

# CONSTRUCTION OF CONCRETE

I started earning my knowledge of concrete construction 56 years ago when I was 7 years old helping my dad mix concrete in an old trough he had built that looked like a boat. I am certain I was more trouble than I was worth but he somehow found the patience to let me help.

Out of high school I went to engineering school and studied concrete, asphalt and wood frame construction for 4 years before being drafted into the Army.

Our engineering professor came in the classroom one day and had a coffee can of rounded river rock and a coffee can of 100% fractured rock. He poured the river rock out on a table and it spread to a thin layer then he poured the fractured rock out and it made a pile.

He told us it would do the same thing in concrete or asphalt. Concrete slabs of river rock will give way and asphalt with round river rock will rut and move, shoving is what we call it in the asphalt business. Over the years his theory has proven 100% true.

A lot of concrete batch plant owners say this isn't true, and they could be saying that because fractured rock is more expensive than screened river rock or there is always the possibility that they believe that or maybe their pharmacist or barber told the plant owner that river rock was just as stable as fractured rock. Either way they are wrong.



This is rounded river rock. This is all we have here in Iraq for the roads and concrete. If you gravel your driveway and vibrate it with this material it will rut, shove and move all over your driveway. It will do the same thing in your concrete and your asphalt. Another thing is that if you lay a bed of this rounded rock 6" deep your vehicle will get stuck in it, just like I have several times here in Iraq, where they have put down a 6" layer of it.

If you use 80-90% fractured rock and vibrate it, it will pack and make a solid driveway and it will do the same thing in your concrete and asphalt, pack and become solid instead of moving.

I still use a jitterbug (tamper) after I screed the slab. It settles the rock and gives you a smooth bed of mud to finish. Most finishers now do not use a jitterbug any more.

For you that don't use a jitterbug. When you lay down your concrete, start your bullfloat and you don't hear the rocks scratching the bullfloat you could have a problem with your mix design. Your slab should be full of gravel and that is the reason I use a jitterbug to tamp down the rock.

If your mix design is correct you should have a 100% rock formation in your concrete slab. When you tamp with a jitterbug it settles and moves the rock so that almost every rock is touching another one and this is what gives a slab its strength. The mortar is in the slab to keep this rock formation from moving.

Our professor then took us to a gravel pit and showed us how you can walk up to a pile of river rock and stomp it with your foot and your foot will go into the pile. Then we stomped a pile of fractured rock and it was 10 times more solid. Rock is the foundation of your structure, whether it is a road, hardstand or a slab and it's not something to skimp on.



I filled this gallon bucket level full with rock and notice how it settled just moving it around and it will keep settling for a long time in your concrete or asphalt. This bucket is 3 parts of our mix.

**A round ball moves easily, a square cube block is not so easy to move.**

A good concrete mix consists of 7 parts, all equal. 1 part water, 1 part cement, 2 parts concrete sand (1/4"-) and 3 parts gravel. This mix is equal to about a 7 or 8 sack mix at a plant, very strong concrete.



I have put 1 part cement into this bucket as you can see on the marks I made on the side.

This cement will bind the sand together and when this happens the mortar will keep the fractured rock from moving which is the strength of the slab. Rounded rock will crush/shove the mortar and allow movement.



I then finished filling the bucket with 2 parts concrete sand.



I then poured the 6 parts of the mix on a mortar board, mixed them, added water and mixed the concrete together. It should have taken 1 and 1/3<sup>rd</sup> quarts of water but this sand had a lot of moisture and it took just less than a quart of water.

All of these seven parts (2 1/3<sup>rd</sup> gallons of material) made a little over one gallon of concrete.

This is hard for some to believe. All I can tell you is to get some material, mix this formula and see for yourself.

A cubic yard is 27 cubic feet. A yard of cement, a yard of sand and a yard of gravel all weigh approximately 2500-2600 pounds. A cubic yard of concrete weighs 4000#. With this information, take one of your batch plant tickets and analyze it.

Understanding the mechanics of a concrete or asphalt mix is something you might think are not that important since you don't own a concrete batch plant or an asphalt drum mixer.

Cement is made from soil and heat. It will melt with heat. There aren't many things on this earth that won't melt with enough heat applied to it.

Concrete will explode with heat as most of you carpenters, construction workers and welders know; it will explode when you hold a torch to it and with no glasses on it could ruin your eyes and you will have no sight for the rest of your life. Small detail you might want to listen to.

Notice I didn't say safety glasses, **any glasses** you wear are better than none, safety glasses are better.

Asphalt paving material should have the same skeleton (rock formation) as concrete and approximately the same rock, sand and binder content. Asphalt

paving material usually is made with about a 1" slump @ 200 degrees. The only difference is the binder we use for mixing asphalt paving material is asphalt cement made from oil sludge and other chemicals.

I was a carpenter on a job where we laid down 12" of gravel, ran a screed over it, vined it, then laid 2-6mil layers of plastic on top of the rock and then added 2" of sand on top of the plastic. We then poured a 6" slab on top of what was left of the sand. Three months later, doing a remodel, we sawed out a 2'x2' section for a pier footing inside the building and almost all the sand was gone. The gravel punched holes in the plastic and the sand filtered down through the holes. Common sense told us carpenters that would happen, before we poured the concrete, we had already seen some small holes in the sand.

I have seen this since then but have never done it and I never will. The slab held but the sub base was doing nothing to stabilize the slab. The rebar was supplying the tension strength and the concrete was supplying the compression strength. The engineers that designed this slab were out of the picture. I know some of you have seen this detail, engineers never cease to amaze me with the ideas they come up with.

I will be doing more concrete articles in the future as concrete is probably the most versatile building product known to man and I show you an example of this in the article I wrote, "**Concrete Countertops**" that's on my website.

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