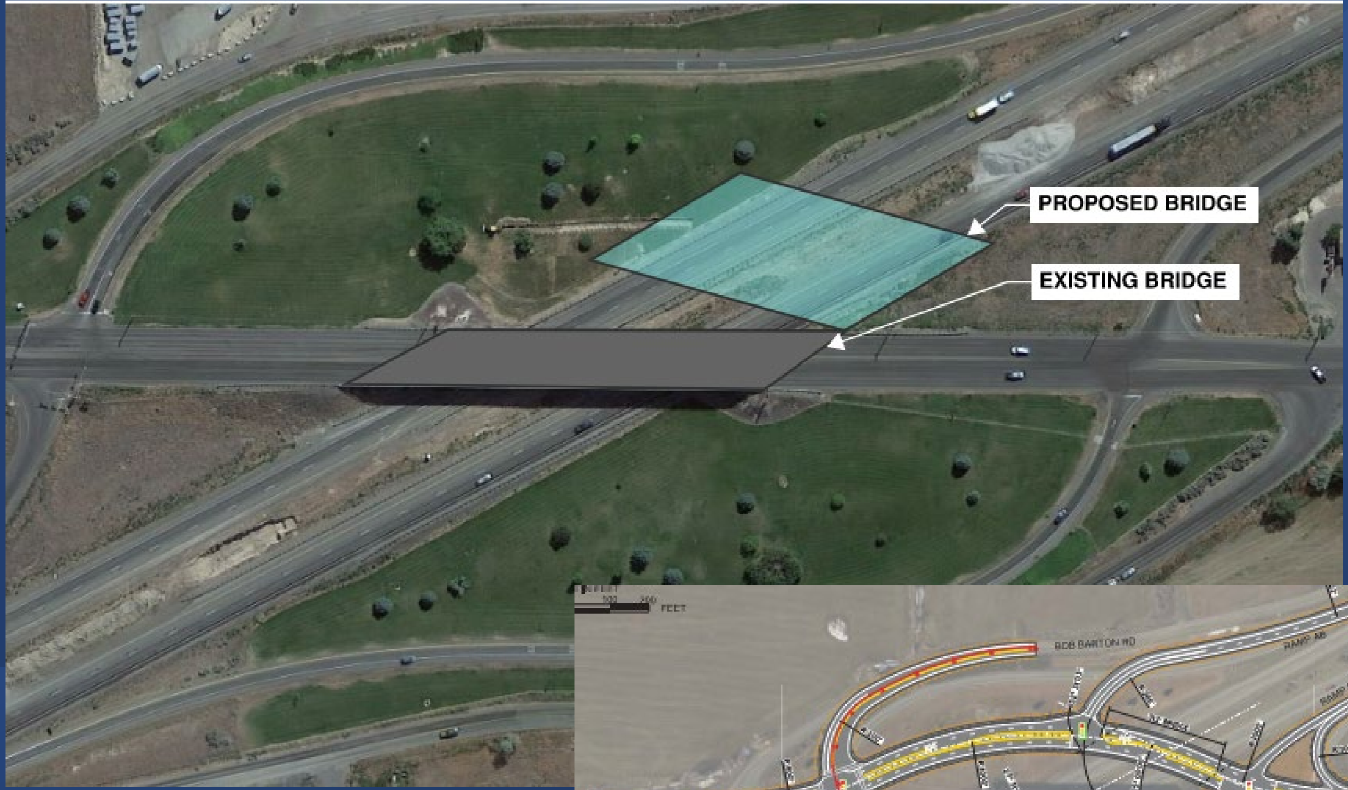
1. Single, 2-Span Bridge on Same Alignment
2. Single, 2-Span Bridge with Slight Alignment Adjustment
3. Two Twin Bridges, 2-Span Bridges on New Alignment

Bridge Alternative 1:



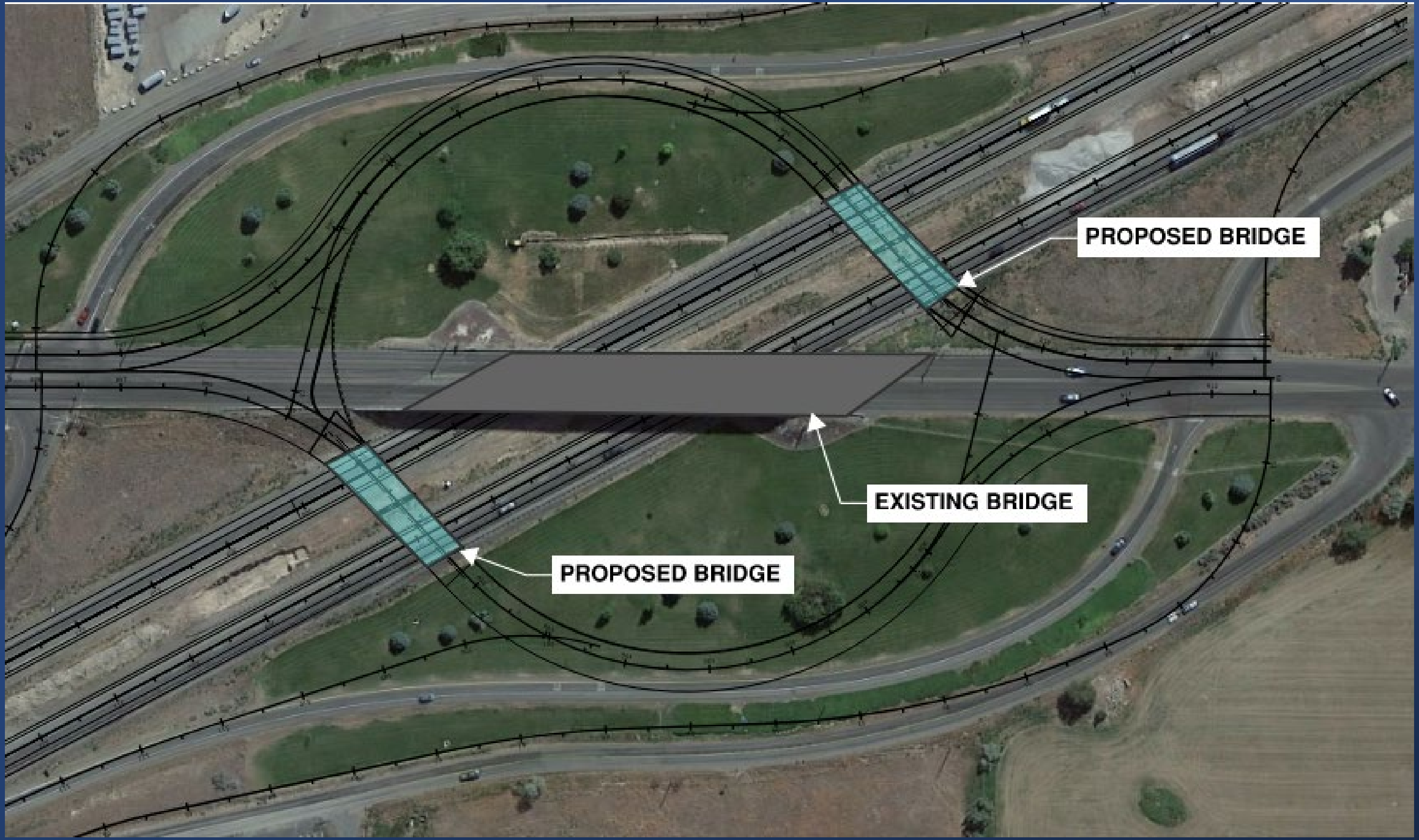
- 62 deg skew
- 83'-4" wide
- 2 Spans at 240'
- 480' Total Length
- $17.2M

Bridge Alternative 2:



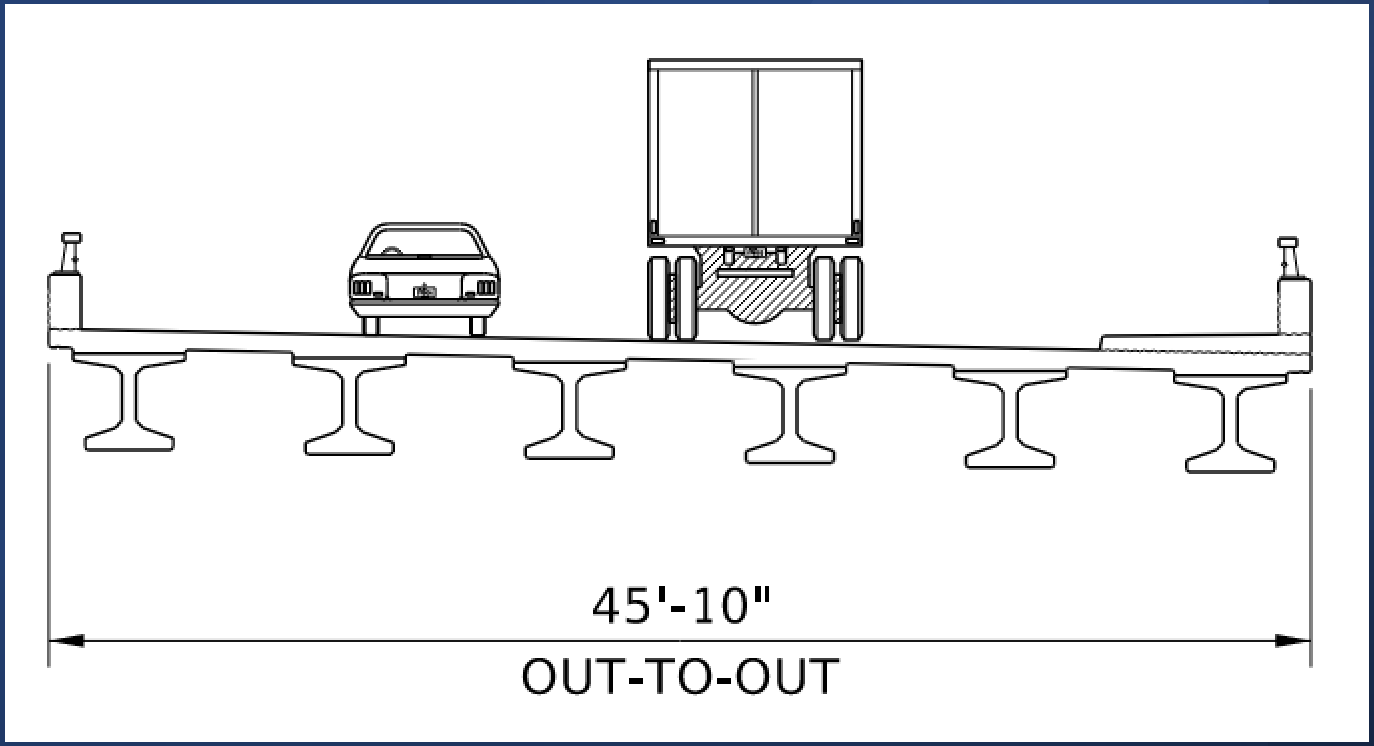
- 45 deg skew
- 83’-4” wide
- 2 Spans at 160’
- 320’ Total Length
- $11.5M

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:

		Operations				Construction		Bridge			
	Total Project Cost	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:

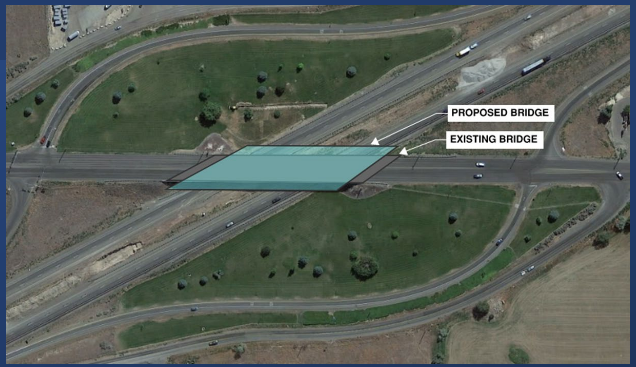
Reduced Skew

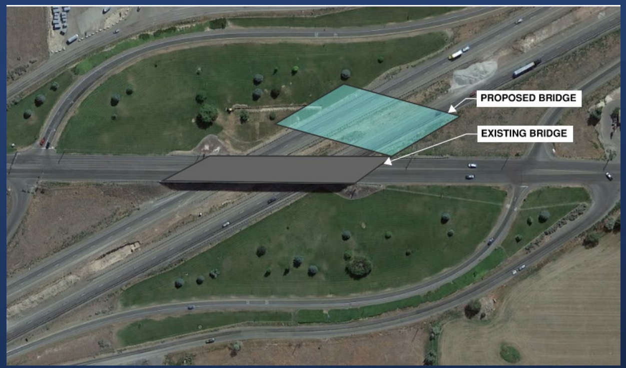
- Simplify Design – Standard ITD bridge design
  - WF42G girders with CIP Deck
  - Integral abutments
  - 3 ~ 4’Dia Column on 6’ Dia Drilled Shafts
- Simplify Construction
  - Longer span steel girders
  - High skew construction complications
  - Contractors more familiar with this type of bridge
  -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

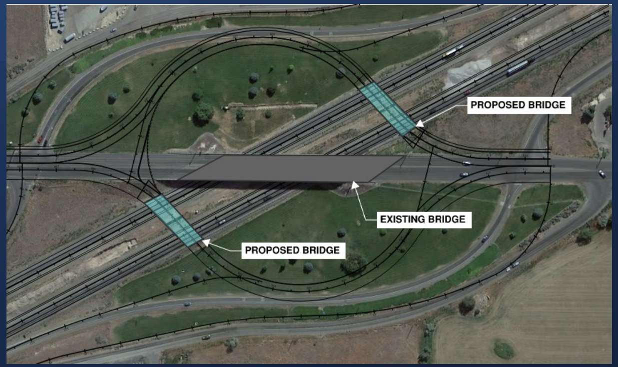
Advantages & Disadvantages:

Reduced Skew:

- Bridge Only - 62^o
- Alternative 1 - 62^o
- Alternative 2 - 45^o
- Alternative 3 - 15^o







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 ($I_C \le 1$)	B	B	A	B
	C ($I_C > 1$)	D	C	B	C
	S ($I_S < 0.30$)	B	B	A	A
	S ($0.30 \le I_S < 0.65$)	B	C	B	B
	S ($I_S \ge 0.65$)	D	D	C	C
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	D	F	B	C
Vertical Displacements	C ($I_C \le 1$)	B	C	A	B
	C ($I_C > 1$)	F	D	F	C
	S ($I_S < 0.30$)	B	A	A	A
	S ($0.30 \le I_S < 0.65$)	B	B	A	B
	S ($I_S \ge 0.65$)	D	D	C	C
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	F	F	F	C
Cross-Frame Forces	C ($I_C \le 1$)	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 ($0.30 \le I_S < 0.65$)	F[b]	F[c]	F[b]	F[c]
	S ($I_S \ge 0.65$)	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]
Flange Lateral Bending Stresses	C ($I_C \le 1$)	C	C	B	B
	C ($I_C > 1$)	F	D	C	C
	S ($I_S < 0.30$)	NA[d]	NA[d]	NA[d]	NA[d]
	S ($0.30 \le I_S < 0.65$)	F[b]	F[e]	F[b]	F[e]
	S ($I_S \ge 0.65$)	F[b]	F[e]	F[b]	F[e]
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	F[b]	F[e]	F[b]	F[e]
Girder Layover at Bearings	C ($I_C \le 1$)	NA[f]	NA[f]	NA[f]	NA[f]
	C ($I_C > 1$)	NA[f]	NA[f]	NA[f]	NA[f]
	S ($I_S < 0.30$)	B	A	A	A
	S ($0.30 \le I_S < 0.65$)	B	B	A	B
	S ($I_S \ge 0.65$)	D	D	C	C
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	F	F	F	C

Advantages & Disadvantages:

Simplified Design:

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  - 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 ($I_C \le 1$)	B	B	A	B
	C ($I_C > 1$)	D	C	B	C
	S ($I_S < 0.30$)	B	B	A	A
	S ($0.30 \le I_S < 0.65$)	B	C	B	B
	S ($I_S \ge 0.65$)	D	D	C	C
	C&S ($I_C > 0.5$ & $I_S > 0.1$)	D	F	B	C
Cross-Frame Forces	C ($I_C \le 1$)	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 ($0.30 \le I_S < 0.65$)	F[b]	F[c]	F[b]	F[c]
	S ($I_S \ge 0.65$)	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]

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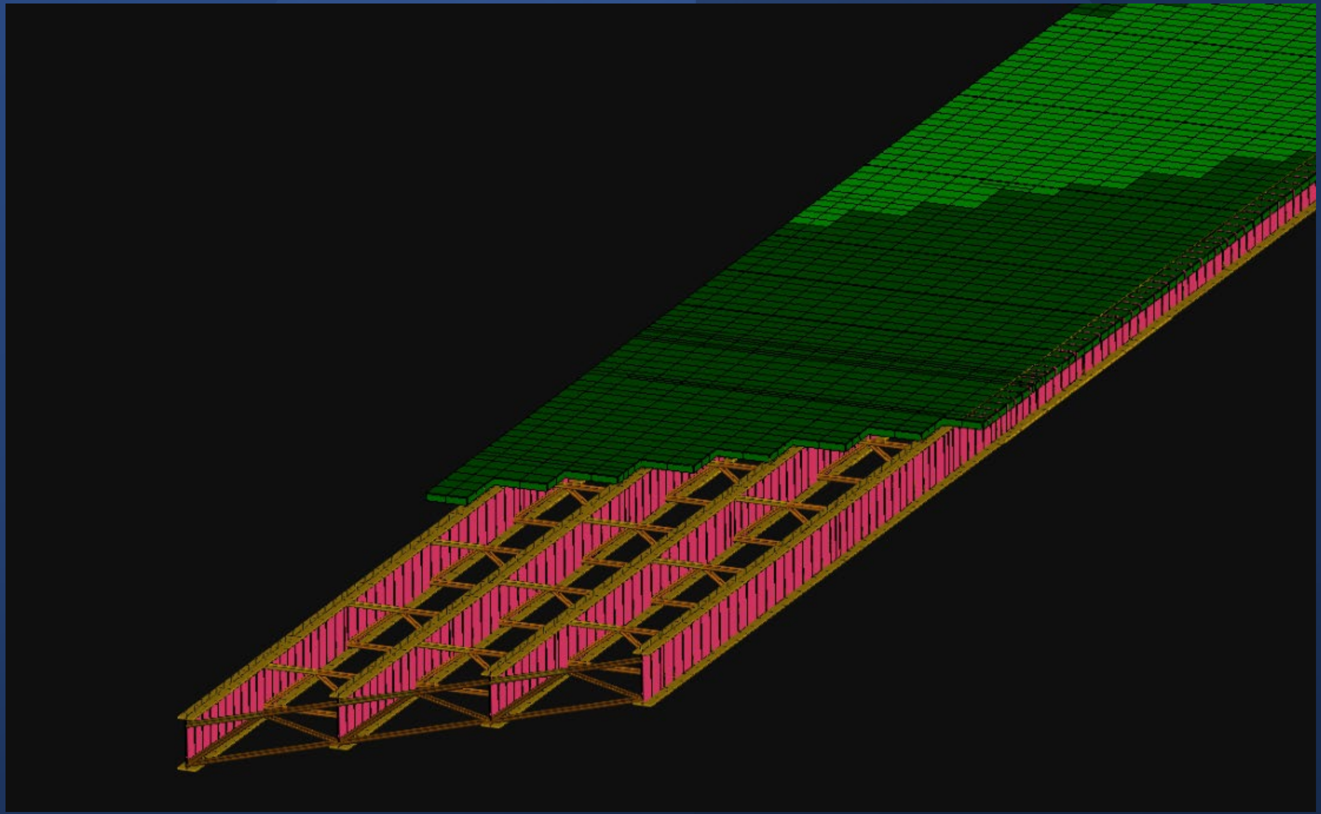
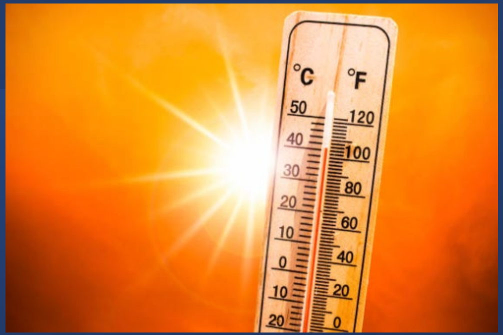
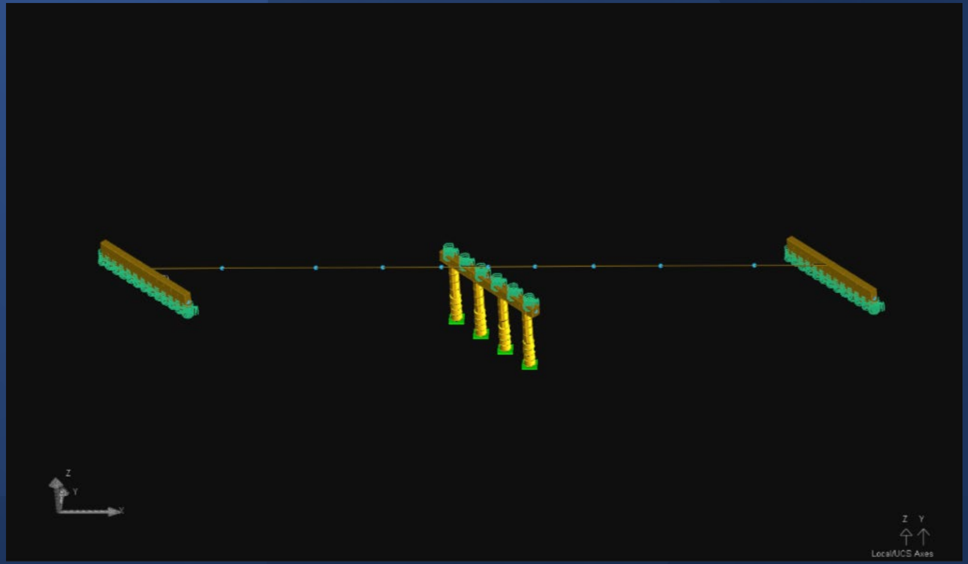


Advantages & Disadvantages:

Simplified Design:

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





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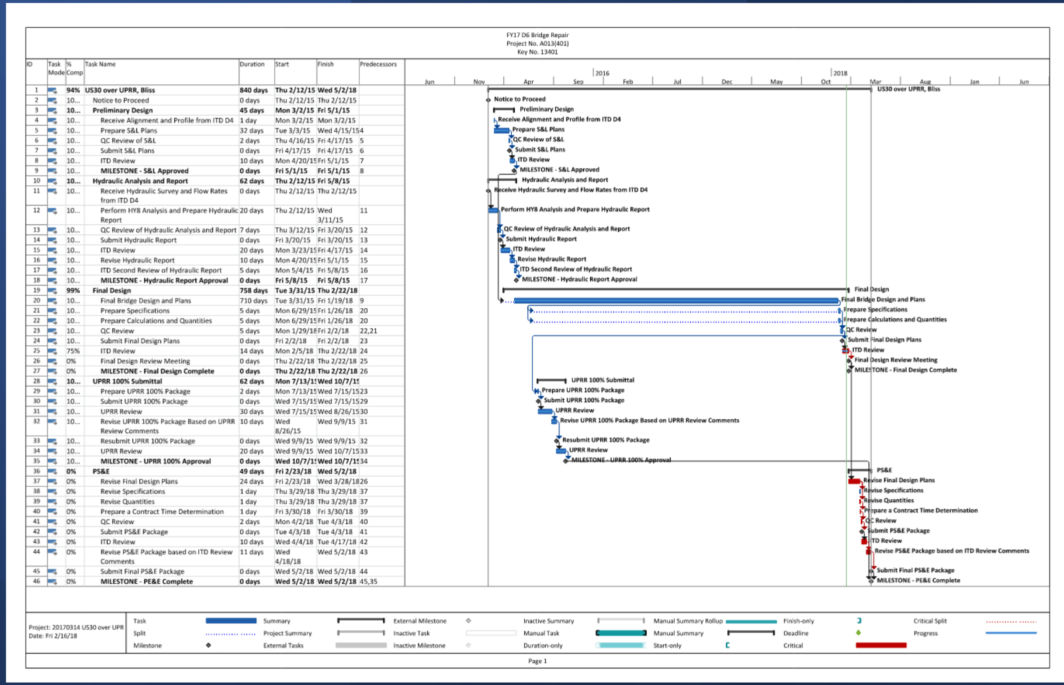
  - AASHTO Eq. 4.6.3.3.2-2
- Temperature Acting The Skewed Structure
- Integral Abutments

Advantages & Disadvantages:

Simplified Design:

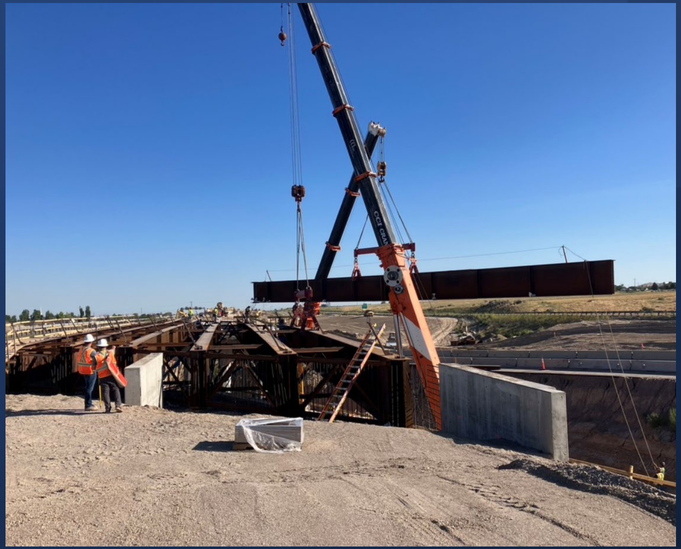
- Steel Girder With High Skew
  - NCHRP 725
  - AASHTO Eq. 4.6.3.3.2-2
- Temperature Acting The Skewed Structure
- Integral Abutments
- Able To Meet An Accelerated Design Schedule



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

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Selected Alternative

Selected Alternative

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

QUESTIONS ??