



(TECHNICAL BULLETIN)

CONCRETE AND MORTAR ADDITIVES

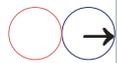
100% ACRYLIC ADMIXTURE DESIGNED FOR FLOORING SYSTEMS

CA-5000



PRODUCT TYPE

100% Acrylic Admixture



DESCRIPTION / USE

CA-5000 is a 100% acrylic admixture specially developed to modify Portland cement, particularly in floor toppings. Floors based on CA-5000 are very hard wearing and non-dusting, they are not damaged by oil, fats or grease and they retain their strength when wet. Their resilience gives them good load-bearing strength and ensures freedom from cracking under impact.

CA-5000 has been exhaustively tested in laboratory and practice trials. Its reliability has been tested and proven in a wide variety of situations. The use of priming or key-coats

with CA-5000 leads to excellent adhesion and overcomes the need for hacking or other roughening of the sub-floor. Floor laying can proceed as rapidly as with ordinary toppings, expansion joints are not necessary and this represents an additional time saving

CA-5000 will demonstrate the following qualities:

- Excellent Durability
- Abrasion Resistance
- Good Flexural Strength
- Chemical Resistance
- Low Odour Application

CEMENT FLOORS

The use of CA-5000 in cement floors leads to major improvements in performance and the reduction of labour costs. This 47% concentrated 100% acrylic is convenient to



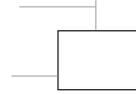
Astec Paints are a 100% Australian owned company committed to the research and development of technologically advanced coatings that provide premium durability against our harsh Australian conditions. Our coatings are manufactured with high regard for worker safety and environmental care and will provide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



CA-5000

(TECHNICAL BULLETIN)

CONCRETE AND MORTAR ADDITIVES



CEMENT FLOORS

handle on site. The product is water based, therefore non-flammable, and any spills and splashes are easily washed away with water before they have dried. The product has only a slight odour and is non-toxic under all normal conditions of use.

Durability of floors will be greatly increased as the substrates abrasion resistance is raised and the floors are non-dusting. The enhanced resilience prevents cracking under impact and ensures good load-bearing ability because of the inclusion of the 100% acrylic. The flooring is resistant to weakening from oil, fat and grease and retains a very high level of abrasion resistance when wet.

CA-5000 will increase speed and economy of working results. The very high order of adhesion ensured by the recommended priming or keying procedures eliminates the need for laborious hacking or roughening of the sub-floor. At the same time, the resilience imparted by the product allows floors to be laid only 6-12mm thick compared with the 38-50mm necessary for conventional heavy duty toppings. A floor can usually be resurfaced without timeconsuming repositioning of machinery and fittings already installed. The extra resilience also eliminates the need for expansion joints

at frequent intervals, thereby saving more time. The laying operation proceeds at least as rapidly as with conventional toppings and the total cost of materials is no higher than that of the normal, thicker toppings.

With CA-5000 simplicity of floor laying is fully maintained. Although including CA-5000 necessitates the need for a drier mix than normal, no new application techniques or equipment is required. Floors can be laid at surface temperatures as low as 5°C, allowing work to proceed during the majority of winter. As previously mentioned, hacking of the sub-floor is unnecessary, as is the use of expansion joints at frequent intervals.

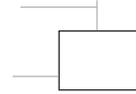
CA-5000 can be stored for long periods even at high temperatures such as those encountered in tropical climates. CA-5000 is a 100% Acrylic product and therefore must be protected from the frost.



CA-5000

(TECHNICAL BULLETIN)

CONCRETE AND MORTAR ADDITIVES



FLOOR LAYING

Preparation

Floor laying must not be carried out if the floor and air temperatures are likely to be less than 5°C while laying or during the first 3-4 days of curing. The sub floor must be free from rising damp. It is essential that the floor is clean and dust-free and that all loose or weak material is removed, but no hacking or roughing is necessary except for areas severely contaminated with grease or oil. Scouring with solvents or hot detergent solution removes normal contamination by grease, oil, paint and similar substances and must be followed by thorough rinsing with clean water. Excess water must be removed with a mop or squeegee and then allow to dry.

Priming

Two methods of priming are suggested. The first is necessary in difficult situations such as where there is permanent dampness (but not rising damp) on very dense sub-floor such as old granolithic concrete or on flexible floors particularly wood. This method may be used in all situations as the labour and material costs are no greater than those of the second method. The second method however may be more convenient and therefore more preferable for substrates not requiring special attention.

→ **METHOD 1 - Slurry Coat**

Some of the dry mix to be used in floor laying or patching is gauged with a 1:1 mixture of the CA-5000 and water to give a brushable slurry - the proportion of mix and liquid is not critical. The slurry is brushed firmly onto the sub-floor with a stiff broom and once it achieves initial set, mixing and laying of the floor should commence. Large floors should be divided and primed in sections to ensure that laying proceeds smoothly.

→ **METHOD 1 - Tack Coat**

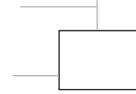
CA-5000 is diluted 1:1 with water brushed over the sub-floor, foaming must be avoided. Approximately 170ml of diluted CA-5000 is required for each square metre, depending on the roughness and porosity of the sub-floor. The product should be left to dry overnight and a second coat applied, at the same spreading rate, to an appropriate part of the floor so that it is still wet when the main flooring mix is laid. It is essential not to allow the floor to become dusty after the first priming coat is applied.



CA-5000

(TECHNICAL BULLETIN)

CONCRETE AND MORTAR ADDITIVES



FLOOR LAYING

Mixing

Hand mixing gives very reliable results, but machine mixing is equally satisfactory provided that air entrainment is avoided.

Most acrylics foam when agitated because of their surfactant or colloid content. CA-5000 can therefore cause air entrainment in cement mixes, especially with machine mixing. To prevent this and avoid severe loss of strength, Astec Anti-foam should be added at the rate of roughly 3g/ litre of CA-5000.

→ METHOD 1 - Hand Mixing

Mix the dry ingredients thoroughly then add CA-5000 mixed with Astec Anti-foam. Add water gradually with thorough mixing and rake out any lumps which need to be broken up. Only add sufficient water to provide a semi-dry consistency (except for terrazzo flooring). Excess water will seriously detract from the strength of the floor, the correct consistency has been achieved if:

- when a small amount of mix is picked up in the hand it is loose and crumbly but will form a coherent mass when squeezed.

OR

- the mix is loose and crumbly and produces only enough fat to be closed when worked gently with a steel or wooden float.

The same amount of water may then be used for subsequent mixes based on aggregate, sand and cement from the same batches, water requirements must be checked for new batches.

→ METHOD 2 - Machine Mixing

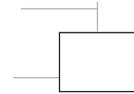
The water requirement is best determined by mixing a small batch by hand, as above. Thoroughly mix the dry ingredients in the machine, then add CA-5000, water and Astec Anti-foam and mix for a maximum of 90 seconds. A longer period may produce severe air entrainment and result in a weaker mortar.



CA-5000

[TECHNICAL BULLETIN]

CONCRETE AND MORTAR ADDITIVES



FLOOR LAYING



Hot Weather

Although the fine surface cracking of toppings laid in hot dry weather has no major effect on wearing properties, its aesthetics are spoiled. It can easily be avoided, however, laying should proceed as usual (see following section) and the toppings should be covered with polythene or other plastic sheeting in the normal way to avoid rapid evaporation of the mixing water.

Laying and Curing

The wet mix is spread on the primed area to a thickness of 6-12mm except over depressions and is compacted with a tamping bar. The surface is worked with wooden floats, metal floats being used only for final closing, after which there must be no re-trowelling. The freshly laid area must be covered with polythene sheeting in hot or very dry weather. As with normal cement toppings, no heavy traffic can be withstood for at least 14 days, but foot traffic is permissible after 24 hours and light traffic after 3-4 days - rapid setting cements give shorter waiting times. If a large floor is to be laid in bays, each bay should be allowed to cure for at least two days before adjacent areas are laid.

FLOORING MIXES

The following systems have been widely proved in practice. The typical mechanical properties for each mix are expressed as a percentage of the corresponding properties of an identical mix containing no CA-5000 (see Test Methods) At 10%-28% CA-5000 on cement weight, good adhesion and flexural/tensile properties are obtained as outlined above. Compressive strength tends to be slightly reduced, but without detriment to load bearing.

Heavy Duty Granolithic Floor	Clean, Dry Granite Chips, 3mm	75kg
	Clean, Dry Sharp Flooring Sand	75kg
	Ordinary Portland Cement	50kg
	CA-5000	11.5 ltr
	Astec Anti-foam	30g
	Water	(to semi-dry consistency)
	Coverage	6.5m ² @ 12mm (approx.)

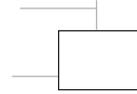
This mix is intended for laying at a thickness of 6-12mm and is equally suitable for use on old, worn floors as it is on new sub-floors. It gives very hard-wearing surfaces and has excellent load-bearing strength, provided that the sub-floor can support the load transferred to it through the topping.



CA-5000

(TECHNICAL BULLETIN)

CONCRETE AND MORTAR ADDITIVES



FLOORING MIXES



Due to the coarseness of the granite chips, the mix is not suitable for feathering, but this effect can be simulated by cutting a channel 25mm x 12mm deep so that the topping can be continued into it to give a smooth change of level at the required point.

Typical Properties

Curing Time [days]	Abrasion Resistance	Flexural Strength	Tensile Strength
7	128%	120%	112%
14	137%	155%	142%
28	137%	170%	169%

Light Duty Topping

Prosand 16	50kg
Clean, Dry Sharp Flooring Sand	50kg
Ordinary Portland Cement	50kg
CA-5000	11.5ltrs
Astec Anti-foam	30g
Water	(to semi-dry consistency)
Coverage	9.5m ² @ 6mm (approx.)

This mix can be modified to give coloured floors: predispersed cement colours and coloured cements are most satisfactory, inorganic pigments may also be used, provided they are stable to cement.

This mix gives a smoother surface than the Heavy Duty Topping described previously and can be laid at 6mm average thickness - it gives a hard-wearing surface suitable in situations where foot and light vehicular traffic predominate. It can be used to level tamped concrete floors, retaining its strength down to 1.5mm over any raised portions of the concrete.

Typical Properties

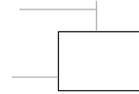
Curing Time [days]	Abrasion Resistance	Flexural Strength	Tensile Strength
7	138%	124%	104%
14	144%	166%	129%
28	154%	164%	162%



CA-5000

[TECHNICAL BULLETIN]

CONCRETE AND MORTAR ADDITIVES



FLOORING MIXES

Levelling Screed or Underlayment

Clean, Dry Sharp Flooring Sand	150kg
Ordinary Portland Cement	50kg
CA-5000	4.5ltrs
Astec Anti-foam	15g
Water	(to semi-dry consistency)
Coverage	6.5m ² @ 12mm (approx.)

Since levelling screeds do not need a high level of abrasion resistance, a lower proportion of CA-5000 to cement is possible. Considerable added resilience is still obtained and coupled with the high adhesion ensured by the recommended priming. This makes it possible to lay the screeds at only 6-12mm thickness. As a result they lose all excess water within a week so that the final decorative flooring can be installed very quickly compared with normal, thicker screeds, which must cure for at least 2 months before the final flooring can be laid.

Typical Properties

Curing Time [days]	Flexural Strength	Tensile Strength
7	127%	101%
14	159%	147%
28	181%	166%

Terrazzo Flooring

Marble Chips, 6mm	100kg
Cement*	50kg
CA-5000	9ltrs
Astec Anti-foam	30g
Water	7ltrs
Coverage	5m ² @ 12mm (approx)

** White cement is necessary for white and pale terrazzo floors; coloured floors are prepared with coloured cements, or by using ordinary Portland cement in conjunction with predispersed cement colours or cement stable inorganic pigments.*

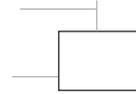
Due to the coarseness of the marble chips, the slurry coat method of priming is unsuitable - the tack coat method must be used to ensure good adhesion and so obviate any need for bonding screed.



CA-5000

(TECHNICAL BULLETIN)

CONCRETE AND MORTAR ADDITIVES



FLOORING MIXES

The flooring mix should be somewhat drier than conventional terrazzo, but is still fully suitable for laying. The resilience of the modified terrazzo eliminates the necessity for expansion joints at frequent intervals. Conventional terrazzo is laid in bays approximately 1 metre square whereas the acrylic-modified system has been laid in bays as big as 4.5 x 1.5m without cracking or lifting.

The modified system cures more rapidly than normal terrazzo, so that grinding and polishing can begin 2-3 days after laying. Grinding should always be carried out with water and sand on the floor and with carborundum stones on the machine. Coarse carborundum is recommended for initial use to cut back protruding chips, but finer grades produce the finished surface. Cove and other areas not accessible to the grinding machine can be dry polished with an electric hand drill fitted with a flexible carborundum pad.

CA-5000 is also valuable in the production of factory made terrazzo panels or tiles for site installation. The increased resilience and tensile strength obtained make it possible to prepare thinner, lighter panels 6mm thick at the same strength as normal terrazzo of 25mm thickness.

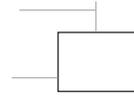
Typical Properties

Curing Time [days]	Abrasion Resistance	Flexural Strength	Tensile Strength
7	127%	111%	110%
14	170%	155%	126%
28	190%	166%	166%

Patching Mix

Clean, Dry Fine Sand	50kg
Prosand 16	50kg
Ordinary Portland cement	50kg
CA-5000	13.5ltrs
Astec Anti-foam	35g
Water	(to semi-dry consistency)
Coverage	5m ² @ 12mm (approx.)

The mix gives high strength and good abrasion resistance at all thicknesses down to a feathered edge and repair work need not entail any cutting back of damaged areas.



FLOORING MIXES

The sub-floor must be clean and sound and primed by either of the previously recommended methods but no special preparation is normally required.

Typical Properties

Curing Time [days]	Abrasion Resistance	Flexural Strength	Tensile Strength
7	118%	102%	104%
14	178%	155%	122%
28	201%	148%	130%

TEST METHODS

The following methods were used in determining the typical properties of the flooring systems recommended in this technical bulletin. In all instances comparisons were made with identical mixes not containing CA-5000 - the addition of water was adjusted to give mixes having standard workability.

All specimens were prepared by hand tamping, followed by air curing at 20°C and 65% relative humidity for 7, 14 or 28 days.

Abrasion resistance was measured using an adaptation of the procedure described in British Standard 368:1936. Slabs 230mm x 140mm x 10mm were fixed into a watertight drum containing 6mm steel balls and 45 litres of water - it was rotated at 22 rev/min for 24 hours and abrasion resistance was assessed in terms of weight lost.

Flexural strength was determined with 100mm x 25mm x 25mm beams tested to breaking with 3-point loading across a 76mm span in a Hounsfield tensometer.

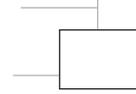
Tensile strength was determined using 'figure-of-eight test specimens as described in British standard 12:1958, with a straight pull in Hounsfield tensometer.



CA-5000

[TECHNICAL BULLETIN]

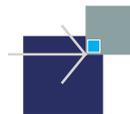
CONCRETE AND MORTAR ADDITIVES



COMPARATIVE TESTING DATA

CA-5000 has been evaluated in both plain and glass reinforced mortars. The following results show its excellent performance against commonly used acrylic modified cements.

MORTARTYPE	EMULSION	AGE OF MORTAR	FLEXURAL STRENGTH [MPa]	COMPRESSIVE STRENGTH [MPa]
Plain	CA-5000	7 days	4.7 +/- 0.7	34.0 +/- 3.0
	TEST	7 days	4.0 +/- 1.7	28.4 +/- 1.6
	CA-5000	28 days	—	47.7 +/- 2.4
	TEST	28 days	—	39.9 +/- 4.5
GRC	CA-5000	7 days	8.9 +/- 1.6	—
	TEST	7 days	6.0 +/- 1.6	—
	CA-5000	28 days	12.8 +/- 3.0	—
	TEST	28 days	9.2 +/- 2.8	—



The conclusions reached are as follows:

1. CA-5000 increases the 28 day strengths of premixed GRC by 40 and 50% respectively over strengths of premixed GRC made with opposition acrylics.
2. Unreinforced mortars showed no significant difference in strength.
3. A relatively constant increase in compressive strength amounting to some 19% is realised when CA-5000 is used instead of opposition acrylics in mortars.



CA-5000

COMPARATIVE TESTING DATA



PRODUCT	TENSILE STRENGTH [MPa]	FLEXURAL STRENGTH [MPa]	COMPRESSIVE STRENGTH [MPa]	ABRASION (G)*
CA-5000	5.08	1.90	42.79	9.8
TEST	3.86	1.94	33.49	12.5
None	0.48	0.14	31.33	85.8

* The abrasion values are expressed as the loss in weight (grams) from a panel immersed in water after 24 hours abrasion by 7 steel ball bearings rotated in circular motion over an area of 3 inches in diameter.

A similar test was carried out dry on a series of panels made from both plain and CA-5000 modified toppings. Each panel was soaked overnight in one of a range of chemicals. The amount of abrasion was assessed visually and is recorded below.

AMOUNT OF ABRASION	CHEMICAL	CA-5000 FLOOR	CONTROL
	Bleaching Powder	V.V. Slight	V.V.Slight
	White Spirit	Slight	Slight
	Oxitol	Slight / Moderate	Slight
	Dibutyl Phthalate	Slight	Moderate
	Isopropyl Alcohol	Moderate	Moderate / Bad
	Water	Slight	Bad
	Oxalic Acid	Moderate	V.Bad
	Process Oil	V.Slight	Bad
	Lactic Acid	Slight / Moderate	V.Bad

The results show the difference in the degree of resistance to various types of chemicals and illustrate that CA-5000 based floors seem most affected by material which solubilise the resin fairly rapidly.

PACKAGING

15 litre open top plastic drums.



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Astec Paints Australasia Pty. Ltd.
22-24 Pinn Street, St. Marys,
South Australia 5042
PO Box 321, Melrose Park, S.A. 5039

Web: www.astecpaints.com.au
Email: enquiries@astecpaints.com.au

Telephone: +61 8 8297 2000
Facsimile: +61 8 8297 2555

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Revised Edition April, 2015

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