

BLOSSOMS VIDEO LESSON TRANSCRIPT

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

Hi, I'm Dr. Norhidayah
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Today, I am going to talk about
The art of road construction
And causes for problematic roads.
I hope that by the end of this video,
You will learn the correct procedure
In road construction.
In this video,
We will use the art of baking a layered cake
Which is a common delicacy in Malaysia
As an analogy to highlight the importance
of using quality materials
and following the correct procedure
in road construction.

Mum, what happened?
The way you are driving
might ruin my cake
Sorry my dear,
There is a big hole
in the middle of the road

Look at this pothole.
This is one of the common problems
that we experience
when we are driving on the road.
We can find many types of road defects.
There are various causes for those defects.
Among them
is due to improper road construction procedure
such as using low quality materials,
inappropriate mixing of materials
and ignorance in following the proper steps
for mixing materials
for road construction.
To help you understand
The basic engineering concept
of road construction,
we will use the analogy of looking
at the correct procedure
for baking a layered cake.
Let us now look at what happened

to the children and their cakes.

Happy Teachers' Day Ms Aida
I've baked a cake for you
Happy Teachers' Day Ms Aida
I've a cake for you,
but
is not as nice as Aminah's
Thank you Aminah and Asiah
For the lovely cakes.
Ooo...Asiah
You don't have to worry about the
cake you gave me.
Asiah would you like me to show
you the right way to bake a layered cake?
Yes teacher.
I would love to improve my baking skill.
Can you come to my house this Saturday?
Yes

After watching the video,
Can you discuss in small groups
Why is the outcome of the layered cakes
Between Aminah and Asiah different
Although the ingredients used are the same.

Activity break #1

A few possible reasons
For the outcome of the layered cake
To be different although the ingredients
Used are the same
are due to ingredients selection
in terms of the quality
and ratio.
Did you get it right?
If the ingredients used are of low quality
or the ratio used is not the right proportion,
you could end up baking a cake
which does not rise adequately.
Similarly, in road construction,
the selection of quality materials is
one of the important factors
to ensure that the constructed road
is long lasting and comfortable
for road users.

To further explain this phenomenon,
lets go back to our analogy,
which is the process of
baking the layered cake.

Aminah and Asiah,
To bake a layered cake,
First
we need to have
all the ingredients
in the right proportion.
We should have
350 gram butter
half tin of condensed milk
1 teaspoon of full mixed spice
1 teaspoon of golden syrup
1 teaspoon of vanilla essence
18 egg yolks
3 white eggs
100 gram of flour
180 gram of sugar
1 tablespoon ovalette
25ml of water

Similar to the process of
baking a layered cake,
the materials required for road construction
should meet the standard specification.

The materials should be of qualified
and measured in the right proportion.
The ingredients used for road construction
are a combination of two main materials.

There are bitumen
Sometimes referred to as asphalt
And aggregates.

Bitumen is a semi-solid materials
Obtained from petroleum refinery
Through the process of petroleum distillation

On the other hand,
aggregates are basically stones
of different sizes
taken from quarry.

They are categorized as
coarse aggregates,
fine aggregates
or filler.

Aggregates being obtained
from a quarry and activities such as,
aggregate crushing,
grinding,

separating into different sizes
and aggregate stockpiles.
There materials are then mixed
to produce a premix which is called
bituminous mixture or asphalt mixture.
This proportion of bitumen
in the premix is around 4%-6%
whereas the aggregates is 94%.
Now that we know about the materials
that can be used for road construction,
your teacher will provide you
with sample of photos.
Based on your general knowledge
about roads
and the information provided earlier,
you will have to name
the type of road for each photo.
Also,
You will have to visualized
what are the materials to be found
underneath of the road structure?

Activity break #2

If you answer is bituminous road,
concrete road
and interlocking concrete block pavement,
you are right.
Let us learn more about road construction.
There are five main road layers
involved in road construction.
The first layer is called the subgrade
which is the existing soil.
The second layer is called the sub-base
which consists of coarse aggregates.
The third layer is called the road base
which is also made of aggregates
but it is finer than the aggregates
in the second layer.
The following two layers
which are the fourth and fifth layers
are commonly known as the surfacing layers.
The fourth layer
is referred as the binder coarse
whereas the fifth layer
is named as the wearing coarse.
Both layers
are made of a mixture of bitumen
and aggregates.

The binder coarse layer has a higher percentage of coarse aggregates than fine aggregates but the wearing coarse has a higher percentage of fine aggregates than coarse aggregates. Based on previous explanation on road layers and the picture shown, why do you think we have to lay the coarse aggregates prior to fine aggregates in road construction? Next, do you think roads are constructed as levelled or slightly inclined and why? Discuss the answer to these questions with your teacher and friends.

Activity break #3

If your answer for the first question is to enable the fine aggregates to fill the gaps between the coarse aggregates particles and ensure smooth ride on the road. You are right. For the second question, look at the diagram shown. If you think that the road is slightly inclined, you are right. This is to prevent water accumulation on the road surface or to channel the water to the nearest drainage. Now that we understand that roads have several layers and consist of different materials. Let us discuss further on the quality of materials used for road construction. We have to ensure that the quality of the materials used have achieved the standard specification.

One of the materials for road construction is the aggregates. There are several basic test that can be conducted to check the properties of aggregates. In road construction, it is important to inspect the materials properties to ensure that the materials have achieved the standard specification. This is because in some countries, unscrupulous contractors have been known to dilute materials or to use substandard materials so that they can keep more money, since substandard materials are cheaper than what is required by specification. For example, to test the quality of the aggregates we can use the following tests. Please look at this

Another material for road construction is the bitumen. In order to test the quality of bitumen, we can use the following tests. Please look at the table shown

Based on the information described earlier, imagine that you are given the task of checking the aggregates shape property and then decide whether they are suitable to be used in road construction. Using the tools And information given by your teacher, complete the following task.

Activity break #4

So, after comparing your result with the specification, don't forget to discuss with your friends If the Flakiness Index is more than 15% the aggregates provided are considered not suitable to be used in the road construction. This is because, the presence of high amount of flaky aggregates are considered as undesirable

in road construction
because of their tendency to break down
during compaction and affect
the aggregate interlock within road structure.

As a result

It will reduce the strength
and durability of the road.

Now we know the materials
that should be used
for road construction.

Through the previous explanation
and activity provided,
you should be able to identify
the quality of material
through various tests.

At this stage,

the students are expected
to have the knowledge
and ability to make decisions
on basic materials selection.

Another important factor
that will be highlighted
on road construction is
procedure.

Let us go back

to the scene in the kitchen
with the teacher and her students,
Asiah and Aminah,
to show the important of
following the right steps
in the process baking a layered cake.

The same process applies
to road construction,
where the road is constructed
layer by layer
following the right sequence of procedure.

Now, the ingredients are ready.

We have to mix all of them.

However,

we have to follow the correct sequence
to make sure they are mixed well.

After that,

cake will be prepared layer by layer.

We have to make sure
each layer is well cooked
is attached to each other.

In road construction,

there are a few steps
that have to be followed correctly.

First,
it starts with the process of
preparing the materials
in the correct proportion.

Next,
the materials are mixed together in a plant.
Then, the prepared premix
will be delivered
to the road construction site
based on the materials
and instruction given,
students work in small groups
to solve a case study
which is related to the topic.

Activity break #5

Asiah and Aminah,
the cake is now ready.
You can see the cake
has a very nice texture
and different layers.
Now you know the importance
of using the right
proportion of materials
and procedure
during the process of baking a cake.

As a conclusion,
this lesson has tried
to highlight the importance of
following the correct specification
for road construction
using the analogy of
baking a layered cake.
Based on what we have learnt
from the process of baking a layered cake,
we can relate it to the situation
in which it has been applied
in the engineering field of road construction.
As an engineer,
you have to take the responsibility
from the design to construction work.
This is to ensure
the structure is constructed
according to the specification,
safe and in good condition for the user.

It should be noted that this video only highlights on the perspective of using quality materials following the correct procedures in road construction.

Please take note there are many layers in the cake but each layers consists of similar materials yet in real road construction each layer contains different materials.

I would also like to highlight that there are other factors to be considered in constructing road, not only those that have been shown earlier.

Can you think of the factors? I shall leave to discuss the answers with your teacher and friends. Have fun.

Activity break #6

The other factors that should be considered for road construction are the traffic volume soil properties weather condition and machineries 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.

The aim of this module is to show the students the art of road construction and causes for problematic roads.

They need to understand the importance of carrying out road construction in a proper way.

The techniques adopted are not complex but based on a simple concept.

The main activity is to ensure the students can understand the process of materials selection in road construction, which involve the materials proportion and quality of materials.

Generally, the students will be given simple activities which is aimed to ensure the students discover a simple concept of road construction by comparing it to the layered cake.

In order to continue with the module, the students need to know the basic knowledge of flexible pavement.

They will also need to know basic algebra and simultaneous equation in order to compute an expression for the uncertainties.

All the end of the module, students will be given activities to solve for a better understanding of the concept.

The module should not take more than 50 minutes to complete, if the students have the basic knowledge as mentioned.

The first activity asks the students to come out with a few reasons on the problem related to the layered cake as shown in the video.

This is to answer:

Why is the outcome of the two layered cakes are different although the ingredients used are the same.

In second activity, the students are divided into small groups are required to find

the right aggregate proportion
for the given problem.
The students will be given
question sheets and instructions.
In the third activity,
within the small groups,
the students have to conduct
a few aggregate tests.
the students are given aggregate samples.
They are required to conduct
simple aggregate tests
to determine the quality
of the aggregate given.
Based on the test,
the students need to come out
with comments and recommendations.
During the fourth activity,
in groups,
the students will be given a case study
where they are required to build a small
scale road model
for the given problem.
The materials and tools are given.
In this task,
they need to apply
all the aforementioned knowledge
to solve the problem.
Finally,
this module needs
to be summarised in term of the fact
that the materials selection
and its quality as well as
following the correct procedure
are important in road construction.
Additionally,
the teacher have to mention
the other factors that have
to be considered in road construction.