

Design Review and Cost Estimation of Planned Asphalt Overlay on Jalan H. Tjutjup Suparna, Balikpapan City

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Abstract: Urban road infrastructure requires periodic planning and maintenance to ensure serviceability and public safety. Jalan H. Tjutjup Suparna, one of the main roads in Balikpapan City, has been selected for a planned asphalt overlay project to address surface degradation and improve driving comfort. This study aims to review the technical design and estimate the cost of the proposed overlay based on engineering drawings, including layout plans, cross-sections, and detailed drawings, as well as Bill of Quantity (BoQ) data. A comprehensive analysis of the design dimensions, planned pavement layers, and associated unit costs is conducted to evaluate the efficiency and consistency of the project documentation. The findings are expected to serve as a reference for improving the accuracy of early-stage planning in similar urban infrastructure projects.

Keywords: Asphalt Overlay; Balikpapan City; Cost Estimation; Design Review; Road H. Tjutjup Suparna; Road Infrastructure



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1. Introduction

Urban road infrastructure plays a vital role in supporting transportation systems, economic activities, and community mobility (El-Sherif, 2021; Yannis & Chaziris, 2022). To ensure roads function optimally, regular planning and maintenance are essential (Lee & Yoon, 2021; Liu et al., 2017), especially in rapidly developing cities such as Balikpapan. Asphalt overlay is one of the most widely used methods in road rehabilitation (Elseifi et al., 2016; Huang, 2004). It involves the application of a new layer of asphalt to improve surface quality and extend the pavement's service life (Kabir et al., 2014; Kuźnia, 2025) without the need for complete reconstruction (Gong et al., 2022; Johnson, 2000).

Jalan H. Tjutjup Suparna is a primary arterial road in Balikpapan City that serves both residential and commercial areas. Due to increasing traffic volume, natural wear, and aging pavement, this road has been identified as a candidate for surface rehabilitation through asphalt overlay (Sol-Sánchez et al., 2017; Wang et al., 2021). As of the time of this study, the overlay project is still in the planning phase, with no physical implementation having been conducted. Therefore, a comprehensive review of the design documents and cost estimation is crucial to ensure that the project planning is technically sound and economically efficient.

This study aims to review the technical design and estimate the cost of the planned overlay using available data, including layout drawings, cross-sections, detail plans, and the Bill of Quantity (RAB). The review process will assess the consistency between design dimensions, selected pavement layers, and unit price items. In addition, the study will identify potential discrepancies or inefficiencies that could affect the accuracy of project budgeting and execution in the future.

By focusing on a single road segment, this study offers a detailed insight into early-stage planning practices for asphalt overlay projects in urban environments. The findings are expected to serve as a reference for city planners, contractors, and engineers in optimizing future road infrastructure interventions, particularly in similar metropolitan contexts.

2. Materials and Methods

2.1. Data Collection

This study utilized secondary data obtained from planning documents prepared for the planned asphalt overlay project on Jalan H. Tjutjup Suparna, Balikpapan City. The data includes:

1. Technical drawings such as the site map, existing road layout, proposed layout, and cross-section details.
2. Photographs of the current condition of the road.
3. A Bill of Quantity (BoQ) or Rencana Anggaran Biaya (RAB), which provides information on work volumes and unit prices.

These data sources form the basis for evaluating the technical feasibility and estimated cost of the project prior to implementation.

2.2. Design Review Method

The design review was conducted by analyzing the technical drawings provided. The process focused on:

1. Examining the dimensions and scale of the existing and proposed layouts.
2. Reviewing the proposed pavement layer structure in the cross-section drawings.
3. Ensuring that the design meets geometric road standards and reflects the actual site conditions.

Each layout and detail drawing was compared against standard urban road design practices and interpreted using supporting photo documentation.

2.3. Cost Estimation Method

The cost estimation was based on the analysis of the RAB document. The evaluation included:

1. Identifying and reviewing unit costs for each work item.
2. Calculating the total estimated cost based on volume and unit price.
3. Summarizing cost components including surface preparation, asphalt overlay layers, and additional works.

This approach was used to determine the financial scope of the project and assess whether the estimated costs were realistic, efficient, and aligned with the proposed technical design.

3. Results

The results of this study are presented in the form of technical analysis and cost summaries based on the planning documents for the asphalt overlay project on Jalan H. Tjutjup Suparna. The findings are divided into two main components: (1) design review outcomes based on the engineering drawings, and (2) cost estimation based on the RAB document.

3.1. Design Review Results

The planned layout and cross-sectional drawings were analyzed to determine the characteristics of the existing road and the overlay design. The proposed pavement structure consists of a new asphalt layer with a specific thickness over the existing pavement surface. Based on the layout and cross-section, the planned overlay dimensions include:

- a. Total pavement width : 6,25 meters,
- b. Length of the road section : 1.127 meters,
- c. Overlay thickness : 6,50 cm.

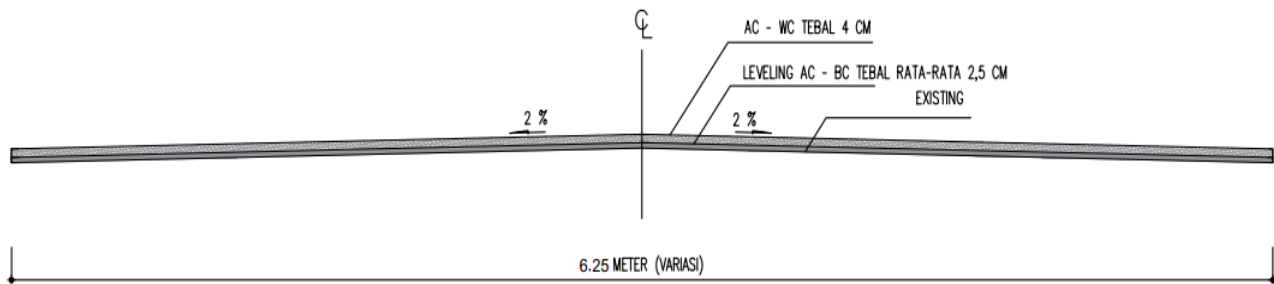


Figure 1. Detail Overlay Thicknesses.

The layout plan shows proper alignment and logical drainage path, and the design meets general urban road standards. However, certain adjustments may be needed in terms of cross slope uniformity or transition zones at intersections.

3.2. Cost Estimation Results

The RAB document was analyzed to determine the total estimated cost of the planned overlay work. The main cost components include:

- Surface preparation (cleaning, patching, etc.).
- Placement of asphalt layers.
- Additional works such as marking or drainage adjustments.

A summary of the cost estimation is shown in Table 1.

Table 1. Summary of Cost Estimation for Planned Asphalt Overlay on Road H. Tjutjup Suparna

No.	Work Component	Volume	Unit	Unit Cost (Rp)	Total Cost (Rp.)
1	Prime Coat – Liquid Asphalt/Emulsion	2,465.22	Liter	38,959.09	96,042,617.37
2	Wearing Course (AC-WC)	653.63	Ton	2,392,944.41	1,564,111,759.33
3	Binder Course (AC-BC)	408.52	Ton	2,269,877.12	927,294,200.79
4	Anti-Stripping Agent	194.37	Kg	115,892.40	22,526,544.54
5	Thermoplastic Road Marking	473.32	M2	288,919.13	136,751,710.06
Total Estimated Cost					2,746,727,052.09

These results highlight the proportional distribution of cost across work categories and can support early decision-making in the budgeting phase.

4. Discussion

The results of the design review and cost estimation provide an overview of the technical and financial feasibility of the planned asphalt overlay project on Jalan H. Tjutjup Suparna. Based on the engineering drawings, the planned pavement dimensions and layer thickness are consistent with standard practices for urban road rehabilitation. The overlay design addresses critical needs such as surface smoothness, structural reinforcement, and drainage alignment.

From a financial standpoint, the total estimated cost of Rp 2.74 billion reflects a moderately scaled road improvement project. The dominant cost components are the asphalt mixtures for the wearing and binder courses, which account for the majority of the budget. This is consistent with typical overlay projects where asphalt materials constitute the largest portion of costs.

The inclusion of thermoplastic road markings as part of the project enhances traffic safety and road usability post-construction. The use of an anti-stripping agent also indicates attention to long-term durability and resistance to moisture damage.

However, the discussion must also consider potential variables that could affect final implementation, such as:

- Variations in material prices and availability at the time of execution.

- b. Unforeseen subgrade conditions that may require design adjustments.
- c. Weather conditions affecting workability and schedule.
- d. Possible coordination issues with existing utilities or traffic control.

Overall, the project demonstrates a clear planning structure with measurable outputs, making it a strong reference for early-stage road overlay planning in other urban areas.

5. Conclusions

This study reviewed the design and estimated the cost of a planned asphalt overlay project on Jalan H. Tjutjup Suparna, Balikpapan City. Based on the analysis of layout plans, cross-sectional drawings, photographic documentation, and cost data from the Bill of Quantity (RAB), several conclusions can be drawn:

1. The proposed pavement design, with a width of 6.25 meters and an overlay thickness of 6.50 cm, is consistent with urban road standards and reflects appropriate engineering practice.
2. The total estimated project cost is Rp 2,746,727,052.09, with asphalt materials representing the largest portion of the budget.
3. The inclusion of thermoplastic road markings and an anti-stripping agent indicates consideration of both functionality and long-term durability.
4. This planning-based review allows for early detection of design or budgeting inconsistencies prior to physical implementation.
5. The approach used in this study can serve as a reference for other municipalities planning similar rehabilitation projects.

This study is expected to serve as a data-driven contribution to local government infrastructure planning and budgeting. However, it is important to note that the scope of this research is limited to the planning stage and does not involve post-construction evaluation. Future research is encouraged to assess implementation accuracy, actual cost realization, and performance durability, as well as incorporate environmental and sustainability metrics into overlay design.

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