



Bridge Economics and Estimating

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- Bridge Economics
- Pay Items
- Quantities

Bridge Economics

- Bridge Cost “Rules of thumb”
 - Our most economical bridge is a single span integral abutment bridge.
 - Our most economical abutment type is pile bent integral abutment
 - Single line of piling versus 2-3 rows
 - No separate footing (cost and time to construct and cure)
 - Stem width 3’ versus 4’ minimum for semi-integral or 4.5’ minimum parapet
 - Abutment can be formed and poured all at once versus 2+ on other types
 - Our most economical pier type pile bent (then pile bent with encasement wall pier)

Bridge Economics

- Myth “tall abutments more economical”
 - False! Typical abutment costs:
 - Pile bent integral typically cost approximately \$100,000/each to \$125,000/each
 - Semi-integral (short) typically cost approximately \$275,000/each to \$300,000/each
 - Parapet (medium high 13'+- stem) typically cost approximately \$375,000/each to \$400,000/each
 - Parapet (high 20'+ stem) can cost +\$500,000/each

Bridge Economics

- PCB bridge superstructure costs run approximately \$90.00-\$105.00/SF (bearings on up)
 - Cost drivers
 - Deck Area
 - Beam spacing
 - Sidewalk, medians, etc.
- Skewed substructures greatly influences total bridge and unit costs (\$/SF)
- Estimating bridges based on \$/SF can be disastrous

Bridge Economics

- Staged construction
 - Has effect on time and therefore money
 - Many time requires substantial support of excavation (SOE)
 - Can run \$50,000 to \$200,000 + depending on abutment height
 - Can require couplers/mechanical splices
 - Can cause design issues to accommodate
 - Can require additional beams or pier columns to accommodate

- Piling
 - When design is requiring a significant number of piles consider discussing with regional engineer increasing pile sizes
 - In many instances the pile lengths do increase to go to the larger pile
 - Cost per ton between 12” pile and 16” is similar but less piles equals less time

Pay Items

- Why pay items are important
 - Pay items are our contractual method for compensating contractors

SCHEDULE OF QUANTITIES FOR BRIDGE 71020			
ITEM NUMBER	ITEM	UNIT	QUANTITY
2401.503	TYPE S (TL-4) 36" BARRIER CONC (3S52)	LIN FT	435(P)
2401.507	STRUCTURAL CONCRETE (1G52)	CU YD	61(P)
2401.507	STRUCTURAL CONCRETE (3B52)	CU YD	221(P)
2401.508	REINFORCEMENT BARS	POUND	5840(P)
2401.508	REINFORCEMENT BARS (EPOXY COATED)	POUND	95230(P)
2401.508	REINFORCEMENT BARS (STAINLESS-75KSI)	POUND	430(P)

- Consistent use of pay items allows owners to project historical pricing for future jobs
- Inconsistent use of pay items offers opening for claims!

Pay Items

- Do's

- Use only pay items from Trns*port list (unless approved by estimating unit)
- Use “long description” from Trns*port list
- <http://transport.dot.state.md.us/Reference/refItem.aspx>

- Don'ts

- Do not include additional work or costs to book (.5XX) or common non-book (.6XX) items

Item Number	Short Description	Long Description	Unit Name	Plan Unit Description	Spec Year
2401.503/00346	TYPE CURB BARRIER CONCRETE (3S52)	TYPE CURB BARRIER CONCRETE (3S52)	L F	LIN FT	18

- Pay item changes with 4 new sections in 2020 Spec Book
 - 2473 Expansion Joint Devices
 - 2474 High-load Multi-rotational Bearings
 - 2475 Metal Railing
 - 2477 Powder Coating

Pay Items

- 2018 Spec Book

- 2402.503 Expansion Joint Devices Type ___
- 2402.503 Modular Bridge Joint System Type ___
- 2402.602 High-load Multi-rotational Bearing
- 2402.503 Ornamental Metal Railing ___
- 2402.503 Structural Tube Railing Design ___
- 2402.503 Pipe Railing ___

- 2020 Spec Book

- 2473.503 Expansion Joint Devices Type ___
- 2473.503 Modular Bridge Joint System Type ___
- 2474.502 High-load Multi-rotational Bearing
- 2475.503 Ornamental Metal Railing ___
- 2475.503 Structural Tube Railing Design ___
- 2475.503 Pipe Railing ___

Pay Items

- 2477 Powder Coating
 - No pay items under this section
- Implementation of new Spec Book Starting with the August 27, 2021 letting
- Other Changes

Pay Items

- 2018 Spec Book

- 2472.502 Couplers
(Reinforcement Bars) T-__
- 2401.607 Bridge Slab
Concrete (3YHPC-_) CU YD
- 2401.618 Bridge Slab
Concrete (3YHPC-_) SQ FT

- 2020 Spec Book

- 2472.502 **Mechanical Splice Couplers (Reinforcement Bars) T-__**
- 2401.**507** Bridge Slab
Concrete (3YHPC-_) CU YD
- 2401.**518** Bridge Slab
Concrete (3YHPC-_) SQ FT

- Properly computing quantities
 - Make sure personnel understand measurement spec
 - For items documented by the Spec Book (.5XX) or Special Provisions (.6XX) make sure personnel calculating quantities read and understand measurement definition.
 - Example: expansion joints are measured out to out of bridge slab along the center of joint
 - Verify quantities tied to work included grading plan
 - Wearing course, barrier, metal railing, sidewalk, median, etc.

- Miscellaneous/incidental quantities
 - Though we no longer put incidental item and “for information only” quantities on our plan sets we still require these items to be calculated for estimating and reporting purposes.
 - Incidental items: cork, joint waterproofing, etc.
 - “For informational only” quantities:
 - Component quantities: conduit systems, drainage systems, etc.
 - How do they get it to me
 - Cu. Yd. Quantities for concrete items paid for by Lin. Ft., Sq. Ft.
- “Incidental” versus “Included in”
- For both new bridges and repair projects

- Quality Requirements
 - All pay items require 2 independent calculation reconciled with the reconciled quantity shown in the SEQ.
 - All incidental and for information only items require a minimum of one set of calcs by experienced personnel.
 - SEQ quantities should match quantities shown in abutment, pier, superstructure summary tables.
 - BMP would have a single summary sheet indicating individual quantities with initials of calculating personnel along with the agreed upon value (see example).

Quantities

SCHEDULE OF QUANTITIES (BR50811)													
ITEM	S ABUT		N ABUT		PIER					SUP.		TOTAL QTY	UNIT
REMOVE REG. WASTE MAT. (BRIDGE)												1	LS
TYPE P-1 BARRIER CONC (3S52)										437	cmh	437	LIN. FT.
										57	skl	57	CU. YD.
STRUCTURAL CONCRETE ((1G52)	124	bt	112	bt	50	tor						286	CU. YD.
		skl		skl		cmh							
STRUCTURAL CONCRETE (3B52)	150	bt	111	bt	119	tor						380	CU. YD.
		skl		skl		cmh							
REINFORCEMENT BARS	6400	bt	5880	bt	2730	bt						15010	POUND
		skl		alb		cmh							
REINF BARS (EPOXY CATED)	12560	bt	10050	bt	24240	bt				52330	bt	99180	POUND
		skl		alb		cmh					skl		

Questions?

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