Readymix Concrete

Ready-mix is the most commonly used product in the construction industry. It can be used for many projects and can be delivered to sites ready for immediate placement.

- Concrete strength is measured in newtons. It can be got in varying characteristic strength ranging from 10n to 60n
- Water cement ratio has a major part to play in determining the strength of your mix and can be explained as follows.

Concrete has three main ingredients which are cement, aggregate and water.

Cement and water paste together is a suspension of cement particles in water. The more therefore you dilute the paste [ie the higher the water/cement ratio] the greater will be the distance between the individual particles in suspension and following on from that the more porous the hardened paste when excess water has evaporated.

From this then derives the fact that the quantity and the quality of the paste to a very large degree governs the fresh and hardened properties of concrete and ultimately the strength of a given mix.

In summary the most significant factors in concrete are:

- Unit water content
- Unit Cement content
- Unit Water cement ratio
- Unit Aggregate properties
- Workability of fresh concrete
- Admixture

Unit Water
The unit water of the mix determines the strength obtained for a given cement content and for a given aggregate content and all together this is called a mix-design. Water determines the consistency of the overall mix. It is the ingredient which decides the drying and shrinkage of a given mix although other factors ultimately also have a bearing on this as they are also water related.

Aggregate Properties
The grading of aggregates influence the amount of paste necessary to fill the voids between the aggregate particles. Good consistent gradation in the aggregates is recommended for consistent quality and workability.

This is best achieved by varying the percentage of sand in the total aggregates per meter cubed. A good mix design will have the lowest sand percentage for the necessary workability and placement of the concrete. This will result in the minimum water requirement and therefore the maximum strength due to the fact that the largest amount of course aggregates is used.

The shape of the aggregate also influences the properties of the mix. Angular course aggregate require a higher percentage of sand [and then more water] then do rounded aggregate in concrete of equal workability but having said that proper consistent graded washed sand is far more important then aggregate for water requirement and workability.

Cement content
The strength of concrete increases with increasing the cement for a fixed water content, But also a stiff lean-mix can have a higher strength then a standard wet mix if the water content of the lean-mix is low enough to give a lower water cement ratio then the wet mix.

Water cement ratio
This is best expressed as previously explained earlier. Cement/water paste is a suspension of cement particles in water. The more water you apply to a given cement content the more voids appear in the suspension particles and the more porous it becomes on maturity.

Workability of fresh concrete
The workability of a concrete mix is closely aligned to the requirements necessary to place the concrete. The workability should always be kept to the minimum necessary to place the concrete. This has to be balanced of course against the proper workability to place the concrete and to get the proper compaction necessary for a proper finish and for durability.
Workability can be measured by taking a slump test of the actual concrete prior to placing.

Admixtures
Can and are used to improve certain qualities in concrete mixes. The common ones used are:

- Plasticiser
- Retarder
- Air entraining agent

Plasticiser
Reduces water requirement and improves workability. It can act as a retarder and may effect strength in the early hours of development but will compliment the final compressive 28day strength.

Retarders
This admixture retards the setting time of ready-mix concrete and may also lead to low early strengths.

Air entraining agent
Entrained air in ready-mix reduces the water requirement and improves the cohesiveness and workability of the fresh concrete.
It also improves resistance to frost and general durability of hardened concrete. It is recommended for all concrete which will be exposed to destructive weather elements on a regular basis.

Guide to the testing of workability of concrete

This is done by means of a slump test and will only be representative of the actual load of concrete you are placing. The tools/equipment you will require is as follows; small scoop, sample extraction scoop, cloth, slump rod, bucket or wheelbarrow, base plate, slump cone and steel rule.

Steps for taking slump test

1. Get sample from the first 3meters cubed of concrete making sure it is representative of the width and depth of the discharged concrete.
2. Remix the sample taken on a pre arranged clean area away from any contamination. Do this with a shovel for about 5 minutes.
3. Set cone up sitting on base plate on level surface. Note that it is very important that the base plate is level to have an accurate result.
4. Stand on foot grip of cone to keep it steady both for pouring and for preparation for lifting when finished.
5. Fill the cone in three equals layers.
6. Rod each layer twenty five times spreading the blows evenly over the area ensuring that you only rod the layer below. Use only the standard recommended rod.
7. Heap up the concrete above the top of the cone before commencing to rod the third and final layer.
8. Clean the spillage from the side of the cone and from around the base plate making sure that the concrete at the top of the cone is finished nice and flush.
9. Having been standing on the foot grip of cone all this time keeping it steady release your feet away but make sure you apply downward pressure with your hands on cone until feet are fully clear. Carefully lift the cone straight up and clear slowly but not too slow. Guide time of between 5 to 10 seconds.
10. Place cone upside down beside concrete ensuring it is on base plate.
11. Place slump rod across top of cone and over concrete.
12. Measure the distance from the underside of the rod to the highest point of the concrete and this will give you your true slump.
13. Record the result.
14. If the result is not true take another sample. If it again is not true get advice from your senior advisor.