

Choosing concrete

What you will learn

When you have finished this introduction module, you should be able to:

- Understand the different types of cement and concrete
- Say what materials are used to make concrete and where to get them from
- Choose the right type of concrete for a job.



Things you need before you start

Materials

None

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Tools or equipment

None

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Course resources

Course video

Video player

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Introduction

The main things you will learn in this module are:

- where cement comes from and how it is made
- how cement and concrete work
- the types of cement, sand and rock you have available
- the right type of concrete for a job.

When you have finished this module you will be ready to start on the rest of the course. The three other modules will show you:

- how to prepare, lay and finish off a concrete path or slab
- background information on concrete blocks
- how to prepare and build a block wall.

What do we use cement and concrete for?

In big towns and cities, concrete is used for tall buildings, bridges, highways.



What is it used for where you live?

Here are some ideas:

- paths and roads
- making bricks/blocks
- buildings — floors and walls
- holding posts in the ground



What other uses do you know?

The names we call things

Some places use different names for things.

That is OK, but we need to be sure we are all talking about the same things.

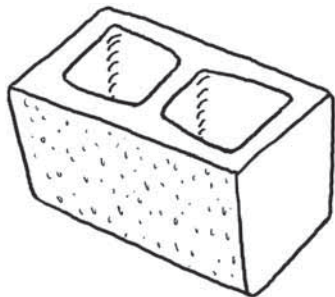
In this course, we will use these names:

This is **concrete**

It is used to make paths and foundations

Some people just call it **cement**.

What do you call it?



We will call this a concrete **block**

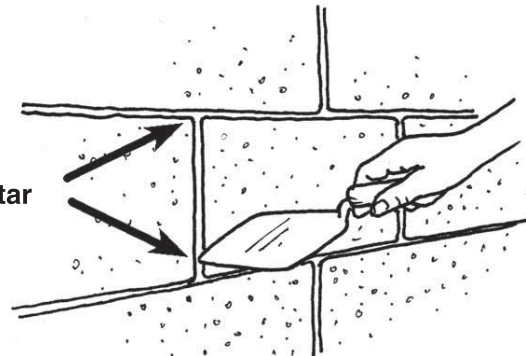
Some people call it a **brick**

What do you call it?

We will call this grey paste between the blocks **mortar**

Some people call it cement. What do you call it?

We will use "**cement**" to mean the grey powder that comes in bags.



What is cement and concrete?

How is cement powder made?

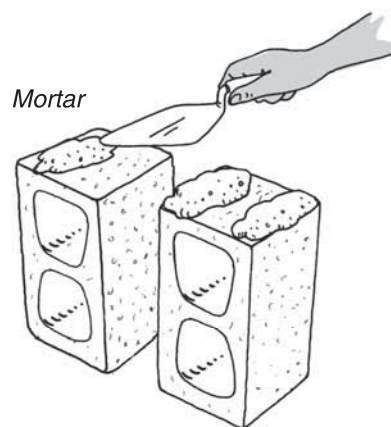
Cement is a grey powder.

It is made by heating limestone rock to about 3000 degrees and then grinding it into a fine powder.



How does cement work?

Cement is mixed with **sand** and **water** to make mortar.



Cement is mixed with **sand**, **water** and **rock** to make concrete.



When cement is mixed with water there is a chemical reaction. This makes the cement go hard and stick (bond) to the sand and rock.

It is not the same as mud that goes hard as it dries. Dried mud is not very strong and it will turn back to mud if it gets wet.

In fact, new concrete should be kept wet/moist for the first few days to stop it drying out too quickly.

Concrete can be hard enough to walk on in a few hours but:

- it reaches 60% of its final strength after 3 days
- it keeps getting stronger for months — and even years.

Types of cement and concrete mixes

Mortar

is used for:

holding bricks/blocks together



It is made from:

cement powder mixed with sand and water

Concrete

is used for:

solid paths or floors

It is made from:

cement powder mixed with water, sand and rock (aggregate).



Changing the amounts of cement, sand and aggregate that you put in a mix makes different types of concrete for different jobs.

Activity

Your tutor will show you some examples of local mortar and concrete.

Study the examples.

See if you can find pieces of rock in the concrete, and grains of sand in the mortar.

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What goes into concrete ?

Cement

Comes in bags. Usually 20Kg and 40Kg.

It is usually a general purpose grade of “Portland cement”. This is usually written on the bag or it may just say “GP”.

Special cements are sometimes used for difficult jobs — quick setting for example.

Store cement bags in a dry place and off the ground — they must not get wet or damp.



Sand

Sand is best when it is:

- clean — not muddy or dusty
- not salty — can give problems
- sharp — has a ‘gritty’ feel rather than smooth

Some places have restrictions on where you can dig sand and rock.



Stone/rock

This is called “aggregate” in some places. It can be crushed rock or river gravel. Some places use crushed coral.

It is best when it is

- clean — not muddy or dusty, no bits of wood, leaves or roots
- a good mix of sizes — from 2mm to 20mm.

The biggest size depends on what the concrete is for.



Water

Clean water is best.

If you can drink the water — then it is OK for concrete.

Do **not** use sea water. The salt in it can weaken the concrete. It will also rust any reinforcing you use.



Additives

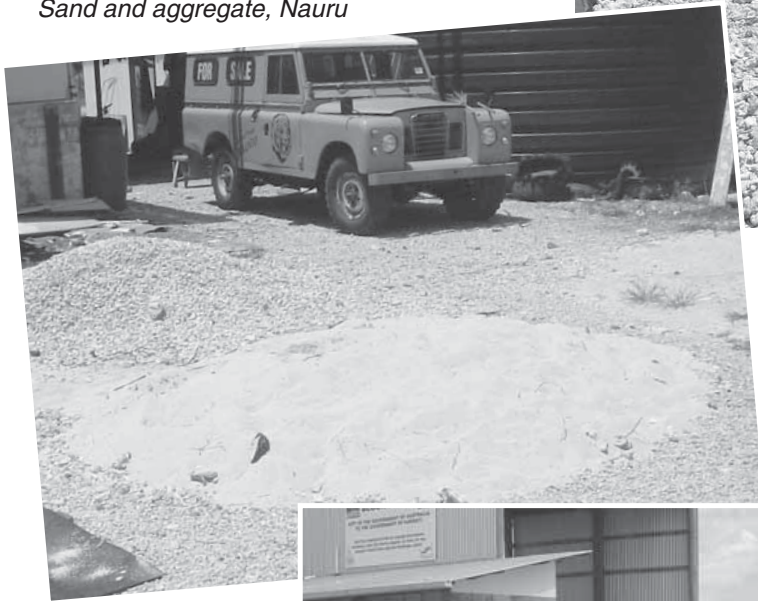
Sometimes things are added to the concrete, to:

- make it smoother and easier to use
- add colour
- slow down or speed-up the setting time

Coral — waiting to be crushed



Sand and aggregate, Nauru



Sand and fine aggregate, Tarawa Block works



Activity

Work with others on this activity.

Answer these questions:

- What is mortar used for?

- What is it made of?

- What do you call a mix of water, sand, cement and rock?

- Why should you **not** use sea water?

Find out:

Cement

- Where can you buy your cement from?

- Where is the cement made?

- What size are the cement bags?

- How much do they cost?

Sand

- Where can you get good sand from?

- What does it cost?

Rock/aggregate

- Where can you get suitable rock from?

- What does it cost?

- What places are you **not** allowed to dig sand or rock?

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Different concrete mixes

Different amounts of cement, sand, rock (aggregate) and water make concrete with different properties.

- Concrete needs to be workable so that it can be handled, poured, compacted and levelled.
- The finished concrete needs to be strong to carry loads and be able to resist wear and the weather.

As a guide:

- The more cement paste (water and cement mixed) in the mixture, the easier it is to work.
- The more cement in the mixture, the stronger the concrete.
- Extra water weakens the concrete.
- Less cement weakens the concrete.

Cement is the most expensive part of the mix — but it is needed for strength.

So —

The different proportions in concrete are a balance between:



Mix amounts for different uses

General purpose concrete is best for most jobs that will not take much load or wear — such as footpaths.

Paving concrete is better for jobs that will take more load, such as large slabs, roadways. It uses more cement, so it is stronger — but it costs more.

Bedding concrete is economical for jobs like fence posts where strength is not too important. It uses less cement.

Here are some suggested “recipes” for the types of concrete:

Use for the concrete	proportions (by volume)	amount per bag of cement	quantities for a 50 litre concrete mixer (1 bucket = 9 litres)	quantity for a hand mix (1 bucket = 9 litres)
General purpose footpath	cement 1 sand 4 20mm rock 4	0.165 cubic metres	cement 12kg 1 bucket sand 35 litres 4 buckets rock 35 litres 4 buckets water (approx) 7.5 litres	cement 0.5 bucket sand 2 buckets rock 2 buckets water 3.7 litres
paving roads	cement 1 sand 3 20mm rock 3.5	0.135 cubic metres	cement 15kg 1.25 bucket sand 35 litres 4 buckets rock 35 litres 4 buckets water (approx) 7.5 litres	cement 0.7 bucket sand 2 buckets rock 2 buckets water 3.6 litres
bedding fence posts	cement 1 sand 4.5 20mm rock 4.5	0.200 cubic metres	cement 10kg 0.75 bucket sand 35 litres 4 buckets rock 35 litres 4 buckets water (approx) 7.5 litres	cement 0.4 bucket sand 2 buckets rock 2 buckets water 3.7 litres

Activity

Work with others on this activity.

Choose the type of concrete you would use for:

1. a footpath up to a house

2. a concrete slab for a water tank

3. a fence post in the ground.

Say why you chose each type of concrete.

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