

BLOSSOMS INTERACTIVE VIDEO LESSON

The Art of Making Layer Cakes: Proper Construction of Bituminous Roads

(60 minutes)

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ACTIVITY 1 (4 minutes)

After watching the video, the teacher will assign the students to work in small groups and discuss the possible answers for the following question.

Why is the outcome of the layered cake different although the ingredients used are the same?

(Answer: Ingredients selection-quality and ratio)

ACTIVITY 2 (4 minutes)

1. What are the different types of road that you know?
2. Apa yang kamu gambarkan ada dibawah jalan?

Note: Answer 1 for teacher: Various road type as follows:



Bituminous road

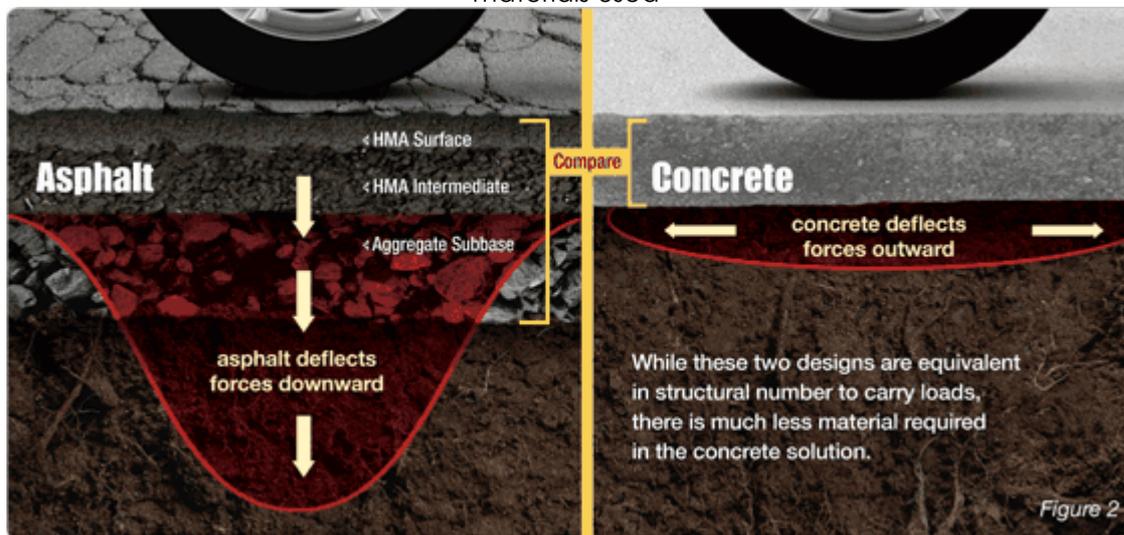


Concrete road



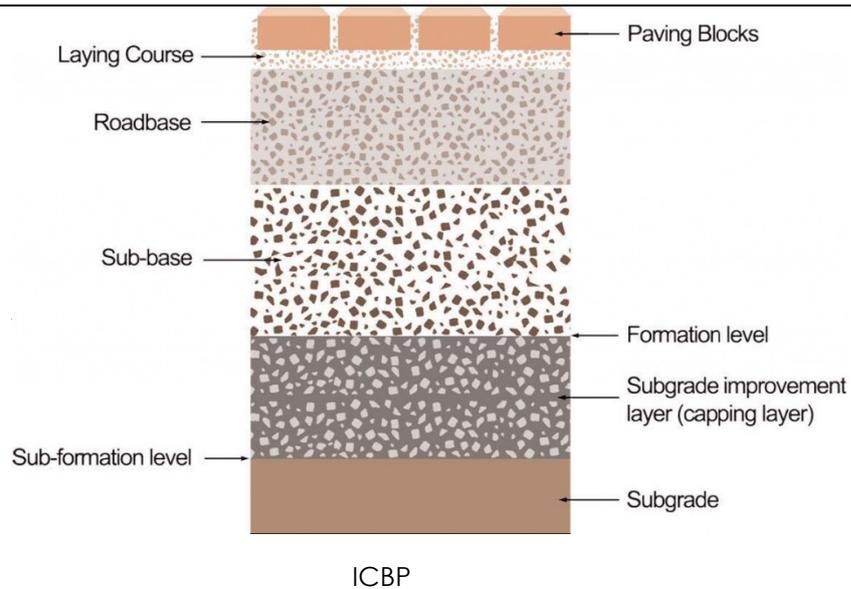
Interlocking concrete block pavement

Note: Answer 2 for teacher: Different road type has different layers and different materials used



Bituminous road

Concrete road



ACTIVITY 3 (4 minutes)

Note: Answer for teacher: To enable the fine aggregates to fill the gaps between the coarse aggregate particles (for better compaction) and ensure smooth ride on the road.

Note: Answer for teacher: To prevent water accumulation on the road surface (channel the water to the nearest drainage): include the demonstration of the pouring water on a levelled and inclined surfaces

ACTIVITY 4 (10 minutes)

Students should work in small groups to conduct a simple aggregate test to determine the quality of the aggregate given. In this activity, students are required to conduct the flakiness test. Aggregate is considered flaky when its thickness is less than 0.6 times its average dimension.

Flakiness Index test

Material and apparatus:

1. Aggregates (20 crushed stones),
2. Replica of grid sieves using cardboard paper
3. Weighing machine
4. Test form to be filled by the students.

(Instruction for materials acquisition and preparation of the grid sieves will be given)

Instruction to Teacher:

Provide each group of students with 20 crushed stones samples. It should be noted that this amount is only for the purpose of education. However, in the real situation, the exact amount and detailed procedures can be referred to BS 812. (The samples are prepared by teacher. It is recommended to collect different sizes of stones from the surrounding). The teacher has to produce a duplicate of the grid sieve using a cardboard. A template of the grid sieve is given

to the teacher as reference.

Instruction to Student:

Each aggregate is to be inserted to the specific slot of the grid sieve replica produced by the teacher where aggregate which passes the slot is considered flaky. The weight of the aggregates which passes the slot will be recorded and the students need to calculate the Flakiness Index. The index is calculated by taking the ratio of the weight of flaky aggregates to the total weight of aggregates tested. This is described in the following equation. It is specified that the specification for the flakiness index should be less than 15%. Based on the test result, the students need to come out with comments.

$$FlakinessIndex = \frac{\sum m_2}{\sum m_1} \times 100\%$$

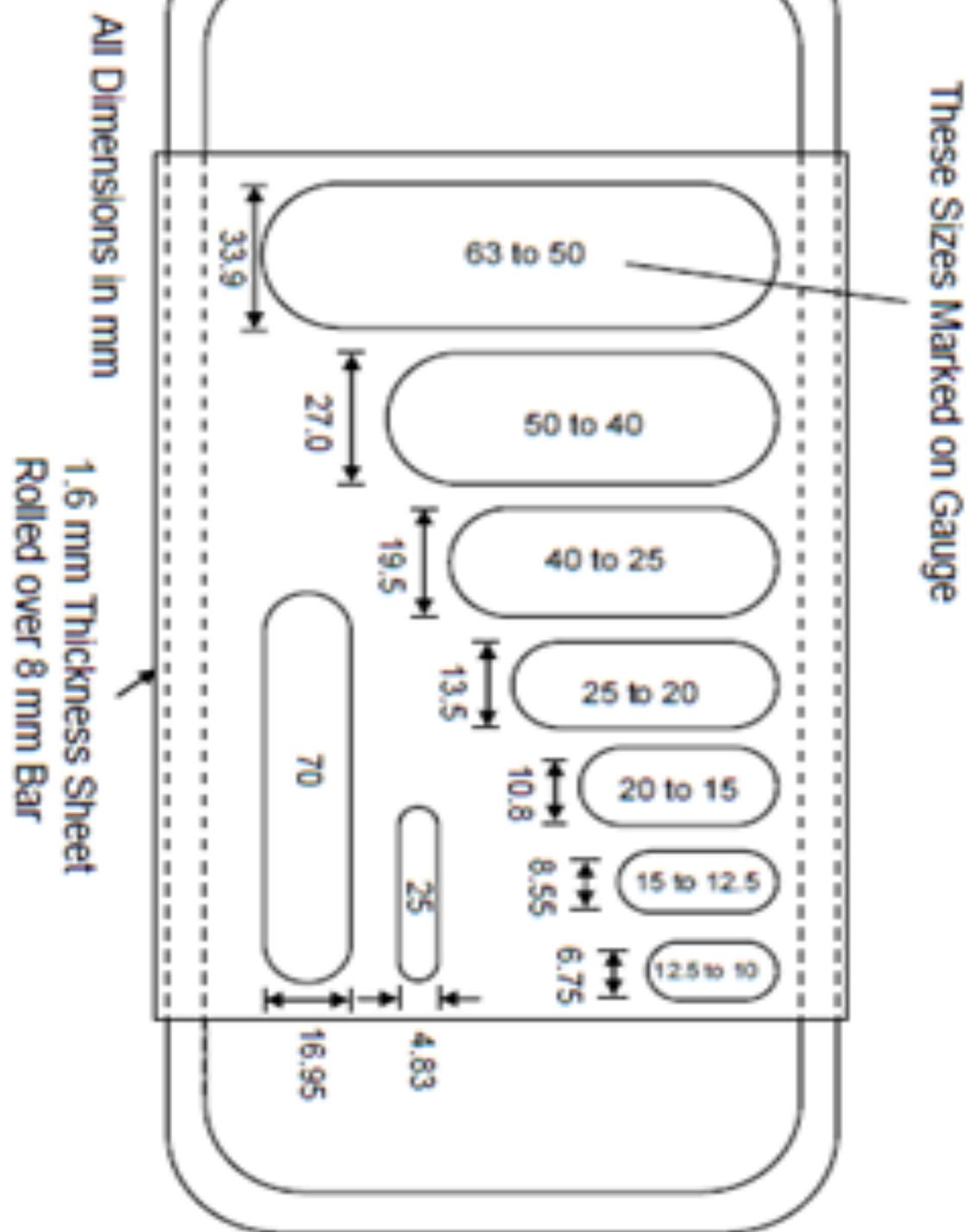
$\sum m_2$ = sum of the masses of aggregates not passing the slot, in grams.

$\sum m_1$ = sum of the masses of aggregates tested in grams.



Grid sieves (for flakiness test)

A copy of this grid sieves is provided to the teacher using a A4 paper as in Figure 1. However it is not in the right scale. The teacher should follow the right dimension as shown in the figure.



ACTIVITY 5 (12 minutes)

Q1. Case Study (Road layer model)

Students are given actual materials, aggregates of different sizes (fine and coarse aggregates) and a transparent perforated container for making a model of road layers. In this task, they have to role play as engineers to design road layers that have to be constructed in a flood prone area. Students must use the materials to build a small-scale road model in the container provided. The students are expected to place the right size of aggregate for the different layers. They have to think in such a way that the road model can drain out the water effectively with no water ponding. For the assessment, the teacher will pour some amount of water to evaluate how effective the model is in draining out the water.

The teacher will evaluate the model in terms of:

1. The road layers
2. The ability of the model to drain out water. The sooner the better.

(Student should use the knowledge on road construction to design a small-scale road model that can withstand flood.)

ACTIVITY 6 (4 minutes)

After watching the video, the teacher will assign the students to work in small groups and discuss the possible answers for the following question.

What are other factors that have to be considered in road construction apart from using quality materials and following the correct procedures?

(Answer: The other factors that should be considered for road construction are the traffic volume, soil properties, weather condition and machineries (showing photos which describe the other factors))

For example, the traffic volume and soil properties should be properly estimated, because the road must be adequately designed to accommodate the accumulated traffic to avoid the structural damage. Another factor is the weather condition. The construction of road should be avoided during periods of high rainfall to prevent the deterioration of the road. In addition, selection of the machineries to be used for the road construction is also very important that determines the effectiveness and the quality of the road structure.

Based on the factors that you have identified to be considered in road construction, suggest ways on how to deal with them?

Answer: The other factors that should be considered for road construction are the traffic volume, soil properties, weather condition and machineries (showing photos which describe the other factors))

For example, the traffic volume and soil properties should be properly estimated, because the road must be adequately designed to accommodate the accumulated traffic. This is to avoid the structural damage of the road. Another factor is the weather condition. The construction of road should be avoided during the periods of high rainfall to prevent the deterioration of the road. In addition, selection of the machineries to be used for the road construction is also very important that determines the effectiveness and the quality of the road structure.