

Engineering Justification for Alternate Pay Item Pricing

****Item:** 714-11956 - STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 10 FT X 9 FT (LFT)**

1. Narrative: Why Alternates Were Needed

The requested pay item, 714-11956, specifies a *coated* reinforced concrete box section with a 10 ft x 9 ft opening. No recent or local bid history exists for this exact item, particularly with the "COATED" requirement. To develop a defensible unit price, alternate pay items were identified and analyzed based on geometric similarity, specification section, recency, locality, and available data volume. This approach ensures the estimate reflects current market conditions and construction practices, even in the absence of direct historical pricing.

2. Candidate Summary

****All candidate alternates considered, with available data counts:****

- ****714-11957**** - STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 15 FT X 6 FT
 - Area: 90 sqft (exact match)
 - Data Points: 3
 - Adjusted Price: \$3,335.00/LFT
 - Notes: Closest geometry, same spec, lacks "COATED" keyword
- ****714-11185**** - STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 10 FT X 8 FT
 - Area: 80 sqft
 - Data Points: 8
 - Adjusted Price: \$2,559.38/LFT
 - Notes: Good geometry, same spec, lacks "COATED"
- ****714-11120**** - STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 16 FT X 6 FT
 - Area: 96 sqft
 - Data Points: 3
 - Adjusted Price: \$2,484.38/LFT
 - Notes: Similar geometry, same spec, lacks "COATED"
- ****714-11187**** - STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 12 FT X 6 FT
 - Area: 72 sqft
 - Data Points: 9
 - Adjusted Price: \$3,750.00/LFT
 - Notes: Lower similarity, missing spec section
- ****714-11444**** - STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 13 FT X 7 FT
 - Area: 91 sqft
 - Data Points: 3
 - Adjusted Price: \$4,500.00/LFT
 - Notes: Lower similarity, missing spec section
- ****714-11755**** - STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 11 FT X 7 FT

- Area: 77 sqft
- Data Points: 3
- Adjusted Price: \$2,712.27/LFT
- Notes: Lower similarity, missing spec section

3. Weighting Narrative

Blended Alternates and Weighting:

The final estimate blends three alternates, each chosen for their high similarity to the target item in geometry, specification, and data quality:

- **714-11957 (15x6, 90 sqft):** *Weight: 0.45*
- Rationale: Perfect area match (90 sqft), same spec section (714), and highest overall similarity score (0.7185). Although only 3 data points, all are recent and local. The lack of "COATED" in the description is a limitation, but geometry and spec alignment take precedence.
- **714-11185 (10x8, 80 sqft):** *Weight: 0.35*
- Rationale: Closest in size to the target (10x8 vs 10x9), moderate data volume (8 points), and same spec section. Slightly lower similarity score (0.6429) but more data points support statistical reliability.
- **714-11120 (16x6, 96 sqft):** *Weight: 0.20*
- Rationale: Slightly larger area (96 sqft), same spec section, all data recent but only 3 points. Lower similarity score (0.6532), but included for additional geometric context.

Area-Ratio Consideration:

All selected alternates are within +/-10% of the target area (90 sqft), minimizing the need for significant area-based price adjustments. The weights reflect a balance between geometric match, data quality, and recency/locality, with the closest match (714-11957) receiving the highest weight.

4. Show the Work

Given:

- 714-11957 (15x6): Adjusted Price = \$3,335.00, Weight = 0.45
- 714-11185 (10x8): Adjusted Price = \$2,559.38, Weight = 0.35
- 714-11120 (16x6): Adjusted Price = \$2,484.38, Weight = 0.20

Formula:

Final Unit Price = (Price * Weight) + (Price * Weight) + (Price * Weight)

Substitute:

Final Unit Price = (3,335.00 * 0.45) + (2,559.375 * 0.35) + (2,484.375 * 0.20)

Result:

Final Unit Price = (1,500.75) + (895.78125) + (496.875)
Final Unit Price = 2,893.40625

Rounded:

Final Unit Price (rounded) = \$2,900.00 per LFT

5. Conclusion: Reasonableness of Result

The resulting unit price of **\$2,900.00/LFT** is reasonable for the project scope and region, given the following:

- All alternates are from the same specification section (714), ensuring technical comparability.
- The blended approach accounts for geometric similarity and available bid history, with weights reflecting both area match and data reliability.
- The lack of "COATED" in all alternates is acknowledged; if a statewide summary or spec-based cost factor for coating becomes available, it should be applied as an adjustment.
- The estimate is consistent with recent, local bid data and falls within the expected range for similar box culvert work in Region 2 for projects of this size.

References:

- Spec Section 714 - Reinforced Concrete Box Sections (State Standard Specifications)
- BidTabs Data (prefix search, Region 2, 2022-2024)
- No statewide summary available for "COATED" box sections; estimate should be revisited if such data emerges.

Summary:

Alternate pay items were required due to the absence of direct bid history for the specified "COATED" box section. The blended, weighted approach using the three closest alternates provides a robust, data-driven estimate that is appropriate for the project's scope and location.