

## Oxide Colouring Pigments in Precast Concrete and GRC

*Precast panels on Sydney Hotel/Casino complex using 0.75% yellow oxide*



### 1 Introduction

Oxide pigments are commonly used to colour architectural precast concrete and glass reinforced concrete (GRC). Any pigments incorporated into concrete for exterior use must be colourfast. Also they must not harm the durability of the concrete. All references to precast concrete below also apply to GRC.

### 2 Application

#### 2.1 General

Colouring pigments used in precast concrete are predominantly metal oxides. These do not change colour or fade as no chemical change can occur with them at normal temperatures.

#### 2.2 Dosage Rates

The dosage rates for precast concrete are typically 0.25% to 1% by weight of cement. Some off-form and other precast concrete finishes may require as much as 8%. The rates best suited to any project will be provided by the precaster and confirmed by architectural samples.

### 3 Characteristics of Metal Oxide Pigments

#### 3.1 General

Fine solid oxide pigment particles rely for their effectiveness on being adequately dispersed throughout the mixed concrete. They do not dissolve and stain the concrete as a dye colourant does.

#### 3.2 Type and Availability

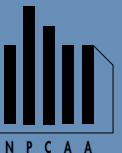
Pigments are available in a wide range of colours from deep to pale pastel hues. The major non-blended standard pigments are green, black, red, brown, yellow, blue and white. These can be obtained in commercially blended form to produce many intermediate colours.

#### 3.3 Characteristics

Pigments for use in precast concrete should have the following characteristics:

- be chemically inert and particularly alkaline resistant
- be insoluble
- be chemically inorganic to prevent fading by photochemical degradation.

Mineral (metal) pigments such as oxides of iron (reds, blacks and yellows), chromium (greens), titanium (white) etc, fulfil the above requirements.



N P C A A

**National Precast Concrete Association Australia**  
8-10 Palmer Street North Parramatta NSW 2151 Australia  
Tel: [02] 9890 8853 Fax: [02] 9890 8854  
Email: [info@npcaa.com.au](mailto:info@npcaa.com.au)  
Web address: [www.npcaa.com.au](http://www.npcaa.com.au)



Patterned precast retaining wall units on Melbourne Freeway project using 7.6% deep marigold oxide

## 4 Pigmented Concrete and In-Service Conditions

### 4.1 Colour Stability

The colour stability of precast concrete coloured with mineral oxide pigments can be affected by the degree of durability and weathering of the concrete rather than by any characteristic of the pigments.

The primary cause of colour changes of the concrete are efflorescence, atmospheric etching and staining and any accumulated dirt and grime. These causes can be controlled by producing precast units of high performance quality concrete that have been well detailed.

Just like all material surfaces left in an open-air environment, precast concrete must be occasionally cleaned to remove pollution and restore colour.

### 4.2 Samples

The same rules should apply to pigmented precast concrete sample evaluation as they apply to the assessment of other architectural precast. Small samples give a guide but existing buildings with similar design should be viewed and evaluated if possible. The first panels of a production run, or prototypes if they are specified, must always be inspected by the client or agent to ensure that the design requirements are being achieved.

An excellent result is usually achieved through the use of a competent precaster experienced in the manufacture of architectural finishes.

## 5 Standards

There is no Australian Standard for the use of mineral oxide pigments in precast concrete. The NPCAA publication *Precast Concrete Handbook* deals with this matter in more detail.

### Further Reading

AS 1379—1997 *The Specification and Manufacture of Concrete*.

Levitt, M, *Pigments as Admixtures*, Proceedings of the International Concrete Society Congress on Admixtures, London, April 1980, Construction Press, 1980, pp 96–102.

BS 1014:1975 *Pigments for Portland Cements and Portland Cement Products*.

Bayer, AG, *The Colouring of Concrete*.

Puttback, E, *Pigments for the Colouring of Concrete*, originally published in *Betonwerk+Fertigteil-Technik*, September 1986.

Lynsdale, C and Cabreta, J, *Coloured Concrete – A State of the Art Review*, *Concrete*, August 1989, pp 29–34.

Barber, RF, *Permanent Coloured Concrete (PCC)*, Ability Building Chemicals Co, Melbourne, Australia

Barber, RF, *Colouring Pigments for Concrete: Their Possibilities for Enhancing Architecture, Landscape Architecture and Civil Engineering*, 1987, Ability Building Chemicals Co, Melbourne, Australia

Cement and Concrete Association of Australia, *Colouring Concrete*, 1959, Publication C5.

Kresse, P, *Pigments: Their Possibilities and Limitations in the Building Industry*, *Chemistry and Industry Magazine*, December 1966.

Kroone, B and Blakey, F A, *Some Aspects of Pigmentation of Concrete*, *Constructional Review*, July 1968.

Gulde, C J, *Colour in Autoclaved Products*, Crowe Gulde Inc, Texas, USA.

Mayer, R, *The Artist's Handbook of Materials and Techniques*, Faber & Faber, London, Fifth Edition, 1991.

Heaton, N, *Outlines of Paint Technology*, Chas Griffin & Co. Pty Ltd, London, 1947.

American Concrete Institute, *A Concrete Primer*, USA.

Concrete Institute of Australia, *Concrete Admixtures*, seminar papers, April 1982.

ASTM C979—1982 *Color Pigments for Integral Coloration of Concretes and Mortars*, USA.

AS K54—1935 *Colour Pigments for Use with Portland Cement*.