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**Agrément
Certificate
No 04/4171**
Second issue*

Designated by Government
to issue
European Technical
Approvals

CONPLAST CN AND CONPLAST CNI CORROSION INHIBITORS

Inhibiteurs de corrosion
Korrosionshemmstoff

Product



• *THIS CERTIFICATE RELATES TO CONPLAST CN AND CONPLAST CNI, CALCIUM NITRITE-BASED CORROSION INHIBITORS FOR REINFORCED CONCRETE, TO PROVIDE INCREASED PROTECTION AGAINST REINFORCEMENT CORROSION.*

• *The products are for use in reinforced and prestressed concrete with a free water/cement ratio of 0.45 or lower, and have no known detrimental effects on the properties of the concrete.*

• *The products are for use in reinforced concrete structures, designed in accordance with BS 5400-4 : 1990, BS 8007 : 1987 or BS 8110-1 : 1997.*

continued

Regulations

1 The Building Regulations 2000 (as amended) (England and Wales)



In the opinion of the BBA, the use of the products is not subject to these Regulations.

2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, the use of the products is not subject to these Regulations.

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, the use of the products is not subject to these Regulations.

continued

They have particular application in severe or very severe exposure conditions (as defined in BS 5400-4 : 1990, Table 13 or BS 8110-1 : 1997, Table 3.2) such as in marine installations, chemical works, power plants, docks and harbour works, and bridges.

- *They are also for use in structures subject to de-icing salts, such as multi-storey car parks.*

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See section:

7 *Delivery and site handling (7.2 and 7.3).*

Technical Specification

5 Description

5.1 Conplast CN and Conplast CNI Corrosion Inhibitors are aqueous solutions of calcium nitrite (minimum 30% ± 2%), with residual calcium nitrate (up to a maximum of 3%). Conplast CNI contains, additionally, a naphthalene sulphonate-based superplasticiser and a hydroxycarboxylic acid salt-based retarder to offset the acceleration of set normal with calcium nitrite corrosion inhibitors.

5.2 Ancillary items to be used with Conplast CNI are:

- Structuro 530 — a polycarboxylate ether-based superplasticiser
- Conplast SP495 — a naphthalene sulphonate-based super plasticiser.

5.3 The following material combinations have been assessed:

- Conplast CN
- Conplast CNI plus Structuro 530
- Conplast CNI plus Conplast SP495.

5.4 The products have physical characteristics of:

specific gravity	1.285 to 1.300
pH (concentrate)	9.5–11.5
appearance	CN — light yellow clear liquid CNI — light brown liquid
flammability	non-flammable
odour	no significant odour.

6 Manufacture and quality control

Conplast CN and Conplast CNI Corrosion Inhibitors are manufactured in a batch-blending process. Quality control is exercised over raw materials, during manufacture and on the final product.

7 Delivery and site handling

7.1 The products are supplied in 210 litre barrels, 1000 litre plastic totes or in bulk tankers. Each container has a label bearing product name, batch

number, volume, manufacturing and use-by date and the BBA identification mark, including the number of this Certificate.

7.2 The products have a shelf-life of 12 months and should be stored in a secure area at temperatures between 2°C and 50°C. Contact with strong oxidising agents, acids and alkalis should be avoided.

7.3 Small spillages should be diluted with water and flushed to waste. Large spillages should be absorbed by an inert material and transferred to containers for landfill disposal in accordance with local waste-disposal regulations.

Design Data

8 General

8.1 Conplast CN and Conplast CNI Corrosion Inhibitors are satisfactory for use in concrete mixes (with up to a maximum free water/cement ratio of 0.45), to provide increased protection to steel reinforcement and pre-stressed tendons against chloride-induced corrosion.

8.2 The products have particular application, where steel would be at risk of chloride-induced corrosion, in severe or very severe corrosion conditions (as defined in Table 13 of BS 5400-4 : 1990 or in Table 3.2 of BS 8110-1 : 1997), such as in marine installations, chemical works, power plants, dock and harbour works, bridges, and multi-storey car parks, where chlorides from the sea or from de-icing salts are present. They may be used also as a precaution to resist corrosion from contamination by chlorides present on reinforcing bars or unintentionally in concrete mix materials.

8.3 The structure should be designed in accordance with BS 5400-4 : 1990, BS 8007 : 1987 or BS 8110-1 : 1997, using the appropriate dosage rate depending on the chloride exposure conditions (see Table 1).

Table 1 Addition rates

CN/CNI (lm^{-3})	Chloride level ⁽¹⁾ (kgm^{-3})
7.5	2.8
10.0	3.6
12.5	4.7
15.0	5.9
17.5	6.5
20.0	7.7
22.5	8.2

(1) Chloride level as calculated at reinforcing bars.

8.4 The dosage rates⁽¹⁾ for Structuro 530 and Conplast SP 495 will vary depending on the materials and conditions experienced on site, but should be within the limits of:

- Structuro 530 — 0.2–3.0 litres/100 kg cement
- Conplast SP495 — 1.5%–3% w/w by cement.

(1) The Certificate holder can advise on suitable dosages for a particular application.

8.5 The products may be used where sulphates are present, but a sulphate-resistant concrete mix will be necessary to avoid sulphate attack on the concrete.

9 Mix design

9.1 The products have been assessed for use in concrete mixes with a maximum free water/cement ratio of 0.45.

9.2 The products are compatible with all cements complying with BS EN 197-1 : 2000 including pozzolanic blends of Portland cements with pulverized-fuel ash, ground granulated blast-furnace slag or silica fume, blended at the mixer.

9.3 Advice on specification (including use with other liquid admixtures) is available from Al Gurg Fosroc LLC's Technical Department.

10 Fresh concrete properties

10.1 Test results indicate that the workability of concrete mixes with the products is similar to a control concrete⁽¹⁾.

10.2 Test data indicate that the assessed combinations have no significant effect on the air content when compared to a control concrete⁽¹⁾.

(1) Control concrete 1 to BS EN 480-1 : 1998.

11 Stiffening times

11.1 Penetration-resistance measurements conducted in accordance with BS EN 480-2 : 1996 show that the presence of the Conplast CN in the concrete mix decreases the initial and final set times.

11.2 Penetration-resistance measurements conducted in accordance with BS EN 480-2 : 1996 show that the presence of the two CNI combinations in the concrete mix significantly increases the initial and final set times.

11.3 The effect on the initial and final setting times should be considered when scheduling concrete construction operations, especially the mixing, placing, compaction and presence of cold joints.

12 Water absorption

Results of Initial Surface Absorption Tests (ISAT), conducted in accordance with BS 1881-208 : 1996, indicate that the presence of the Conplast CN does not significantly affect the water absorption characteristics of concrete.

13 Strength characteristics

13.1 Results of compressive strength cube tests conducted in accordance with BS 1881-116 : 1983, after 28 days, indicate that the presence of Conplast CN has no significant effect on the concrete's compressive strength. However, the two CNI combinations show a significant increase in the concrete's compressive strength compared to the control concrete.

13.2 The products have no significant effect on the flexural strength of the concrete and all normal reinforcement is still required as for conventional concrete.

13.3 Results of steel to concrete bond strength tests indicate that whilst the Conplast CNI plus Structuro 530 mix was comparable to the control concrete, the Conplast CN and the Conplast CNI plus Conplast SP495 mixes gave a significant increase in bond strength.

14 Resistance to leaching

14.1 Results of test data and visits to inspected sites show no evidence of the products leaching out from within the concrete.

14.2 The products have not been assessed for use in potable water systems.

15 Durability

15.1 The use of calcium-nitrite-based corrosion inhibitors has been studied since the early 1970s and have been used successfully in reinforced concrete structures since 1978. Visits to existing sites confirmed that there were no visible signs of corrosion in the structures, and that they are continuing to perform satisfactorily.

15.2 Test data confirm that the use of the products has no adverse effects on the fresh and hardened properties of concrete.

15.3 When chlorides are present the life of a reinforced concrete structure is determined by the corrosion which takes place at the reinforcement. The use of Conplast CN and Conplast CNI Corrosion Inhibitors in these situations provides increased corrosion protection to the reinforcement and extends the life of the structure.

Installation

16 General

The basic workmanship should comply with the relevant requirements of BS 8000-2.1 : 1990 and BS 8000-2.2 : 1990.

17 Mixing

Conplast CN and Conplast CNI Corrosion Inhibitors are added to conventional concrete mixes with the mix water, in accordance with Al Gurg Fosroc LLC's instructions at the appropriate dosage rate (see section 8.3 and Table 1).

18 Placing

18.1 Concrete mixes containing the products can be transported by normal conveying methods.

18.2 Special precautions are not necessary when pouring into moulds or shutters.

18.3 Concrete mixes containing the products may be vibrated by conventional means to provide full compaction.

18.4 Where concrete containing the products is delivered by a supplier of ready mixed concrete, Conplast CN or Conplast CNI should be clearly marked on the delivery ticket, together with the actual addition rate in lm^{-3} .

19 Curing

It is essential that all normal good curing procedures for conventional concrete in accordance with BS 8110-1 : 1997 are strictly followed.

20 Finishing

Placed concrete mixes may be floated and trowelled using all normal hand or power tools.

21 Miscellaneous

The presence of the products in the fresh concrete mix can be verified by use of the Hach test.

Technical Investigations

The following is a summary of the technical investigations carried out on Conplast CN and Conplast CNI Corrosion Inhibitors.

22 Tests

22.1 The following characterisation tests were carried out on the products:

- pH
- chloride content.

22.2 Tests were carried out to determine the effect of the products on the following early age properties of concrete :

- slump
- density
- setting time.

22.3 Tests were carried out on cured concrete containing the products, and controls to determine the effect on:

- compressive strength
- flexural strength
- initial surface absorption (ISAT)
- bond strength to steel.

22.4 An examination was made of independent test data relating to the effect of the products on the rate of corrosion of reinforcing steel in chloride-contaminated concrete.

23 Investigations

23.1 The manufacturing process at Al Gurg Fosroc LLC's factory in Dubai, UAE, was examined, including the methods adopted for quality control and composition of the materials used.

23.2 Visits were made to existing sites where the product has been in service.

23.3 A user survey of specifiers, engineers and contractors was conducted to establish the products' performance in use and in service.

23.4 A literature search was conducted to investigate the use of calcium nitrite in reinforced concrete.

Additional Information

The management systems of the manufacturer have been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2000 by the Bureau Veritas Quality International (Certificate No 134453/A).

Bibliography

BS 1881-116 : 1983 *Testing concrete — Method for determination of compressive strength of concrete cubes*

BS 1881-208 : 1996 *Testing concrete — Recommendations for the determination of the initial surface absorption of concrete*

BS 5400-4 : 1990 *Steel, concrete and composite bridges — Code of practice for design of concrete bridges*

BS 8000-2.1 : 1990 *Workmanship on building sites — Code of practice for concrete work — Mixing and transporting concrete*

BS 8000-2.2 : 1990 *Workmanship on building sites — Code of practice for concrete work — Sitework with in-situ and precast concrete*

BS 8007 : 1987 *Code of practice for design of concrete structures for retaining aqueous liquids*

BS 8110-1 : 1997 *Structural use of concrete — Code of practice for design and construction*

BS EN 197-1 : 2000 *Cement — Composition, specifications and conformity criteria for common cements*

BS EN 480-1 : 1998 *Admixtures for concrete, mortar and grout — Test methods — Reference concrete and reference mortar for testing*

BS EN 480-2 : 1997 *Admixtures for concrete, mortar and grout — Test methods — Determination of setting time*

BS EN ISO 9001 : 2000 *Quality management systems — Requirements*

Conditions of Certification

24 Conditions

24.1 This Certificate:

- (a) relates only to the product that is named, described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) is valid only within the UK;
- (d) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (e) is copyright of the BBA;
- (f) is subject to English law.

24.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

24.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabrication including all related and relevant processes thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine; and

(c) are reviewed by the BBA as and when it considers appropriate.

24.4 In granting this Certificate, the BBA is not responsible for:

- (a) the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the actual works in which the product is installed, used and maintained, including the nature, design, methods and workmanship of such works.

24.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, Conplast CN and Conplast CNI Corrosion Inhibitors are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 04/4171 is accordingly awarded to Al Gurg Fosroc LLC.

On behalf of the British Board of Agrément

Date of Second issue: 8th March 2005

Chief Executive

**Original Certificate issued 10th November 2004. The amended version includes the revision of the addition rates in Table 1 and revised Conditions of Certification.*

Electronic Copy

British Board of Agrément

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For technical or additional information, contact the Certificate holder (see front page).
For information about the Agrément Certificate, including validity and scope, tel: Hotline 01923 665400, or check the BBA website.