



HDR



BRIDGE PRICING PROJECT SUMMARY

December 11, 2019





01 INTRODUCTION TO PROJECT

02 PROJECT APPROACH

03 RESULTS

04 CONCLUSIONS

A large, illuminated arch bridge at night over a river. The bridge features multiple arches and is lit with warm lights. The sky is a deep blue, and the city lights in the background are reflected in the water. The overall scene is a nighttime urban landscape.

01 INTRODUCTION TO PROJECT

PROJECT OBJECTIVES

- Understand the in-place cost of structural steel versus precast concrete in the bridge market on a national, regional, and state basis.
- Compare construction cost of structural steel versus precast concrete bridges



PROJECT SCOPE

Focus of the project

- Structural steel and concrete bridges
- New and replacement structures
- Bridges let by State Departments of Transportation
- Projects constructed after 2013
- Design-Bid-Build delivery approach





02

PROJECT APPROACH

PROJECT APPROACH

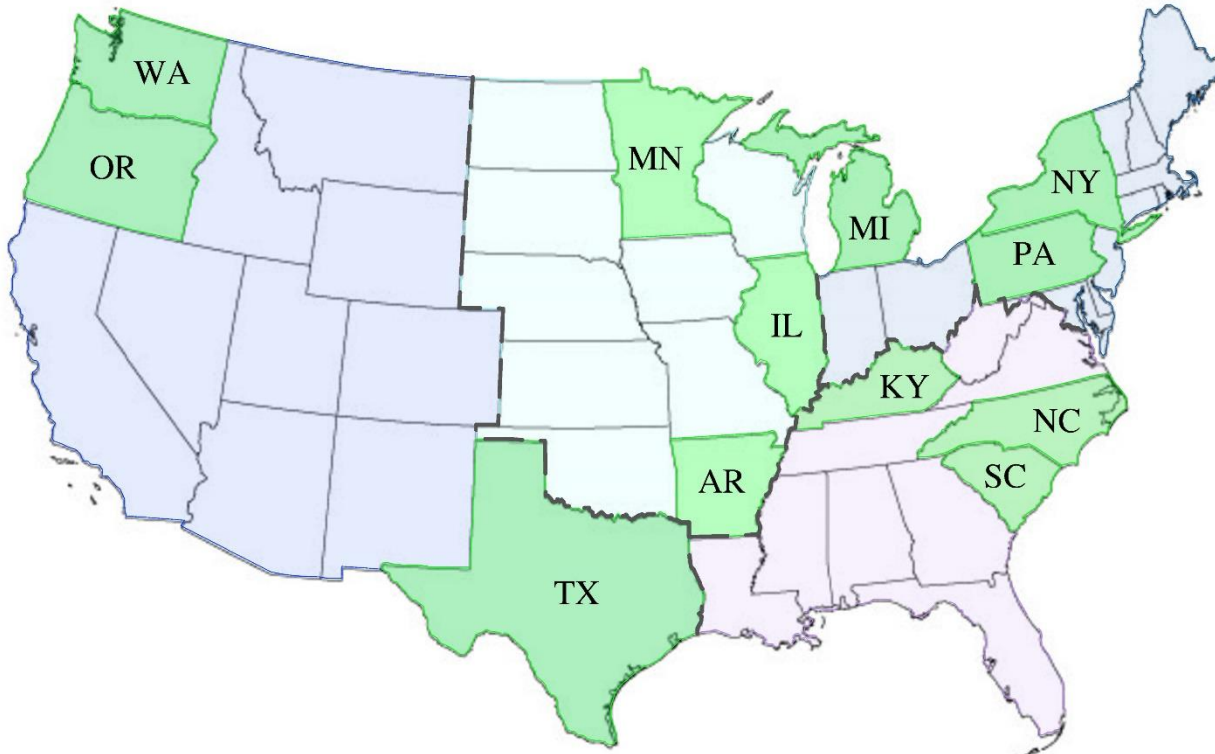
Overview

- Selected 12 states
- Gathered required information
 - Historical Bid Tabs
 - Bridge Plans
- Take off information from plan sets
- Organized bid tab data
- Calculated parametric cost information
- Compared construction costs



PROJECT APPROACH

Selected States



Bridge Count per State			
State	Steel	Concrete	Total
Washington	0	39	39
Oregon	4	23	27
Texas	6	92	98
Minnesota	2	50	52
Illinois	31	33	64
Arkansas	53	0	53
North Carolina	17	54	71
South Carolina	2	41	43
Kentucky	3	47	50
Michigan	15	56	71
New York	38	8	46
Pennsylvania	7	91	98
Total	178	534	712

PROJECT APPROACH

Takeoff Data

- **General Items** – region, state, bridge id, partial or rehab identifier, outlier identifier
- **Layout Characteristics** – length, width, deck area, no of spans, span lengths, horizontal curvature and skew
- **Service Characteristics** – Service Type (freeway, rural road, railroad), Crossing Service Type (freeway, rural road, railroad, waterway)
- **Bridge Type Characteristics** – beam type (Steel, Concrete) and subtype (plate girder, rolled beam, I-beam, box beam, slab beam) categories
- **Physical Characteristics** – Size and/or grade of structural elements, weight of structural steel
- **Construction Characteristics** – Staging, alternative construction methodology, funding, delivery method

PROJECT APPROACH

Organize Bid Tab Costs

- Work Categories aggregate similar items of work

Category Name
GENERAL
CIVIL
STRUCTURES
SIGNALS
LIGHTING
ITS
POWER
COMM
WATER
SEWER
ENVIRO
MISC.

PROJECT APPROACH

Organize Bid Tab Costs

- Work Categories aggregate similar items of work
- Hierarchy allows increasing detail

Category Name	Group Name
GENERAL	
CIVIL	
STRUCTURES	BRIDGES
	RETAINING WALLS
	OVERHEAD SIGNS
	MINOR
	REMOVAL
SIGNALS	
LIGHTING	
ITS	
POWER	
COMM	
WATER	
SEWER	
ENVIRO	
MISC.	

PROJECT APPROACH

Organize Bid Tab Costs

- Work Categories aggregate similar items of work
- Hierarchy allows increasing detail
- Bridge categories allow for analysis of various bridge components

Category Name	Group Name	Sub Group Name
GENERAL		
CIVIL		
STRUCTURES	BRIDGES	BRIDGE REMOVAL
		STRUCTURE EX
		FOUNDATIONS
		SUBSTRUCTURE
		BEAMS
		SUPERSTRUCTURE
		AESTHETICS
		TEMP WORK
		MAINTENANCE
		DRAINAGE
	BARRIER	
	BRIDGES TOTAL	
	RETAINING WALLS	
	OVERHEAD SIGNS	
	MINOR	
REMOVAL		
SIGNALS		
LIGHTING		
ITS		
POWER		
COMM		
WATER		
SEWER		
ENVIRO		
MISC.		

PROJECT APPROACH

Organize Bid Tab Costs

- Work Categories aggregate similar items of work
- Hierarchy allows increasing detail
- Bridge categories allow for analysis of various bridge components
- Individual bid items are assigned into specific categories

Category Name	Group Name	Sub Group Name	Item	Item Description
GENERAL				
CIVIL				
STRUCTURES	BRIDGES	BRIDGE REMOVAL		
		STRUCTURE EX		
		FOUNDATIONS		
		SUBSTRUCTURE		
		BEAMS		
			7070050	Structural Steel, Mixed, Erect
			7070051	Structural Steel, Mixed, Furn and Fab
			7070053	Steel Diaphragm, Prest Conc Beam, Furn and Fab
			7070054	Steel Diaphragm, Prest Conc Beam, Erect
			7070060	Structural Steel, Plate, Erect
			7070061	Structural Steel, Plate, Furn and Fab
			7070070	Structural Steel, Rolled Shape, Erect
			7070071	Structural Steel, Rolled Shape, Furn and Fab
			7080033	Prest Conc I Beam, Furn, 54 inch
			7080034	Prest Conc I Beam, Erect, 54 inch
			7080037	Prest Conc I Beam, Furn, 70 inch
			7080038	Prest Conc I Beam, Erect, 70 inch
			7080065	Prest Conc Box Beam, Furn, 27 inch
			7080066	Prest Conc Box Beam, Erect, 27 inch
			7080075	Prest Conc Box Beam, Furn, 39 inch
			7080076	Prest Conc Box Beam, Erect, 39 inch
			7080120	Prest Conc Bulb-Tee Beam, Furn, 48 inch
			7080121	Prest Conc Bulb-Tee Beam, Erect, 48 inch
			7080130	Prest Conc Bulb-Tee Beam, Furn, 60
			7080131	Prest Conc Bulb-Tee Beam, Erect, 60
		BEAMS TOTAL		
		SUPERSTRUCTURE		
		AESTHETICS		
		TEMP WORK		
MAINTENANCE				
DRAINAGE				
BARRIER				
BRIDGES TOTAL				
RETAINING WALLS				

PROJECT APPROACH

Comparable Costs

- Only compare items that relate to a typical bridge

Comparable Categories		
Category	Group	Sub Group
GENERAL	MOBILIZATION	MOBILIZATION
STRUCTURES	BRIDGES	STRUCTURE EX
		FOUNDATIONS
		SUBSTRUCTURE
		BEAMS
		SUPERSTRUCTURE

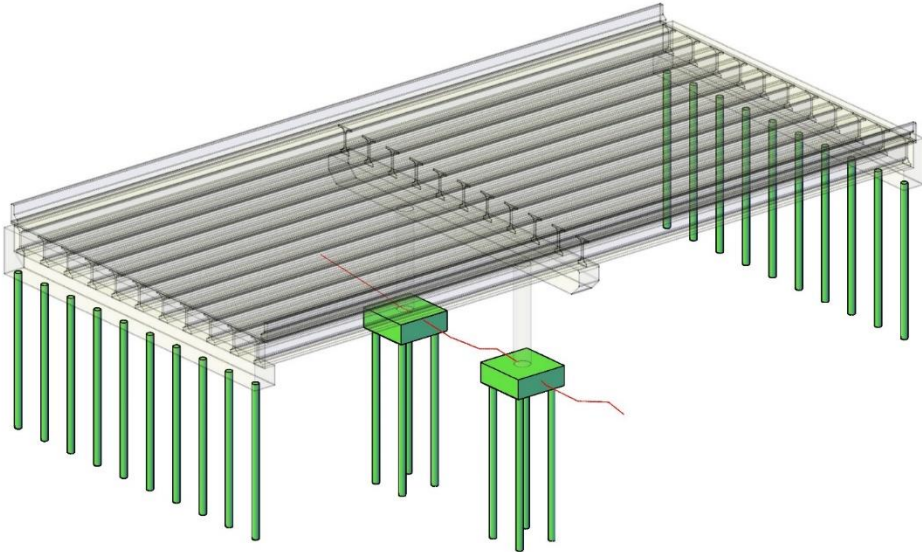


All Categories			
Category	Group	Sub Group	
GENERAL	MOBILIZATION		
	GENERAL CONDITIONS		
	TRAFFIC CONTROL		
	TEMP EROSION CONTROL		
	PROJECT SURVEY		
CIVIL	DEMOLITION		
	GEOTECH		
	EARTHWORK		
	DRAINAGE		
	CONCRETE		
	PAVEMENT		
	PAVEMENT MARKINGS		
	SIGNING		
	BARRIER		
	FENCING		
	LANDSCAPING		
	EROSION CONTROL		
	STRUCTURES	BRIDGES	BRIDGE REMOVAL
STRUCTURE EX			
FOUNDATIONS			
SUBSTRUCTURE			
BEAMS			
SUPERSTRUCTURE			
AESTHETICS			
TEMP WORK			
MAINTENANCE			
DRAINAGE			
BARRIER			
BRIDGES Total			
RETAINING WALLS			
OVERHEAD SIGNS			
MINOR			

WORK CATEGORIES

Foundations

- Size Depends on
 - What they are built on / in
 - Weight of what is above them

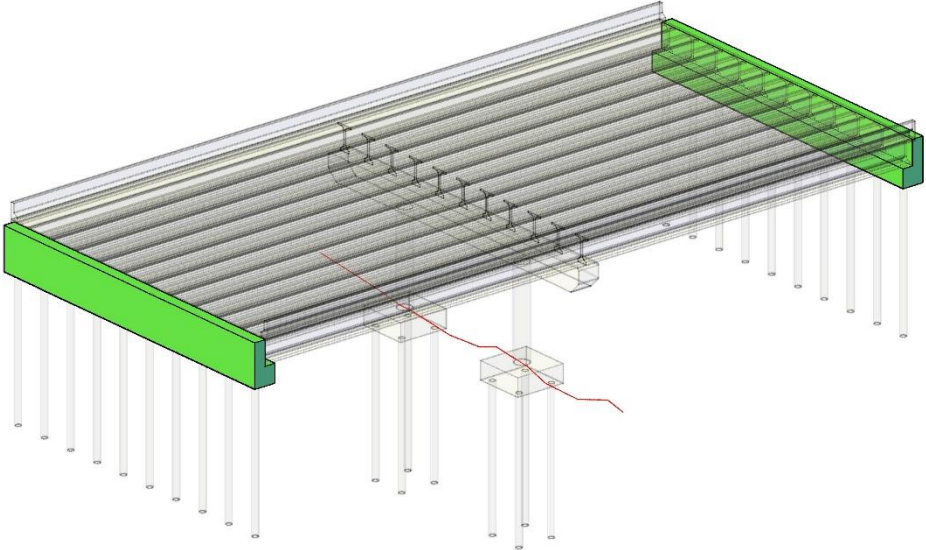


Group Name	Sub Group Name
BRIDGES	BRIDGE REMOVAL
	STRUCTURE EX
	FOUNDATIONS
	SUBSTRUCTURE
	BEAMS
	SUPERSTRUCTURE
	AESTHETICS
	TEMP WORK
	MAINTENANCE
	DRAINAGE
	BARRIER

WORK CATEGORIES

Substructure

- Size Depends on
 - What they are built on / in
 - Weight of what is above them
 - Size of the beams

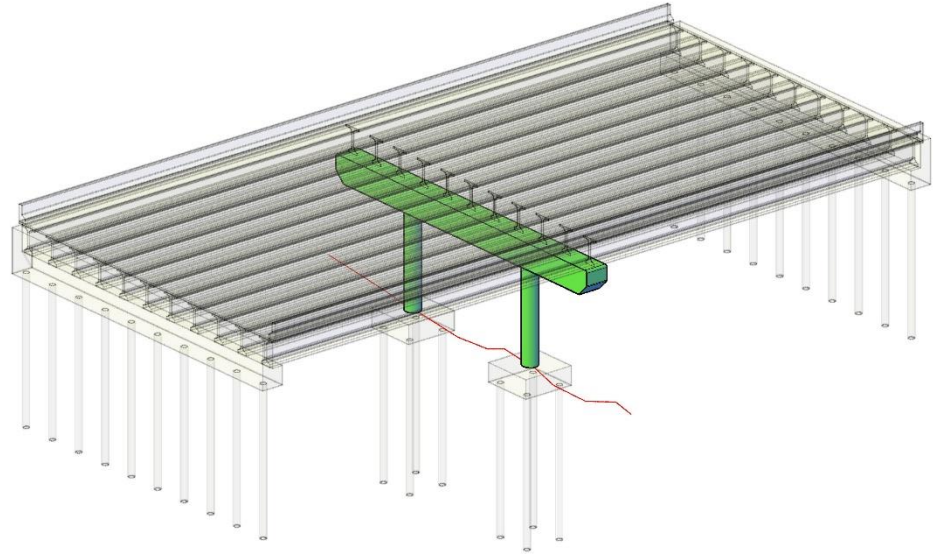


Group Name	Sub Group Name
BRIDGES	BRIDGE REMOVAL
	STRUCTURE EX
	FOUNDATIONS
	SUBSTRUCTURE
	BEAMS
	SUPERSTRUCTURE
	AESTHETICS
	TEMP WORK
	MAINTENANCE
	DRAINAGE
BARRIER	

WORK CATEGORIES

Substructure

- Size Depends on
 - What you're going over
 - Weight of what is above them

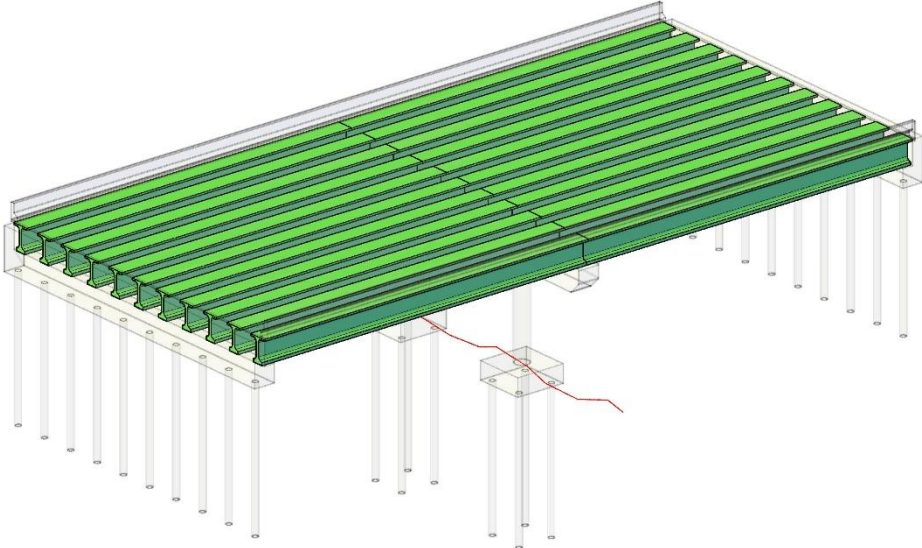


Group Name	Sub Group Name
BRIDGES	BRIDGE REMOVAL
	STRUCTURE EX
	FOUNDATIONS
	SUBSTRUCTURE
	BEAMS
	SUPERSTRUCTURE
	AESTHETICS
	TEMP WORK
	MAINTENANCE
	DRAINAGE
BARRIER	

WORK CATEGORIES

Beams

- Size Depends on
 - Span Length
 - Traffic Loading

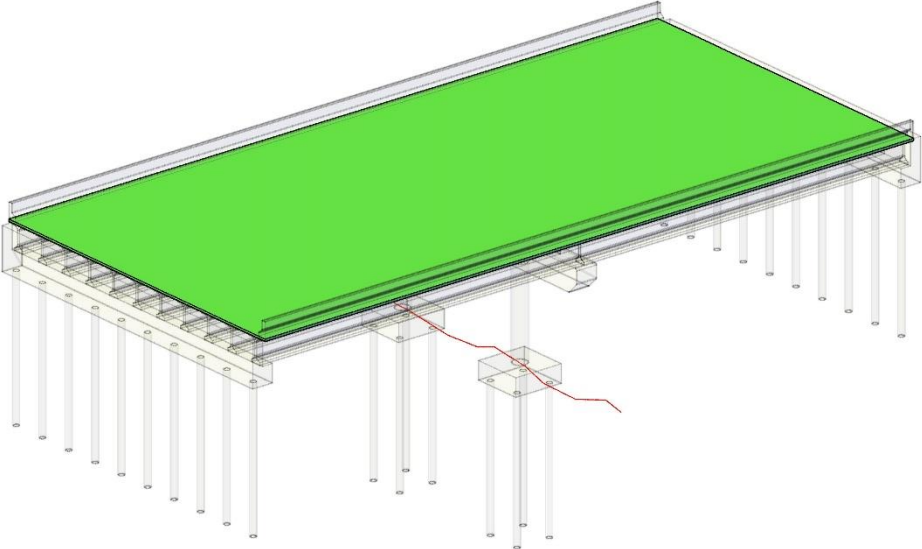


Group Name	Sub Group Name
BRIDGES	BRIDGE REMOVAL
	STRUCTURE EX
	FOUNDATIONS
	SUBSTRUCTURE
	BEAMS
	SUPERSTRUCTURE
	AESTHETICS
	TEMP WORK
	MAINTENANCE
	DRAINAGE
	BARRIER

WORK CATEGORIES

Superstructure

- Size Depends on
 - Traffic Loading
 - Service Type / Life



Group Name	Sub Group Name
BRIDGES	BRIDGE REMOVAL
	STRUCTURE EX
	FOUNDATIONS
	SUBSTRUCTURE
	BEAMS
	SUPERSTRUCTURE
	AESTHETICS
	TEMP WORK
	MAINTENANCE
	DRAINAGE
	BARRIER

WORK CATEGORIES

Comparable Costs

- Generate costs for consistent bridge elements across all samples
- Compare costs not only at bottom line, but within sub categories

Comparable Categories			
Category	Group	Sub Group	Cost / SF
GENERAL	MOBILIZATION	MOBILIZATION	\$18.85
STRUCTURES	BRIDGES	STRUCTURE EX	\$14.66
		FOUNDATIONS	\$17.57
		SUBSTRUCTURE	\$21.35
		BEAMS	\$70.35
		SUPERSTRUCTURE	\$30.69
TOTAL COST			\$173.47

ADJUSTMENTS

ESCALATION

Steel Bridges versus Concrete Bridges

- Necessary to escalate project costs from past years to consistent base year for comparison
- Goal to introduce the least amount of variability as possible in calculation
 - Due to variability in data available and approach used from state to state
- Explore potential differences between concrete and steel bridges that might make escalation rates different for each

ESCALATION

Approach

- Determine portion of bridge costs that fall within certain cost categories
 - Supervisors of Construction and Extraction Workers
 - Construction Trades Workers
 - Construction machinery and equipment
 - Fabricated structural metal bar joists and concrete reinforcing bars
 - Fabricated structural metal for bridges
 - Ready-mix concrete
 - Prestressed concrete bridge beams and solid and hollow cored slabs and panels
 - ENR CCI

	Supervisors of Constr. and Extraction Workers	Constr. Trades Workers	Constr. machinery and equipment	Fabricated structural metal concrete reinforcing bars	Fabricated structural metal for bridges	Ready-mix concrete	Prestressed concrete bridge beams	ENR CCI
	Bureau of Labor Statistics		Producer Price Index - Commodity					ENR
Steel	\$2,143,371	\$6,665,397	\$3,699,429	\$1,656,775	\$9,897,564	\$3,087,413		\$2,395,071
Concrete	\$2,143,371	\$4,733,224	\$3,985,348	\$1,785,455	\$314,300	\$3,258,114	\$8,392,871	\$2,386,040

ESCALATION

Approach

- Research indices from Bureau of Labor Statistics, Producer Price Index, and ENR
- Calculate annual compounded escalation rate for each over 5 year time period

Year	Supervisors of Constr. and Extraction Workers	Constr. Trades Workers	Constr. machinery and equipment	Fabricated structural metal bar joists and concrete reinforcing bars	Fabricated structural metal for bridges	Ready-mix concrete	Prestressed concrete bridge beams	ENR CCI
	Bureau of Labor Statistics		Producer Price Index - Commodity					ENR
2013	59,700	39,892	209.4	183.9	108.7	219.9	115.6	9,412
2014	60,380	40,429	213.0	184.2	114.0	227.7	118.9	9,668
2015	60,990	41,275	216.6	189.8	113.4	239.5	122.3	9,936
2016	62,070	41,796	218.7	188.7	105.7	248.3	125.9	10,152
2017	62,980	43,028	220.2	199.0	100.7	257.2	129.7	10,530
2018	64,070	43,988	217.9	200.0	110.0	267.1	134.0	10,873
2019	65,230	45,338	231.1	217.4	109.5	272.5	140.3	11,186
Escalation (5 yr)	1.6%	2.3%	1.6%	3.4%	-0.8%	3.7%	3.4%	3.0%

ESCALATION

Approach

- Escalate each component separately
- Determine annual compounding escalation rate for each bridge type

Year	Supervisors of Constr. and Extraction Workers	Constr. Trades Workers	Constr. machinery and equipment	Fabricated structural metal bar joists and concrete reinforcing bars	Fabricated structural metal for bridges	Ready-mix concrete	Prestressed concrete bridge beams	ENR CCI
Base Cost								
Steel	\$2,143,371	\$6,665,397	\$3,699,429	\$1,656,775	\$9,897,564	\$3,087,413		\$2,395,071
Concrete	\$2,143,371	\$4,733,224	\$3,985,348	\$1,785,455	\$314,300	\$3,258,114	\$8,392,871	\$2,386,040
Escalation	1.6%	2.3%	1.6%	3.4%	-0.8%	3.7%	3.4%	3.0%
Escalated Cost								
Steel	\$2,176,749	\$6,819,941	\$3,760,268	\$1,712,606	\$9,818,162	\$3,200,335	\$0	\$2,465,960
Concrete	\$2,176,749	\$4,842,969	\$4,050,889	\$1,845,623	\$311,779	\$3,377,279	\$8,675,177	\$2,456,662

Concrete Bridge = 2.75%

Steel Bridge = 1.40%

LOCATION ADJUSTMENT

- Necessary to adjust project costs from state specific to national average for comparison

- Utilized RS Means City Cost Indexes to determine adjustment factor for each state

DIVISION		ILLINOIS																		
		CARBONDALE			CENTRALIA			CHAMPAIGN			CHICAGO			DECATUR			EAST ST. LOUIS			
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	
015433	CONTRACTOR EQUIPMENT	1133	1133		1133	1133		1056	1056		969	969		1056	1056				1133	1133
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	99.5	101.5	100.5	99.3	103.4	102.0	106.2	101.6	103.0	103.6	105.7	103.7	93.5	101.2	99.3	100.3	102.0	101.7	
0310	Concrete Forming & Accessories	89.6	108.2	105.4	91.1	114.7	111.2	90.6	116.7	112.8	99.5	162.3	152.7	91.8	115.9	112.9	87.0	111.5	107.9	
0320	Concrete Reinforcing	90.2	106.3	98.4	90.2	107.0	98.8	99.1	100.6	98.4	100.2	154.7	128.0	88.5	100.9	94.0	90.1	107.0	98.7	
0330	Cas-in-Place Concrete	88.9	102.3	95.6	89.3	101.6	101.3	113.6	111.9	113.1	126.4	154.6	136.9	97.0	113.7	103.2	90.9	121.5	102.3	
03	CONCRETE	79.1	107.3	91.5	79.5	117.1	96.7	104.2	112.8	108.0	109.4	157.3	130.6	89.3	113.1	99.9	80.5	115.7	96.1	
04	MASONRY	76.0	112.4	96.5	76.0	125.5	106.6	133.3	121.3	126.4	104.5	166.2	142.6	71.8	120.2	101.7	76.3	125.5	106.7	
05	METALS	103.2	130.7	111.6	103.3	133.8	112.5	94.8	119.7	102.4	102.1	146.8	115.6	137.2	119.2	110.9	104.4	133.5	113.2	
06	WOOD, PLASTICS & COMPOSITES	88.7	105.4	97.9	91.2	110.9	101.9	90.4	114.3	103.7	101.1	161.7	134.0	89.8	114.9	103.4	85.8	106.9	97.3	
07	THERMAL & MOISTURE PROTECTION	95.0	102.3	98.2	95.1	113.2	102.9	99.9	114.7	105.8	93.8	152.0	119.1	100.7	113.0	106.1	95.1	112.5	102.6	
08	OPENINGS	89.2	116.9	95.5	89.2	120.0	96.3	93.9	116.6	99.2	104.4	170.9	119.9	100.3	116.9	104.2	89.0	117.7	95.9	
0920	Plaster & Gypsum Board	95.3	105.7	102.2	96.6	111.3	106.3	90.6	115.4	107.0	94.8	163.5	140.1	97.8	115.4	109.4	93.8	107.2	102.6	
0950, 0980	Ceilings & Acoustic Treatment	84.6	105.7	98.9	84.6	111.3	102.7	89.7	115.4	107.1	99.8	163.5	143.0	90.5	115.4	107.4	84.8	107.2	98.9	
0960	Flooring	113.2	113.8	112.0	112.0	127.7	116.5	90.4	114.7	97.1	98.7	164.8	117.9	99.5	115.2	104.1	110.2	127.7	115.3	
0970, 0990	Wall Finishes & Fairing/Coating	109.1	107.7	108.3	109.1	114.6	112.3	88.7	115.4	105.5	104.9	162.3	136.9	100.8	114.4	108.9	109.1	114.6	112.3	
09	FINISHES	92.8	108.1	101.1	93.2	117.1	106.3	88.8	116.6	100.0	96.4	163.5	133.9	92.8	116.2	105.6	92.4	114.4	104.4	
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	102.3	100.5	100.0	104.3	100.9	100.0	105.4	100.2	100.0	128.1	106.2	100.0	104.8	101.1	100.0	103.8	100.8	
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	96.4	106.5	100.5	96.4	88.8	97.4	96.5	108.3	100.4	99.8	138.0	115.3	99.9	96.4	98.5	99.9	99.9	97.7	
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	91.2	108.8	100.2	92.5	108.9	100.8	97.4	92.6	96.9	97.4	134.1	116.1	94.9	89.6	92.3	92.1	102.1	97.2	
MF2016	WEIGHTED AVERAGE	93.1	109.8	100.2	93.3	113.0	101.8	98.7	109.8	102.5	101.7	146.1	120.7	97.2	107.0	101.4	94.4	111.3	101.6	

DIVISION		ILLINOIS																	
		EFFINGHAM			GALESBURG			JOLIET			KANKAKEE			LA SALLE			NORTH SUBURBAN		
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT	1056	1056		1047	1047		954	954		954	954		1047	1047		954	954	954
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	97.8	100.4	98.5	89.5	99.8	99.7	99.3	101.7	101.0	93.1	101.3	98.8	88.9	101.3	100.6	88.5	102.0	101.0
0310	Concrete Forming & Accessories	96.3	116.6	113.8	90.5	119.5	115.7	98.8	161.1	151.8	92.1	148.3	128.0	134.5	126.0	129.8	88.1	168.8	147.8
0320	Concrete Reinforcing	91.4	96.2	93.5	95.5	108.6	102.1	100.2	140.6	120.7	101.0	138.9	120.3	95.7	137.5	100.3	100.2	153.3	129.2
0330	Cas-in-Place Concrete	95.7	109.2	101.9	101.0	111.5	104.9	115.0	148.1	127.9	107.1	138.1	118.6	109.9	125.0	109.9	115.0	154.5	129.7
03	CONCRETE	80.0	111.0	98.3	84.7	115.4	103.9	102.2	151.3	124.3	96.0	141.3	116.1	95.6	128.2	110.0	102.2	136.4	125.8
04	MASONRY	80.2	114.1	101.2	111.1	123.7	118.9	103.7	160.0	138.5	100.0	148.4	129.9	111.1	145.6	132.4	100.7	161.8	138.6
05	METALS	104.2	114.5	107.3	94.9	124.1	103.7	100.0	135.6	110.8	100.0	133.9	110.2	95.0	142.8	109.4	101.1	142.0	115.5
06	WOOD, PLASTICS & COMPOSITES	92.1	117.3	105.9	90.5	118.7	106.7	99.2	162.3	133.5	92.1	144.5	120.6	106.5	123.3	115.6	98.1	157.7	130.5
07	THERMAL & MOISTURE PROTECTION	100.1	109.8	104.4	98.3	112.1	104.3	98.1	149.2	119.9	97.1	141.1	116.2	98.5	128.9	111.7	98.4	148.9	120.3
08	OPENINGS	95.3	116.2	100.2	93.3	118.6	99.2	101.5	165.5	116.9	94.8	156.8	103.2	93.3	135.2	103.0	102.0	168.4	117.4
0920	Plaster & Gypsum Board	97.8	117.9	111.0	90.8	119.3	109.5	87.3	164.1	137.9	85.5	148.0	125.3	98.3	124.1	115.7	90.9	169.5	136.1
0950, 0980	Ceilings & Acoustic Treatment	84.6	117.9	107.1	89.7	119.3	109.8	99.4	164.1	143.3	99.4	146.0	131.0	89.7	124.1	113.0	99.4	159.5	130.1
0960	Flooring	100.5	116.9	105.3	90.2	124.9	100.3	95.7	154.8	113.5	93.7	156.7	111.7	96.7	122.9	104.3	97.2	164.8	116.8
0970, 0990	Wall Finishes & Fairing/Coating	100.8	112.2	101.6	88.7	101.1	96.0	97.0	167.3	138.6	97.0	138.3	121.4	88.7	136.5	117.8	99.0	168.2	138.9
09	FINISHES	91.9	117.4	105.8	88.1	119.4	105.2	93.7	162.0	131.0	92.2	147.5	122.4	91.1	125.3	110.9	94.5	161.8	131.2
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	97.2	96.3	100.0	101.4	100.2	100.0	125.0	106.5	100.0	117.8	102.9	100.0	102.7	100.6	100.0	121.3	104.7
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	96.5	104.7	99.3	96.5	105.7	100.2	99.9	133.0	113.3	96.4	132.4	111.0	96.5	127.0	108.8	99.9	136.4	114.6
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	92.9	108.8	101.0	95.1	83.8	89.3	96.5	136.5	116.9	91.8	133.8	113.2	92.2	133.9	113.4	96.4	136.7	116.4
MF2016	WEIGHTED AVERAGE	95.7	109.2	101.3	95.9	109.5	101.8	99.7	142.2	117.9	96.4	136.1	113.4	96.1	128.9	110.2	99.3	144.1	118.8

LOCATION ADJUSTMENT

Region	State	Location Factor
West	Washington	0.9969
	Oregon	0.9889
	Texas	0.8293
Central	Minnesota	0.9820
	Illinois	1.0676
	Arkansas	0.8040
Southeast	North Carolina	0.8412
	South Carolina	0.8365
	Kentucky	0.8821
Northeast	Michigan	0.9303
	New York	1.1506
	Pennsylvania	0.9846

OUTLIERS

- Definition – where cost of bridge is greater than 3 times the difference between the third quartile and first quartile.
- Calculated at state level for each bridge subtype
- Removed outliers from calculation of results prior to comparison



03 RESULTS

KEY PARAMETERS

KEY PARAMETERS

Bridge Type and Subtype Categories

- Steel
 - SPG – Steel Plate Girder
 - RSB – Rolled Steel Beam

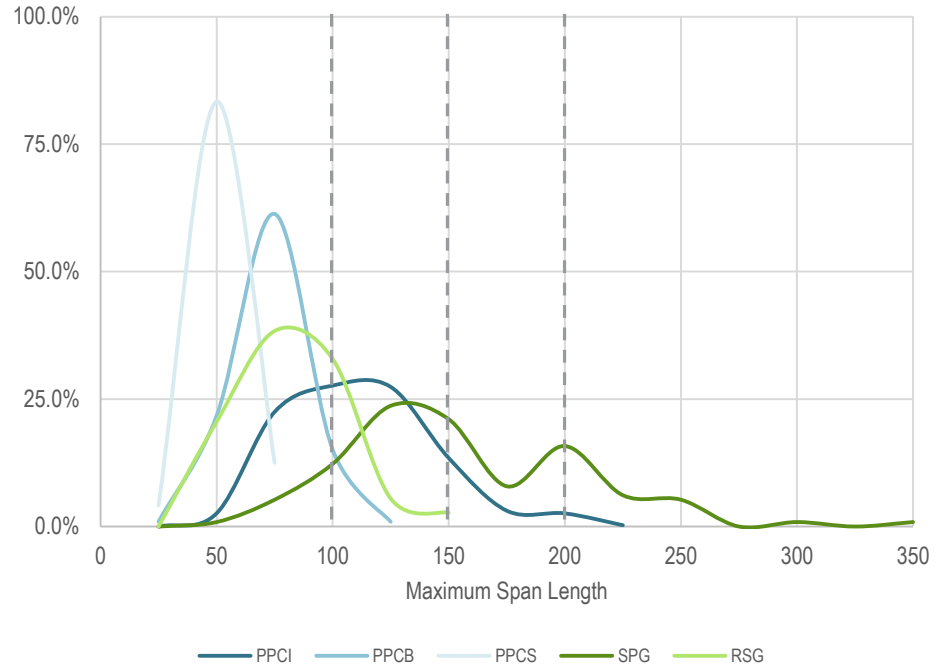
- Concrete
 - PPCI – Precast Prestressed Concrete I Beam
 - PPCB – Precast Prestressed Concrete Box Beam
 - PPCS – Precast Prestressed Concrete Slab Beam

Beam Type	Beam Subtype	No. of Bridges
Steel	SPG	106
	RSB	72
Concrete	PPCI	381
	PPCB	105
	PPCS	48
Total		712

KEY PARAMETERS

Span Classification

- span length - distance along the centerline of the bridge from one end of the bridge to the midpoint of the next adjacent pier, or the opposite end of the bridge for a single-span bridge; or the distance from midpoint to midpoint of adjacent piers
- Span Length Classification
 - < 100 feet
 - 100 to 150 feet
 - 150 to 200 feet
 - > 200 feet
- Based on maximum span length



Span Category	Steel	Concrete	Total
< 100 feet	85	356	441
100 to 150 feet	55	154	209
150 to 200 feet	25	21	46
> 200 feet	13	3	16

KEY PARAMETERS

Alignment Classification

- Horizontal Curvature – centerline alignment has a radius greater than zero
- Skew Angle – angle in degrees between a line perpendicular to the centerline alignment of the bridge and a line along the centerline of the bridge abutments or piers
- Alignment Classification
 - Straight – straight and skew less than 30 degrees
 - Highly Skewed – straight and skew greater than 30 degrees
 - Horizontally Curved

Span Category	Steel	Concrete	Total
Straight	128	372	500
Highly Skewed	25	101	126
Horizontally Curved	25	61	86

NATIONAL COST ANALYSIS

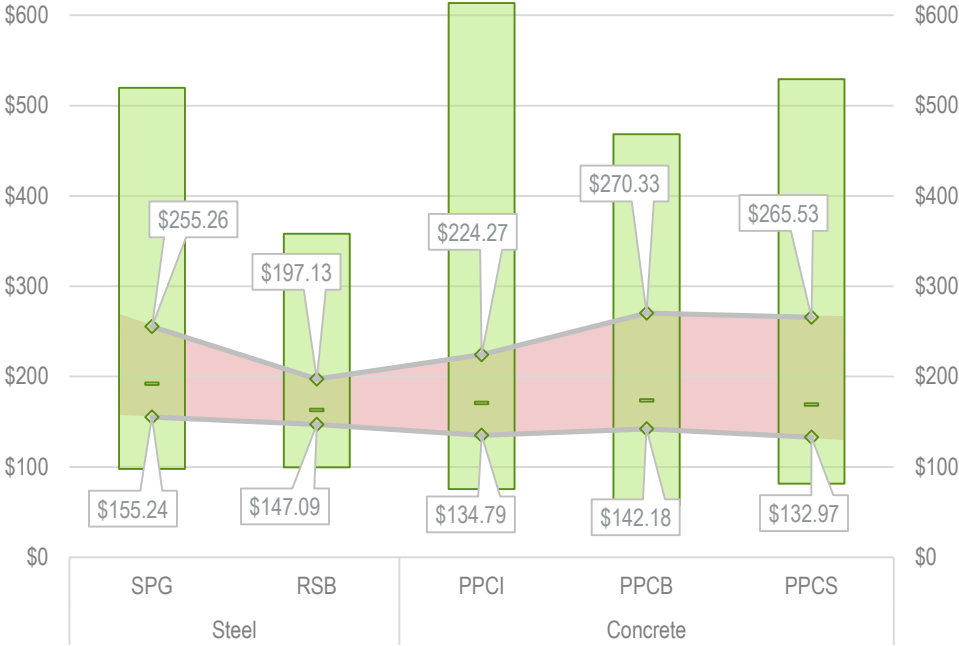
All Bridges



- Green bars show overall range of bridge costs by bridge subtype

NATIONAL COST ANALYSIS

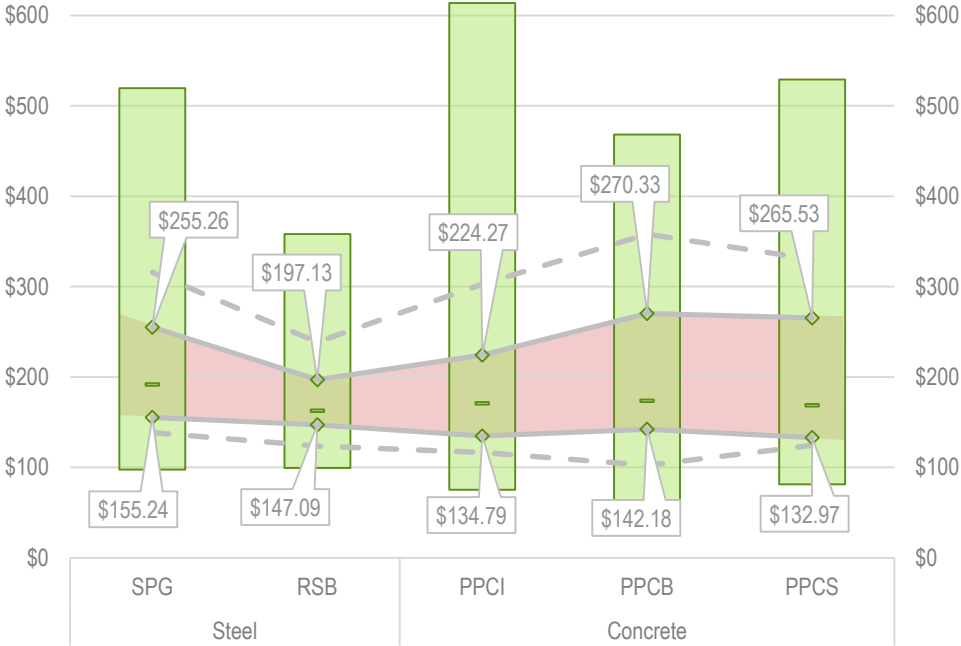
All Bridges



- Middle 50th Percentile shown between lines

NATIONAL COST ANALYSIS

All Bridges

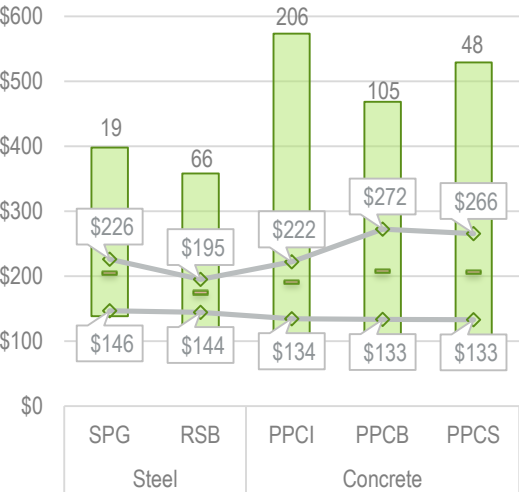


- Middle 80th Percentile shown between dashed lines

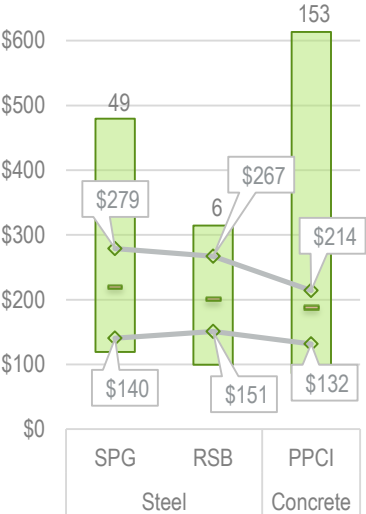
NATIONAL COST ANALYSIS

Span Classification

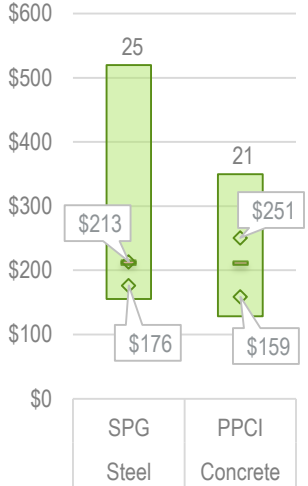
<100'



100' to 150'

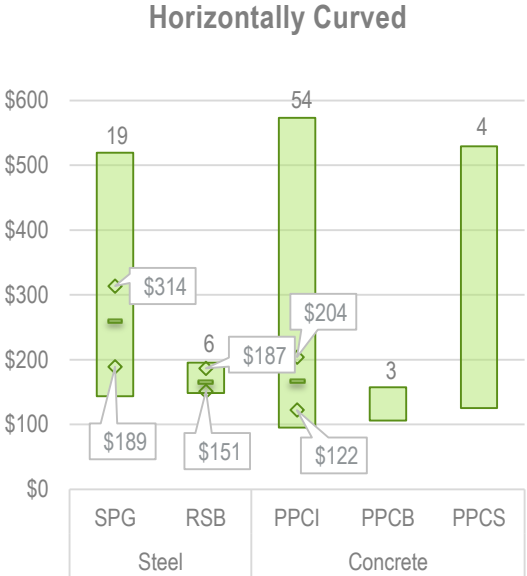
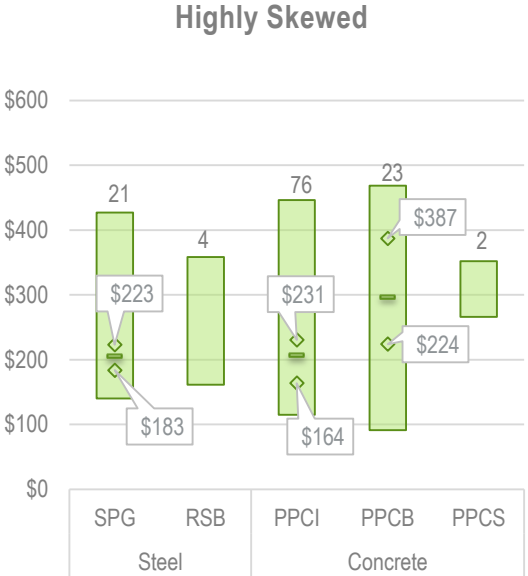
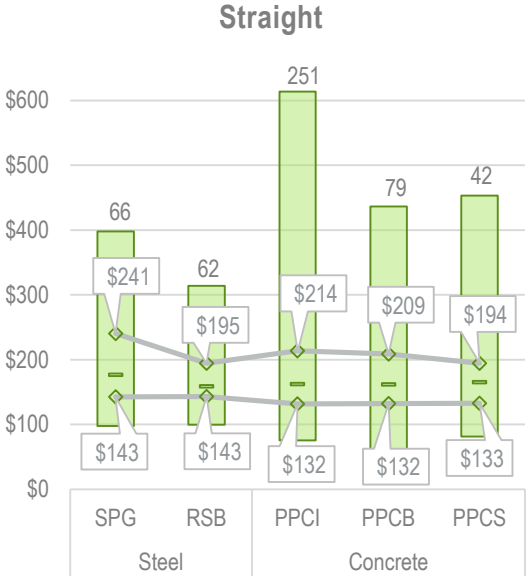


150' to 200'



NATIONAL COST ANALYSIS

Alignment Classification





04 KEY TAKEAWAYS

KEY TAKEAWAYS

- There is significant overlap in all bridge cost ranges, especially within the middle 50th percentile of projects
- At the 75th Percentile - The most cost competitive bridge type is Rolled Steel Beam / The least cost competitive bridge type is Concrete Box Beam
- Steel Plate Girder and Concrete I-Beam bridge costs are consistently within a similar range for the middle 50th percentile
- Steel Plate Girder bridges are more cost competitive in the <100' span classification than Box Beam and Slab Beam bridges
- Designers need to understand the current steel market as part of their bridge selection process

QUESTIONS?