TECHNICAL DATA SHEET

Conplast PA21

Air entraining and water reducing admixture

Uses

- To produce air entrained concrete for increased durability and resistance to damage by frost and deicing salts. Typical applications include concrete roads and bridge decks, airport runways and taxiways andother extensive areas of concrete exposed to potential frost damage
- To improve cohesion and workability of concrete mixes where poorly graded aggregates must be used and bleeding, segregation or sand runs occur
- To reduce permeability of lean concrete mixes
- To improve stability and cohesion in extruded concrete

Advantages

- Air entrainment increases the resistance of concrete to attack by frost and de-icing salts, reducing problems of surface scaling and concrete failure
- Entrained air bubbles assist in the formation of a stable cohesive mix, reducing segregation and bleeding
- Air entrainment improves workability and helps produce a dense, uniform, close textured surface free from gravel nests and sand runs, further enhancing durability
- Water reduction allows concrete to be produced with reduced permeability and increased strength compared to that obtained with air entrainment alone

Standards compliance

Conplast PA21 complies with ASTM C260 and C494 type A, and with the uniformity and air entrainment requirements of BS 5075 Part 2.

Conplast PA21 complies with the requirements of the United Kingdom Water Fittings Byelaws Scheme and is listed in the Directory of Materials as suitable for use in contact with potable water under its previous name, Conplast AE21.

Description

Conplast PA21 is a chloride-free air entraining admixture based on selected sugar reduced lignosulphonates and compatible surface active agents. It is supplied as a brown solution which instantly disperses in water.

The surface active agents in Conplast PA21 act at the interface between the mixing water and cement/aggregate particles to produce microscopic air bubbles, which are evenly distributed throughout the concrete. The entrained air enhances durability by providing protection against the rapid temperature changes found in freezing and thawing conditions and with the use of de-icing salts.

Technical support

Fosroc provides a technical advisory service for on-site assistance and advice on admixture selection, evaluation trials and dispensing equipment. Technical data and guidance can be provided for admixtures and other products for use with fresh and hardened concrete.

Typical dosage

The optimum dosage of Conplast PA21 to meet specific requirements must always be determined by trials using the materials and conditions that will be experienced in use. This allows the optimisation of admixture dosage and mix design and provides a complete assessment of the concrete mix. A starting point for such trials is to use a dosage within the normal typical range of 0.25 to 0.60 litres / 100 kg of cementitious material, including PFA, GGBFS and microsilica.

Use at other dosages

Dosages outside the typical range quoted above may be used if necessary and suitable to meet particular mix requirements, provided that adequate supervision is available. Compliance with requirements must be assessed through trial mixes. Contact the Fosroc Technical Service Department for advice in these cases.

Properties

Appearance: Brown liquid
Specific gravity: Typically 1.18 at 20°C **Chloride content:** Nil to BS 5075 **Alkali content:** Typically less than 5.0 g. Na2O equivalent / litre of admixture.
A fact sheet on this subject is available.

TECHNICAL DATA SHEET

Instructions for use

Checking and control
Once a suitable dosage has been selected, particular care should be taken to ensure consistency of materials used and mixing and delivery procedures. Variability in the cleanliness and grading of the aggregates may have differing effects on the plasticising and air entraining properties of the admixture. Air content should be checked regularly by such means as the pressure method described in BS 1881 and ASTM C231.

Factors affecting air entrainment
A number of factors can affect the air entrainment obtained for a particular dosage of air entraining admixture, some of which are listed below. The examples given of changes that these factors may make to a concrete mix should be taken as guidelines only and the actual effects in any particular situation confirmed in trials.

(a) Sands of apparently the same grading may have significantly different effects on the level of air entrainment, depending on factors such as silt content, particle size distribution and particle shape. Where changes in sand source or content must be made, or where sand varies within the same source, a careful check must be made on the effects on air entrainment.

(b) Increased cement fineness or cement content will tend to decrease air entrainment. Changes in cement source and type may also lead to changes in the admixture dosage required to obtain a particular air content.

(c) The presence of carbon or organic impurities may reduce the effectiveness of an air entrainer and require an increased dosage. This will not usually be a problem but care may be required when using PFA, certain pigments or lignite bearing sands.

(d) Increased concrete temperature will tend to reduce air entrainment. Typically a rise from 10°C to 32°C may halve the level of air. In normal mixing conditions daily fluctuations will not give significant variations.

(e) Variations of mixer type and transit time may change the level of air entrainment. Small losses may occur during pumping. These will generally be consistent for a given set of conditions. High air contents may significantly reduce pump efficiency over long pump distances.

(f) Normal compacting procedures will not affect airentrainment. Prolonged vibration should be avoided.

(g) Increased dosages may be required at low workability levels to achieve the required air content.

Compatibility
Conplast PA21 is compatible with other Fosroc admixtures used in the same concrete mix. All admixtures should be added to the concrete separately and must not be mixed together prior to addition. The resultant properties of concrete containing more than one admixture should be assessed by the trial mix procedure recommended on this data sheet.

Conplast PA21 is suitable for use with all types of ordinary Portland cement. Contact the Fosroc Technical Service Department for advice on use with special cements and blends containing cement replacement materials.

Dispensing
The correct quantity of Conplast PA21 should be measured by means of a recommended dispenser. The admixture should then be added to the concrete with the mixing water to obtain the best results. Contact the Fosroc Technical Service Department for advice regarding suitable equipment and its installation.

Effects of overdosing

An overdose of double the intended amount of Conplast PA21 will result in a significant increase in air entrainment, which will tend to reduce strength. The degree of this effect will depend on the particular mix design and overdose level. An increased plasticising effect will also be obtained, together with an increase in setting time.

Curing
As with all structural concrete, good curing practice should be maintained. Water spray, wet hessian or a Concure* spray applied curing membrane should be used.

TECHNICAL DATA SHEET

Typical performance examples with UK materials

Many variables in concreting materials and conditions can affect the selection and use of an admixture. Trials should be made using relevant materials and conditions to determine the optimum mix design and admixture dosage to meet specific requirements.

Typical performance examples from evaluation studies of Conplast PA21 are included on this data sheet. The values quoted are representative of results obtained and are provided as illustrations of performance in different situations. Because of the variability of concreting materials, the results should only be taken as typical of the performance to be expected. Results quoted in individual examples should not be taken as necessarily directly comparable with other examples given here or results obtained elsewhere for Conplast PA21 or other products. Unless otherwise specified, all testing was carried out to the relevant parts of applicable British Standards.

Sand gradings for example 1

Grading (% passing)	Sand A	Sand B
5.00 mm	100	100
2.36 mm	100	86
1.18 mm	92	77
600 µm	71	68
300 µm	20	24
150 µm	12	3
75 µm	2	1
Field settlement (% by volume):	Nil	7

Example 1: Effect of variation in sand grading on dosage of Conplast PA21 required to obtain particular air contents

(a) Results with sand A, nominal cement content 300 kg/m³ OPC, Thames Valley gravel aggregates.

Mix	Dosage litre / 100 kg	Air content %	Density kg/m³	W/C ratio	Slump mm	Compressive strength N/mm² 7 day	28 day
Control	—	1.3	2394	0.560	80	39.0	48.0
Conplast PA21	0.20	4.2	2334	0.485	70	40.0	47.5
Conplast PA21	0.25	4.9	2313	0.473	60	40.0	45.5
Conplast PA21	0.30	5.6	2287	0.467	70	36.0	42.5

(b) Results with sand B, nominal cement content 300 kg/m³ OPC, Thames Valley gravel aggregates.

Mix	Dosage litre / 100 kg	Air content %	Density kg/m³	W/C ratio	Slump mm	Compressive strength N/mm² 7 day	28 day
Control	—	0.4	2348	0.72	60	30.5	36.5
Conplast PA21	0.30	2.8	2335	0.60	55	37.5	42.5
Conplast PA21	0.45	4.5	2276	0.59	75	30.5	33.0
Conplast PA21	0.60	5.4	2268	0.56	65	31.0	35.0
Conplast PA21	0.75	6.5	2226	0.54	75	27.0	31.5

Example 2: Comparison of water reduction benefit with standard air entraining admixture in BS 5075 mixes

Mix	Dosage litre / 100 kg	Air content %	Cement kg/m³	W/C ratio	Compacting factor	Compressive strength N/mm² 7 day	28 day
Control	—	0.9	300	0.52	0.89	39.5	52.5
Plain AEA	0.08	5.1	300	0.47	0.91	30.0	39.0
Conplast PA21	0.25	4.9	300	0.42	0.87	41.0	50.0
Control	—	1.3	2394	0.51	0.88	45.0	55.5
Plain AEA	0.08	4.2	2334	0.46	0.86	36.0	44.5
Conplast PA21	0.25	5.6	2287	0.42	0.86	44.0	52.5

TECHNICAL DATA SHEET

Limitations

Conplast PA21 is designed to give both water reductioand air entraining properties, changing dosage will change both at the same time. In situations such as where highly variable aggregates are used and independent control of the water reducing and air entraining properties is required then the use of a combination of admixtures, such as Conplast P509* and Conplast AE300*, is recommended.

Estimating - packaging

Conplast PA21 is available in drum and bulk supply. For larger users, storage tanks can be supplied. Details of specific packaging volumes are available on request.

UN packaging regulations

To comply with current regulations, all products of a hazardous nature that are involved in a sea crossing as part of the delivery requirements must be packed in United Nations Approved receptacles.

When a known sea crossing is involved, whether local to the United Kingdom or for export worldwide, Fosroc will supply in the correct UN packaging. Where Fosroc are only requested to deliver within the United Kingdom mainland, but the purchaser intends to ship on, it is incumbent on the purchaser to specify that UN packaging is required at the time of placing the order. Otherwise, once delivery is received, the responsibility is that of the purchaser.

The use of UN packaging may affect the selling price of products. Refer to the local Fosroc office or representative.

Storage

Conplast PA21 has a minimum shelf life of 12 months provided the temperature is kept within the range of 2°C to 50°C. Should the temperature of the product fall outside this range then the Fosroc Technical Service Department
should be contacted for advice.
Freezing point: Approximately .2°C.

Precautions

Health and safety

Conplast PA21 does not fall into the hazard classifications of current regulations (see notes 1 and 2 below). However, it should not be swallowed or allowed to come into contact with skin and eyes.

Suitable protective gloves and goggles should be worn. Splashes on the skin should be removed with water. In case of contact with eyes rinse immediately with plenty of water and seek medical advice. If swallowed seek medical attention immediately . do not induce vomiting.
For further information consult the Product Safety Data Sheet available for this product.

Fire

Conplast PA21 is water based and non-flammable.

Cleaning and disposal

Spillages of Conplast PA21 should be absorbed onto sand, earth or vermiculite and transferred to suitable containers. Remnants should be hosed down with large quantities of water.
The disposal of excess or waste material should be carried out in accordance with local legislation under the guidance of the local waste regulatory authority.

Additional information

Note 1: CPL regulations 1984 Supply-Schedule 1. Note 2: HSE publication Guidance Note EH40. *See separate data sheet.

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