

### ### Engineering Justification for Alternate Pay Item Pricing

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

**\*\*Quantity:\*\*** 98 LFT

**\*\*Target Area:\*\*** 90 sq ft

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#### #### 1. Narrative: Why Alternates Were Needed

The requested item, 714-11956, specifies a \*coated\* reinforced concrete box section with dimensions 10 ft x 9 ft. No exact historical bid data was available for this precise geometry and coating specification. The lack of direct matches is likely due to the infrequency of this particular size and the added coating requirement, which is not commonly separated in historical bid tabs. Therefore, alternate pay items with similar geometry and specification were identified and used to estimate a reasonable unit price. The alternates were selected based on closeness in area, geometry, and specification, with adjustments made for differences in size and the presence/absence of the coating keyword.

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#### #### 2. Candidate Summary

##### **\*\*Alternates Considered:\*\***

- All candidates are reinforced concrete box sections of similar size, but none are explicitly "coated."
- Data points are limited, with the highest count being 9 for a less similar size.

Item Code	Description	Area (sq ft)	Adjusted Price	Data Points
714-11957	15 FT X 6 FT (closest area/geometry, not coated)	90	\$3,335.00	3
714-11185	10 FT X 8 FT (good geometry, not coated)	80	\$2,559.38	8
714-11120	16 FT X 6 FT (good geometry, not coated)	96	\$2,484.38	3
714-11755	11 FT X 7 FT (moderate geometry, not coated)	77	\$2,712.27	3
714-11187	12 FT X 6 FT (lower geometry, not coated)	72	\$3,750.00	9
714-11444	13 FT X 7 FT (very close area, not coated)	91	\$4,500.00	3

**\*\*Note:\*\*** All candidates lack the "coated" keyword, which may understate the price for the requested item.

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#### #### 3. Weighting Narrative

##### **\*\*Blended Alternates and Weights:\*\***

The final price is a weighted blend of the four most relevant alternates, with weights assigned as follows:

- **\*\*714-11957 (15x6, 90 sq ft):\*\*** 0.45

**\*Rationale:** Perfect area match and highest overall similarity. Despite only 3 data points, its geometry and recency are ideal.

- **\*\*714-11185 (10x8, 80 sq ft):\*\*** 0.30

**\*Rationale:** Good geometry (close in width and height), more data points (8), moderate similarity.

- \*\*714-11120 (16x6, 96 sq ft):\*\* 0.15

\*Rationale:\* Good geometry and recency, but only 3 data points and slightly less similar.

- \*\*714-11755 (11x7, 77 sq ft):\*\* 0.10

\*Rationale:\* Moderate geometry, high recency, but lowest similarity and only 3 data points.

#### \*\*Why These Weights?\*\*

Weights prioritize geometry (area and shape), recency, and available data. The perfect area match (714-11957) receives the highest weight, while alternates with more data but less geometry similarity (714-11185) are also strongly considered. Lower weights are assigned to alternates with less similarity or fewer data points. Area-ratio adjustments are already reflected in the "adjusted price" for each candidate.

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#### #### 4. Show the Work

##### \*\*Given:\*\*

- 714-11957: Adjusted Price = \$3,335.00, Weight = 0.45

- 714-11185: Adjusted Price = \$2,559.38, Weight = 0.30

- 714-11120: Adjusted Price = \$2,484.38, Weight = 0.15

- 714-11755: Adjusted Price = \$2,712.27, Weight = 0.10

##### \*\*Formula:\*\*

Weighted Average =  $(P1 * W1) + (P2 * W2) + (P3 * W3) + (P4 * W4)$

##### \*\*Substitute:\*\*

=  $(3,335.00 * 0.45) + (2,559.38 * 0.30) + (2,484.38 * 0.15) + (2,712.27 * 0.10)$

##### \*\*Result:\*\*

=  $(1,500.75) + (767.814) + (372.657) + (271.227)$

= 2,912.448

##### \*\*Rounded Unit Price:\*\*

= \$2,900.00 per LFT

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#### #### 5. Concluding Remark

The resulting unit price of \*\*\$2,900.00 per LFT\*\* is reasonable for the project scope, given the lack of direct matches for the coated specification and the limited data volume. The estimate is robustly constructed by blending the most geometrically and specification-relevant alternates, with area-ratio and recency considered. The price is consistent with recent bid history for similar box culvert sizes and reflects a prudent approach in the absence of direct "coated" item data. This approach aligns with best practices for alternate pay item estimation per AASHTO guidance and typical DOT cost estimation procedures when direct bid history is unavailable.

##### \*\*References:\*\*

- INDOT Standard Specifications Section 714 (Reinforced Concrete Box Structures)

- AASHTO Guide for Estimating Highway Construction Costs

- BidTabs historical data (Region 2, 2019-2024)

- No statewide summary or reference data available for this item; only BidTabs alternates used.

