



KEMENTERIAN PENGAJIAN TINGGI



LAPORAN INOVASI PITEX SESI JUN2020  
UNIT PENYELIDIKAN DAN INOVASI

TAJUK PROJEK: MIX HDPE BITUMEN  
JABATAN: KEJURUTERAAN AWAM

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## MIX HDPE BITUMEN

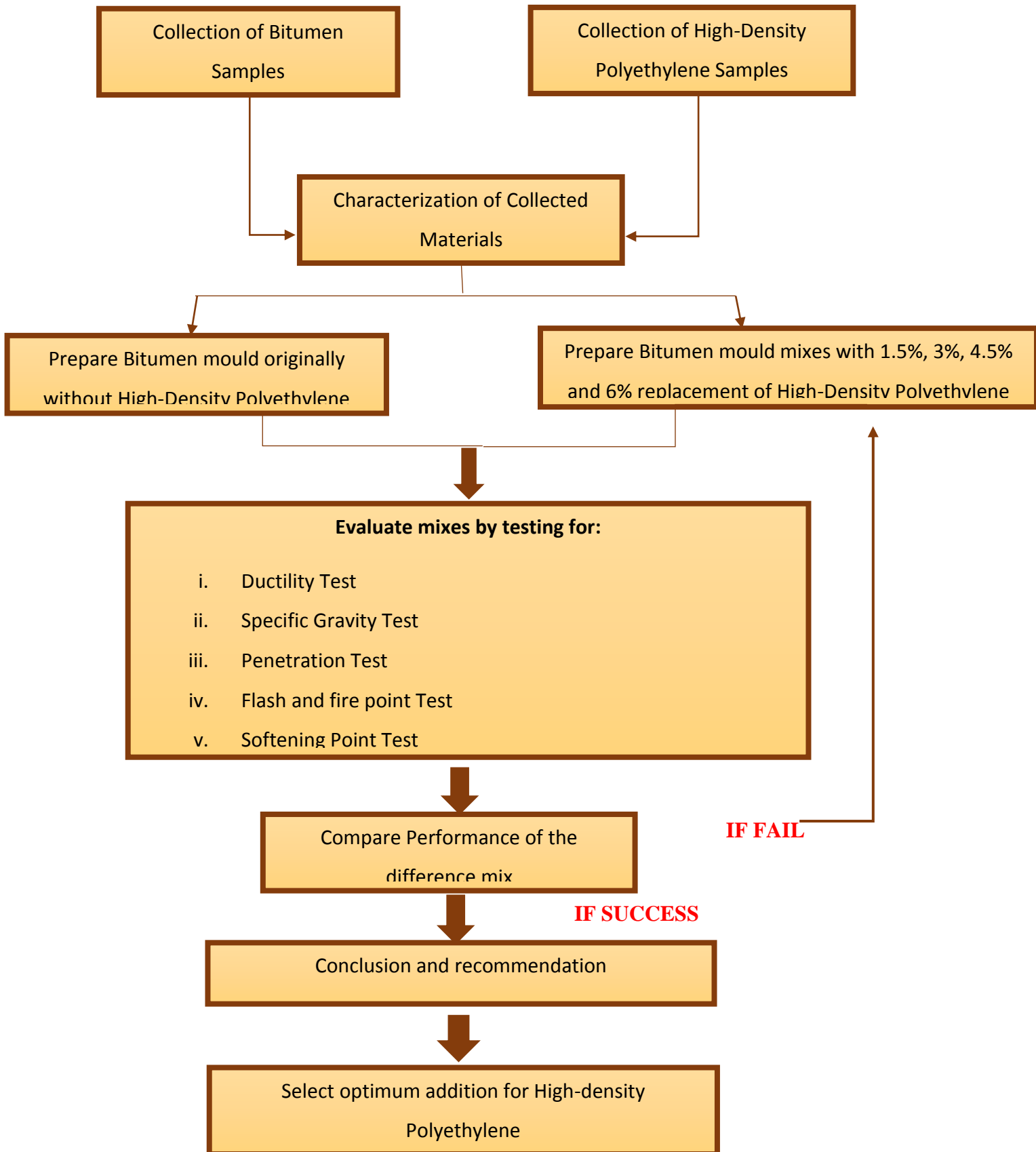
### 2. RESEARCH PROBLEM

Bitumen roof is also very durable. They have a high-tensile strength so they are unlikely to develop the kinds of cracks that other flat and membrane roofs are known for. They are also rated against wind, fire, and hail so they are unlikely to be damaged in the event of a storm. Included in this is usually a very long manufacturer's warranty that can help to guarantee the roof's longevity. Granules need to be included as part of the installation process to help protect the roof from the sun. If they are not included, this can further raise the temperature of the building or damage the roof. Unfortunately, not all types of bitumen roofs include granules as part of the installation process. Finally, if your roof is likely to hold a lot of water or to gather puddles of standing water after rainstorms, this can prematurely age and damage the bitumen roof. So, it is very dangerous if the bitumen failure to support the traffic.

In addition, the quantity of waste increases after the rains and makes cleaning work difficult. This causes the cleanup contractor to require large numbers of workers. In addition, floating debris floating in lakes and rivers has disrupted rezoning activities such as kayak sports and affected lake pollution.

Crack in pavement cracks will not necessarily run in a perfectly straight line, but they do extend across the entire slab; that is, each crack runs either edge-to-edge or until it reaches another crack. The cracks can develop due to a variety of factors. These include overloading, thermal expansion and contraction, moisture stresses, slab curling, and loss of support underneath the slab. Often a combination of factors is involved, and traffic loads usually contribute to some degree.

### 3. METHODOLOGY STUDY





**Bitumen (60/70)**



**High Density Poly Ethylene**

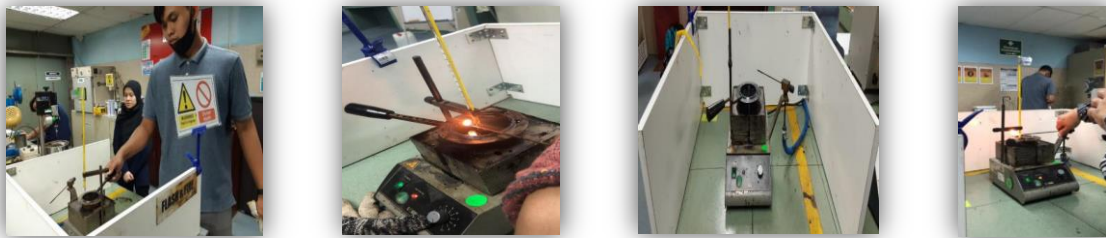
### 3.1 DUCTILITY TEST

Ductility is the property of bitumen that permits it to undergo great deformation or elongation. Ductility is defined as the distance in cm, to which a standard sample or briquette of the material will be elongated without breaking. Dimension of the briquette thus formed is exactly 1 cm square. The bitumen sample is heated and poured in the mould assembly placed on a plate. These samples with moulds are cooled in the air and then in water bath at 270C temperature. The excess bitumen is cut and the surface is leveled using a hot knife. Then the mould with assembly containing sample is kept in water bath of the ductility machine for about 90 minutes. The sides of the moulds are removed, the clips are hooked on the machine and the machine is operated.



### 3.2 FLASH AND FIRE POINT

Flash point of bitumen is the temperature at which, its vapour will ignite temporarily during heating when a small flame is brought into contact with the vapour. The knowledge of this point is of interest mainly to the user, since the bitumen must not be heated to this point. The flash point tells the critical temperature at and above which suitable precautions are required to be taken to eliminate the danger of fire during heating. This temperature, however, is well below that at which the bitumen will burn. The latter temperature is called the fire point.



### 3.3 PENETRATION TEST

The penetration value of bitumen is measured by distance in tenths of mm that a standard needle would penetrate vertically into bitumen sample under standard conditions of test. By this test we can determine the hardness or softness value of bitumen.

In this test, firstly heat the bitumen above its softening point and pour it into a container of depth atleast 15mm. bitumen should be stirred wisely to remove air bubbles. Then cool it to room temperature for 90 minutes and then placed it in water bath for 90 minutes. Make dial reading zero and release the needle for exactly 5 seconds and note down the penetration value of needle for that 5 seconds. Just repeat the procedure thrice and note down the average value.



### 3.4 SOFTENING POINT TEST

Softening point of bitumen indicates the point at which bitumen attains a particular degree of softening under specified conditions of the test. Take small amount of bitumen sample and heat it up to 75-100oC. Ring and ball apparatus is used to conduct this test. Heat the rings and apply glycerin to prevent from sticking. Fill this rings with bitumen and remove the excess material with hot sharp knife. Then apply temperature @ 5oC per minute. At certain temperature bitumen softens and ball slowly move downwards and touches the bottom plate, this point is noted as softening point.



### 3.5 SPECIFIC GRAVITY TEST

In paving jobs, to classify a binder, density property is of great use. In most cases, bitumen is weighed, but when used with aggregates, the bitumen is converted to volume using density values. The density of bitumen is greatly influenced by its chemical composition. Increase in aromatic type mineral impurities causes an increase in specific gravity.

The specific gravity of bitumen is defined as the ratio of the mass of given volume of bitumen of known content to the mass of the equal volume of water at 27 C. The specific gravity can be measured using either pycnometer or preparing a cube specimen of bitumen in the semi-solid or solid state. The specific gravity of bitumen varies from 0.97 to 1.02.



#### **4 . SOLUTION PROPOSAL**

To mix bitumen with plastic (HDPE) we need to scrape or sculpt the plastic until it is smooth so that it is easily dissolved with bitumen. Next, we need to heat the bitumen and melt the bitumen so that the plastic material we use is easily dissolved in the bitumen. We have to make sure the plastic solution into the bitumen is well blended so that it does not become lumps. so we mixed it for a long time. After that, all the materials are already, we will pour into a mold container to test the bitumen mixed with plastic.

#### **5. BENEFITS**

After we conducted this study we found that this study can have a good effect even it brings benefits. among the benefits we found was that the cost of shipping bitumen to the construction site became less because the actual cost calculation lies in the weight of the goods carried. Second, it can reduce the clogged drainage system caused by garbage dumping everywhere. Third, the material we use is used material. We just reuse the plastic and it becomes an additive in bitumen. Lastly, the road becomes less water absorption, this is because the more water absorption in the pavement will cause cracks on the road surface as well as the road surface will be slippery if water stagnates and it is dangerous to users.

## 6. METHOD OF USE





## **7. CONCLUSION**

Overall, the objective of this study was achieved because the polymer content used in the mixture successfully increased the average strength of bitumen structure compared to the bitumen available in the industry. Based on the test's results, this study also shows that the manufacture of bitumen with the blend of high density polyethylene can produce more effective products in the road industry. Based on the Penetration and Softening Point test, the results for 1.5% usage of HDPE show better results than the control bitumen. The test taken to shows the hardness and consistency of the bitumen. The results for those test are greater than the control bitumen. In conclusion, the use of this plastic waste is very appropriate and in line with the government needs in terms of innovation in road construction. The main objective is accomplished.

## 8. APPENDIX



POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH  
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Ruj. Kami : PSA.700-1/7/1( )  
Tarikh :

Kepada sesiapa yang berkenaan,

Tuan,

**KEBENARAN MENGUMPUL MAKLUMAT KAJIAN BAGI PELAJAR JABATAN KEJURUTERAAN  
AWAM POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH**

Dengan segala hormatnya, perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pelajar jabatan ini perlu mengumpulkan maklumat kajian untuk memenuhi keperluan kursus yang sedang diikuti yang merupakan salah satu syarat penganugerahan diploma.
3. Butiran kajian dan pelajar terlibat adalah seperti di lampiran.
4. Sehubungan dengan itu, kerjasama dari pihak tuan amatlah diharapkan untuk membenarkan pelajar tersebut mendapatkan maklumat kajian yang berkaitan. Sekiranya terdapat sebarang pertanyaan, tuan bolehlah menghubungi pegawai seperti di lampiran.
5. Segala kerjasama dari pihak tuan amatlah dihargai dan didahului dengan ucapan ribuan terima kasih.

Sekian.

**"BERKHIDMAT UNTUK NEGARA"**

Saya yang menjalankan amanah,

(DR. HJ MOHD ZAHARI BIN ISMAIL)  
Pegarah,  
Politeknik Sultan Salahuddin Abdul Aziz Shah.

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(U.P.: KACAWATI OTHMAN)

Butiran kajian dan pelajar terlibat adalah seperti berikut:

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Sekiranya terdapat sebarang pertanyaan, tuan bolehlah menghubungi pegawai Pn. Maswira Mahasan di talian 0194816763.

## **ACTIVITIES THROUGHOUT THE FINAL PROJECT**

