Study Characteristics of Asphalt Concrete Lapis Aus (HRS-WC) By Using Sand Pumice For Material Substitute.

M Rizal*, M Darwis, & I Ridwan
Department of Civil Engineering, Faculty of Engineering, Khairun University, Ternate, North Maluku
*Email: adams.rizal@yahoo.co.id

Abstract: Tidore Islands has the potential of natural resources in the form of the availability of plenty of floating sand. This study was conducted to determine the effect of the use of floating sand as a substitute for sand on the characteristics of asphalt concrete mix wear (HRS-WC). This study uses the methods of The Asphalt Institute, Indonesian National Standards (SNI), and General Specifications 2018-Section 6.3. Percentage variation used in replacement material is 15% of normal sand: quicksand 15%, normal sand 7.5% : 7.5% quicksand, normal sand 11.25% : 3.75% quicksand and sand floating 11.25% normal sand 3.75%. For find out the Marshall characteristics of the HRS – WC (Hot Rolled Sheet-wearing course) mixture by using a substitute for floating sand aggregate. Results of testing marshall with sand floating 11.25% sand normally 3.75% indicates the value of the stability of the highest = 1361.43 on levels of bitumen 6%, sand normal 15% to the value of the stability of the highest = 1408.6 at the level of asphalt 5.5%, the highest stability value = 1435.9 at 7% asphalt content, the highest stability value = 1472.2 at 6.5% asphalt content, and the highest stability value = 1687.8 at 6% asphalt content. And the average value of stability is 1473.19.

Keywords: Floating Sand As Substitute Material, HRS-WC, Marshall Test Characteristics , The Asphalt Instutute.

1. Introduction
At first, the only form of traces of humans who are looking for the needs of life or source of water, and then evolved into the footpath, road rocky, until the pavement roads with asphalt as an ingredient binder. But in use, the asphalt that cause pollution are not friendly to the environment. With more and more increasing awareness of man would dangers of pollution environment of living and increasing development of technology in the field of pavement road, then appeared an idea of the mixture of asphalt concrete using stone pumice.

Asphalt Concrete (HRS - WC) is one of the types of layers of pavement construction pavement pliable type of pavement is a mixture evenly between aggregates and bitumen as an ingredient binder at temperatures specific. Construction of pavement bending consists of layers - layers that are placed above tana h base that has been compacted. The composition of the flexible pavement construction layer consists of a foundation layer (HRS - BASE), and a wear layer (HRS - WC)[1].

This research was conducted to determine the effect of the use of floating sand as added material to the asphalt concrete mix wear[2]. The method used is the Marshall method. In the Marshall method there are several steps that need to be carried out, including: specific gravity testing, aggregate gradation.
planning, aggregate composition planning, calculation of aggregate bulk density, testing the maximum mixture specific gravity and calculating Marshall parameter values[3].

2. Research Method

2.1 Research Location and Time
This research activity is located in the Road and Asphalt Laboratory of Civil Engineering Study Program, Faculty of Engineering, Khairun University, Ternate.

2.2 Research Stages
The research was carried out in several stages, namely:

- Literature review
  At this stage, it is carried out for the collection of research concerning (HRS -WC), mixed characteristics, pumice testing and Marshall Test.

- Problem Formulation Phase and Research Objectives
  On stage is done about the problem of research, the purpose of the study, and the study of literature.

- Material Selection Stage
  On stage this whole material in need in peneletian prepared in advance in advance so that research can be run with smoothly. In stages it can be done the selection of material as well as material aggregate coarse, aggregate coarse medium, abubatu, From Ternate Village Togafo, asphalt penetration 60 / 70 Dari Ternate and Stone Pumice material is derived from the Exodus Tidore City Rum. Aggregates are taken and used in the manufacture of a mixture of asphalt HRS - WC (Hot Rolled Sheet-wearing course) consists of:
  a. Coarse aggregate, is broken stone with a maximum size of ¾ "inches or 10 mm.
  b. Medium coarse aggregates are aggregates with a maximum size of 1/2 "inches.
  c. Fine aggregate is stone ash is aggregate with a maximum size of 0.5 mm

- Pumice is as added material from coarse aggregate

- Laboratory Testing Stage
  These stages include the following:
  a. Physical Examiner Stage
  b. At this stage, testing of the asphalt concrete mixture making material is intended to determine the nature and characteristics of the material. In addition to knowing whether the material meets the requirements or not. This test uses the appropriate requirements in the Concrete Asphalt Characteristics Study (HRS - WC) Using Floating Sand as a Substitute.

3. Results and Discussion

3.1 Combined Aggregate Planning
In this combined aggregate planning, the composition value of each aggregate is determined randomly, for ingredients. The value of this composition, can be used if the results of its multiplication with the average value of the percentage of qualifications meet the aggregate gradation gradation specifications[4]. The composition values used in this study are listed in table 1.
Table 1. Composite Gradation Composition for Material Variations

| Aggregate     | Normal Sand 155 | Floating Sand 15% |
|---------------|-----------------|-------------------|
| 10-20 mm (%) | 30              | 30                |
| 5-10 mm (%)  | 25              | 25                |
| Stone Ash (%)| 30              | 30                |
| Normal Sand (%) | 15            | 7.5% Sand : floating sand 7.5% |
| Floating Sand (%) |            | 3.75% Normal sand |
| Total         | 100             | 100               |

Source: The results of calculations, Year 2019

3.2 Mixed Composition Planning

The levels of tar in the sand normally 15% is determined by way of calculation of the data the percentage of aggregate retained each sieve[5]. From the combined gradations known:

% CA = (100 - 50.63) = 49.37%
% FA = (50, 63 - 8.81) = 41.82%
% FF = 8, 81%
K = 0, 83
Settlement:
Pb = (0.035 x 49.37%) + (0.045 x 41.82%) + (0.18 x 8.81%) + 0.83
Pb = 6, 03 % = 6.0%.

In planning the composition of the mixture, the total weight of the mixture plan must be 1100 grams, meaning that each cumulative total weight of the mixture plus the weight of the total asphalt content must be 1100 grams to match the mold capacity.

Table 2. Planning the composition of the mixture of 15% normal sand variation

| Kadar Aspal | %  | 5%  | 5.5% | 6%  | 6.5% | 7%  |
|-------------|----|-----|------|-----|------|-----|
| Berat Aspal | gr | 55,00 | 60,50 | 66,00 | 71,50 | 77,00 |
| Kadar Agregat | %  | 95,0% | 94,5% | 94,0% | 93,5% | 93,0% |
| Berat Agregat | gr | 1045,00 | 1039,50 | 1034,00 | 1028,50 | 1023,00 |
| Kasar (gr) | 30% | 313,50 | 311,85 | 310,20 | 308,55 | 309,90 |
| Kasar Sedang (gr) | 25% | 261,25 | 259,88 | 258,50 | 257,13 | 255,75 |
| Abu Batu | 30% | 313,50 | 311,85 | 310,20 | 308,55 | 306,90 |
| Pasir (gr) | 15% | 156,75 | 155,93 | 155,10 | 154,28 | 153,45 |
| Kapasitas Mould | gr | 1100,00 | 1100,00 | 1100,00 | 1100,00 | 1100,00 |

Source: The results of calculations, Year 2019

3.3 Data Results of Testing Marshall Test Against Variations Material
Figure 1. Graph Relations Levels Asphalt by VIM against Material

Figure 2. Graph Relations Levels Asphalt with VMA

Figure 3. Graph Relations Levels Asphalt with VFB

Figure 4. Graph Relationship of Asphalt Levels with Stability
Figure 5. The Relationship between Asphalt and Flow Levels

![Graph showing the relationship between asphalt and flow levels.]

Figure 6. The Relationship between Asphalt and Flow Levels

![Graph showing the relationship between asphalt and MQ levels.]

1. Determination Result (KAO) to the normal Sand Material 15%

Table 3. Determination of Optimum Asphalt Levels (KAO) of normal Sand Material 15%

| Kadar Aspal | VIM (%) | VMA (%) | VFB (%) | Stabilitas (kg) | Flow (mm) | MQ (kg/mm) |
|------------|---------|---------|---------|-----------------|-----------|------------|
| 5          | 8.99    | 18.54   | 51.52   | 1216.5          | 3.99      | 315.61     |
| 5.5        | 7.11    | 17.88   | 60.26   | 1408.6          | 3.91      | 363.84     |
| 6          | 6.14    | 18.05   | 66.00   | 1687.8          | 3.20      | 528.11     |
| 6.5        | 5.49    | 18.50   | 70.32   | 1472.2          | 4.47      | 329.88     |
| 7          | 5.18    | 19.23   | 73.07   | 1435.9          | 4.97      | 289.21     |
| Spec.      | 4 - 6   | Min.17  | Min.68  | Min.600         | Min.3     | Min.250    |

Results of the Decision on the Determination (KAO) of Material Variations
Table 4. Recapitulation of Optimum Asphalt Levels (KAO) of Material Variations

| Material Variations          | Optimum Asphalt Levels | Note       |
|-----------------------------|------------------------|------------|
| Normal sand 15%             | 6.5%                   | Fulfill    |
| Quicksand 15%               |                        |            |
| Normal Sand 7.5%            |                        | Does not meet |
| Quicksand 7.5%              |                        |            |
| Normal Sand 11.25%          |                        | Does not meet |
| Quicksand 3.75%             |                        |            |
| Quicksand 11.25% : Normal   |                        | Does not meet |
| Sand 3.75%                  |                        |            |

4. CONCLUSION
Based on the results of the research, then we can conclude several things, namely:
1. Marshall test results with 11.25% floating sand 3.75% normal sand shows the highest stability value = 1361.43 at 6% asphalt content, 15% normal sand with highest stability value = 1408.6 at 5.5 asphalt content %, the highest stability value = 1435.9 at 7% asphalt content, the highest stability value = 1472.2 at 6.5% asphalt content, and the highest stability value = 1687.8 at 6% asphalt content. And the average value of stability is 1473.19
2. Based on the above results, the addition of sandpapers affect the stability value, but excessive asphalt content can also cause a decrease in the stability value.
3. Based on the 2018 Bina Marga specifications of Revision 3 Asphalt Pavement Division 6, the table on the Provisions on the Characteristics of Lataston Mixture (HRS) then some do not meet all the conditions of the marshall parameter values.

5. References
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