JICE Journal Innovation of Civil Engineering

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

Analysis of Contract Price Fairness Based on Unit Prices Using the Cost-Plus Pricing Approach: A Case Study of the IAIN Fattahul Muluk Library Building in Jayapura

Erwin[1], **Idham Khaliq**[2]

[1]Civil Engineering Department, Cenderawasih University, Jayapura, 99351, Indonesia
[2]Electrical Engineering Department, Cenderawasih University, Jayapura, 99351, Indonesia

e-mail: tandekerwin@gmail.com

ABSTRACT

Construction projects in remote areas with significant logistical challenges, such as Papua, are prone to discrepancies between contract prices and local base prices, undermining the accuracy of cost planning. This study aims to evaluate the differences between contract-based Cost Estimates (RAB) and base-price-based Cost Estimates using Unit Price Analysis (AHSP) for the construction project of the IAIN Fattahul Muluk Jayapura Library Building. The method used is a descriptive-quantitative case study combining data from local material price surveys and project contract documents. The analysis results indicate that the contract price for structural works, amounting to Rp 19.83 billion, was only 2.4% higher than the base price of Rp 19.35 billion, with a difference of approximately Rp 479.3 million, suggesting that the contract price is relatively close to the fair value based on local costs. Conversely, for architectural works, the contract price of Rp 11.53 billion was 10.4% higher than the base price of Rp 10.33 billion, resulting in a difference of Rp 1.19 billion, indicating that the contract price tended to exceed the estimated fair cost. The largest deviation was observed in floor and wall works, reaching 23%. These findings suggest that price deviations are not evenly distributed across work categories, with architectural works being more sensitive to variations in finishing material prices, specifications, and supply constraints. Therefore, the application of cost estimates (RAB/HPS) based on local prices is crucial, particularly for architectural work packages, to enhance the accuracy of cost estimates and the reasonableness of prices in construction projects in remote areas.

Keywords: *Contract Price; Base Price; Cost-Plus Pricing; AHSP, Structural Works; Architectural Works; Construction Projects.*

1. Introduction

Infrastructure development in Jayapura City continues to increase, as reflected in the growing number of government buildings and public facilities constructed to support regional development. One strategic project in the education sector is the construction of the IAIN Fattahul Muluk Jayapura Library Building, which is expected to support academic services and human resource development in Papua. As with other construction projects, the successful completion of a building depends heavily on the accuracy of planning, particularly in cost management, as cost performance remains one of the key indicators of a project's effectiveness and efficiency [1], [2].

Construction projects in Papua face unique challenges compared to projects in more accessible regions of Indonesia. Geographical constraints, limited connectivity and transport, longer supply chains, and reliance on materials supplied from outside the region tend to increase construction costs and complicate budgeting. Previous studies have shown that project cost overruns are often linked to inaccurate estimates, project uncertainty, implementation constraints, and exposure to risks during construction [1], [3], [4]. In remote locations, logistics also becomes a critical cost component as

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

inefficiencies in procurement, transport, and distribution can significantly affect a project's final cost structure [5], [6].

In construction practice, the contract price refers to the value agreed between the client and the contractor to carry out the works, whilst the base price refers to the estimated cost of the work items calculated from a unit price analysis covering materials, labour, and equipment. In this study, the base price was derived from the Work Unit Price Analysis (WUPA) framework, which is based on national construction cost standards. However, from a pricing perspective, the contract price is not determined solely by direct costs but also reflects overhead components, profit, competitive strategy, project complexity, and perceived risk. Research on tendering strategies indicates that contractors incorporate various business considerations when determining tender prices, including the level of competition and profit expectations [7]–[10].

Most previous studies in construction management have focused on *cost overruns*, cost escalation, and project performance degradation, including the identification of causal factors and the prediction of costs using statistical and machine learning approaches [1]–[4]. Other studies emphasise bidding strategies and contractors' *markup* behaviour in the context of competitive procurement [7]–[10], whilst research on supply chain aspects tends to focus more on logistics efficiency and material distribution [5], [6]. However, these studies generally focus on the accuracy of cost estimates or bidding strategies, and very few directly evaluate the fairness of contract prices by comparing them against a cost basis using a *cost-plus* pricing approach, particularly at the unit price level. This shortcoming becomes increasingly significant in construction projects in remote areas, where cost uncertainty and material price fluctuations are higher than in other regions.

In light of this gap, this study proposes an evaluative approach that integrates unit-price analysis based on the AHSP and the cost-plus pricing perspective to assess the reasonableness of contract prices at the work-item level. This approach offers a distinct contribution compared to previous studies, as it not only identifies cost deviations but also assesses whether the agreed contract price remains within a reasonable range based on standardised cost bases [2], [7], [8], [11].

This study aims to quantitatively compare contract prices and base prices based on AHSP for the construction project of the IAIN Fattahul Muluk Jayapura Library Building. The analysis focuses on structural and architectural works as the main components of building costs. Through this comparison, the study identifies the magnitude of price deviations and evaluates their distribution across work categories. Factors such as logistical constraints, supply constraints, and estimation accuracy are used to provide contextual explanations. Still, they are not analysed causally as this study does not employ inferential approaches such as regression or structural modelling.

This study has several limitations. Firstly, the analysis covers only structural and architectural works, and thus does not include other work packages such as mechanical, electrical, and plumbing. Secondly, the estimates of overhead and profit components are indicative as they are not based on detailed internal contractor data. Nevertheless, this study makes a practical contribution to the preparation of cost estimates/preliminary cost estimates based on local prices, particularly in regions with significant logistical constraints. It contributes academically to the development of approaches for evaluating the reasonableness of contract prices based on unit price analysis and *cost-plus* pricing [5], [6], [11], [12].

2. Materials and Methods

Time and Location of the Study

This study was conducted in 2025 in the city of Jayapura, Papua Province, Indonesia, using the construction project of the IAIN Fattahul Muluk Jayapura Library Building as a case study. Jayapura was selected because it represents a construction environment characterised by relatively high logistical dependence, limited transport connectivity, and constrained material supply conditions, all of which are relevant sources of cost uncertainty in construction projects [13]. Furthermore, studies on construction costs and risks indicate that project estimates and budget performance are sensitive to external uncertainties and constraints, particularly in regions with complex supply conditions [14].

A survey of building material prices was conducted among suppliers in South Jayapura District, Abepura District, and Heram District, which serve as the main building material distribution centres

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

in the city of Jayapura. The suppliers included in the survey were medium- and large-scale shops that routinely supply construction projects in Jayapura. The inclusion criteria were as follows: 1) actively supplying materials for medium to large-scale construction projects, 2) stocking the main materials required for structural and architectural work, 3) able to provide verifiable price information via quotations, invoices, printed price lists, or direct sales records, and 4) maintaining relatively consistent stock availability throughout the survey period.

Research Design

This study employs a descriptive-quantitative case study design. This design was chosen because the research objective is to measure, compare, and interpret the discrepancies between contract prices and base prices based on the AHSP for selected work items, rather than to establish causal relationships. This analytical framework combines unit price analysis, comparative cost analysis, and a cost-plus pricing perspective to assess whether fixed contract prices remain reasonable compared to standard cost bases. Such an approach is suitable for evaluating construction prices under conditions of fluctuating and uncertain material prices [13], [14].

Materials, Variables, and Data Sources

This study utilises primary and secondary data. Primary data consists of unit prices for building materials collected directly from selected suppliers, along with supporting contextual information obtained through limited structured interviews. Secondary data comprises project contract documents, Bills of Quantities (BoQs), cost estimates (RABs), working drawings, and technical specifications relating to structural and architectural works.

The variables analysed in this study are: 1) contract-based cost of works, 2) base cost of works based on the AHSP, 3) absolute deviation, 4) percentage deviation, 5) estimated overhead and profit margin, 6) standard deviation of surveyed prices, and 7) coefficient of variation of surveyed prices.

Supplier Sampling Technique

Suppliers were selected purposively and grouped by district. Shops were first grouped by location—namely, South Jayapura, Abepura, and Heram—and then purposively selected within each district according to the inclusion criteria outlined above. This approach was chosen because the study required suppliers who were well-informed and directly relevant to the actual building materials market used by construction projects in Jayapura, rather than a random sample of all retail outlets.

The sampled shops are spread across three districts identified as key hubs for building materials trading in Jayapura. The sample is considered adequate, as it provides cross-store observations to examine price consistency and market dispersion whilst remaining directly relevant to the case project's procurement environment. In construction price comparison studies, the relevance of the sampled suppliers is as important as the number of observations, as market representation depends on whether the sampled outlets truly reflect the procurement channels used in practice [13].

Data Collection Methods

Data was collected through three complementary methods.

1) Direct price recording.
   The main price survey was conducted by directly recording price quotations, invoices, printed price lists, displayed prices, and seller-confirmed prices. For each material item, the survey recorded the item name, technical specifications, unit of measure, unit price, supplier identity, survey date, and type of documentary evidence. This procedure ensured the traceability and comparability of the data collected.
2) Document review.
   Project documents are reviewed to obtain contract prices, work volumes, BoQ structures, technical specifications, and descriptions of work items. These documents are then matched against surveyed market prices for structural and architectural works.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

3) Limited structured interviews.
Limited structured interviews are conducted with supplier representatives and selected informants associated with the project to obtain contextual information regarding stock availability, delivery lead times, logistical constraints, and supply uncertainties. Interview results are used solely for interpretative support, not as a basis for causal inference.

Price Reliability Test

To strengthen methodological rigour, this study incorporates a price reliability check using standard deviation (SD) and coefficient of variation (CV) for each group of key materials. CV is widely used as a measure of relative dispersion as it expresses standard deviation relative to the mean and is useful for comparing the variability of different data series [15].

The formula used is:

$$\bar{P}_j = \frac{1}{n}\sum_{s=1}^{n} P_{js}$$

$$SD_j = \sqrt{\frac{\sum_{s=1}^{n}(P_{js} - \bar{P}_j)^2}{n-1}}$$

$$CV_j = \frac{SD_j}{\bar{P}_j} \times 100\%$$

where$\bar{P}_j$ is the average surveyed price for the ingredient$j$, P_{js} is the observed price for the ingredient$j$ at shops$s$, n is the number of valid observations,SD_j is the standard deviation, andCV_j is the coefficient of variation.

In this study, CV is used as an indicator of reliability rather than as a hypothesis-testing statistic. Items with very high price dispersion were re-examined to ensure there were no specification discrepancies, incomparable brands, temporary stock shortages, or anomalous price offers before being included in the database.

Analysis and Calculation Methods

Determination of Base Material Prices

The base price for each item was determined after matching specifications and reliability checks. When multiple valid prices were available for the same material specification, a representative price was selected using transparent rules. The median was used as the primary representative price when price variation across shops was relatively high, as the median is less sensitive to extreme values. When observed variation was low and price offers were relatively consistent, the mean was used as the benchmark. These rules are applied to ensure that the selected base price reflects actual market conditions whilst remaining robust against abnormal price offers.

AHSP-Based Unit Price Analysis

Unit prices are calculated using the Indonesian Unit Price Analysis (AHSP) framework and the applicable construction cost estimation guidelines under the Ministry of Public Works and People's Housing. The current regulatory basis is Regulation of the Minister of Public Works and People's Housing No. 8 of 2023 [16], whilst the technical reference for AHSP in the Public Works sector is set out in SE DJBK No. 68 of 2024, Annex VI [17].

The AHSP-based unit price for each work item is calculated using:

$$HSP_i = \sum(k_b \times h_b) + \sum(k_u \times h_u) + \sum(k_a \times h_a)$$

whereHSP_i is the unit price of the work item$i$,k_b is the material coefficient,h_b is the base material price,k_u is the labour coefficient,h_u is the labour wage rate,k_a is the equipment coefficient, andh_a is the unit cost of equipment.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

Formula for Explicit Base Prices and Cost Components

To make the cost calculation structure explicit, the base price of each work item is formulated as:

$$BP_i = (M_i + L_i + E_i) \times (1 + f_i)$$

where BP_i is the base price of the work item i, M_i is the material cost component, L_i is the labour cost component, E_i is the equipment cost component, and f_i is the adjustment factor, if applicable.

In this study, f_i is generally set at zero at the base price stage unless the applicable cost allocation rules require a formally justified adjustment. Therefore, the AHSP-based base price essentially represents a standardised direct cost base.

For the purposes of interpreting price reasonableness, the two commercial components are defined as follows:

1) Overhead (OH) refers to indirect costs associated with the project and the company that cannot be directly allocated to a single item of work, such as site management, temporary facilities, supervision, administration, utilities, and general support costs.
2) Profit refers to the return expected by the contractor above costs after taking into account execution effort, business risk, and commercial objectives.

As the contractor's detailed internal pricing structure is unavailable, OH and profit are treated as inferred indicative components rather than audited accounting values.

Preparation of the Base Price Cost Budget Plan

The AHSP-based cost budget is prepared by multiplying the volume of work by the appropriate AHSP-based unit price:

$$RAB_{BP} = \sum_{i=1}^{m} (V_i \times HSP_i)$$

where RAB_{BP} is the total budget estimate based on base prices, V_i is the volume of work for item i, HSP_i is the unit price based on the AHSP for item i, and m is the number of work items analysed.

Only structural and architectural work items are included in this calculation in accordance with the scope of the study.

Comparison Analysis of Contract Prices and Base Prices

The comparison between contract prices and base prices is conducted at the item and work group levels. Deviations are calculated using:

$$\Delta_i = HC_i - HB_i$$
$$\%\Delta_i = \frac{HC_i - HB_i}{HC_i} \times 100\%$$

where Δ_i is the absolute deviation for item i, HC_i is the contract-based value, and HB_i is the base price value based on the AHSP.

This analysis is used to identify: 1) the total deviation for structural works, 2) the total deviation for architectural works, and 3) the dominant items contributing to the overall deviation.

Price Reasonableness Analysis Using Cost-Plus Pricing

To evaluate price reasonableness, this study adopts a cost-plus pricing perspective, in which the contract price is defined as the sum of the cost base and the agreed commercial margin. Research on construction bidding strategies indicates that contractors do not base their bids solely on direct costs but also consider competitiveness, uncertainty, and expected returns when setting the price they offer [18]. This logic aligns with the broader cost-plus pricing approach discussed in the literature review.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

The fair price formula used in this study is:

$$HW_i = C_i + (C_i \times m)$$

or

$$HW_i = C_i(1 + m)$$

whereHW_i is the indicative fair price of the item$i$, C_i is the cost base based on AHSP, and$m$ is the combined margin parameter representing overheads and profit.

As the contractor's actual overhead and profit structure is not directly observed, the resulting fair value estimate should be interpreted as indicative, not definitive.

Sensitivity Analysis of Overhead Costs and Profit Margin

To enhance robustness, this study includes a sensitivity analysis for the combined overhead and profit margin parameters(m) . Construction cost and risk studies emphasise that conclusions must be tested against changes in key assumptions as project estimates are sensitive to uncertainty and risk exposure [14], [19].

The analysis was conducted based on three scenarios:

1) Scenario 1 (lower bound): 10%
2) Scenario 2 (reference): 15%
3) Scenario 3 (upper limit): 20%

For each scenario, the indicative fair price was recalculated and compared with the contract price. This step was intended to assess whether the conclusions regarding price reasonableness remained stable under varying levels of commercial margin.

Treatment of Logistical Factors and Risks

Logistics-related conditions, such as transport dependency, stock continuity, delays in material delivery, and regional supply constraints, are treated in this study solely as contextual interpretative factors. The construction logistics literature indicates that logistics organisation, delivery systems, and supply chain efficiency can significantly influence project costs and performance, whilst evidence from Indonesia suggests that logistics costs can represent a significant portion of project investment [19], [20].

However, these factors are not modelled quantitatively as causal variables. Therefore, any discussion regarding logistics, estimation quality, supply constraints, or location constraints should be interpreted as potential contributing factors, not as causal conclusions.

Scope and Methodological Limitations

This study has three main methodological limitations. First, the quantitative comparison is limited to structural and architectural work items only. Second, the OH and profit components are indicative values, not audited contractor accounting figures. Third, this study does not employ causal methods such as regression, Delphi, or structural equation modelling; therefore, the discussion explaining the factors of deviation remains interpretative, not causal.

3. Results and Discussions

Research Overview

This study presents the results of a comparative analysis between contract-based Cost Estimates (RAB) and AHSP-based base-price Cost Estimates (RAB) for structural and architectural works on the IAIN Fattahul Muluk Jayapura Library Building Project, located in Buper Waena, Heram District, Jayapura City. The analysis covers two main groups of works. The first is structural works, including foundation work, basement concrete work, floor concrete work, roof slab work, ring beams, and staircase roof slab work. The second is architectural works, including floor and wall works, framing, doors and windows, ceilings and partitions, hanging and fixing works, painting, and interior-exterior works.

For a more robust scientific presentation, the project overview must explicitly state the building area, total contract value, and implementation period, as these parameters influence the interpretation

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

of cost magnitude, procurement complexity, and budget structure. Within the scope analysed in this study, the contract value for structural works amounted to IDR 19,830,500,000, whilst the contract value for architectural works amounted to IDR 11,530,000,000, both inclusive of Value Added Tax (VAT) at 11%. A comparative analysis was conducted by recalculating the unit prices of works using 2025 local price data from the City of Jayapura and comparing cost estimates based on the AHSP with those based on the contract. This comparison, adjusted for local conditions, is relevant because recent construction studies indicate that budget reliability is significantly influenced by price volatility, the quality of estimates, and regional supply conditions [21], [22], [16], [17].

Contract Price-Based Cost Estimate (RAB)

The Cost Estimate (RAB) based on contract prices was obtained from the project contractor and used as secondary data in this study. The analysis focused on the structural and architectural work items that were the subject of this research; therefore, not all items in the contract RAB are presented. Based on the contract documents, the total BEP value for structural works is IDR 19,830,500,000, whilst the total BEP value for architectural works is IDR 11,530,000,000, including Value Added Tax (VAT) at 11%. These values serve as a basis for comparison in the analysis of the cost estimates calculated using the prevailing base prices in Jayapura City.

Table 1. Summary of the Contract-Based Cost Estimate (RAB)

No.	Description of Work	Contract Price (Rp)
a	Foundation Construction Work	7,127,083,200
b1	Basement Floor Concrete Works	1,298,631,901
b2	First Floor Concrete Works	3,543,063,259
b3	Second Floor Concrete Works	3,323,389,615
b4	Roof Concrete Works	2,278,474,949
b5	Concrete Work for Perimeter Beams and Roof Stair Floors	294,664,609
	Total Contract Budget (excluding VAT)	17,865,307,533
	VAT 11%	1,965,183,829
	Total	19,830,491,362
	Rounded	19,830,500,000

Source: Project Secondary Data, 2023

Based on Table 1, the cost structure indicates that foundation works constitute the dominant component, accounting for Rp 7.13 billion, or approximately 39.9% of the total structural cost excluding VAT. This dominance indicates that the early construction phase is characterized by high cost intensity, which is generally influenced by geotechnical conditions, the need for large volumes of materials, and relatively high technical risks. In the context of projects in regions such as Jayapura, the high cost of foundation works may also reflect additional logistical burdens for heavy materials such as crushed stone and cement.

Furthermore, floor concrete works (from the basement to the roof) account for over 60% of the total structural costs, indicating that the building's structural system relies heavily on reinforced concrete elements. This high proportion is not only due to the volume of work but also to the use of strategic materials such as cement and reinforcing steel, which are highly sensitive to price fluctuations and distribution costs.

More specifically, the relatively concentrated distribution of costs across a few key items (foundations and concrete) indicates that the project's cost structure is driven by key materials (intensive). This is significant because, under such conditions, the accuracy of unit price estimates for key materials will largely determine the overall reliability of the Bill of Quantities (BoQ). In other words, even a small error in estimating the price of concrete or steel can result in significant cost deviations at the project level.

On the other hand, the smaller proportion of costs for works such as ring beams and stair slabs indicates that these items make a marginal contribution to the total cost, so their impact on the total

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

deviation is relatively limited. Nevertheless, these minor items remain important in comparative analysis as they may reflect variations in unit prices due to differences in construction methods or contractor efficiency.

From a cost evaluation perspective, the cost distribution structure in Table 1 also provides an initial indication that structural works tend to be more standardised and measurable, as they are dominated by items with clear technical specifications (concrete, reinforcement, foundations). This explains why, in the research findings, the deviation between the contract price and the base price for structural works is relatively small (±2.4%). In other words, the higher the level of standardisation of a project, the smaller the scope for price variation.

Cost Budget Plan Based on Jayapura City Base Prices

The Cost Estimate (RAB) based on Jayapura City base prices was compiled through several stages, including the determination of base prices for materials and labour, the calculation of the Unit Price Analysis (AHSP), and the preparation of the RAB based on the volume of work. The base prices used in this study were obtained from a survey of building material prices and labour wages conducted in Jayapura City, supplemented by national prices sourced from the E-Catalogue for materials not available locally.

The survey of building material prices was carried out in three main districts of Jayapura City: South Jayapura (Entrop), Abepura, and Heram, which were selected because they represent the main building material distribution centres. For each material type, the base price was set to the lowest average from several supplier shops, to provide a realistic price that reflects local market conditions.

Summary of Base Prices for Materials and Labour in Jayapura City

For analysis and presentation in this article, the highly detailed list of material and labour prices has been grouped into several main categories. A summary of the base prices for materials and labour used as inputs for the AHSP calculation is presented in Table 2.

Table 2. Summary of Basic Material and Labour Costs in Jayapura City

No.	Category of Materials / Labour	General Unit	Base Price Range (IDR)
1	Timber and Plywood	m^3 / sheet	5,870,000 – 10,600,000
2	Sand, Soil and Aggregate	m^3	300,000 – 650,000
3	Stone Materials and Derivative Products	m^3 / unit	300,000 – 907,000
4	Iron and Steel Materials	kg / m	15,000 – 57,875
5	Cement	bags/kg	105,000 – 2,100
6	Ready-mix concrete	m^3	1,900,000 – 2,350,000
7	Glass and Aluminium Materials	m^2 / unit	174,000 – 750,000
8	Ceramic Tiles and Floor Finishes	m^2 / unit	28,800 – 1,800,000
9	Paint, Finishing Materials, and Adhesives	kg/litre	28,000 – 95,000
10	Labour Wages	working days (WD)	160,000 – 230,000

Source: Survey of Building Material Prices and E-Catalogue of Jayapura City, 2025

Based on Table 2, it is evident that the price characteristics of building materials in Jayapura City exhibit a high level of variation (dispersion), particularly in the categories of timber, ready-mix concrete, and finishing materials. For example, the price range for timber and plywood spans more than 80% between the lower and upper limits, whilst finishing materials such as ceramics have a very wide range (Rp 28,800 to Rp 1,800,000). This variation indicates heterogeneity in quality and specifications, as well as differences in supply sources, which directly increases uncertainty in cost estimation.

Conversely, the prices of basic materials such as aggregates (sand and stone) show a relatively narrower range, indicating that these materials are more readily available locally or have a more stable supply chain. This suggests that the degree of reliance on out-of-region supplies is a key factor

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

in determining price volatility. Materials with high dependence on inter-regional distribution, such as steel, ready-mix concrete, and finishing materials, tend to experience greater price fluctuations.

Meanwhile, labour wages show a relatively limited range (Rp 160,000–Rp 230,000 per day), reflecting that the local labour market is more stable than the materials market. Thus, within the context of construction cost structures in Jayapura, the materials component is the dominant factor in cost uncertainty, whilst labour acts as a more predictable component.

From a cost analysis perspective, these differing levels of variation have significant implications. High price variation in certain materials increases the potential for deviation between contract-based and base-price cost estimates, particularly in works heavily reliant on finishing materials and non-structural components. This is consistent with research findings that cost deviations in architectural works are higher than in structural works.

Furthermore, the wide price range indicates that using average values in UPC calculations risks oversimplifying the inherently dynamic market reality. Therefore, cost estimates based on UPCs should be understood as a representative approach rather than an absolute value, particularly for items with high price variability.

Analysis of Unit Prices for Structural and Architectural Works

The Unit Price Analysis (UPA) is compiled from a base price survey in Jayapura City, covering material prices, labour wages, and equipment costs. The UCA calculation refers to the Unit Cost Analysis method in accordance with Indonesian National Standards (SNI) and guidelines from the Ministry of Public Works and People's Housing (PUPR), which include direct cost components (labour, materials, and equipment) as well as indirect costs in the form of overheads and a profit margin of 10% to 15%.

Given the large number of structural and architectural work items analysed, the UPA results in this study are summarised in a single table presenting the final unit prices for each type of work. This simplification is intended to improve readability and maintain focus in the discussion, without reducing the accuracy of the detailed calculations, which remain in the appendix.

Table 3. Summary of Unit Price Analysis for Structural and Architectural Works Based on the Cost Price in Jayapura

No.	Work Category	Type of Work	Unit	Unit Price (IDR)
1	Earthworks	Foundation excavation	m^3	221,100
2	Earthworks	Selected backfill material	m^3	655,050
3	Earthworks	Sand filling	m^3	847,330
4	Foundation	Crushed stone foundation (1:4)	m^3	1,874,867
5	Concrete	K-175 concrete	m^3	1,759,824
6	Concrete	K-225 concrete	m^3	1,832,974
7	Concrete	K-300 Concrete (Ready-mix)	m^3	2,806,898
8	Reinforcing steel	Reinforcing steel works	kg	285,717
9	Formwork	Foundation formwork	m^2	338,762
10	Piles	12/12 practical columns	m	181,261
11	Beam	Ring beam 12/15	m^3	8,558,436
12	Walls	Brick wall (1:4)	m^2	211,387
13	Walls	Wall plastering (1:2)	m^2	133,821
14	Walls	Wall finishing (thin coat)	m^2	69,713
15	Flooring	60×60 cm granite tiles	m^2	303,420
16	Flooring	Granite skirting boards	m	71,653
17	Boards	9 mm plasterboard	m^2	80,823
18	Board	3.5 mm calcium silicate board	m^2	69,631
19	Ceiling	PVC ceiling panels	m^2	265,128
20	Partitions	ACP wall partitions	m^2	1,771,527

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

No.	Work Category	Type of Work	Unit	Unit Price (IDR)
21	Painting	Interior wall paint	m²	58,594
22	Painting	Ceiling paint	m²	46,003
23	Door frames & fittings	Aluminium door locks	set	820,571
24	Frames & Accessories	Door cover	set	1,057,931
25	Frames & Accessories	Tempered glass door hinges	set	2,688,257

Source: Processed Primary Data, 2025

Based on Table 3, there is a significant difference in price structure between structural and architectural works, both in terms of magnitude and the characteristics of the cost components. In structural works, unit prices tend to be higher and are concentrated on specific items, such as ring beams (Rp 8,558,436/m³) and K-300 concrete (Rp 2,806,898/m³). These high values indicate that structural works are material-intensive, with a strong reliance on primary materials such as cement and reinforcing steel.

Furthermore, the price differences among concrete grades (K-175, K-225, and K-300) show a relatively gradual increase, reflecting rising demand for material quality and quality control. However, the price differentials between concrete grades are not perfectly linear, indicating the influence of external factors such as distribution costs and purchase scale on the formation of unit prices.

For reinforcing steel works, the price reached Rp 285,717/kg, which is relatively high compared to standards in other regions of Indonesia. This indicates a significant logistics cost premium, given that steel is supplied almost entirely from outside the Papua region. Consequently, structural components exhibit high sensitivity to transport and distribution costs, yet remain within a relatively standardised price framework.

Conversely, in architectural works, variations in unit prices reflect the heterogeneity of specifications and material choices rather than being dominated by volume or structural requirements. For example, the price of ACP partitions reaches Rp 1,771,527/m², far higher than that of brick walls (Rp 211,387/m²), indicating a significant difference between conventional materials and modern/finishing materials. This confirms that architectural works have greater specification flexibility, making them more susceptible to price fluctuations.

Furthermore, accessories such as tempered glass door hinges (Rp 2,688,257 per set) and aluminium door locks (Rp 820,571 per set) have relatively high unit prices compared to other items in the same category. This indicates that non-structural components with a high degree of import dependency or specific technical specifications can be a primary source of cost deviation in architectural works.

When analysed as a whole, the price structure in Table 3 reveals two main characteristics. Firstly, structural works have high prices but low variability, as they are dominated by standard materials with clear technical specifications. Secondly, architectural works exhibit greater price variability with a higher degree of uncertainty, due to differences in specifications, design preferences, and material availability.

The implications of these findings are crucial for comparative cost estimate analysis. Works with more stable pricing characteristics (such as structural works) tend to result in smaller deviations between contract prices and base prices. Conversely, works with high variability (such as architectural works) are more susceptible to estimation discrepancies, which ultimately explains why cost deviations in architectural works in this study exceeded 10%.

Cost Estimate for Structural Works

Based on the processing of contract data and the recalculation of work volumes, a Cost Estimate (RAB) was prepared for the construction project of the IAIN Fattahul Muluk Jayapura Library Building. This summary of the Cost Estimate covers all main work groups, namely structural works and architectural works, which are further divided into several sub-works in accordance with the contract documents and field calculation results. The presentation in the form of a summary table is

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

intended to provide a comprehensive overview of the project's cost composition and to facilitate comparative analysis with the Cost Estimate based on base prices.

Table 4. Cost Estimate Summary

No.	Work Description	Cost Value (IDR)
I	Structural Works	
a	Foundation Construction Work	7,871,425,825.02
b	Concrete Works (Basement, Floors, Roof Slabs, Ring Beams & Stairs)	9,562,089,444.21
	Total Structural Works	17,433,515,269.23
II	Architectural Works	
a	Flooring and Wall Works	2,808,667,139.24
b	Framework, Doors, Windows, and Fences	3,053,385,783.45
c	Ceiling and Partition Wall Works	513,308,491.65
d	Installation and Fixing Works	1,658,807.070.64
e	Painting Works	467,169,644.21
f	Interior and Exterior Works	1,786,177,286.20
	Total Architectural Works	10,287,515,415.38
	Actual Costs	41,190,506,790.67
	VAT 11%	4,530,955,746.97
	Total Cost	45,721,462,537.64
	Rounded	45,721,400,000.00

Source: Processed Primary Data, 2025

Based on Table 4, the total construction cost of the IAIN Fattahul Muluk Jayapura Library Building project amounts to Rp 45,721,400,000, including 11% VAT. The project cost structure indicates that structural works constitute the dominant component, accounting for Rp 17,433,515,269.23, or approximately 38.1% of the total cost. This dominance stems primarily from foundation and concrete works, which cumulatively account for the majority of structural costs, reflecting the nature of the work as volume-intensive and highly dependent on primary materials such as concrete and reinforcing steel. This situation indicates that price fluctuations in these primary materials will significantly affect the total project cost.

Meanwhile, architectural works amount to Rp 10,287,515,415.38, or approximately 22.5% of the total project cost, with costs more evenly distributed across various sub-works. Unlike structural works, which are concentrated on a few key components, architectural works exhibit a more fragmented cost pattern, with the largest contributions coming from framework, doors, windows, and fencing works, followed by floor and wall works, as well as interior and exterior works. This pattern indicates that architectural costs are more influenced by the diversity of material specifications and work types than by volume alone.

This difference in characteristics indicates that structural works tend to be quantity-driven, whereas architectural works are more specification-driven. The implication is that architectural works are more sensitive to variations in material prices, particularly for finishing components and non-standard elements. Furthermore, there is a discrepancy between the total costs of structural and architectural components and the project's actual total cost before VAT, suggesting contributions from other works outside the scope of the analysis, such as mechanical, electrical, and other supporting works.

Overall, this cost composition confirms that structural works are the primary driver of project costs, whilst architectural works exhibit greater cost variation. This condition forms a crucial foundation for subsequent comparative analyses, particularly in explaining why cost deviations in architectural works tend to be greater than those in structural works.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

Summary of the Cost Estimate for Structural Works

This subsection presents a summary of the Cost Estimate (RAB) for structural works calculated based on the base rates of Jayapura City. The calculations were performed using the Unit Price Analysis Method (AHSP) in accordance with Indonesian National Standards (SNI), with overhead costs and a reasonable profit margin added. This summary provides an overview of the total cost of structural works as a basis for comparison with the Cost Estimate based on contract prices.

Table 5. Summary of the Cost Estimate

Description	Value (Rp)
Total Cost Estimate for Structural Works (Base Price)	17,433,515,269
VAT 11%	1,917,686,680
Total	19,351,201,949
Rounded	19,351,200,000

Source: Primary Data, 2025

Based on Table 5, the total Cost Estimate (RAB) for structural works based on the base prices of Jayapura City, after adding Value Added Tax (VAT) of 11%, amounts to Rp 19,351,200,000. This figure reflects the estimated actual cost of the structural works, calculated using the unit prices of materials, labour wages, and equipment applicable in Jayapura City in 2025.

This Cost Estimate summary is then used as the primary benchmark against the contract-based Cost Estimate for structural works. The difference in value between the two calculations is analysed to identify the magnitude of the cost variance and the factors influencing price differences in the construction project of the IAIN Fattahul Muluk Jayapura Library Building.

Summary of the Cost Estimate for Architectural Works

This subsection presents a summary of the Cost Estimate (RAB) for architectural works calculated based on the base prices of Jayapura City. The Cost Estimate was calculated using the Unit Price Analysis (UPA) method in accordance with applicable technical standards, along with unit prices for materials and labour obtained from a survey conducted in Jayapura City. This summary serves as the basis for analysis and comparison with the contract-based Cost Estimate for architectural works.

Table 6. Summary of the Cost Estimate

Description	Value (Rp)
Total Cost Estimate for Architectural Works (Cost Price)	9,309,449,109
VAT 11%	1,024,039,402
Total	10,333,488,511
Rounded	10,333,490,000

Source: Processed Primary Data, 2025

Based on the summary in Table 6, the total Cost Estimate (RAB) for the architectural works, based on the City of Jayapura base prices and including Value Added Tax (VAT) at 11%, amounts to Rp 10,333,490,000. This figure reflects the estimated actual cost of the architectural works, calculated using locally applicable unit prices for materials and labour.

This summary of the architectural works' RAB is subsequently used as a benchmark for comparison with the contract-based RAB for architectural works. This comparative analysis aims to determine the magnitude of the cost difference and to evaluate the impact of the disparity between contract and base unit prices on the total cost of architectural works in the IAIN Fattahul Muluk Jayapura Library Building construction project.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

Comparison between Contract-Based Cost Estimates and Jayapura City Base Price-Based Cost Estimates

This comparison was conducted to identify differences in the value of the Cost Estimate (RAB) between calculations based on contract prices and those based on Jayapura City base prices for structural and architectural works in the construction project of the IAIN Fattahul Muluk Jayapura Library Building. The analysis was carried out by comparing the total costs of each work category and calculating the absolute difference and percentage variation.

Table 7. Summary of Comparison between Contract-Based RAB and Base Price-Based RAB

No.	Description of Work	Contract-Based Cost Estimate (IDR)	Cost-Based Budget (IDR)	Difference (%)
I	Structural Works			
a	Foundation Construction Works	7,127,083,200	7,871,425,825	9
b1	Basement Floor Concrete Works	1,298,631,901	1,178,453,602	10
b2	First Floor Concrete Works	3,543,063,259	3,137,182,024	13
b3	Second Floor Concrete Works	3,323,389,615	2,947,075,429	13
b4	Roof Slab Concrete Works	2,278,474,949	2,032,307,222	12
b5	Concrete work for perimeter beams and roof floor of the staircase	294,664,609	267,071,166	10
	Total Structural Cost Estimate	17,865,307,533	17,433,515,269	2
	VAT 11%	1,965,183,829	1,917,686,680	2
	Total	19,830,491,362	19,351,201,949	2
	Rounded	19,830,500,000	19,351,200,000	2
II	Architectural Works			
a	Flooring and Wall Works	3,447,824,851	2,808,667,139	23
b	Door and Window Frames, Doors, Windows and Fences	3,328,802,054	3,053,385,783	9
c	Ceiling and Partition Wall Work	539,185,434	513,308,492	5
d	Installation and Fixing Works	691,147,247	680,740,765	2
e	Painting work	525,420,753	467,169,644	12
f	Interior and Exterior Work	1,854,838,526	1,786,177,286	4
	Total Architectural Cost Estimate	10,387,218,865	9,309,449,109	12
	VAT 11%	1,142,594,075	1,024,039,402	12
	Total	11,529,812,941	10,333,488,511	12
	Rounded	11,530,000,000	10,333,490,000	12

Source: Processed Primary Data, 2025

The comparison results in Table 7 show that, for structural works, the difference between contract-based and base-price cost estimates is relatively small, with an overall deviation of around 2%. This indicates that contract prices for structural works generally align closely with cost estimates calculated based on local base prices.

Conversely, architectural works show a far greater difference, with a total deviation of around 12%. The largest discrepancy is observed in floor and wall work, reaching 23%, indicating that

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

architectural work items—particularly those related to finishing materials—are more sensitive to fluctuations in material prices, supply availability, and logistics costs.

Overall, these findings indicate that the disparity between contract prices and base prices is more pronounced in architectural works than in structural works. This highlights the importance of accurate local price surveys and cost-estimation practices, particularly for finishing items, to enhance cost efficiency and price reasonableness in construction projects in areas with high logistical constraints, such as Jayapura City.

Comparative Analysis of Structural Works

Based on the comparison results, the total Cost Estimate (RAB) for structural works based on contract prices reached IDR 19,830,500,000, whilst the RAB based on Jayapura City's base prices reached IDR 19,351,200,000. Consequently, the following cost reductions occurred:

1. Cost Difference for Structural Works
   = IDR 19,830,500,000 − IDR 19,351,200,000
   = IDR 479,300,000
2. Percentage Difference for Structural Works
   = (Rp 479,300,000 / Rp 19,830,500,000) × 100%
   = 2.4%

These cost savings indicate that calculations based on Jayapura City's base prices yield more efficient cost estimates than those based on contract prices, particularly for work items involving concrete and flooring.

Comparative Analysis of Architectural Works

For architectural works, the total cost estimate based on the contract price is Rp 11,530,000,000, whilst the cost estimate based on the Jayapura City base price is Rp 10,333,490,000. The resulting cost difference is as follows:

1. Cost Difference for Architectural Works
   = IDR 11,530,000,000 − IDR 10,333,490,000
   = IDR 1,196,510,000
2. Percentage Difference for Architectural Works
   = (Rp 1,196,510,000 / Rp 11,530,000,000) × 100%
   = 10.4%

Variations influence the relatively large discrepancy in architectural works in the prices of finishing materials, structural components, and fittings, as well as interior systems, which are more sensitive to fluctuations in local market prices.

Percentage Comparison between Contract-Based Cost Estimates and Cost Estimates Based on Jayapura City Base Prices

A percentage comparison was carried out to determine the magnitude of the difference between the Cost Estimate (RAB) based on contract prices and the RAB based on Jayapura City base prices for structural and architectural works. The percentage difference was calculated using the following formula:

$$\text{Percentage Difference} = \frac{\text{Highest Price} - \text{Lowest Price}}{\text{Highest Price}} \times 100\%$$

The results of the percentage difference calculation are presented in Table 8.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

Table 8. Comparison of Percentages between Contract-Based Cost Estimates and Cost Estimates Based on Jayapura City's Base Prices

Description of Work	Contract Price (IDR)	Base Price (IDR)	Difference (%)
Structural Works	19,830,500,000	19,351,200,000	2.4
Architectural Works	11,530,000,000	10,333,490,000	10.4

Source: Processed Primary Data, 2025

Based on Table 8, the price difference between architectural and structural works is greater, indicating that the architectural component is more sensitive to changes in local material prices and labour costs.

Comparison Chart between Contract-Based Cost Estimates and Cost-Based Cost Estimates

To further clarify the comparison between contract prices and the base prices of Jayapura City, the calculation results are presented in a bar chart in Figure 1.

Figure 1. Comparison Chart of Contract-Based Cost Estimates and Cost-Based Cost Estimates for Jayapura City

Source: Processed Primary Data, 2025

The diagram shows that for structural works, the difference between contract prices and base prices is relatively small, so that the two values appear almost to overlap. This indicates that contract prices for structural works are close to cost estimates based on local conditions and can therefore be categorised as having a low deviation and remain within reasonable limits. In other words, there is consistency between contract prices and base prices for structural works.

Conversely, in architectural works, a wider gap is observed between the two bars, reflecting that contract prices are systematically higher than base prices. This significant visual difference reinforces the quantitative finding that architectural works exhibit a larger deviation, namely, over 10%. This situation indicates that architectural components have a higher potential for overpricing, whilst also presenting opportunities for cost efficiency if budget planning is based more on local base prices.

Analytically, this diagram confirms that cost deviations do not occur uniformly, but are concentrated in specific work categories, particularly architectural works. This indicates that factors such as variations in material specifications, reliance on finishing materials, and logistical conditions have a stronger influence on price formation in architectural works compared to structural works. Consequently, this visualisation serves not only as an illustrative tool but also as empirical evidence that a local-price-based approach becomes more crucial for work categories with high cost variability.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

Reasonable Profit Analysis for Structural and Architectural Works

A reasonable profit analysis was conducted to evaluate the reasonableness of prices for structural and architectural works using the Cost-Plus Pricing approach. The total construction costs used in this analysis are based on the Bill of Quantities (BoQ) value before the inclusion of Value Added Tax (VAT) at 11%.

The profit margin applied consists of Overheads and Profit, in accordance with Regulation of the Minister of Public Works and People's Housing of the Republic of Indonesia No. 1 of 2022, Article 6 Paragraph (3), which stipulates that indirect costs are set at 10%–15%.

The calculation of fair value uses the following formula:

Reasonable Price = Total Construction Cost + (Total Construction Cost × Profit Margin)

Reasonable Profit Based on the Contract Price for Structural Works

The total construction cost of the structural works, based on the contract price, is Rp 17,865,307,533, with a 13% profit margin. The calculation shows that the total fair value for the structural works is Rp 20,187,797,513, with a fair profit of Rp 2,322,489,979.

Reasonable Profit Based on Contract Price for Architectural Works

Total construction costs for architectural works based on a contract price of IDR 10,387,218,865, with a profit margin of 13%. The analysis indicates a total fair price of IDR 11,737,557,318, resulting in a fair profit of IDR 1,350,338,453.

Reasonable Profit Based on the Jayapura City Cost Price for Structural Works

Based on the Jayapura City Cost Estimate, the total construction cost for structural works is IDR 17,433,515,269, with a minimum profit margin of 10%. The resulting total fair value is IDR 19,176,866,796, with a fair profit of IDR 1,743,351,527.

Reasonable Profit Based on the Cost Price of Jayapura City for Architectural Works

The total construction cost of the architectural works, based on the Jayapura City Cost Price, is IDR 9,309,449,109, with a 10% profit margin. The calculation results show a total fair price of IDR 10,240,394,020, with a fair profit of IDR 930,944,911.

Detailed Calculation of Fair Profit

Structural Works Based on Contract Price

The total construction cost of the structural works based on the contract price is Rp 17,865,307,533. The profit margin applied is 13% for Overheads and Profit. The fair price is calculated using the Cost-Plus Pricing method as follows:

$$\text{Reasonable Price} = 17{,}865{,}307{,}533 + (17{,}865{,}307{,}533 \times 13\%)$$
$$= 17{,}865{,}307{,}533 + 2{,}322{,}489{,}979$$
$$= 20{,}187{,}797{,}513$$

Based on this calculation, the fair profit for structural works is Rp 2,322,489,979, bringing the total price to Rp 20,187,797,513 after adding the profit margin.

Architectural Works Based on Contract Price

The total construction cost of the architectural works based on the contract price is IDR 10,387,218,865. The profit margin applied is 13% for Overheads and Profit. The calculation of the fair price using the Cost-Plus Pricing method is as follows:

$$\text{Reasonable Price} = 10{,}387{,}218{,}865 + (10{,}387{,}218{,}865 \times 13\%)$$
$$= 10{,}387{,}218{,}865 + 1{,}350{,}338{,}453$$
$$= 11{,}737{,}557{,}318$$

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

Consequently, the fair profit for architectural works based on the contract price is IDR 1,350,338,453, bringing the total cost to IDR 11,737,557,318.

Structural Works Based on the Jayapura City Cost Price

The total construction cost for the structural works, based on the Jayapura City Cost Price, is IDR 17,433,515,269. The profit margin applied is the minimum Overhead and Profit rate of 10%, in accordance with Regulation of the Minister of Public Works and People's Housing No. 1 of 2022.

$$\text{Reasonable Price} = 17{,}433{,}515{,}269 + (17{,}433{,}515{,}269 \times 10\%)$$
$$= 17{,}433{,}515{,}269 + 1{,}743{,}351{,}527$$
$$= 19{,}176{,}866{,}796$$

Based on this calculation, the reasonable profit for structural works is IDR 1,743,351,527, bringing the total cost to IDR 19,176,866,796.

Architectural Works Based on the Cost Price of Jayapura City

The total construction cost for architectural works based on the Jayapura City Cost Price is IDR 9,309,449,109. The applied profit margin is 10%, the minimum permitted under applicable regulations.

$$\text{Reasonable Price} = 9{,}309{,}449{,}109 + (9{,}309{,}449{,}109 \times 10\%)$$
$$= 9{,}309{,}449{,}109 + 930{,}944{,}911$$
$$= 10{,}240{,}394{,}020$$

Consequently, the reasonable profit for the architectural works based on the Jayapura City Cost Price is Rp 930,944,911, bringing the total cost to Rp 10,240,394,020.

Interpretation of Indicative Cost-Plus Pricing

The analysis of cost-plus pricing in this study indicates that contract prices are generally higher than the base price estimates based on the AHSP, though with varying degrees of deviation across work categories. For structural works, the contract price was recorded as 2.4% higher (Rp 479,300,000) than the base price, whilst for architectural works, the contract price was 10.4% higher (Rp 1,196,510,000).

From a cost-plus perspective, a deviation of 2.4% in structural works can still be categorised as a relatively reasonable markup, as it falls within the tolerance range for construction cost variations, which are generally influenced by operational factors and site uncertainties. Conversely, a deviation of 10.4% in architectural works indicates that the contract price is relatively too high (overpricing) compared to local cost bases, particularly when considered alongside standard overhead and profit margins of 10%–15%.

Several factors can explain this discrepancy. Firstly, the inclusion of a higher markup (margin) on architectural works, particularly on finishing items, which offer greater price flexibility and scope for negotiation than Secondly, potential inaccuracies in initial estimates, particularly for architectural works that are heavily influenced by material specifications and design changes. Thirdly, site conditions in remote areas, such as limited material supply, high logistics costs, and the risk of procurement delays, prompt contractors to include a risk premium in the contract price.

However, this interpretation remains indicative as it is not supported by detailed data on the contractor's internal cost structure, including actual overhead components, financing costs, and the tendering strategies employed. Therefore, the cost-plus analysis in this study is more appropriately understood as an evaluative approach to price reasonableness rather than as a direct measure of the contractor's profit margin.

Comparison with Previous Studies and Managerial Implications

The findings of this study reinforce previous literature indicating that construction project cost performance is significantly influenced by the quality of estimates, contract management, and market

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

and supply chain dynamics [21]. Furthermore, these results are consistent with research highlighting that material price volatility and logistical complexity are key factors influencing cost deviations, particularly in regions with limited access, such as Papua [16], [17].

However, this study makes an additional contribution by demonstrating that cost deviations are not aggregate in nature, but rather specific to certain categories of work. In this context, structural works indicate that contract prices are relatively not too high and remain close to fair value (a deviation of 2.4%), whilst architectural works show that contract prices tend to be too high with a significant deviation (10.4%). This difference confirms that the risk of overpricing is more concentrated in works with non-standard and specification-based characteristics, such as finishing and interiors.

From a managerial perspective, these findings have important implications for project efficiency. The small deviation in structural works suggests that cost planning in this category is relatively efficient and reliable. Conversely, the greater deviation in architectural work indicates potential cost inefficiencies that, if unchecked, could significantly increase the total project cost.

In the context of the state budget, particularly for public construction projects, this situation has the potential to lead to sub-optimal budget allocation, where part of the project funds is used to cover price discrepancies that do not fully reflect actual costs. If this pattern occurs systematically, it could result in reduced efficiency of public spending and a narrowing of fiscal space for other development projects.

Therefore, the findings of this study confirm that preparing cost estimates (RAB/HPS) in remote areas requires not only regular updating of local price data but also a stricter focus on verifying architectural and finishing works. This approach is crucial to ensure that the resulting contract prices are not only competitive but also reflect reasonable costs based on local market conditions, thereby enhancing project efficiency whilst maintaining accountability in the use of public funds.

4. Conclusion

This study shows that the base-price-based RAB (AHSP) for Jayapura City consistently produces lower cost estimates than the contract-based RAB. Quantitatively, contract prices for structural works were higher by IDR 479,300,000 (2.4%), whilst for architectural works, they were higher by IDR 1,196,510,000 (10.4%) compared to fair value based on local prices. These findings confirm that there is a significant difference between contract prices and base prices, with the degree of deviation varying across work categories.

The results of this study indicate that contract prices for structural works remain relatively fair, as the 2.4% difference falls within the range of reasonable margins typically used in construction practice. Conversely, for architectural works, a 10.4% difference indicates that contract prices tend to be overpriced relative to cost estimates based on local conditions. Thus, the fairness of contract prices is not uniform but is strongly influenced by the characteristics of each type of work.

This difference in deviation levels suggests that structural works, which are more standardised in nature—such as foundations, concrete, and reinforcement—exhibit greater alignment with the base price. Conversely, architectural works, particularly finishing components such as floors and walls, show greater deviation. This can be explained by several factors, including higher margins applied to certain items, inaccuracies in initial cost estimates, and logistical conditions in remote areas, which lead to variations in material prices and supply constraints.

In terms of implications, these findings suggest that price discrepancies in architectural projects can reduce project efficiency by creating significant cost differences relative to the intended baseline value. In the context of public projects, this situation may also lead to wastage of public funds if adequate controls are not in place. Therefore, a stricter evaluation mechanism is required for unit prices, particularly for high-variability work items.

In practical terms, this study underscores the importance of preparing cost estimates (RAB/HPS) based on local prices, particularly in remote areas such as Jayapura. The use of up-to-date, location-specific price data is crucial for improving cost planning accuracy and ensuring fairness in the procurement process. Furthermore, cost evaluation should not be limited to the total contract level but should also focus on unit-price analysis to identify sources of deviation in greater detail.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

From an academic perspective, this study contributes by introducing an approach to evaluating contract price fairness using a cost-plus perspective at the unit price level, a relatively underexplored approach in the construction management literature. This study also demonstrates that cost deviation analysis based on work categories provides a deeper understanding compared to an aggregate approach at the project level. Thus, this study enriches the literature on construction cost management, particularly in the context of projects in remote areas.

Nevertheless, this study has limitations as it covers only structural and architectural works and does not directly access the contractor's internal cost structure. Therefore, further research is recommended to expand the scope of analysis to include mechanical, electrical, and plumbing (MEP) works, as well as to integrate an approach that captures contractor bidding behaviour more comprehensively.

Acknowledgements

The authors wish to express their sincere gratitude to the Civil Engineering Programme, Faculty of Engineering, Cenderawasih University, for providing facilities and guidance throughout the research process. Thanks are also extended to IAIN Fattahul Muluk Jayapura and the implementation team of the Library Building Construction Project for granting access to the necessary data and information. Furthermore, the authors would like to thank all building material suppliers in the sub-districts of South Jayapura, Abepura, and Heram for their contributions to the material price survey.

References

[1] C. Julca-Varas, T. García-Segura, C. Torres-Machi, and L. Montalbán-Domingo, "Key Risks of Delays and Cost Overruns in Drinking Water Supply and Sanitation Projects in Peru," Journal of Management in Engineering, 2025, doi: 10.1061/JMENEA.MEENG-6496.

[2] K.-W. Lee and K.-H. Kim, "A Comparison of Cost Performance in Road Construction Projects Considering Tender Conditions and Project Characteristics," Sustainability, vol. 16, no. 22, p. 10083, 2024, doi: 10.3390/su162210083.

[3] K.-W. Lee and K.-H. Kim, "Analysis of Cost and Schedule Growth in Road Construction Projects Considering Project Characteristics," Sustainability, vol. 13, no. 24, p. 13694, 2021, doi: 10.3390/su132413694.

[4] M. A. Alotaibi, A. A. Alqahtani, and M. A. Abotaleb, "Analysis of Factors Causing Cost Overruns in the Global Construction Industry," Buildings, vol. 15, no. 1, p. 18, 2025, doi: 10.3390/buildings15010018.

[5] E. Subiyanto and Y. G. M. Y. Sanjaya, "Determining Logistics Costs in Projects: Empirical Findings Based on the Implementation of Several Cement Projects in Indonesia," Heliyon, vol. 6, no. 7, p. e04352, 2020, doi: 10.1016/j.heliyon.2020.e04352.

[6] S. Wen, H. Tang, F. Ying, and G. Wu, "Exploring Global Research Trends in Construction Project Supply Chain Management Based on Bibliometric Analysis: Current Status and Future Prospects," Buildings, vol. 13, no. 2, p. 373, 2023, doi: 10.3390/buildings13020373.

[7] I. S. Abotaleb and I. H. El-Adaway, "Estimation of Construction Bid Markups Using a Staged Decision Theory Approach," Journal of Construction Engineering and Management, vol. 143, no. 1, 2017, doi: 10.1061/(ASCE)CO.1943-7862.0001204.

[8] A. Faraji, M. Rashidi, N. A. Eftekhari, S. Perera, and S. Mani, "A Decision Support Model for Bidding/Markup in the Contractor Tender Strategy Development Phase Based on Project Complexity Measurement in the Downstream Oil Industry Sector," Journal of Open Innovation: Technology, Markets, and Complexity, vol. 8, no. 1, p. 33, 2022, doi: 10.3390/joitmc8010033.

[9] A. Leśniak and M. Zima, "Contractor Bidding Pricing Strategies: A Model with Correlation among Competitors' Bids," Open Engineering, vol. 9, no. 1, pp. 159–166, 2019, doi: 10.1515/eng-2019-0021.

[10] T. Hanák, A. Drozdová, and I. Marović, "Bidding Strategies in Public Construction Procurement: A Contractor's Perspective," Buildings, vol. 11, no. 2, p. 47, 2021, doi: 10.3390/buildings11020047.

Vol. 7, No. 1, pp. 21-40
Submit: 08-02-2026 |
Accepted: 08-05-2026 |
Publish: 07-06-2026 |

[11] W. Hanson, "The Dynamics of Cost-Plus Pricing," Managerial and Decision Economics, vol. 13, no. 2, pp. 149–161, 1992, doi: 10.1002/mde.4090130207.
[12] M. A. Musarat, W. S. Alaloul, and M. S. Liew, "Incorporating Inflation Rates into Construction Project Costs: A Forecasting Model," Heliyon, vol. 10, 2024, doi: 10.1016/j.heliyon.2024.e26037.
[13] E. Zaneldin and W. Ahmed, "A General Framework for Managing Schedule and Cost Risks in Construction Projects Using PERT and EV Techniques," Buildings, vol. 14, no. 7, p. 1918, 2024, doi: 10.3390/buildings14071918.
[14] Y. Alhammadi, M. S. Al-Mohammad, and A. A. Rahman, "Modelling the Causes and Mitigation Measures of Cost Overruns in Building Construction: A Case Study of the ' ' Higher Education Project," Buildings, vol. 14, no. 2, p. 487, 2024, doi: 10.3390/buildings14020487.
[15] M. Rady, A. B. Tawfik, and A. A. Alasow, "The Influence of Unit Prices on the Optimal Cost of Reinforced Concrete Beams: A Comparative Study," Journal of Engineering Research, 2024, doi: 10.1016/j.jer.2024.01.002.
[16] M. C. Okika, A. Vermeulen, and J. H. C. Pretorius, "A Systematic Approach to Identifying and Managing Supply Chain Risks in Construction Projects," Journal of Financial Management in Property and Construction, vol. 30, no. 1, pp. 42–66, 2025, doi: 10.1108/JFMPC-09-2023-0057.
[17] J. Cassandro, C. Mirarchi, C. Zanchetta, and A. Pavan, "Improving Accuracy in Cost Estimation: Integration of Structured Cost Data and Model Validation," Journal of Information Technology in Construction, vol. 29, pp. 1293–1325, 2024, doi: 10.36680/j.itcon.2024.058.
[18] M. Abrudan, M. Bliuc, and A. Călin, "Selection and Determination of Factor Weights for a Price Adjustment Formula Based on the Bill of Quantities," Systems, vol. 13, no. 12, p. 1069, 2025, doi: 10.3390/systems13121069.
[19] M. Abrudan, M. Bliuc, and A. Călin, "Assessment of Price Adjustment Mechanisms in Romanian Public Construction Contracts: A Longitudinal Cost Impact Analysis (2018–2024)," Buildings, vol. 15, no. 12, p. 2076, 2025, doi: 10.3390/buildings15122076.
[20] K. Kim et al., "Construction Cost Estimation Using a Case-Based Reasoning-Based Hybrid Genetic Algorithm Supported by BIM and IFC," Sustainability, vol. 12, no. 19, p. 7920, 2020, doi: 10.3390/su12197920.
[21] R. Drew, S. Skitmore, and A. Lo, "The Influence of Clients and the Type and Size of Construction Projects on Contractors' Bidding Strategies," Building and Environment, vol. 36, no. 3, pp. 393–406, 2001, doi: 10.1016/S0360-1323(99)00070-6.
[22] A. Krzemińska, A. Leśniak, and M. Plebankiewicz, "Who Bears the Risk and Wins?—Simulated Cost Variations in Sustainable Construction Projects," Sustainability, vol. 12, no. 8, p. 3370, 2020, doi: 10.3390/su12083370.