SPECIFYING CONCRETE

Quality concrete is made from quality materials, yet poor concrete can be made from the same materials. Subtle changes in the concrete mix and treatment on site can have significant effects on the finished product. Specifying concrete and how it is treated on site are of crucial importance to the designer, the supplier and the contractor to ensure that the design intent is achieved.

INTRODUCTION

Specifying concrete defines the properties of concrete, and its expected performance.

MAIN PROPERTIES

Permeability is a critical factor affecting concrete's durability and will determine the degree of penetration of aggressive agents. It is controlled by factors which are allied to concrete's strength e.g. water cement ratio, cement content and degree of hydration/curing. Durability of reinforced concrete is achieved by combining concrete quality with an appropriate level of crack control and cover to reinforcement.

Strength is a convenient method of specification and control, and the strength of concrete is the common measure of its quality. All other factors being equal, increasing the strength generally decreases permeability and hence increases the durability.

Lowering the water:cement ratio, the ratio of the amount of water to the amount of cement per cubic metre of concrete, by increasing the quantity of cement in the mix increases its strength.

Workability is a measure of concrete's ability to be readily handled, placed, compacted and finished. Water:cement ratio, aggregate grading and admixtures all affect workability.

Slump is used to measure the consistency of concrete from one batch to another and is commonly used to indicate the workability of concrete and to assess if there is excess water in the concrete mix. A higher than expected slump measurement may indicate excess water.

SPECIFYING

Concrete is specified in accordance with AS 1379 as Normal-class (N) or Specialclass (S). Specifying Normal-class concrete is the most common method used. The main properties specified for Normal-class concrete are:

- Strength 20, 25, 32, 40 or 50 MPa.
- Slump 20 to 120 mm.

- Aggregate size 10, 14 or 20 mm.
- Placement method chute, tube, pump, spray etc.
- Air entrainment up to 5%

Special-class concrete must be specified if any of the properties required are outside the range for Normal-class concrete, such as colour control or if other special properties are required, such as low shrinkage. CONSTRUCTION

The way concrete is handled on site contributes significantly to its performance. Some important aspects to consider are:

- Supply of concrete should be completed within the allowed delivery time and temperature range, adequately mixed with no excess water added on site.
- Placing of concrete should not be carried out at temperatures below 10°C or above 30°C without taking special precautions. To avoid segregation, concrete should not be dropped from a height of more than 2 m or moved horizontally by use of an immersion vibrator
- Compaction removes the air entrapped within the concrete during mixing and placing and thereby increases the density of concrete.
- Finishing should not be started until all bleed water has risen to the surface and the water sheen has disappeared, as trowelling bleed water into the surface increases the water:cement ratio of the surface and lowers its strength.
- Curing retains moisture and allows concrete to gain strength. Curing should commence as soon as possible after finishing and continue for the specified minimum period. Methods of curing include ponding with water or covering with a material such as a plastic membrane or a liquid membrane forming compound.



Versatility of Concrete



Melbourne – a concrete skyline



The Sydney Opera House raised the bar for concrete quality

Relevant Publications

Concrete Basics - A guide to concrete practice. Cement Concrete and Aggregates Australia (CCAA).

Relevant standards

AS 1012 (series) Methods of testing concrete AS 1141 (series) Methods for

sampling and testing aggregates.

AS 1379 Specification and supply of concrete.

AS 1478 (series) Chemical admixtures for concrete, mortar and

grout. AS 2159 Piling - Design and Installation.

AS 2758.1 Aggregates and rock for engineering purposes - Concrete

aggregates.

AS 3582 (series) Supplementary cementitious materials. AS 3600 Concrete structures. AS 3972 General purpose and blended cements

Relevant websites

Cement Concrete and Aggregates Australia www.ccaa.com.au

Relevant worksections

0274 Concrete pavement

- 0301 Piling
- 0310 Concrete combined
- 0311 Concrete formwork
- 0312 Concrete reinforcement
- 0313 Concrete post-tensioned
- 0314 Concrete in situ
- 0315 Concrete finishes
- 0318 Shotcrete
- 0321 Precast concrete 0322 Tilt-up concrete