[TECHNICAL BULLETIN]

CONCRETE AND OUR ENVIRONMENT

ASTEC IS COMMITED TO ONGOING RESEARCH AND DEVELOPMENT

Concrete & Our Environment

THE INVISIBLE ENEMY OF CONCRETE

From the moment concrete is poured it is under attack not only from industrial pollutants in the atmosphere but also from naturally occuring gases such as carbon dioxide. It is an attack which is both gradual and relentless and unfortunately, by the time it becomes apparant to the human eye, the damage has spread to the reinforcing steel, resulting in expensive repair and renovation. This attack is known as carbonation. The carbonation of concrete and subsequent corrosion of the steel reinforcement has led to the eventual collapse of concrete structures, causing increasing concern among Architects and Construction Engineers throughout the world.

CONCRETE - THE INDISPENSABLE MATERIAL

1.1 Visible effect of carbonation on concrete

There is no substitute for concrete. Its ability to accept high compressive stresses makes it irreplacable as a building material. However, the long term durability of the concrete is dependent upon the concrete type.

Concrete is an artificial stone. Its quality and properties are dependant upon the quality of cement, the grading and choice of aggregates, and the care taken during mixing and pouring. Concrete can boast a high compressive strength but it needs the addition of steel to provide the necessary tensile strength. Therefore, it is not only the concrete that comes under attack but also the steel reinforcing which is vunerable to the corrosion attack.

ASTEC PAINTS

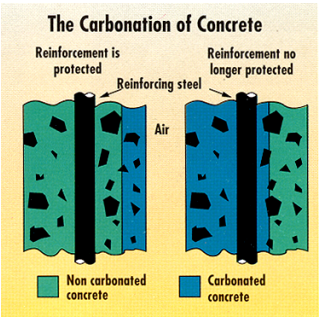
Astec Paints are a 100% Australian owned company committed to the research and development of technologically advanced coatings that provide premium durability against our harsh Australian conditions. Our coatings are manufactured with high regard for worker safety and environmental care and will provide you with absolute confidence in long term performance.

THE ALKALINITY OF CONCRETE PROTECTS STEEL REINFORCEMENTS

Concrete is alkaline, when new its alkalinity approaches pH-13 and it is this alkalinity that protects any steel reinforcement from corrosion. However, over the years acid gases in the air attack the concrete reducing its alkalinity and its ability to protect steel.

THE INVISIBLE ENEMY

The acid gases in the air are carbon dioxide (CO_2), naturally present in all air, and increased by industrial produced gases such as sulphur dioxide (SO_2). These two gases combine with the moisture in the atmosphere and react with the calcium hydroxide in the concrete producing calcium carbonate and calcium sulphate (gypsum). When this happens, the natural alkalinity of the concrete is lost leaving the steel reinforcments unprotected and free for corrosive attack to occur. The worlds increased levels of environmental pollutants accelerate these degrative affects to masonry.



1.2 Carbonated versus non-carbonated concrete

THE AFFECTS OF ACID ATTACK ON CONCRETE

Acid rain places high demands on concrete structures. Corrosion starts where the pH value of the concrete falls below 10 and it is at this point that the damage to the structure becomes obvious. Carbonation of the concrete leaves the surface friable and unsound. Where the concrete is reinforced rust occupies a greater volume than its parent steel. The initial hair line cracks rapidly develop into major damage as products from the corroded steel reinforcements expand with an explosive effect on the surrounding concrete.

A SIMPLE TEST FOR ALKALINITY

When phenolphthalein is sprayed onto concrete, only those areas with a pH level greater than 10 will turn pink. Other areas where the phenolphthalein remains colourless are carbonated.

PREVENTION IS BETTER THAN CURE

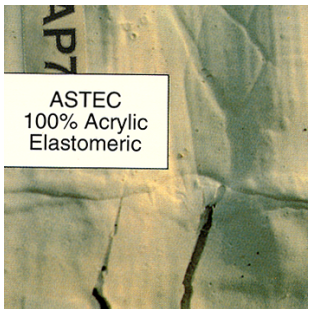
During construction of many masonry structures, poor on site practice can leave reinforcements closer to the surface than originally intended or specified with concrete substandard in nature. Naturally it is impossible to reposition the reinforcing bars to allow greater cover. Therefore, the only solution to prevent alkalinity loss in the concrete is by applying a surface coating which eliminates the diffusion of acid gases.

EC-2000 was designed as sophisticated 'molecular sieve', allowing moisture to diffuse out but preventing the entry of acid gases such as CO_2 and SO_2. EC-2000 boasts the ability to have a protective equivalent of 65 metres of air or 160mm of pH13 concrete.

In addition, EC-2000's superior crack bridging properties offer absolute confidence in long term masonry protection, by it's state of the art ability to withstand forthcoming cracks 4.9 times the dry film thickness. 350 microns dry will accomodate a forthcoming crack of 1.75mm.

EC-2000

EC-2000 is a 100% acrylic, elastomeric wall coating designed for the long term protection durability and aesthetics of masonry walls. EC-2000 exhibits outstanding exterior durability and possesses the elasticity and elongation properties necessary to bridge continually moving cracks without itself cracking or wrinkling. The crack bridging properties of EC-2000 will eliminate the need for costly, premature re-coats where the general integrity of many wall coatings are sound apart from unsightly product failure over continually moving masonry cracks.



1.3Astec EC-2000 Elastomeric paint

This new design second generation acrylic incorporates two unique chemistries, surface curing and low glass transition by internal plasticisation, in combination with our unique ceramic extenders to allow coating formulations that possess the necessary qualities to:

- Bridge cracks easily
- Adhere well to the substrate
- Deliver superior low temperature flexibility and recovery
- Resist dirt pick-up and hydrolysis
- Chalk less

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Revised Edition August, 2010

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