

Field-Based Evaluation of Unit Price Coefficients for Red Brick Masonry Wall Construction: A Comparison with AHSP 2025

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Accurate unit price analysis is essential for reliable construction cost estimation because it depends on labor and material coefficients that represent actual resource requirements. This study evaluates labor and material coefficients for red brick masonry wall construction based on field observations and compares them with the coefficients specified in AHSP 2025. Field data were collected from a construction project at the Gorontalo Vocational Training Center (BLK), Indonesia, through direct observation over 14 working days. Daily productivity, labor composition, and material consumption were recorded and used to calculate field-based coefficients and unit prices. The results showed an average masonry productivity of 51.83 m²/day. The field-based labor coefficients were 0.131 OH/m² for workers, 0.097 OH/m² for masons, 0.019 OH/m² for head masons, and 0.019 OH/m² for foremen. Material coefficients were 67.50 pieces/m² for red bricks, 8.92 kg/m² for cement, and 0.050 m³/m² for sand. The resulting field-based unit price was IDR 203,024.09/m², which was 7.03% lower than the AHSP 2025 value of IDR 218,382.87/m². For the observed project volume of 1,514.17 m², the difference corresponded to a potential cost reduction of approximately IDR 23.26 million. The findings demonstrate the importance of field-based coefficient evaluation and provide empirical support for local calibration of standardized construction cost coefficients.

Keywords: AHSP 2025; labor productivity; material coefficient; red brick masonry; unit price analysis; construction cost estimation.

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Introduction

Accurate construction cost estimation is essential for project planning, budgeting, procurement, and cost control. The reliability of cost estimates depends largely on the accuracy of unit price analysis, which is based on labor, material, and equipment coefficients representing resource requirements per unit of work. In Indonesia, these coefficients are standardized through the *Analisis Harga Satuan Pekerjaan* (AHSP), with the latest guidelines issued through Circular Letter No. 30/SE/DK/2025. Although AHSP provides a practical reference for preparing Bills of Quantities and contractor bids, standardized coefficients may not fully represent actual field conditions because construction productivity is influenced by labor skills, crew composition, management practices, material characteristics, and local construction methods (Ardian & Bhaskara, 2019; Fitri, 2021; Handayani et al., 2021; Direktorat Jenderal Bina Konstruksi, 2025; Ayob et al., 2024).

Labor productivity is one of the most influential factors affecting the accuracy of construction cost

estimation. Previous studies have shown that productivity varies according to worker experience, work organization, supervision quality, material handling, and environmental conditions (Khanh et al., 2023; Hong et al., 2023; Jian et al., 2025). In masonry construction, the accuracy of labor and material coefficients is particularly important because masonry walls remain widely used in building projects. Material consumption may vary due to differences in brick dimensions, mortar composition, joint thickness, and workmanship quality. Technical guidance and recent studies indicate that these factors significantly affect brick and mortar requirements, resulting in potential differences between standardized and actual material consumption (Brick Industry Association, 2009, 2020; Ahmed et al., 2024; Grigorjev et al., 2025).

Several studies have evaluated productivity and coefficient variations in construction activities. Karima et al. (2020) compared reinforced concrete productivity based on Indonesian standards and field observations, while Fadillah and Putra (2025) and Meitry et al. (2025) investigated labor productivity in masonry work using

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field-based approaches. Yuliamora (2023) also reported differences between field productivity coefficients and AHSP values for red brick masonry work. Despite these contributions, studies evaluating the recently issued AHSP 2025 for red brick masonry wall construction remain limited, particularly for local construction conditions in Gorontalo Province.

Therefore, this study evaluates labor and material coefficients for red brick masonry wall construction based on direct field observations and compares the results with AHSP 2025. The novelty of this study lies in the use of the latest AHSP 2025 standard, the utilization of 14-day field observation data to determine actual labor productivity and material consumption, and the evaluation of individual labor and material coefficients rather than only the final unit price. The findings are expected to provide empirical evidence for improving construction cost estimation accuracy and supporting future calibration of standardized coefficients based on local construction conditions.

Material and Method

Data Collection and Field Observation

Primary data were collected through direct field observation. The observation process focused on labor productivity and material consumption during masonry wall construction activities.

Several instruments were used during data collection, including a digital camera for documentation, tape measures (5 m and 50 m) for measuring completed wall areas, and structured observation sheets for recording daily construction activities. Daily observations were conducted from 07:00 to 17:00 local time. Considering a one-hour lunch break, the effective working time was approximately seven hours per day.

The composition of the work crew was recorded daily and consisted of workers (helpers), masons, a head mason, and a foreman. During three observation days (Days 6, 7, and 10), the number of workers decreased from seven to six because of worker absence. These observations were retained in the dataset to represent actual field conditions and to evaluate their influence on productivity.

At the end of each working day, the completed masonry wall area was measured and recorded in square meters (m²). Material consumption data were simultaneously collected, including the number of red bricks used, cement consumption, and sand volume required for mortar preparation. These data were subsequently used to calculate field-based labor and material coefficients.

The 14-day observation period was selected because it represented a complete masonry work cycle within the project. The observed productivity ranged from 48.30 to 55.40 m²/day, which was considered representative of normal working conditions for a medium-scale building project in Gorontalo.

Calculation of Labor Coefficients

Labor coefficients were calculated based on the ratio between labor input and daily masonry output. The

coefficient for each labor category was expressed in man-days per square meter (OH/m²) using Equation (1):

$$LC = \frac{N}{Q} \quad (1)$$

where LC is labor coefficient (OH/m²), N is number of workers in a labor category (OH/day), and Q is daily masonry output (m²/day).

Average labor coefficients were calculated using the complete 14-day observation dataset. The resulting values were used to develop the field-based unit price analysis.

Calculation of Material Coefficients

Material coefficients were determined from the ratio between material consumption and completed masonry wall area. The material coefficients were calculated using Equation 2, Equation 3, and Equation 4.

Red brick coefficient

$$MC_b = \frac{B}{Q} \quad (2)$$

where: MC_b is red brick coefficient (pieces/m²), B is number of red bricks used, and Q is completed wall area (m²).

Cement coefficient

$$MC_c = \frac{C}{Q} \quad (3)$$

where: MC_c is cement coefficient (kg/m²), and C is cement consumption (kg).

Sand coefficient

$$MC_s = \frac{S}{Q} \quad (4)$$

where: MC_s is sand coefficient (m³/m²), and S is sand consumption (m³). Average values obtained from the observation period were subsequently adopted in the field-based unit price analysis.

Unit Price Analysis

Unit price analysis was performed using both labor and material coefficients obtained from field observations. Labor costs were calculated by multiplying the field coefficients by the corresponding labor wage rates, while material costs were calculated using local market prices.

The labor wage rates adopted in this study were based on the 2025 Regional Unit Price Standard of Gorontalo Province: Worker: IDR 107,300/OH, Mason: IDR 110,000/OH, Head Mason: IDR 120,000/OH, and Foreman: IDR 125,000/OH

Material prices were obtained from the local market in Gorontalo City during March 2025: Red brick: IDR 2,000/piece, Portland cement: IDR 1,516/kg, and Sand: IDR 132,500/m³

The final unit price was calculated by adding labor costs and material costs, followed by an overhead and profit allowance of 10%, consistent with the contractual provisions applied in the project.

Comparison with AHSP 2025

The field-based coefficients and unit prices were compared with the values specified in AHSP 2025, as stipulated in Circular Letter No. 30/SE/Dk/2025 for red brick masonry wall construction ($22 \times 11 \times 5$ cm, half-brick wall, mortar ratio 1 cement: 5 sand).

The comparison was conducted at two levels:

1. Coefficient level, including labor and material coefficients;
2. Cost level, including unit price per square meter and total project cost.

Figure 1 presents the research workflow employed in this study. Field productivity and material consumption data obtained from a 14-day observation period were used to calculate labor and material coefficients. These coefficients were then incorporated into a field-based unit price analysis and compared with AHSP 2025 to evaluate differences in resource requirements, unit prices, and overall project costs.

Results and Discussion

Daily Productivity of Red Brick Masonry Wall Construction

The field productivity of red brick masonry wall construction was observed for 14 working days, as presented in Table 1 and illustrated in Figure 2. The average daily productivity was $51.83 \text{ m}^2/\text{day}$, with values ranging from $48.30 \text{ m}^2/\text{day}$ on Day 6 to $55.40 \text{ m}^2/\text{day}$

m^2/day on Days 3 and 12. This relatively narrow range suggests that the work team maintained a stable production pattern during the observation period, although minor day-to-day fluctuations were still evident. In the context of unit price analysis, this finding is important because stable productivity provides a more reliable basis for deriving field-based labor coefficients.

A noticeable decline in productivity occurred on Days 6, 7, and 10, when the number of workers decreased from seven to six, while the number of masons, head mason, and foreman remained unchanged. On these days, the recorded productivity decreased to $48.30 \text{ m}^2/\text{day}$, $48.50 \text{ m}^2/\text{day}$, and $49.50 \text{ m}^2/\text{day}$, respectively. This pattern indicates that supporting workers or helpers were not merely supplementary labor, but played an operational role in maintaining the continuity of masonry activities. In red brick wall construction, helpers support the main masons through material handling, mortar preparation, brick supply, and site clearing. When the number of helpers was reduced, the masons may have experienced interruptions in work flow, even though their number remained constant.

This result is consistent with the broader understanding that construction labor productivity is affected not only by the number and skill of the main workers, but also by crew composition, work

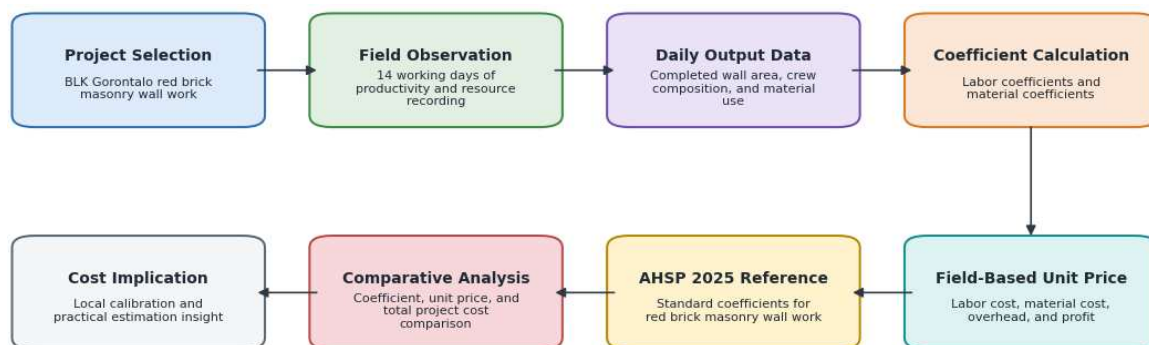


Figure 1 Research framework for field-based unit price coefficient evaluation

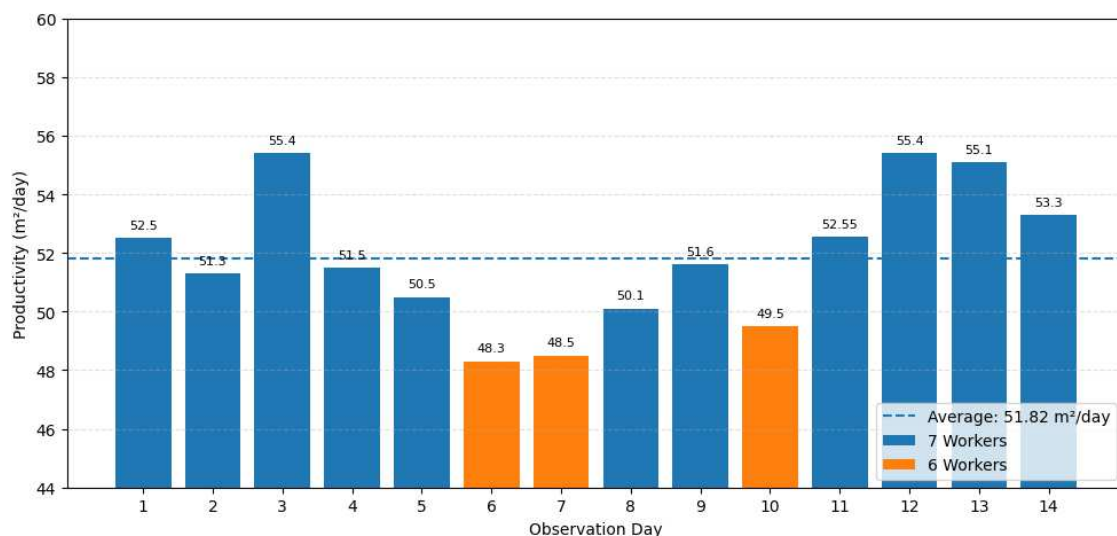


Figure 2 Daily Productivity of Red Brick Masonry Wall Construction (14-Day Observation, BLK Gorontalo)

coordination, site management, and field conditions. Earlier studies on construction productivity in Indonesia also indicate that field productivity may differ from standard coefficients due to actual working conditions and project-specific practices (Karima et al., 2020; Yuliamora, 2023). More recent studies provide similar support. Khanh et al. (2023), in a study on brick masonry construction, emphasized that variations in masonry productivity are closely related to the characteristics and skill level of workers. Hong et al. (2023) also showed that masonry productivity can be better understood when worker activities are observed in detail, since productivity is shaped by the distribution of productive and supporting activities during construction work.

Table 1 Daily Productivity of Red Brick Masonry Wall Construction

Day	Worker	Mason	Head Mason	Foreman	Output (m ²)
1	7	5	1	1	52.5
2	7	5	1	1	51.3
3	7	5	1	1	55.4
4	7	5	1	1	51.5
5	7	5	1	1	50.5
6	6	5	1	1	48.3
7	6	5	1	1	48.5
8	7	5	1	1	50.1
9	7	5	1	1	51.6
10	6	5	1	1	49.5
11	7	5	1	1	52.55
12	7	5	1	1	55.4
13	7	5	1	1	55.1
14	7	5	1	1	53.3
Average	-	-	-	-	51.83

The average productivity obtained in this study is also comparable to recent Indonesian evidence on masonry-related work. Fadillah and Putra (2024), for example, reported labor productivity in lightweight brick masonry work using field observation and work sampling. Although lightweight brick masonry and red brick masonry differ in material properties, work methods, and unit size, the comparison shows that field-based productivity measurement is useful for understanding the actual performance of masonry crews in Indonesian construction projects. Therefore, the present finding strengthens the argument that productivity values used in cost estimation should not rely solely on standardized assumptions, but should also consider field data when such data are available.

Nevertheless, the interpretation of this productivity pattern should be made cautiously. The observed decrease in productivity on days with fewer workers suggests a relationship between helper availability and daily output, but the data do not prove that worker reduction was the only cause of lower productivity. Other factors, such as wall location, work complexity, material supply distance, weather, or site congestion, may also have contributed to daily productivity

variation. Because these factors were not separately measured in this study, the discussion should be understood as an interpretation of observed field patterns rather than a causal conclusion.

From a practical perspective, the results indicate that crew composition should be considered carefully when estimating labor coefficients for red brick masonry wall construction. A small reduction in supporting workers may reduce daily output and affect the calculated labor coefficient per square meter. This has direct implications for preparing a realistic unit price analysis, especially when comparing field-based coefficients with AHSP 2025. Scientifically, the finding supports the need for localized field-based evaluation of unit price coefficients, as construction labor productivity is influenced by worker-related, managerial, environmental, and regional factors (Jian et al., 2025). Thus, field productivity data can serve as a useful empirical basis for calibrating AHSP coefficients to better reflect actual construction conditions in specific regions.

Nevertheless, this productivity pattern should be interpreted cautiously. The lower productivity on days with fewer workers suggests a relationship between helper availability and daily output, but other factors such as wall location, work complexity, material supply distance, weather, or site congestion may also have contributed. Therefore, the result should be understood as a field-based indication rather than a direct causal conclusion.

Practically, the findings indicate that crew composition should be considered when estimating labor coefficients for red brick masonry wall construction. Since construction labor productivity is affected by worker-related, managerial, environmental, and regional factors, field productivity data can provide a useful basis for calibrating AHSP coefficients to better reflect local construction conditions (Jian et al., 2025).

Field-Based Labor Coefficients and Comparison with AHSP 2025

The field-based labor coefficients were calculated from the daily productivity data presented in Table 1. The coefficients represent the labor requirement in man-days per square meter (OH/m²) for each labor component, including workers, masons, head mason, and foreman. The daily and average labor coefficients are presented in Table 2.

Figure 3 compares the average field-based labor coefficients with the corresponding AHSP 2025 coefficients. The largest difference occurred in the worker coefficient, where the field value was 0.131 OH/m², lower than the AHSP 2025 value of 0.200 OH/m². This suggests that, under the observed project conditions, supporting workers assisted masonry activities more efficiently than assumed in the standard coefficient. In contrast, the mason coefficient was relatively similar between the field data and AHSP 2025, at 0.097 OH/m² and 0.100 OH/m², respectively.

The field coefficients for head mason and foreman were higher than the AHSP 2025 values. This difference appears to reflect the supervisory structure of the observed project, where one head mason and one

foreman supervised a relatively small work crew. Therefore, the higher coefficients should not be interpreted directly as supervisory inefficiency, but rather as a consequence of project-specific crew organization.

Table 2 Daily and Average Labor Coefficients

Day	Productivity (m ² /day)	Worker Coeff. (OH/m ²)	Mason Coeff. (OH/m ²)	Head Mason Coeff. (OH/m ²)	Foreman Coeff. (OH/m ²)
1	52.5	0.133	0.095	0.019	0.019
2	51.3	0.136	0.097	0.019	0.019
3	55.4	0.126	0.09	0.018	0.018
4	51.5	0.136	0.097	0.019	0.019
5	50.5	0.139	0.099	0.02	0.02
6	48.3	0.124	0.104	0.021	0.021
7	48.5	0.124	0.103	0.021	0.021
8	50.1	0.14	0.1	0.02	0.02
9	51.6	0.136	0.097	0.019	0.019
10	49.5	0.121	0.101	0.02	0.02
11	52.55	0.133	0.095	0.019	0.019
12	55.4	0.126	0.09	0.018	0.018
13	55.1	0.127	0.091	0.018	0.018
14	53.3	0.131	0.094	0.019	0.019
Avg.	51.83	0.131	0.097	0.019	0.019

These findings are consistent with previous studies showing that construction labor productivity may differ from standard coefficients because of crew composition, worker skills, work organization, and field conditions (Karima et al., 2020; Yuliamora, 2023). In masonry work, productivity is influenced not only by masons but also by the balance between masons, helpers, and supervisory personnel (Khanh et al., 2023). More broadly, construction labor productivity is affected by worker-related, managerial, environmental, and regional factors (Jian et al., 2025).

Nevertheless, these coefficient differences should be interpreted as project-specific findings. Different wall heights, work locations, labor skills, supervision

systems, and material supply conditions may produce different coefficients. Practically, the results support the use of field-based coefficients as a complementary basis for preparing more realistic unit price analyses, particularly for repetitive masonry work where local productivity may differ from national standard assumptions.

Material Coefficients for Red Brick Masonry Wall Construction

The material coefficients for red brick masonry wall construction were compared with the AHSP 2025 coefficients, as shown in Figure 4. The field coefficients for red bricks and cement were lower than the AHSP 2025 values, at 67.50 pieces/m² compared with 71.91 pieces/m² and 8.92 kg/m² compared with 9.68 kg/m², respectively. In contrast, the field coefficient for sand was slightly higher, at 0.050 m³/m² compared with 0.045 m³/m² in AHSP 2025.

The lower red brick coefficient suggests that the number of bricks used per square meter in the observed project was smaller than the standard assumption. This difference may be related to actual brick dimensions, mortar joint thickness, bond pattern, workmanship, and material waste control. Brick Industry Association (2009) explains that brick quantity and mortar requirements are influenced by brick size, joint size, bond pattern, breakage, and waste allowance. Thus, the difference between the AHSP 2025 and field coefficients can be interpreted as a reasonable field variation rather than merely a calculation deviation.

The lower cement coefficient indicates more economical mortar use in the observed project, possibly due to controlled mixing practices, consistent mortar application, or actual joint thickness in the field. Mortar use is affected by mortar ingredients, material properties, and application practices (Brick Industry Association, 2020). Ahmed et al. (2024) also showed that changes in masonry joint systems can reduce mortar consumption, supporting the argument that mortar application practices influence material requirements.

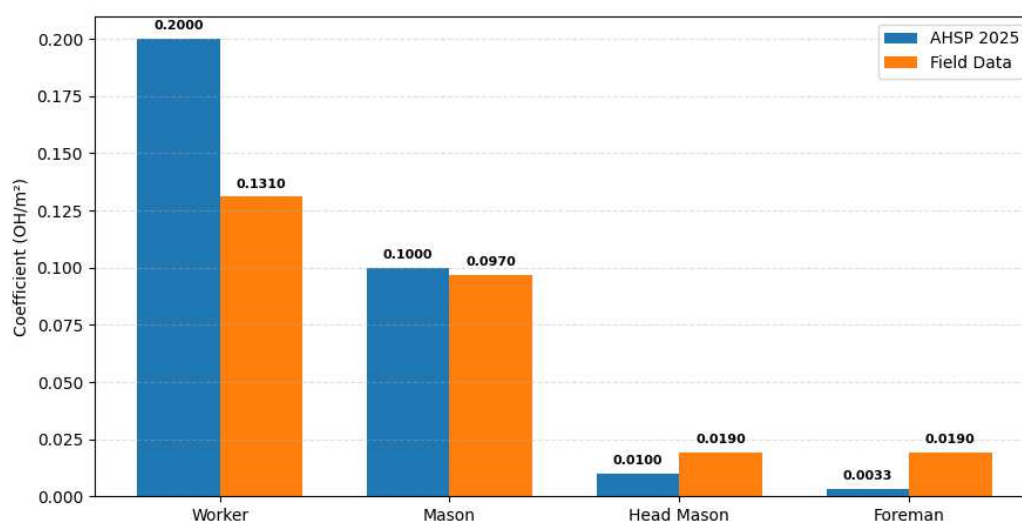


Figure 3 Comparison of Labor Coefficients: AHSP 2025 vs. Field Data

The higher sand coefficient may be associated with local sand characteristics, such as gradation, moisture condition, or workability adjustment during mortar preparation. Fine aggregates are a major component of masonry mortar, and their characteristics can affect water demand, consistency, and workability (Grigorjev et al., 2025). However, this interpretation should be made cautiously because this study did not include laboratory testing of sand gradation, moisture content, mortar strength, or joint thickness.

Overall, the comparison confirms that material consumption in red brick masonry wall construction may differ from standardized AHSP values due to local field conditions. The lower red brick and cement coefficients contributed to a lower field-based unit price, while the higher sand coefficient shows that not all field material components were more efficient than the standard values. These findings support the need for local calibration of material coefficients when standardized values are applied to regions with different material characteristics, workmanship practices, and construction methods.

Unit Price Analysis Based on Field Data and AHSP 2025

Tables 3 and 4 present the unit price analysis based on field data and AHSP 2025, respectively. The field-based unit price was IDR 203,024.09/m², while the AHSP 2025-unit price was IDR 218,382.87/m². This represents a difference of IDR 15,358.78/m², or approximately 7.03% of the AHSP 2025 value.

The difference was mainly influenced by lower labor and material costs in the field-based calculation. Field labor cost was IDR 29,419.63/m², lower than the AHSP 2025 labor cost of IDR 34,072.50/m², primarily due to the lower worker coefficient observed in the field. Material costs also decreased because the field coefficients for red bricks and cement were lower than the AHSP 2025 values, although sand consumption was slightly higher.

These findings confirm that variations in labor productivity and material consumption can affect unit

price estimation. Previous studies have similarly shown that field productivity and resource utilization may differ from standardized coefficients because of labor organization, workmanship, material characteristics, and project-specific conditions (Karima et al., 2020; Yuliamora, 2023). Therefore, field-based unit price analysis can provide a more realistic representation of actual construction costs than relying solely on standard coefficients.

Table 3 Unit Price Analysis Based on Field Data

No.	Description	Unit	Coef.	Unit Price (IDR)	Amount (IDR)
A	Labor				
	Worker	OH	0.131	107,300.00	14,049.68
	Mason	OH	0.097	110,000.00	10,633.30
	Head Mason	OH	0.019	120,000.00	2,319.99
	Foreman	OH	0.019	125,000.00	2,416.66
	Total Labor Cost (A)				29,419.63
B	Materials				
	Red Brick	Piece	67.5	2,000.00	135,000.00
	Portland Cement	kg	8.92	1,516.00	13,522.72
	Sand	m ³	0.05	132,500.00	6,625.00
	Total Material Cost (B)				155,147.72
D	Subtotal (A + B)				184,567.35
E	Overhead & Profit (10% × D)				18,456.74
F	Unit Price (D + E)				203,024.09

However, the lower field-based unit price should be interpreted as a project-specific result, not as evidence that AHSP 2025 generally overestimates construction costs. AHSP coefficients are designed as generalized

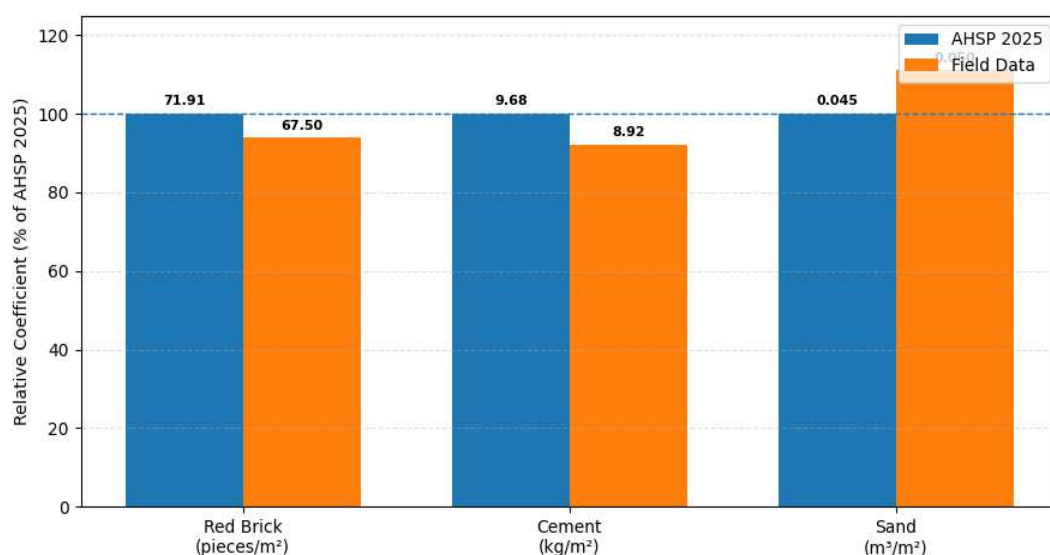


Figure 4 Comparison of Material Coefficients: AHSP 2025 vs. Field Data

references, whereas the coefficients in this study reflect one project, one crew arrangement, and one construction environment. Practically, the results support the periodic evaluation of field productivity and material consumption to improve the accuracy of unit price estimation, especially for repetitive work such as red brick masonry wall construction.

Table 4 Unit Price Analysis Based on AHSP 2025

No.	Description	Unit	Coef.	Unit Price (IDR)	Amount (IDR)
A Labor					
	Worker	OH	0.2	107,300.00	21,460.00
	Mason	OH	0.1	110,000.00	11,000.00
	Head Mason	OH	0.01	120,000.00	1,200.00
	Foreman	OH	0.0033	125,000.00	412.5
	Total Labor Cost (A)				34,072.50
B Materials					
	Red Brick	Piece	71.91	2,000.00	143,820.00
	Portland Cement	kg	9.68	1,516.00	14,674.88
	Sand	m ³	0.045	132,500.00	5,962.50
	Total Material Cost (B)				164,457.38
D Subtotal (A + B)					198,529.88
E Profit (10% × D)					19,852.99
F Unit Price (D + E)					218,382.87

Cost Component Comparison and Implications for Total Project Cost

The comparison of cost components between AHSP 2025 and the field-based calculation is presented in Table 5 and Figure 5. The results show that the largest cost contribution in both methods originated from red brick materials, followed by labor and cement costs. Although several components exhibited relatively small differences, the cumulative effect resulted in a noticeable difference in the final unit price.

Among all components, red brick consumption contributed the largest absolute difference in material cost. The field-based cost for red bricks was IDR 135,000.00/m², compared with IDR 143,820.00/m² under AHSP 2025. This difference reflects the lower brick coefficient observed in the field and confirms that material consumption has a substantial influence on the overall unit price because red bricks represent the dominant cost component in masonry wall construction. Cement costs also decreased under field conditions, whereas sand costs increased slightly. However, the increase in sand cost was relatively small and did not offset the reductions obtained from brick and cement consumption.

A similar pattern can be observed in labor costs. The worker cost component decreased significantly from IDR 21,460.00/m² under AHSP 2025 to IDR 14,049.68/m² in the field-based calculation. This

reduction was primarily associated with the lower worker coefficient discussed in the previous subsection. In contrast, the costs of head mason and foreman increased because their field coefficients were higher than the standardized values. Nevertheless, the additional supervisory cost was considerably smaller than the savings generated from the worker and material components.

Table 5 Comparison of Cost Components per m²: AHSP 2025 vs. Field Data

Component	Unit	AHSP 2025 Coef.	Field Coef.	AHSP Cost (IDR)	Field Cost (IDR)
Worker	OH	0.2	0.131	21,460.00	14,049.68
Mason	OH	0.1	0.097	11,000.00	10,633.30
Head Mason	OH	0.01	0.019	1,200.00	2,319.99
Foreman	OH	0.0033	0.019	412.5	2,416.66
Red Brick	Piece	71.91	67.5	143,820.0	135,000.0
Cement	kg	9.68	8.92	14,674.88	13,522.72
Sand	m ³	0.045	0.05	5,962.50	6,625.00
Total Including 10% Overhead & Profit				218,382.87	203,024.09

The combined effect of these differences resulted in a field-based unit price of IDR 203,024.09/m², compared with IDR 218,382.87/m² using AHSP 2025, as shown in Figure 6(a). The difference of IDR 15,358.78/m² corresponds to approximately 7.03% of the AHSP 2025 value. Although the percentage difference appears moderate, it becomes more significant when applied to large project volumes.

When multiplied by the total masonry wall volume of 1,514.17 m², the field-based calculation produced a total project cost of approximately IDR 307.41 million, whereas the AHSP 2025 calculation resulted in approximately IDR 330.67 million, as illustrated in Figure 6(b). Consequently, the use of field-based coefficients generated a potential cost reduction of approximately IDR 23.26 million for the observed project. This finding demonstrates how relatively small differences in labor and material coefficients can accumulate into substantial financial impacts at the project scale.

The result is consistent with the general principle that construction cost estimates are highly sensitive to productivity and resource-consumption assumptions. Previous studies have reported that differences between standardized coefficients and actual field conditions may arise from variations in labor productivity, work organization, material utilization, and project-specific characteristics (Karima et al., 2020; Yuliamora, 2023). More recently, Khanh et al. (2023) and Jian et al. (2025) emphasized that productivity and resource requirements are influenced by worker characteristics, managerial practices, and local conditions, suggesting that standardized values may not always represent actual project performance.

However, the observed cost reduction should not be interpreted as evidence that AHSP 2025 systematically overestimates masonry construction costs. AHSP coefficients are designed as generalized reference values intended for broad applicability across different regions and project conditions. The field-based coefficients obtained in this study reflect the specific characteristics of a single project, including its labor composition, material supply system, management practices, and local construction environment. Therefore, the difference identified in this study should be viewed as a project-specific calibration rather than a universal adjustment factor.

From a practical standpoint, the findings indicate that periodic evaluation of field productivity and material consumption can improve the accuracy of cost estimation and support more efficient project budgeting. For contractors, the adoption of field-based coefficients may enhance competitiveness during tender preparation and reduce the uncertainty associated with resource planning. From a scientific perspective, the study reinforces the importance of validating standardized unit price coefficients using empirical field data, particularly for repetitive construction activities such as red brick masonry wall construction.

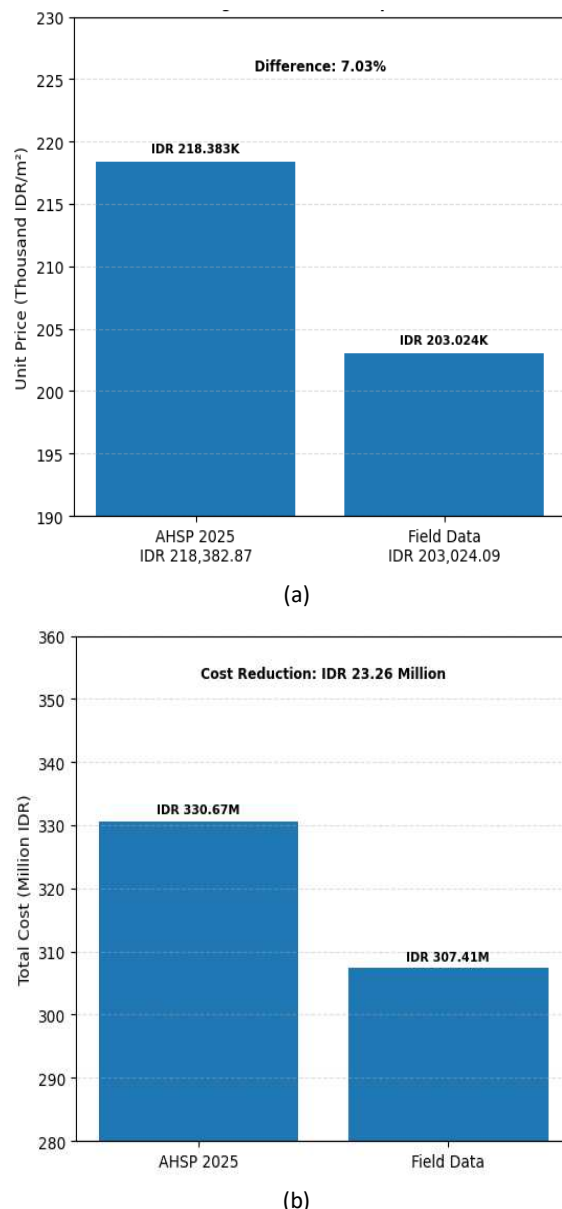


Figure 6 Comparison of Unit Price and Total Project Cost between AHSP 2025 and Field Data. (a) Comparison of unit price per square meter. (b) Comparison of total project cost for a masonry wall volume of 1,514.17 m². The field-based calculation resulted in a 7.03% lower unit price and an estimated cost reduction of approximately IDR 23.26 million compared with AHSP 2025.

Limitations of the Study and Practical Implications

This study has several limitations that should be considered when interpreting the findings. First, the data were obtained from a single construction project in Gorontalo City, Indonesia. Therefore, the field-based coefficients derived in this study may reflect the specific labor productivity, management practices, material supply, and workmanship characteristics of the observed project and cannot be directly generalized to all construction projects in Gorontalo or other regions.

Second, the field observations were conducted during a single observation period in March 2025. As a result, potential seasonal effects, such as weather variation, labor availability, and material supply conditions, were not fully evaluated. Third, the analysis was limited to one masonry wall specification, namely red brick masonry using bricks measuring 22 × 11 × 5 cm, a half-brick wall configuration, and a mortar mix ratio of 1 cement: 5 sands. The resulting coefficients may therefore differ for projects using different brick dimensions, wall thicknesses, mortar compositions, or construction methods.

Fourth, the labor composition observed in this project may not represent the workforce structure commonly used in other projects. Differences in crew size, worker skills, supervision practices, and project organization can influence field productivity and, consequently, the calculated labor coefficients. Thus, the results should be interpreted as project-specific empirical evidence rather than as universal correction factors for AHSP 2025.

Despite these limitations, the findings have important practical implications. The results show that field-based labor and material coefficients may differ from standardized AHSP coefficients and can influence the final unit price and total project cost. For contractors and cost estimators, periodic evaluation of actual field productivity and material consumption can improve the accuracy of cost estimation, support more competitive bidding strategies, and reduce uncertainty in resource planning.

For policymakers and construction cost database developers, this study indicates the need to consider localized field data when evaluating or updating standardized unit price coefficients. Future studies should include multiple projects, longer observation periods, and different masonry specifications to develop more representative regional coefficient databases. Such efforts would strengthen the reliability

of unit price analysis and support more adaptive construction cost estimation practices across different local contexts.

Conclusions

This study evaluated field-based labor and material coefficients for red brick masonry wall construction and compared them with AHSP 2025. Based on 14 days of field observation at the BLK Gorontalo project, the average productivity was 51.83 m²/day. The worker coefficient was lower than AHSP 2025, while the mason coefficient was relatively similar. In contrast, the head mason and foreman coefficients were higher because of differences in crew composition and supervisory structure.

Material consumption also differed from the standard coefficients. The field coefficients for red bricks and cement were lower than AHSP 2025, while the sand coefficient was slightly higher. These differences indicate that actual labor and material requirements may vary according to local construction practices and field conditions.

The field-based unit price was IDR 203,024.09/m², which was 7.03% lower than the AHSP 2025 value of IDR 218,382.87/m². For the total masonry wall volume of 1,514.17 m², this difference resulted in an estimated cost reduction of approximately IDR 23.26 million. The findings confirm that field-based coefficient evaluation can improve cost estimation accuracy and support future local calibration of standardized AHSP coefficients.

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Artificial Intelligence (AI) Use Disclosure

The authors used artificial intelligence (AI)-assisted language tools to support English language editing, grammar checking, and text refinement during the preparation of this manuscript. The authors reviewed, revised, and verified all generated content and remain fully responsible for the accuracy, originality, interpretation, and conclusions presented in this article.

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