MAKING OF FOAMED CONCRETE

The first step is determine whether there are any required parameters, such as density and compressive strength. A theoretical mix design is formulated and site trials are undertaken. The results from the site trials are used as a control for making the foamed concrete that is to be used for the work that is to be carried out.

The next step is to make a cement slurry or a sand cement slurry that is appropriate for the mix design. The second step is to make suitable foam. The foam is made separately from the slurry. Once the foam has been made it is blended in to the slurry to make foamed concrete.

Making the Slurry

The cement used for the slurry is usually Type 1 Portland Cement although other cements can be used. If sand is specified in the mix design ideally it should be fine with 2mm maximum size and 60 to 90% passing through a 600 micron sieve (8). Other ingredients such as Pulverized Fuel Ash (PFA) can also be used. The water: cement ratio of the slurry is usually between 0.5 and 0.6. If necessary more water can be added to increased the workability. However it is important not to use too little water in the slurry since this can cause water to be drawn out of the foam.

The slurry can be made using a readymix truck mixer. Firstly, the cement mortar slurry is made at the batching plant, according to the mix design, by either the DRY or WET method.

When using the DRY method the ingredients are loaded, in their correct proportions, by ‘ribbon feeding’, into the drum of a ready mix truck, where they are mixed together.

For the WET method all the ingredients are loaded into a high speed blade mixer and thoroughly mixed, before being transferred to the readymix truck. The WET method gives a better quality slurry.

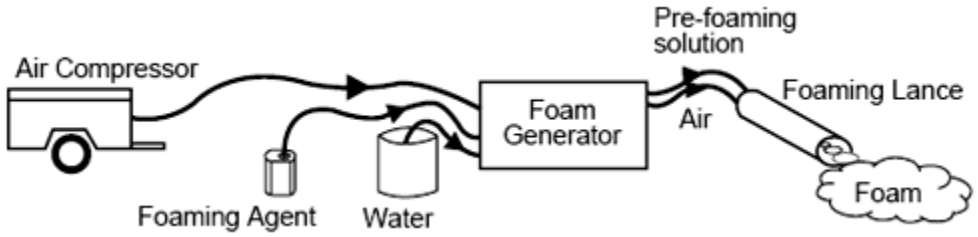
The mortar slurry is then transported to site, and the foam is added there, and not at the batching plant.

Some batching plants are reluctant to make mortar slurries, as they can stick to the insides of the drum, making them hard to clean. However, this is not a problem when making foamed concrete for several reasons:

- more water is used in the slurry making it less likely to stick
- when the foam is added, the foamed concrete is very fluid
- the foam itself has a cleaning action.

Making the Foam

Foam for foamed concrete is made from a concentrated Foaming Agent. Foaming Agents are based on protein hydrolyzates or synthetic surfactants or both. The foam is made using a foam generator. In the foam generator the foaming agent is diluted in water to make a prefoaming solution and then the pre-foaming solution is expanded with air into foam. The foam is stiff, like shaving foam, with a density in the region of 45 g/litre. The bubbles are stable and able to resist the physical and chemical forces imposed during mixing, placing and hardening of the foamed concrete. Between 75 and 85% of the bubbles are of 0.3 to 1.5 mm in diameter (8).

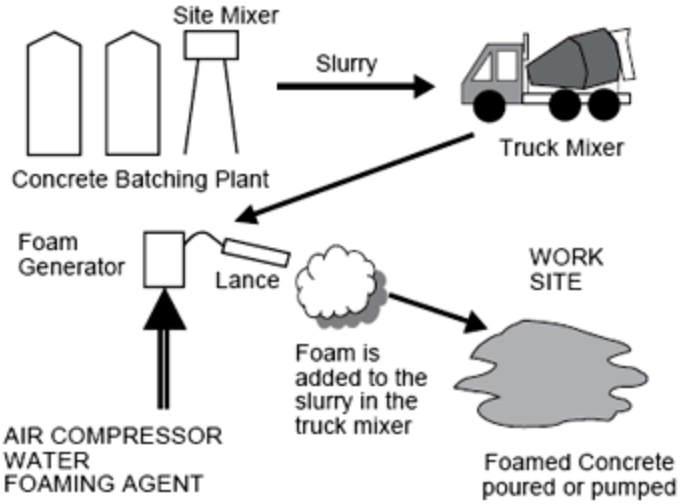


Making foam from foaming agent, water and compressed air.

There are two methods of making foam and hence two types of foam generator. The methods used are the DRY and WET methods. These terms have no relation to the wet and dry methods that are used for making slurry.

The DRY method is where foam is created by forcing the pre-foaming solution through a plastic mesh with compressed air. The foam created using the dry method is uniform and very stable.

Making Foamed Concrete



A Schematic diagram showing the stages involved when making foamed concrete.

It is important to make the slurry first, before making the foam. Ideally the foam should be generated and delivered directly into the mixer of the readymix truck that contains the slurry. The mixer should be rotated at approximately 10 revolutions per minute. All of the foam should be allowed to blend into the slurry. A sample

of the foamed concrete should be tested for its wet density. If the density is too low, more foam can be added. When making subsequent batches the amount of foam added can be adjusted.