



Truss Bridges



Webinar Outline

- General Concepts
- Focus on a set of Ohio projects
- Cost Data
- Review
- Conclusions

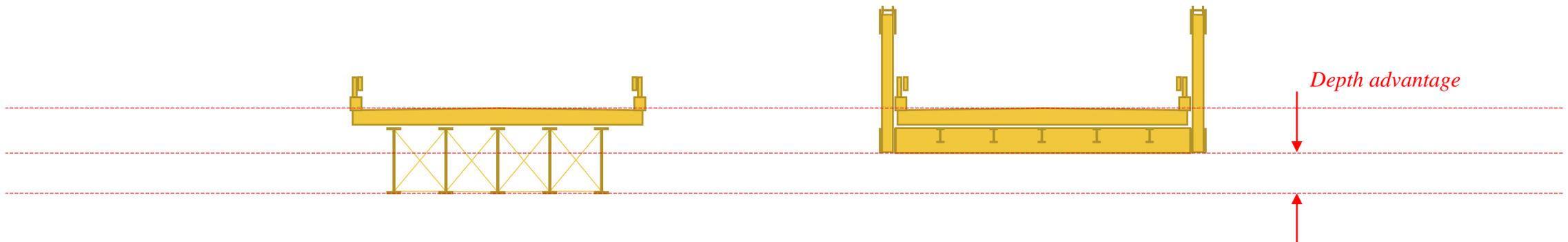


Most Suitable Conditions

- Lower volume city streets and rural roads.
- Facilities with three lanes or less.
- Nearby Drives or Intersections
- Spans between 75 ft. and 275 ft.
- When piers are prohibited or undesirable.
- When the superstructure depth greatly impacts the project footprint.
- Where visibility or aesthetics are important.

Flipping the Framing Arrangement

- Truss girders - long span (outside and above deck)
- Floor beams – short span (below deck)
- What controls the structure depth? transverse floor beams

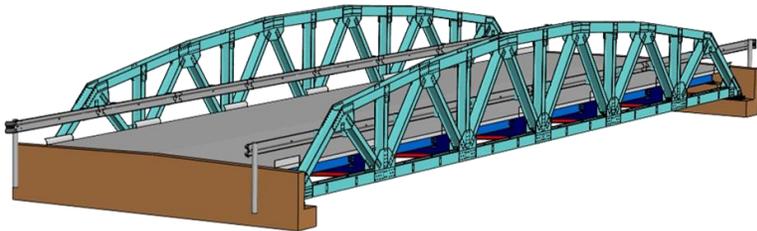


Hydraulic Opening

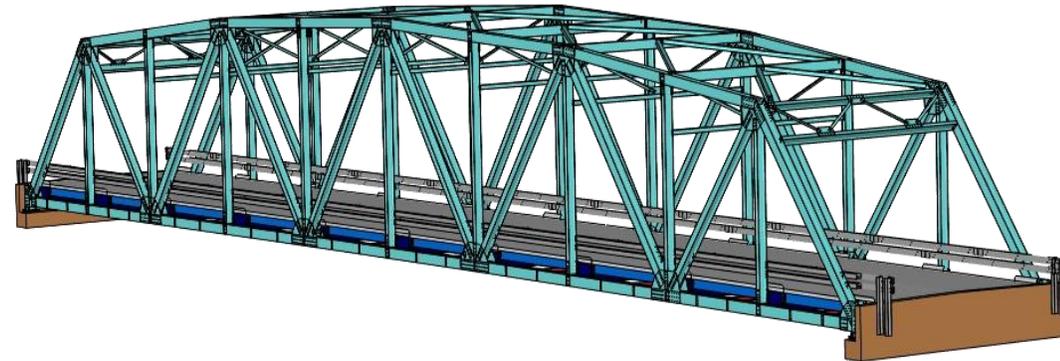


Maximum Spans

- Low Truss Max. Spans
 - One lane \equiv 200 ft.
 - Two lanes \equiv 180 ft.
 - Three lanes \equiv 165 ft.



- High Truss Max. Spans
 - One lane \equiv 300 ft.
 - Two lanes \equiv 275 ft.



Special Set of Projects in Ohio

- Federally funded truss bridge projects
- Programmed through ODOT & Administered by CEAO
- ODOT Construction Specs. & Pay Items
- Environmental Process/Documents
- Site plans designed by counties and consulting engineers
- Design-Bid/Design-Build



Federally Funded Steel Truss Bridge Projects 2008 - 2024

PROJECT (^GC)	Job No.	PID	Span	Width	Flr	Railg	Exp Jt	B/T?	Ldg	DL Rxn	LL Rxn	Built	Fund/Spec
GUE-Campbell Avenue	41102	77178	160.00 ft.	28.00 ft.	CDF	TST-SM	STRPSL	T-FS	HS25	277 K	165 K	2008	LBR
AUG-CR152-13.51 (Harrison St)	41740	81135	152.50 ft.	55.00 ft.	CDF	TPLT-TM	CMPSL	T-FS	HL93	228 K	148 K	2009	LBR
FAY-TR143-0.03 (Clemens Road)	51718	86054	54.58 ft.	28.00 ft.	SF&A	WB-TMBO	STAOA	T-KB	HL93	53 K	93 K	2013	LBR
PER-CR23-02.70 (Flag Dale Road)	51829	23145	90.00 ft.	24.00 ft.	CDSIP	TST-TMBO	STAOA	T-KB	HL93	118 K	101 K	2013	LBR
ATB-TH550B (Callender Road)	52240	79516	170.17 ft.	28.14 ft.	LTP	TST-TM	WP&SL	T-FS	HL93	245 K	148 K	2013	LBR
ATB-CH541B (Johnson Road)	52612	84559	162.00 ft.	28.00 ft.	LTP	TST-TM	WP&SL	T-FS	HL93	233 K	145 K	2015	LBR
VAN-TR41-2 (Harner Road)	53160	84904	150.00 ft.	28.00 ft.	SF&A	TST-TMBO	STAOA	T-KB	HL93	196 K	140 K	2015	LBR
MUS-CR38 (Hamby Hill Road)	53295	97472	110.00 ft.	24.00 ft.	CDSIP	TST-SM	STRPSL	T-KB	HL93	172 K	109 K	2016	OHP
MRW-CR137 (Curtis Road)	150052.1	97618	90.00 ft.	24.00 ft.	CDF	TST-SM	STRPSL	T-KB	HL93	131 K	101 K	2016	OHP
MRW-T138 (Curl Road)	150052.2	97618	70.00 ft.	24.00 ft.	CDF	TST-SM	STRPSL	T-KB	HL93	105 K	92 K	2016	OHP
RIC-TR-403-02.87 (Stoffer Road)	160343	75610	132.00 ft.	28.00 ft.	CDF	TST-SM	STRPSL	T-FS	HL93	234 K	132 K	2017	LBR
WYA-CR113-3.74	170218	94004	102.67 ft.	32.00 ft.	SF&C	TST-TM	STAOA	T-EV	HL93	134 K	129 K	2017	LBR
MUS-Lambert Road	180105	83287	118.50 ft.	20.00 ft.	SF&C	TST-TM	CMPSL	T-KB	HL93	144 K	104 K	2018	LBR
ROS-West Junction	189310	92108	145.00 ft.	24.00 ft.	CDF	TST-SM	STRPSL	T-KB	HL93	226 K	123 K	2019	LBR
JAC-Roberts Road	199202	97347	94.00 ft.	20.00 ft.	CDF	TST-SM	STRPSL	T-EV	HL93	125 K	95 K	2019	LBR
MIA-Crofts Mill Road	209002	102037	120.00 ft.	28.00 ft.	CDSIP	TST-SM	STRPSL	T-EV	HL93	226 K	127 K	2020	LBR
LAK-Markell Road D/B	209288	102069	142.00 ft.	24.00 ft.	CDSIP	TST-SM	STRPSL	T-KB	HL93	236 K	122 K	2021	LBR
JAC-N High Street (City of Jackson)	210303	108735	100.67 ft.	30.00 ft.	CDF	TST-SM	STRPSL	T-EV	HL93	184 K	121 K	2022	LBR
MAR-TR68C-2.76 D/B	219065	101101	80.00 ft.	24.00 ft.	SFC&A	TST-TM	STAOA	T-EV	HL93	81 K	93 K	2021	LBR
MUS-Okey Road	219256	104046	100.00 ft.	22.00 ft.	CDSIP	TST-TM	STRPSL	T-EV	HL93	128 K	97 K	2021	LBR
WYA-CR16-10.99	220193	108947	116.00 ft.	28.00 ft.	SF&C	TST-TM	STAOA	T-EV	HL93	137 K	125 K	2022	LBR
LIC-Bennington Chapel Rd	229159	106591	120.00 ft.	24.00 ft.	CDSIP	TST-TM	JTLSS	T-EV	HL93	175 K	113 K	2022	LBR
CLI-TR169-1.97 D/B (Borum Road)	239062	117500	67.67 ft.	20.00 ft.	CDF	TST-TM	STAOA	T-EV	HL93			2023	BFP
HAR-CR150	239131	117353	93.00 ft.	24.00 ft.	CDSIP	TST-SM	STRPSL	T-EV	HL93			2023	BFP
HUR-TR 154-0.51 D/B (Auster Road)	230049	117396	101.00 ft.	24.00 ft.	SF&C	TST-TM	STAOA	T-EV	HL93			2023	BFP
GEA-TR76 (Robinson Road)	<i>bidding</i>	117535	65.00 ft.	28.00 ft.	CDF	TST-TM	JTLSS	T-EV	HL93			2023	BFP
MUS-CR 46-4.39 (Darlington Road)	239165	115529	142.00 ft.	24.00 ft.	CDSIP	TST-TM	STRPSL	T-EV	HL93			2023	LBR
MUS-TR 274-2.49 (Lower Kroft Road)	239164	113796	90.00 ft.	20.00 ft.	CDSIP	TST-TM	STRPSL	T-EV	HL93			2023	LBR
MUS-CR 5-4.16 (Clay Pike Road)	239124	110919	105.00 ft.	22.00 ft.	CDSIP	TST-TM	STRPSL	T-EV	HL93			2023	LBR
MUS-CR67 (Piper Road)	<i>Construct.</i>	117329	70.75 ft.	20.00 ft.	CDSIP	TST-TM	STRPSL	T-EV	HL93			2024	BFP
MUS-TR118 (Schoolhouse Road)	<i>Construct.</i>	117330	98.67 ft.	20.00 ft.	CDSIP	TST-TM	STRPSL	T-EV	HL93			2024	BFP



VAN-HARNER ROAD (150'x28')



WYA-CH113 (102.67'x32')



ROS-WEST JUNCTION ROAD (145'x24')



RIC-STOFFER ROAD (132'x28')



JAC-ROBERTS ROAD (90'x20')



MUS-LAMBERT ROAD (118.5'x20')



MIA-CROFT MILL ROAD (120'x28')



LAK-MARKELL ROAD 142'x24'



ATB-CALLENDER ROAD (170.17'x28')



ATB-JOHNSON ROAD 162'x28')



FAY-CLEMENS ROAD (54.583'x28')



MAR-TR68 (80'x24')



vertical curvature

PER-FLAG DALE ROAD (90'x24')



MUS-OKEY ROAD (100'x22')



WAY-CR16-10.99 (116'x28')



JAC-N. HIGH STREET (100.67'x30')



jointless bridge

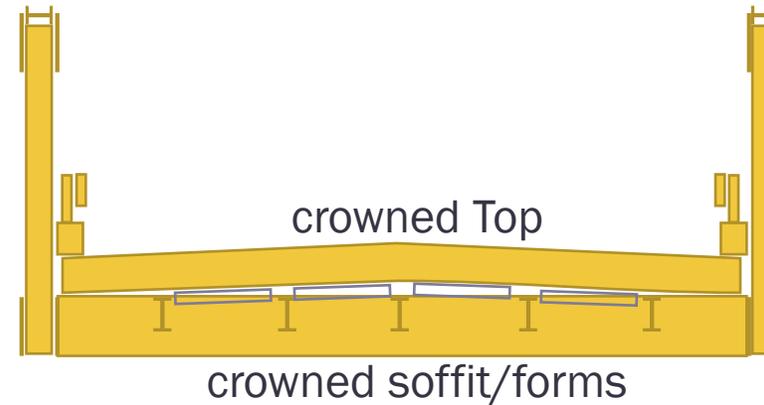
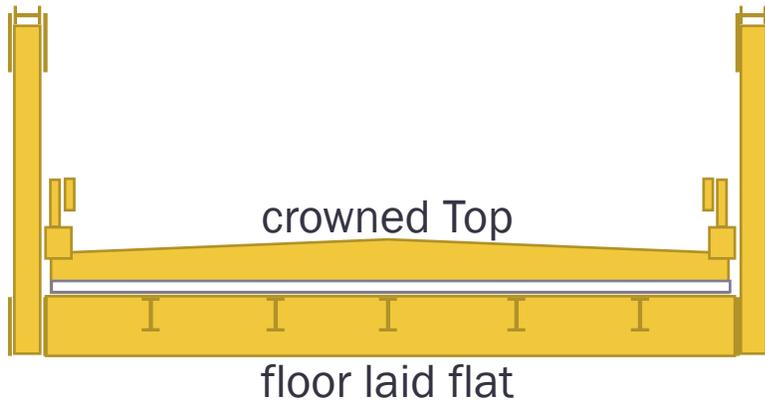
LIC-BENNINGTON CHAPEL ROAD (120'x24')



continuous stringers

MUS-HAMBY HILL ROAD (110'x24')

Floors vs. Slabs



heavy gage
(structural)



light gage
(formwork)



RIC-TR-403-02.87 (Stoffer Road)

RIC-TR-403-02.87 (Stoffer Road)			
Project Information		Project Information	
ODOT PID	75610	Date Built	2017
Contractor	US Bridge	Span	132 ft.
Erector	US Bridge	Width	28 ft.
Fabricator	US Bridge	Floor	Conc. Slab on Lumber Forms
Site Plans	RCEO	Railing	Slab Anchored TST-1-99
Designer	US Bridge	Exp. Joint	EXJ-4-87 (Strip Seal)
Loading	HL93	Bearings	Con-Slide (CDP) Brg Pads
Project Cost	\$1,029,215	Floor Beam	Raised W27x94 (Comp.)
Funding	Fed/Local : 80/20	Corr. Protect.	Hot Dip Galv.



$$8.5'' + 2'' + 27'' = 37.5'' = 3.125 \text{ ft.}$$







MIA-TR84-0.37 (Croft Mill Road)

MIA-TR84-0.37 (Croft Mill Road)			
Project Information		Project Information	
ODOT PID	102037	Date Built	2020
Contractor	Brumbaugh Const.	Span	120 ft.
Erector	US Bridge	Width	28 ft.
Fabricator	US Bridge	Floor	Conc. Slab on SIP Formwork
Site Plans	MCEO	Railing	Slab Anchored TST-1-99
Designer	US Bridge	Exp. Joint	EXJ-4-87 (Strip Seal)
Loading	HL93	Bearings	Lam. Elast. Brg. Pads
Project Cost	\$1,109,943	Floor Beam	Lowered W27x146 (NC)
Funding	Fed/Local : 80/20	Corr. Protect.	Hot Dip Galv.



$$8.5'' + 2'' + 10'' + 27'' = 47.5'' = 3.96 \text{ ft.}$$









ATB-CH541B (Johnson Road)

ATB-CH541B (Johnson Road)			
Project Information		Project Information	
ODOT PID	84559	Date Built	2015
Contractor	US Bridge	Span	162 ft.
Erector	US Bridge	Width	28 ft.
Fabricator	US Bridge	Floor	Glu-lam, W/P & Asph.
Site Plans	ACEO	Railing	TST on Truss
Designer	US Bridge	Exp. Joint	W/P over Joint Sealer
Loading	HL93	Bearings	Con-Slide CDP's
Project Cost	\$1,282,481	Floor Beam	Raised W30x116 (NC)
Funding	Fed/Local : 80/20	Corr. Protect.	Hot Dip Galv.



$$6.75" + 5.375" + 30" = 42.125" = 3.51 \text{ ft.}$$







MAR-TR68C-2.76 (Wyandot-Marion Road) D/B

MAR-TR68C-2.76 (Wyandot-Marion Road) D/B			
Project Information		Project Information	
ODOT PID	101101	Date Built	2021
Contractor	R&I Construction	Span	80 ft.
Erector	US Bridge	Width	24 ft.
Fabricator	US Bridge	Floor	5Ga, Conc. Corr./WP & Asphalt
Site Plans	ELR, then PDG	Railing	TST on Truss
Designer	US Bridge	Exp. Joint	Steel Angle over Angle
Loading	HL93	Bearings	Lam. Elast. Brg. Pads
Project Cost	\$579,000	Floor Beam	Lowered W24x131 (NC)
Funding	Fed/Local : 95/5	Corr. Protect.	Hot Dip Galv.



$$3'' + 3.75'' + 12'' + 24'' = 42.75'' = 3.56 \text{ ft.}$$







MUS-TR209-02.74 (Okey Road)

MUS-TR209-02.74 (Okey Road)			
Project Information		Project Information	
ODOT PID	104046	Date Built	2021
Contractor	US Bridge	Span	100 ft.
Erector	US Bridge	Width	22 ft.
Fabricator	US Bridge	Floor	Conc. Slab on SIP Formwork
Site Plans	MCEO	Railing	TST on Truss
Designer	US Bridge	Exp. Joint	EXP-4-87 (Strip Seal)
Loading	HL93	Bearings	Con-Slide CDPs
Project Cost	\$738,838	Floor Beam	Part. Raised W21x62 (NC)
Funding	Fed/Local : 80/20	Corr. Protect.	Hot Dip Galv.



$$8.5'' + 2'' + 21'' = 31.5'' = 2.625 \text{ ft.}$$







WYA-CR16-10.99

WYA-CR16-10.99		Project Information	
Project Information		Project Information	
ODOT PID	108947	Date Built	2022
Contractor	R&I Construction	Span	116 ft.
Erector	US Bridge	Width	28 ft.
Fabricator	US Bridge	Floor	Corr. Stl. Flr. & Conc. Fill
Site Plans	WCEO	Railing	TST on Truss
Designer	US Bridge	Exp. Joint	Steel Angle Over Angle
Loading	HL93	Bearings	Con-Slide CDPs
Project Cost	\$952,757	Floor Beam	Lowered W27x114 (NC)
Funding	Fed/Local : 95/5	Corr. Protect.	Hot Dip Galv.



$$3'' + 4'' + 12'' + 27'' = 46'' = 3.83 \text{ ft.}$$







Cost Tabulations

OHIO FED/LOCAL TRUSS BRIDGE PROJECTS SUMMARY

PROJECT	Span	Width	Built	Original Prices					Current Yr		2023		Adjusted Prices (Corrected for Inflation)										Area Costs			
				Fab ¹	Flr. Ded.	Install ²	All Other ³	Project ⁴	CF ₂₀₁₇	CF _{Pres. Yr.}	Fab1	%	Flr. Ded	Fab2	%	Install	%	All Other*	%	Project	%	Fab	Install	All Other*	Project	
1	ATB-CH541B (Johnson Road)	162.00 ft.	28.00 ft.	2015	#####		#####	\$758,958	\$1,282,481	0.967	1.204	#####	###	\$0	#####	###	#####	##	\$944,969	59%	\$1,596,802	100%	#####	#####	\$208/sf	\$352/sf
2	ATB-TH550B (Callender Road)	170.17 ft.	28.14 ft.	2013	#####					0.95	1.204	#####			#####								#####			
3	FAY-TR143-0.03 (Clemens Road)	54.58 ft.	28.00 ft.	2013	#####	1	#####	\$181,461	\$350,377	0.95	1.204	#####	###	#####	#####	###	#####	##	\$273,917	62%	\$444,057	100%	#####	#####	\$179/sf	\$291/sf
4	PER-CR23-02.70 (Flag Dale Road)	90.00 ft.	24.00 ft.	2013	#####					0.95	1.204	#####			#####								#####			
5	JAC-Main Street (City of Jackson)	100.67 ft.	30.00 ft.	2022	#####		#####	\$710,561	\$1,248,171	1.178	1.204	#####	###	\$0	#####	###	#####	##	\$726,244	57%	\$1,275,720	100%	#####	#####	\$240/sf	\$422/sf
6	JAC-Roberts Road	94.00 ft.	20.00 ft.	2019	#####		#####	\$478,352	\$821,329	1.042	1.204	#####	###	\$0	#####	###	#####	##	\$552,722	58%	\$949,021	100%	#####	#####	\$294/sf	\$505/sf
7	LAK-Markell Road D/B	142.00 ft.	24.00 ft.	2021	#####		#####	\$744,444	\$1,276,719	1.092	1.204	#####	###	\$0	#####	###	#####	##	\$820,797	58%	\$1,407,665	100%	#####	#####	\$241/sf	\$413/sf
8	MAR-TR68-2.76 D/B	80.00 ft.	24.00 ft.	2021	#####	1	#####	\$249,412	\$579,000	1.092	1.204	#####	###	#####	#####	###	#####	##	\$330,193	52%	\$638,385	100%	#####	#####	\$172/sf	\$332/sf
9	MIA-Crofts Mill Road	120.00 ft.	28.00 ft.	2020	#####		#####	\$593,153	\$1,109,943	1.066	1.204	#####	###	\$0	#####	###	#####	##	\$669,940	53%	\$1,253,632	100%	#####	#####	\$199/sf	\$373/sf
10	MUS-Lambert Road	118.50 ft.	20.00 ft.	2018	#####	1	#####	\$365,612	\$765,624	1.02	1.204	#####	###	#####	#####	###	#####	##	\$499,703	55%	\$903,737	100%	#####	#####	\$211/sf	\$381/sf
11	MUS-Okey Road	100.00 ft.	22.00 ft.	2021	#####		#####	\$353,769	\$738,838	1.092	1.204	#####	###	\$0	#####	###	#####	##	\$390,053	48%	\$814,616	100%	#####	#####	\$177/sf	\$370/sf
12	RIC-Stoffer Road	132.00 ft.	28.00 ft.	2017	#####		#####	\$634,590	\$1,029,215	1.000	1.204	#####	###	\$0	#####	###	#####	##	\$764,046	62%	\$1,239,175	100%	#####	#####	\$207/sf	\$335/sf
13	ROS-West Junction	145.00 ft.	24.00 ft.	2019	#####		#####	\$986,929	\$1,633,892	1.042	1.204	#####	###	\$0	#####	###	#####	##	\$1,140,367	60%	\$1,887,914	100%	#####	#####	\$328/sf	\$543/sf
14	VAN-TR41-2 (Harner Road)	150.00 ft.	28.00 ft.	2015	#####	1	#####	\$284,256	\$895,316	0.967	1.204	#####	###	#####	#####	###	#####	##	\$474,674	43%	\$1,114,747	100%	#####	#####	\$113/sf	\$265/sf
15	MUS-CR38 (Hamby Hill Road)	110.00 ft.	24.00 ft.	2016	#####		#####	\$227,772	\$617,394	0.979	1.204	#####	###	\$0	#####	###	#####	##	\$280,120	37%	\$759,287	100%	#####	#####	\$106/sf	\$288/sf
16	WYA-CR113-3.74	102.67 ft.	32.00 ft.	2017	#####	1	#####	\$349,360	\$805,380	1.000	1.204	#####	###	#####	#####	###	#####	##	\$515,086	53%	\$969,678	100%	#####	#####	\$157/sf	\$295/sf
17	LIC-Bennington Chapel Rd	120.00 ft.	24.00 ft.	2022	#####		#####	\$506,129	\$1,039,702	1.178	1.204	#####	###	\$0	#####	###	#####	##	\$517,300	49%	\$1,062,650	100%	#####	#####	\$180/sf	\$369/sf
18	WYA-CR16-10.99	116.00 ft.	28.00 ft.	2022	#####	1	#####	\$332,762	\$952,757	1.178	1.204	#####	###	#####	#####	###	#####	##	\$433,486	45%	\$973,786	100%	#####	#####	\$133/sf	\$300/sf
AVERAGE				117.09 ft.	25.79 ft.							#####	###		#####	###	#####	##	\$583,351	53%	\$1,080,679	100%	#####	#####	\$197/sf	\$365/sf

¹ Fab1 cost includes railings, expansion joints, and corrugated steel floor (if applicable); it does not include SIP forms which are part of 'All Other'; Fab2 removes the cost of corrugated steel floor from those projects.

² Install costs include site assembly, rigging, erecting, anchoring and attaching corr. steel floor (but not SIP forms)

³ All Other = roadway items, foundations, abutments; deck (forms, rebar, concrete) or road build-up (w/p + asphalt or concrete fill); engineering and drafting

⁴ from ODOT's ELLIS PROJ system, construction only (no inspection costs)

	Fab	Install	All Other*	Total
Min.	\$76/sf	\$10/sf	\$106/sf	\$265/sf
Max.	\$175/sf	\$63/sf	\$328/sf	\$543/sf
Simple Avg.	\$132/sf	\$37/sf	\$197/sf	\$365/sf
GeoMean	\$130/sf	\$34/sf	\$189/sf	\$358/sf

Useful Averages

	Fab	Install	All Other*	Total
Min.	\$76/sf	\$10/sf	\$106/sf	\$265/sf
Max.	\$175/sf	\$63/sf	\$328/sf	\$543/sf
Simple Avg.	\$132/sf	\$37/sf	\$197/sf	\$365/sf
GeoMean	\$130/sf	\$34/sf	\$189/sf	\$358/sf
	36.4%	10.5%	53.2%	100%

**All Other = roadway items, foundations, abutments; deck (forms, rebar, concrete) or road build-up (w/p + asphalt or concrete fill); engineering and drafting*

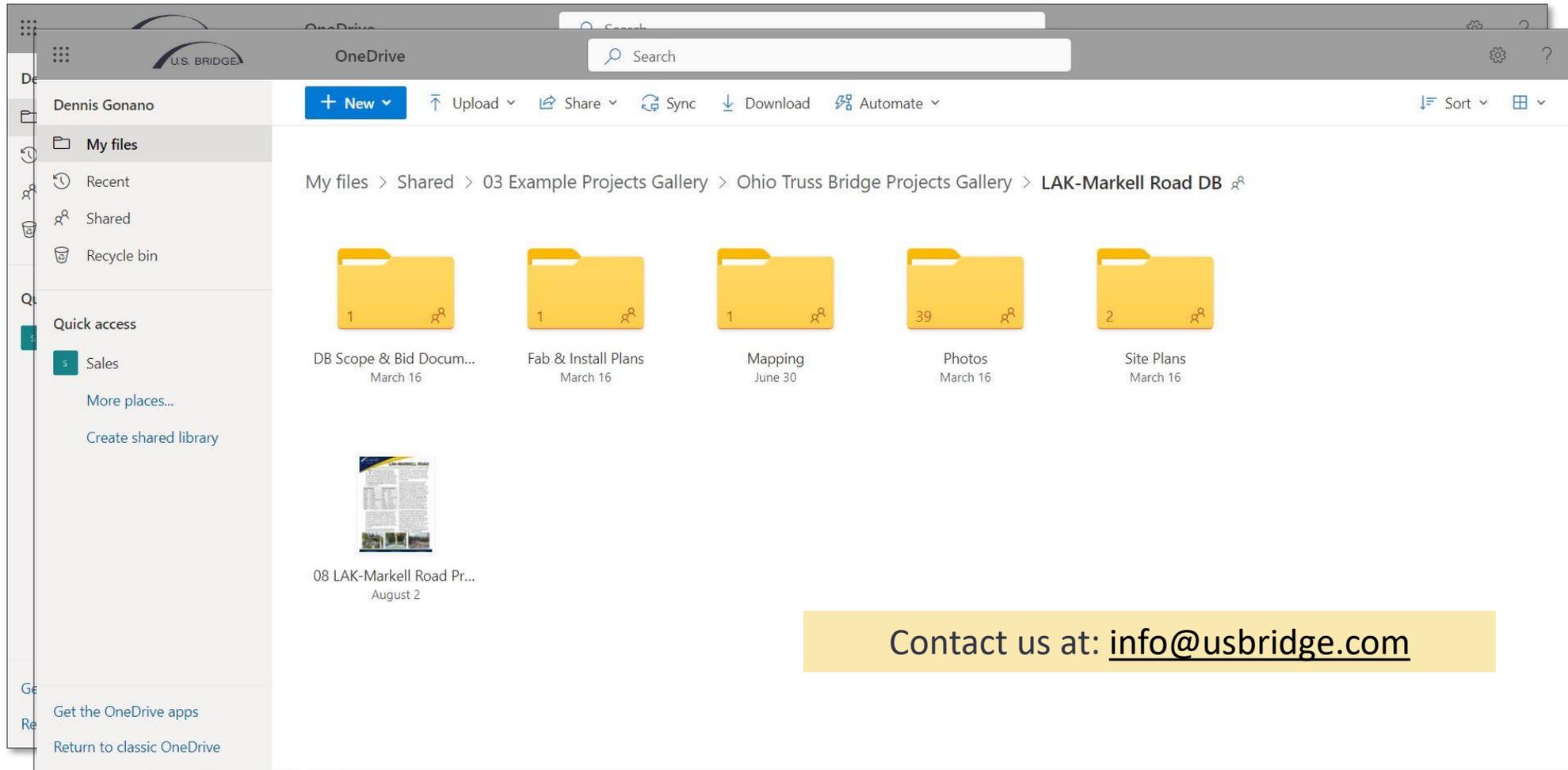
Review

- Truss girder position allows for very shallow structure depths.
- Limits the profile rise needed and minimizes the project's footprint.
- Lessens environmental impacts which simplifies permitting review.
- Very competitive when all costs like pier construction, embankment construction and project limits are considered.
- Customized scope & specifications.
- No standards to go by.
- Design-Bid/Design-Build.

In Conclusion

- When developing a project and evaluating alternatives:
 - If site constraints warrant
 - And you're in need some preliminary details
 - or cost estimates
 - or reactions to analyze abutments
- If only ... there was a library of design plans, bid specs, pay items, plan notes, installation drawings, erection procedures, finish and construction photos.

OneDrive Shared Examples Folders





Questions