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THIKCNESS DESIGN OF RIGID PAVEMENT ON THE ROAD SECTION GUBERNUR SUBARJO (STA 6 + 000 S / D STA 11 + 000) BANJARMASIN

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ABSTRACT

Gubernur Subarjo Jalan Banjarmasin is one of inter-provincial road traffic of that activity is quitehigh. As the road plays an important role road transport is still experiencing problems namely: increasing the amount of traffic, especially on heavy vehicles which resulted in pavement damagethese. Therefore it is necessary to choose the alternative pavement suitable for use at this location according to road conditions and environment. This thesis aims to calculate the pavement thickness and the draft budget the Gubernur Subarjo roads Banjarmasin.

On the roads studied, pavement used is rigid pavement structure *(Rigid Pavement)* the calculation using the method Pavement Design Manual No. 02 / M / BM / 2013 which is controlled by the method of Pd T-14-2003 and for the calculation of the budget using the guidelines Employment Analysis Unit Price (AHSP), 2013. Total segment length is used as a research location is 5000 m long.

The results obtained for road width of 7.5 m and 2 m wide shoulders, a new pavement covering the rigid pavement with 265 mm thick, with thick layers of foundation LMC and Aggregate Class A is 150 mm. Budget obtained Rp. 29.903 billion corresponding unit price is determined.

1. INTRODUCTION

Banjarmasin City Government in handling're trying to improve transport services on the roads of Gubernur Subarjo (Port Trisakti-Liang Anggang), ie, widen pavement. With the widening of road pavement is expected to improve service to the community, reduce the density of traffic flows, reducing transport and reduce the cost of transportation as well as developed regions. To build a pavement widening and improvement required in connection with the additional highway capacity, it will require effective methods in the design and planning, in order to obtain the best results and economical, yet meet the elements of road safety and can serve according to plan.

The condition of the current structure on this road is the use of flexible pavement *(flexible pavement)* with a road width of 7.5 meters, 2 meters road shoulder. From the state in the field there are flexible pavement*(flexiblepavement)* is not able to serve existing traffic load, such that there was damage to the pavement. So the required design is able to serve existing traffic load, such as using rigid pavement *(rigid pavement).* When viewed from the age ofis planned *rigid pavement* to reach 40 years old and able to serve heavy traffic load, while the *flexible pavement* can only serve the traffic load is relatively not too heavy and can achieve design life of 5-20 years, andmaintenance costs *rigid pavement* relatively nothing. In this thesis I will plan a rigid pavement*(rigidpavement)* on the road section Gubernur Subarjo (Port Trisakti - Liang Anggang) Banjarmasin, South Kalimantan, with a length of 5 km planning, road width of 7.5 m and 2 m shoulders.

With the planning of this road, it is expected to improve the quality of road construction as well as service to the community, reducing traffic density, and cultivate South Kalimantan region.

2. THEORITICAL STUDY

Growth Factors traffic based on data of the historical growth or formulations correlation with growth factors other valid, if not then is used as the minimum value. process design for rigid pavement according Pd T-14-2003 or metode10 Austroad 2004 requires a number of groups of axes and and not load spectrum requires the value of CESA. The number of groups over the age axis as input.

On concrete road pavement, there is only one layer of subbase. Can therefore also directly referred to as a base course. In general, the function of subbase layer*(sub-base)*for rigid pavement structure does not work too structural in the sense of existence is to donate the value of the structure to a thickness of the floor plate. Lapis foundations on rigid pavement has the main function as the work floor is flat and uniform. Thickness of the base layer is the minimum is 100 mm

type base layer below them is:

1. Foundation Base Material Bullet
2. Foundations Down Materials with Material

   Fastener (Bound Sub-Base)
3. Base Down with Mixed Concrete Thin

Concrete strength must be expressed in terms of flexural strength of 28 days, obtained on the test results with the imposition of a three-point beam (ASTM C-78) the amount of about 3-5 MPa (30-50 kg/cm).

In concrete road pavement, the most common parameters used to declare base on the soil bearing capacity rigid pavement is the modulus of subgrade reaction (k). Although the plan must be declared with characteristic flexural tensile strength which is rounded up to 0.25 MPa (2.5 kg/cm2).

The relationship between the compressive strength characteristics with-bending tensile strength of concrete. M ost of the load on the rigid pavement borne by in the MPa or a concrete slab, but the durability and strength of the plate is strongly influenced by the nature of where: the soil bearing capacity and uniformity of the base. Therefore, the

need to be prepared subgrade secarara well, among others, by concrete compressive strength characteristics of 28 days (kg/cm^2) compressing, forming, and complete with drainage facilities.

Concrete can be reinforced with steel fibers *(steel-fiber)* to increase the tensile strength and the flexibility of controlling cracks on the strong-tensile reinforcement permits plate , Steel fibers can be used in the concrete mix, cement used for the concrete work should be selected and in accordance with the environment where the pavement will be implemented.

Minimum thickness of all types of rigid pavement to be traversed commercial vehicles, can not be less than 150 mm but not reinforced pavement continued without spokes (dowel), must have a minimum thickness of 200 mm. Minimum thickness is also applies to rigid pavement with a surface layer of the existing asphalt.

Plate thickness calculation can be done by first trying to select a specific plate thickness is then calculated *"total fatigue"* based configuration and axle load during the design life.

If the total *fatigue* of more than 100%, and then taken a larger plate thickness and the re-examination of *fatigue* repeated. Thickness of the plan is the thickness which gives a total *fatigue* approaching or equal to 100%.

The main purpose of reinforcement are:

1. Limiting the crack width in order flexural strength may be maintained
2. Enables use of longer plates in order to reduce the number of cross-connections in order to increase comfort.
3. Reduce maintenance costs

Dowel in the form of rods of reinforcing steel plain or profile, which is used as a means of connecting, fastening on some kind of connection slab concrete pavement , Dowel acts as a conduit load on the connection, which is fitted with half the length and half the length bound lubricated or painted to give it the freedom to shift. The diameter of the spokes depending on the concrete slab thickness.

Tie bars are profiled steel pieces are mounted on smbungan tongue groove with a view to binding plate that does not move horizontally. Stem fastener mounted on the longitudinal joint. The distance between the longitudinal joint about 3-5 m.

Aft connection must be equipped with a trunk diameter of 16 mm fastener, dowel length of 65mm, and the distance rod fastener used 750 mm.

Determination traffic load plans for cement concrete pavement axis is expressed in the number of commercial vehicle *(commercial*vehicle),in accordance with the axis configuration on the track plan for UMR plans. Traffic must be analyzed based on the calculation of traffic volume and vehicle configuration reviewed for planning concrete pavement cement is having a total weight of at least 5 tons of

Configuration axis for planning consists of four types of groups of axes as follows:

1. Axes single single wheel (STRT)
2. Wick single dual wheel (Strg)
3. axis tandem double wheel (STdRG)
4. tridem dual wheel axis (STrRG)

Ageplan is determined on the road pavement classification considerations functional road, traffic patterns and the economic value of the road in question, which can be determined among other things by using *Benefit Cost Ratio, Internal Rate of*Return,a combination of these methods or other methods that can not be separated from the pattern of regional development. Generally, cement concrete pavement can be planned with a design life 20 years to 40 years.

Traffic growth

Traffic volumes will increase with the age of the plan or to the point where road capacity is achieved by traffic growth factors. Roadway that accommodates the largest commercial vehicle traffic. If the road does not have a lane boundary markers, the number of lanes and the distribution coefficient (C) commercial vehicles.

Trafficplan is the cumulative number of commercial vehicles on the lane axis of the plan during the life of the plan, including the i proportion of the axis and the load distribution on any type of vehicle axis. The load on an axis types are typically grouped in

intervals of 10 kN (1 ton) when taken from the survey burden. The number of axes of commercial vehicles during the life of the plan.

Analysis describes a unit price calculation of unit prices of materials and the work that is for commercial per day when road is the opened. Factor is the security of this load used in connection their various levels of planning reliability. technically specified in detail by a working methods and assumptions in accordance with what is described in a sfesifikasi engineering and component unit price, both for maintenance activities , and improved roads.

According to DGH, the basic unit price data used in the calculation of unit price analysis is as follows:

1. The local market price at the time in question.
2. The contract price for the goods / work local kind ever undertaken by considering the factors of price increases that occurred.
3. Unit price information is officially published by the Central Bureau of Statistics (BPS) and other print media.
4. List prices / rates and goods / services issued a factory or a single agent.
5. Standard price list issued by the authorized agencies both national and local.
6. Other data that can be used

3. METHODOLOGY

Collecting data necessary for planning pavement consists of two phases, namely the primary data and secondary data.

1. Primary Data

   Primary data were obtained as follows:

   a. Initial conditions in the field, b. Data LHR (1 x 24 hours)

   c. Data CBR land (9 points)

2. Secondary Data

   Secondary data collected in the form:

   a. data traffic growth rate (i) The b. price of the basic unit

4. RESULT AND DISCUSSION

Obtained from a survey carried out in streets Gubernur Subarjo the review period of 24 hours, from 06.00 pm until 06.00 pm. A survey conducted in Annex, following the conclusion of the survey conducted LHR, traffic volume in 2016. In addition to the data LHR, primary data pavement thickness required in the planning of this is data CBR field. Field CBR data is obtained from DCP tests performed per 500 m, starting from the station 6 + 000 s / d station 11+ 000 on the road section Gubernur Subarjo. The DCP of the test gained 11 points of testing, from the data that we get value DCP collision with penetration.

Rigid Pavement Thickness Design Methods Highways 2013

From the foregoing discussion it can be seen:

a. subgrade CBR:1,6%
b. Quality of concrete:K350
c. concrete slab thickness:230
d. under the foundations of Materials:Base Class A 30 mm
e. coefficient of friction between the concrete slab foundation (μ): 1.8
f. the shoulders:Yes
g. Trellis
h. (dowels):Yes

i. Data average daily traffic -rata:
   Passenger Cars: 1772 pieces/day Truck 2 AS:1543 pieces/day
j. traffic growth(i):0.386%
k. Age Plan (UR):40 years of cement concrete pavement is planned for 1 lane 2-way street for arterial roads.
l. Planning includes Concrete Pavement Reinforcement Continued With (BBDT)

From subgrade CBR calculations obtained from the previous calculation, obtained subgrade CBR value of 1.6%. According to the regulations Pd T-14-2003, for subgrade has a CBR of less than 2% then used the foundation CBK 150 mm thick and is considered to have an effective subgrade CBR by 5%.

By obtaining the number of axes for each type and commercial vehicle axle load and the number of commercial vehicle axis of the plan, the amount repitisi axis and plans for each type of commercial vehicle axle load can be known. From the graph above, it can be deduced that the minimum thickness of concrete slab is 170 mm.

Thick concrete slab can be determined by using analysis of fatigue and erosion, where the level of damage that occurs from the analysis of fatigue and erosion should be less than 100%. Determination of fatigue and erosion analysis can be determined by nomogram repitisi load permits (Fatigue Factor) and nomogram repitisi load permits (Erosion Factor)

In the determination of fatigue and erosion following analysis is attempted with plate thickness and quality of different concrete. Quality of the concrete used was K-400, K-350, K-300, K-250, while the plate thickness used is 350 mm, 265 mm, 250 mm, 230 mm. From this analysis, will have the most value close to 100%. For the analysis of K-400, K-350, K-300, K-250, with a slab thickness of 180mm, 178mm, 170mm, 165mm, 160mm. Total Area Reinforcement obtained a minimum of manual ISO-2002 thickness 265 mm with concrete quality K-350.

5. CONCLUSION

1. Designing thick rigid pavement *(rigid pavement)* using Road pavement Design Manual No. 02 / M / BM / 2013, which is controlled by the method of Pd T-14-2003 with a design life of 40 years, with a road length of 5000 m, 7.5 m width of the road and shoulder width and 2 m.
2. Planning rigid pavement *(rigid pavement)* using a type of cement concrete pavement with reinforcement continued.
3. Subgrade CBR value of 1.6% by using the smallest value for the data set is less than 16 readings based method 2013.Pavement Design Manual
4. Concrete which is used for the upper structure is K-350 with a thickness of 265 mm by using Road Pavement Design Manual 2013, whereas for LMC foundation layer and base course Aggregate Class A with a thickness of 150 mm.
5. Reinforcement is used respectively as follows:
   - reinforcement extends = 5Ø9 - 320 mm
   - rebars transversely = 6Ø8 - 270 mm
6. For the slab thickness 265 mm is required *dowel* Ø 36 mm, with the length (L) of 450 mm and the distance (s) between the dowel300 mm.
7. For slab thickness 265 mm is required *tie bar* Ø 16 mm, with a length of 1000 mm and a maximum distance of 750 cm.
8. For the calculation of the Draft Budget obtained Rp 29.903 billion (TwentyNine Billion Nine Hundred ThreeMillion).

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