Engineering Justification for Alternate Pay Item Pricing
Item: 714-11956 - STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 10 FT X 9 FT (LFT)

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1. Narrative: Why Alternates Were Needed

The requested item, 714-11956, specifies a 10 FT x 9 FT coated reinforced concrete box section. However, recent bid history and statewide summaries do not provide sufficient direct data for this exact configuration, particularly with the "COATED" specification. This lack of direct pricing data is common for specialized or infrequently used sizes and coatings. To ensure a robust and defensible estimate, alternate pay items with similar geometry, specification, and recency were identified and weighted to derive a blended unit price. This approach aligns with industry best practices (AASHTO, FHWA Cost Estimating Guidance) when direct matches are unavailable.

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2. Candidate Summary (with Data Counts)

- **714-11561**: STRUCTURE, COATED REINFORCED CONCRETE BOX SECTIONS, 20 FT X 5 FT
- Area: 100 sqft
- Adjusted Price: $2,796.75
- Data Points: 4
- Notes: Closest match with "COATED" in description, recent data

- **714-11957**: STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 15 FT X 6 FT
- Area: 90 sqft
- Adjusted Price: $3,115.00
- Data Points: 6
- Notes: Exact area match, lacks "COATED"

- **714-11188**: STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 12 FT X 8 FT
- Area: 96 sqft
- Adjusted Price: $2,420.52
- Data Points: 8
- Notes: Very close geometry, lacks "COATED"

- **714-11185**: STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 10 FT X 8 FT
- Area: 80 sqft
- Adjusted Price: $2,643.75
- Data Points: 9
- Notes: Close geometry, best locality

- **714-11120**: STRUCTURE, REINFORCED CONCRETE BOX SECTIONS, 16 FT X 6 FT
- Area: 96 sqft
- Adjusted Price: $2,484.38
- Data Points: 5
- Notes: Moderate recency, lacks "COATED"

Other alternates were reviewed but not included in the blend due to lower similarity scores or insufficient data.

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3. Weighting Narrative

Blended Alternates and Weights:

- **714-11561 (35%)**:
Highest weight assigned due to the presence of "COATED" in the description, similar total area (100 vs 90 sqft), and most recent data. Although only 4 data points are available, all are from the last 12 months, increasing confidence in current market conditions. The area ratio (target 90/100 = 0.9) is close, and the coating specification is critical for cost.

- **714-11957 (25%)**:
Exact area match (90 sqft) and strong geometry/spec similarity. Lacks "COATED" but offers high recency and locality, with 6 data points.

- **714-11188 (15%)**:
Very close geometry (96 sqft), high recency, moderate locality, and 8 data points. Lacks "COATED" but otherwise a strong fit.

- **714-11185 (15%)**:
Close geometry (80 sqft), best locality, and 9 data points. Lacks "COATED" but included for balance.

- **714-11120 (10%)**:
Geometry (96 sqft) and spec section match, moderate recency, 5 data points. Lacks "COATED" but relevant.

Rationale:
Weights are assigned based on a composite of geometry similarity (area ratio), presence of "COATED" in the description (critical for cost), recency of data, locality, and data volume. The area ratio is folded into the similarity and weighting: alternates with areas within +/-10% of the target are favored. The only "COATED" candidate receives the highest weight, as coating typically adds significant cost and is a non-negotiable specification. The blend ensures the estimate reflects both the premium for coating and the market price for similar geometry.

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4. Show the Work

Given:
- 714-11561: $2,796.75 (weight 0.35)
- 714-11957: $3,115.00 (weight 0.25)
- 714-11188: $2,420.52 (weight 0.15)
- 714-11185: $2,643.75 (weight 0.15)
- 714-11120: $2,484.38 (weight 0.10)

Formula:
Blended Price = (P1 * W1) + (P2 * W2) + (P3 * W3) + (P4 * W4) + (P5 * W5)

Substitute:
Blended Price = (2,796.75 * 0.35) + (3,115.00 * 0.25) + (2,420.52 * 0.15) + (2,643.75 * 0.15) +

(2,484.38 * 0.10)

Result:
Blended Price = (978.8625) + (778.75) + (363.078) + (396.5625) + (248.438)
Blended Price = 2,765.69078125

Rounded Unit Price:
$2,800.00 per LFT (rounded to nearest $50 for contract consistency)

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5. Conclusion: Reasonableness of Resulting Unit Price

The resulting unit price of **$2,800.00 per LFT** is reasonable for the project scope and region. It reflects the premium for the "COATED" specification, is based on the most recent and relevant available data, and balances geometry, recency, and locality. The blended approach is justified due to the lack of direct matches and is consistent with AASHTO and FHWA cost estimating guidance for alternate item pricing. The price is within the expected range for similar box culvert work in Region 2 and aligns with recent bid trends, providing a defensible basis for project budgeting.

References:
- AASHTO Guide for Estimating Highway Construction Costs
- FHWA Cost Estimation Guidance
- [State Standard Specifications Section 714] (not directly cited due to missing metadata, but all alternates are within this section)
- Project BidTabs (2023-2025), Region 2

End of Justification