CEMENTAID

The Everdure Caltite System

for truly damp-proof and corrosion resistant concrete

EVELINA CHILDREN'S HOSPITAL
Architects: Michael Hopkins & Partners
Structural Engineer: Buro Happold

Contents

Welcome to Cementaid

Cementaid is delighted to have the endorsement of the late Adam Neville, renowned international authority on concrete. He wrote over 250 research and technical papers and ten books, the most famous of which is 'Properties of Concrete'. His last book, 'Concrete - Neville's Insights and Issues' was published in 2006.

My first contact with Caltite was in the late 1960s. Initially I was sceptical about it, just as I felt about waterproofing admixtures in general. However, after being involved in some tests on concrete containing Caltite, I changed my mind. I visited various sites and inspected concrete containing Caltite both in the UK and overseas. Probably the most impressive example of the performance of Caltite was a wall to a sea-front site where the basement extended 10 metres below sea level. Accordingly, I became a consultant to the manufacturers of Caltite.

Although I no longer have any professional or business involvement with the Cementaid Group, I can express the view that, if used correctly, Caltite is an effective and long-lasting waterproofing admixture.

LONDON, APRIL 2006

Adam Neville: *CBE, DSc (Eng), DSc, FREng, FICE, FIStructE, FRSE; former Principal and Vice-Chancellor of the University of Dundee; Professor of Civil Engineering at the University of Leeds and Dean of Engineering at the University of Calgary.*

Paradise Street, Liverpool
Photograph courtesy of Grosvenor Estates and Laing O'Rourke

Architect: Austin-Smith Lord
Engineer: Waterman Partnership

The need for Everdure Caltite

Structural concrete even of the highest quality contains a network for pores and capillaries through which water will readily pass by the simple process of absorption. These pores and capillaries are formed by the excess water required to enable concrete to be properly mixed and placed, over and above the amount of water actually required to hydrate the cement.

Ordinary good quality concrete, free of voids or cracks may well prevent the free flow of running water. However, even good quality concrete absorbs water and allows constant water transmission, occurring as a function of capillarity, when there is water one side of a structure and air on the other. With ordinary concrete, a $1m^2$ area of retaining wall with one face in contact with water and the other face air dried (as might occur in an air-conditioned basement room or perhaps a tunnel) can transpire up to half a litre of water in an hour which will then simply evaporate from the 'dry' face; resistant to the free flow of water perhaps, but waterproof or resistant to water vapour? Absolutely NOT!

To make concrete structures truly waterproof and provide resistance to water vapour transmission, the traditional approach has been to line concrete elements with an impervious membrane or coating. Such systems are often costly to install, delay construction time, waste valuable space and are highly susceptible to 'contractor error'. Worse still, when defects do arise, they can be notoriously difficult to repair. Once water has by-passed a membrane, reinstating the grade of basement required (BS8102) is almost impossible.

All of the common mechanisms of corrosion to reinforced concrete (chloride induced corrosion, sulfate and thaumasite attack, carbonation, freeze-thaw damage, Alkali Silica Reaction) require the ingress of water.

If concrete could be made with ultra-low absorption characteristics it would no longer need to be coated or wrapped in a membrane to be waterproof and water vapour resistant. It would also be highly resistant to corrosion.

In today's construction environment, not only is there a need to use proven, technically superior products but also such systems must offer tangible benefits in ease of 'buildability', increased speed of construction together with the experience and expertise of a financially stable supplier to provide significant monetary benefits to all parties involved in the construction process.

The Everdure Caltite System meets these challenges.

How Everdure Caltite works

The Caltite system comprises two ingredients which are added to the concrete at the batch plant. The first is a high range water reducing admixture which provides the basis for a good quality, dense and low permeability mix.

The second component is Caltite, a unique double-action, waterproofing compound, which lines the pore and capillary structure of the cement paste, reversing normal capillary suction and physically blocking capillaries when subjected to hydrostatic pressure.

Cementaid personnel add the Caltite ingredient to the concrete at the batch plant.

Caltite itself has two distinct waterproofing actions:

1. Firstly there is a reaction of the 'hydrophobic' components of Caltite with cement components which fundamentally changes surface tension. Pores and capillaries throughout the entire mass of the concrete become inherently water-repellent and non-absorptive. This addresses the predominant mechanism by which water enters and is transmitted through concrete; absorption.

2. In the second action, discreet polymer globules, moving with the bleed water, collect in the capillaries to form a physical plug, thereby physically blocking the capillaries and significantly reducing the passage of water vapour.

ORDINARY CONCRETE

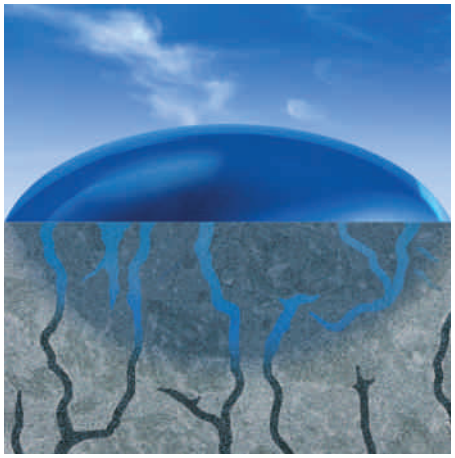


Fig 1a: Ordinary absorptive concrete. Water is actively 'sucked' through micro-cracks and capillaries due to low surface tension forces.

CALTITE CONCRETE

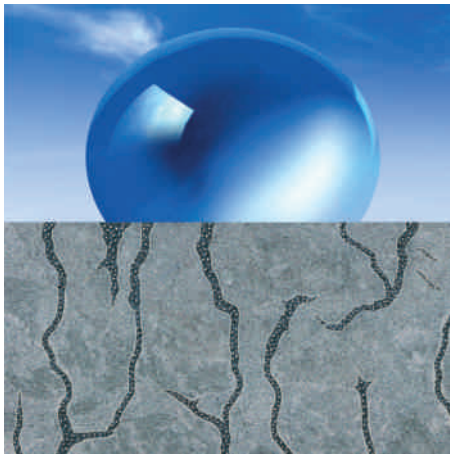


Fig 1b: Water repellent concrete with Everdure Caltite. The hydrophobic matrix prevents water and moisture being absorbed into the concrete.

Fig 2a: Ordinary concrete under hydrostatic pressure. Water is forced into the concrete under pressure.

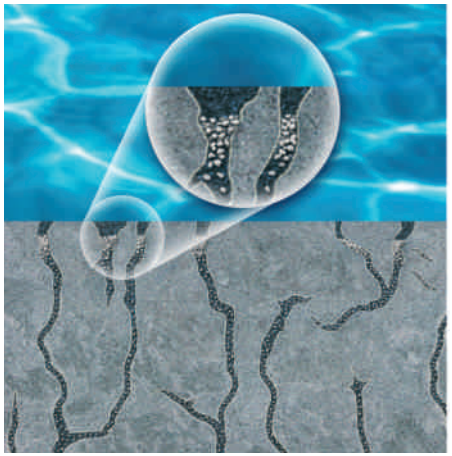
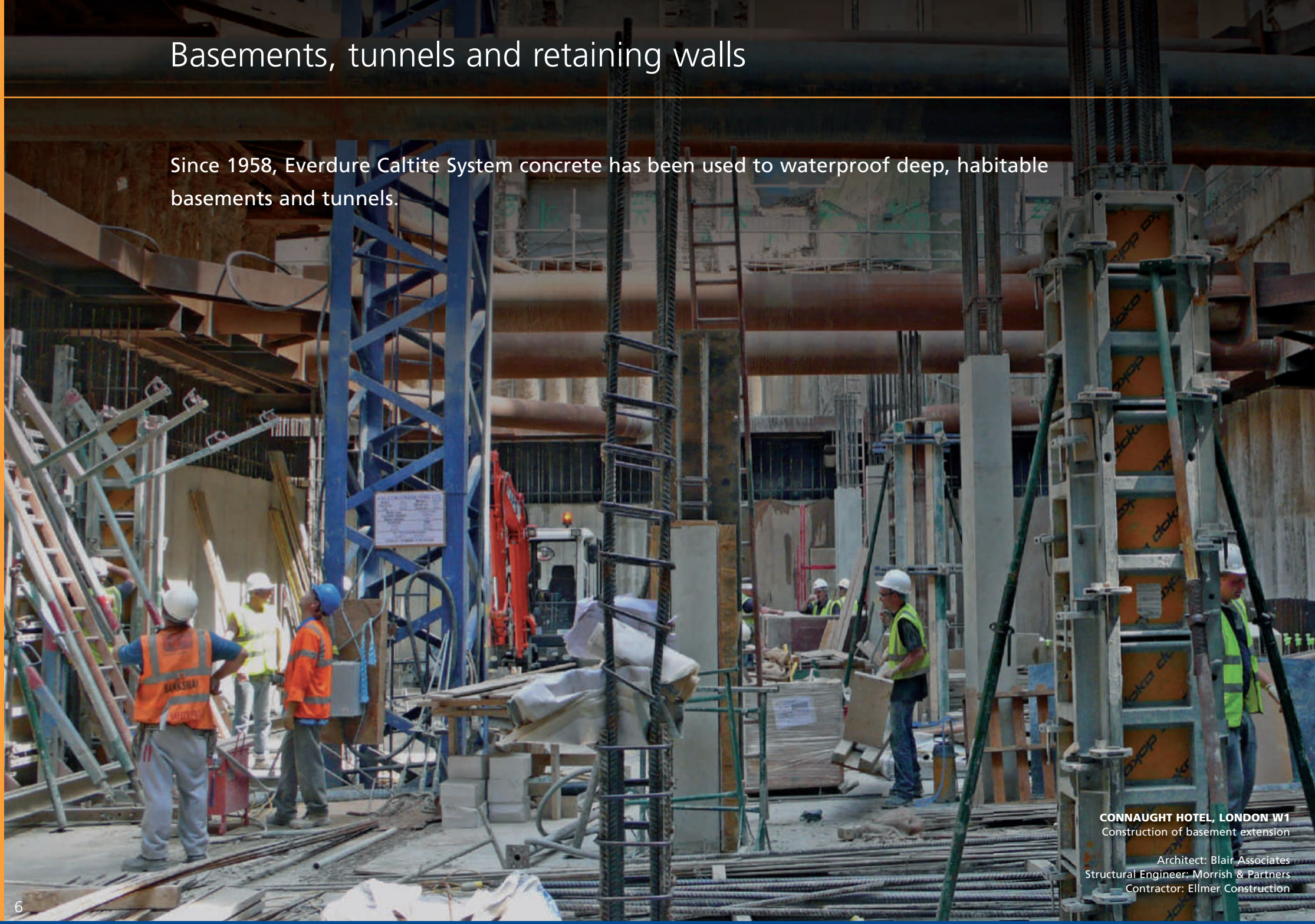


Fig 2b: CALTITE concrete under hydrostatic pressure. As pressure is applied, the polymer globules coalesce forming physical 'plugs' within the capillaries sealing them against water penetration.

Basements, tunnels and retaining walls

Since 1958, Everdure Caltite System concrete has been used to waterproof deep, habitable basements and tunnels.



CONNAUGHT HOTEL, LONDON W1
Construction of basement extension

Architect: Blair Associates
Structural Engineer: Morrish & Partners
Contractor: Ellmer Construction

Just consider the advantages of using the EVERDURE CALTITE SYSTEM:

Reduced construction costs

- Delivering maximum usable area to the owner by enabling the structure to extend to the site boundaries
- No need for additional excavation to allow for the installation of external tanking
- No need for cavity walls and associated drainage
- No need for time consuming additional treatments - the structure is waterproofed as the Caltite concrete is placed.

Buildability

- Simplicity
- No over-excavation to enable membrane installation
- Less back-filling
- No time delays due to waterproofing installation
- No delays due to bad weather.
- Maintenance-free

Peace of mind

The Caltite admixtures are added by Cementaid at the concrete supplier's batch plant. We also attend site to record the placement details of the Caltite System concrete.

Far simpler detailing

No requirement for laborious detailing of membranes, cavity drainage systems or other paraphernalia.

Guarantee

Cementaid (UK) Limited for UK projects or Cementaid (Ireland) Limited for projects in the Republic of Ireland, provide a 20-year guarantee on all projects which includes construction joints contained within Caltite concrete and sealed in accordance with the Cementaid specification.

HOLBORN PLACE, LONDON
Architect: Foster & Partners
Structural Engineer: Yolles

RIVERSIDE, HAMPTON WICK | Architect: Barlow Henley | Structural Engineer: Dewhurst MacFarlane

Swimming pools and tanks

The EVERDURE CALTITE SYSTEM simplifies the design and construction for waterproofing swimming pools, water features and tanks. Please note that if your pool or tank involves a suspended slab or surround, also refer to design considerations section on roofs and suspended decks on page 17. Its many advantages include:

- Simplified and reduced design time
- Simple, guaranteed detailing for pipe penetrations, light fixings etc.
- No additional protection required, surface finishes bonded directly to EVERDURE CALTITE concrete.
- Corrosion resistant - protects against chlorine and salt water induced corrosion.
- Reduced construction time and cost.
- Permanently waterproof, eliminating membrane repair or replacement.

Ozone purified salt water swimming pool, Lambourn, Berks

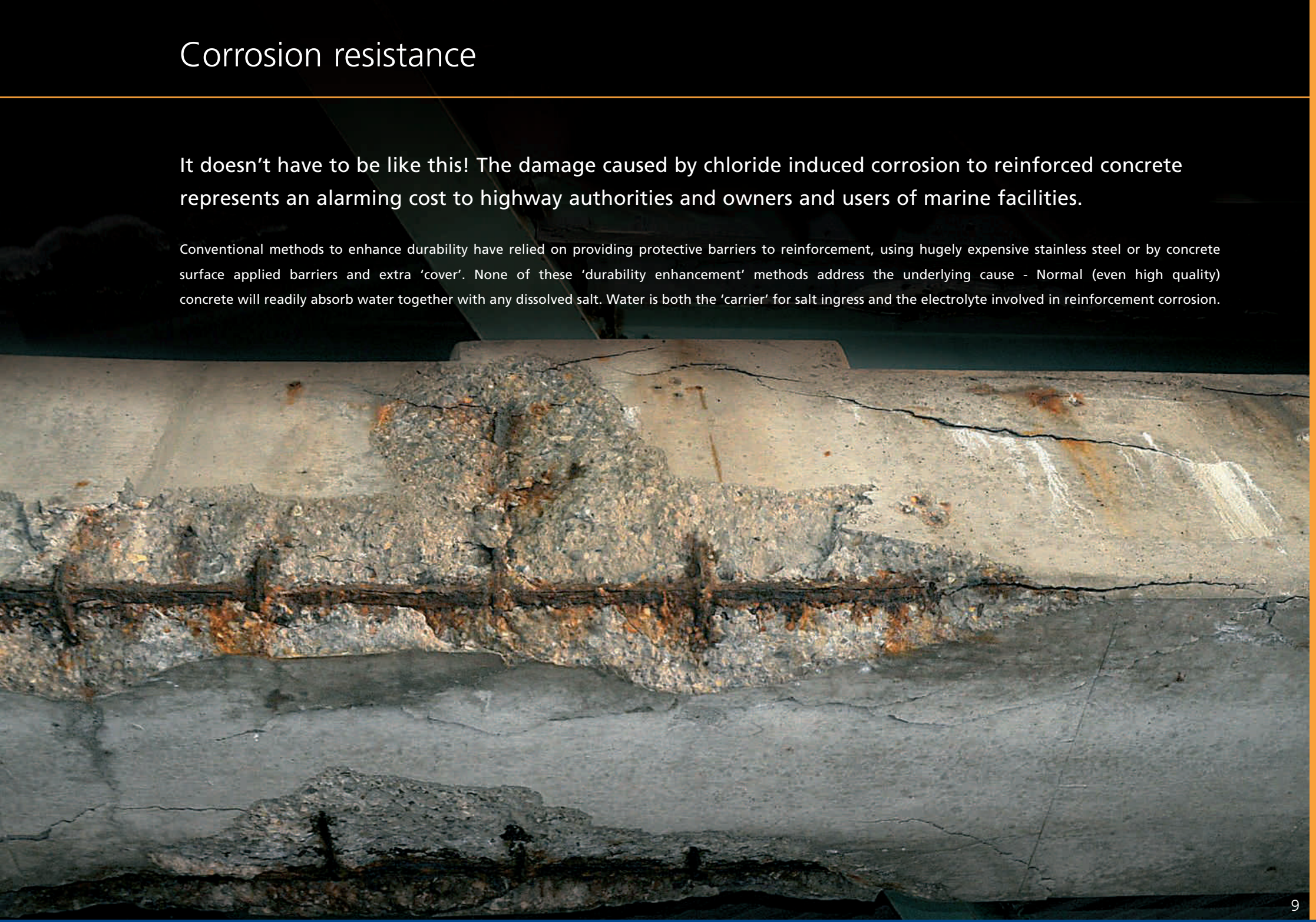
Architect:
Johnston Cave

Structural Engineer:
Batchelor Stebbings Partnership

Corrosion resistance

It doesn't have to be like this! The damage caused by chloride induced corrosion to reinforced concrete represents an alarming cost to highway authorities and owners and users of marine facilities.

Conventional methods to enhance durability have relied on providing protective barriers to reinforcement, using hugely expensive stainless steel or by concrete surface applied barriers and extra 'cover'. None of these 'durability enhancement' methods address the underlying cause - Normal (even high quality) concrete will readily absorb water together with any dissolved salt. Water is both the 'carrier' for salt ingress and the electrolyte involved in reinforcement corrosion.



Marine and salt environments

Unsatisfactory durability performance of concrete structures is a world-wide phenomenon. The cause is not defects in design or construction but the use of concrete which is inappropriate for the many conditions of extreme exposure which structures must endure.

These concrete supports for a pipeline run across a tidal salt pan in South Australia where summer temperatures can reach 40°C. They are partially submerged in seawater twice daily (as indicated by the distinct appearance of the surfaces). These supports were initially un-reinforced, but damage as seen below, due to salt scaling and sulfate attack was evident within 3 years of construction. Repairs, carried out in the early 1960's, involved forming a Caltite concrete 'jacket' around the salt damaged chairs. These jackets were just 100mm thick, the concrete was reinforced with no more than 50mm 'cover' and the mix design for the concrete identical to the original save for the inclusion of Caltite. These remarkable photographs show the normal concrete after 19 years compared to Caltite Concrete after 17 and 47 years exposure. These demonstrate that Caltite System Concrete will provide hugely enhanced performance, even in these most aggressive of situations. Cores extracted from the Caltite Concrete jackets after 23 years showed that the reinforcement was still in pristine condition, with no sign of sulfate attack and little sign of surface erosion to the concrete. To put this into perspective, the ground sulfate levels on this site were measured at 7.2g/litre and chlorides at 53g/litre. These exceed the worst possible cases indicated in BRE Special Digest 1 – (DS5 & DC4).

19 year old ordinary concrete

17 year old Caltite concrete

47 year old Caltite concrete

Water and the corrosion process

Whether considering rebar corrosion caused by chloride ingress or carbonation, damage from Alkali Silica Reaction, Sulphate attack or damage due to freeze/thaw, all such concrete problems relate to absorption of water. Without sufficient water, none of these corrosion mechanisms can occur. Traditional protective measures (surface coatings, epoxy-coated or stainless steel rebar, cathodic protection) add huge cost, often involving maintenance. Some are simply impracticable. At best they only delay the onset of corrosion. None address the basic problem, i.e. concrete absorbs water by simple capillarity. This is exactly what Caltite ultra-low absorptive concrete was designed to do - keep water out.

'Permeability' as the measure of porosity is misleading and of limited value as "Calculation of the water penetration depth during wetting showed the speed of capillary absorption to be in the order of a million times faster than permeability"*. Making concrete denser may actually be detrimental to what you want to achieve as "…the narrower the pores in saturated concrete, the lower its permeability, the greater the resultant capillary pressure and the greater the influx of water*'. The correct test to determine concrete porosity is capillary absorption.

** 'Capillary absorption by concrete', Dr A Butler, TRL (Concrete July 1997)*

Sewage and industrial

Another common form of concrete corrosion occurs when structures are in contact with acid.

In such cases it is predominantly the cement matrix itself which is attacked. Sewer pipes and treatment work structures can suffer serious damage due to the formation of sulphuric acid following microbial (thiobacilli) conversion of Hydrogen Sulphide. Caltite System concrete has been used extensively to combat this known problem and to provide built-in durability far in excess of any normal concrete. Acid storage bunds and manufacturing plants can be similarly damaged.

Corrosion resistant dairy floors

Acids, either from industrial processing or occurring as a function of microbial action (as in sewers), are readily absorbed into even the highest quality normal concrete and can destroy its integrity very rapidly. A typical approach has been to coat normal concrete with an acid resisting material such as epoxy or polyurethene to prevent direct contact of the acid with the absorptive concrete.

The problem with this approach has been that when damage or wear to the coating occurs, acid is rapidly absorbed through any defect, destroying the concrete to which it is adhered. This leads to rapid delamination of coatings and accelerated damage to the entire structure.

Ultra-low absorptive Caltite System concrete prevents this – the coating protects the surface of the Caltite but importantly, the Caltite concrete ensures that the coating remains intact meaning that only very minor localised surface etching can occur, if and where there is mechanical damage to the coating.

Caltite System Concrete can provide corrosion resistance for:

- Industrial floors
- Warehouse bulk storage of sugar and salt
- Abattoirs
- Aggressive chemical storage and processing
- Food production, dairy floors, brewery floors
- Sewage treatment works and pipelines
- Effluent run-off areas

Botanic acid plant, Purfleet
Contractor: Dew Group
Structural Engineer: Adams Consulting Engineers

Meteor Business Park, Cheltenham
Contractor: Stallard Construction
Structural Engineer: Clarke Nicholls Marcell
Everdure Caltite system concrete used for corrosion protection in a tin plating factory

Everdure Caltite System: technical section

This technical section provides key information required to successfully specify and install Everdure Caltite System concrete

UNIVERSITY COLLEGE LONDON HOSPITAL
Basement construction
Architect: Llewellyn Davies
Structural Engineer: Clarke Nicholls Marcel

Specification for Everdure Caltite System concrete

SHORT SPECIFICATION

All concrete (state areas) to be constructed in accordance with the drawings and strictly in accordance with current Cementaid EVERDURE CALTITE SYSTEM specifications, using not less than 335kg/m³ of CEM1 (Portland Cement) and having a water/cement ratio not in excess of 0.45, and other details conforming to current recommendations and requirements of Cementaid. Mixes incorporating blended cements may be used subject to the agreement of Cementaid.

DETAILED SPECIFICATION

Concrete

All concrete (state areas) must conform to current European Standard Specifications and be designed, WITHOUT ADDITIVES, for a compressive strength complying with the requirements of C28/35 (EN 206), or greater if required by the structural engineer. The concrete must contain a minimum of 335kg/m³ CEM1 (Portland cement) (the cement content being stated on the delivery dockets) and have a water:cement ratio not in excess of 0.45. Mixes incorporating blended cements may be used subject to the agreement of Cementaid.

Admixtures

All concrete shall contain Cementaid Everdure Caltite at the rate of 30 litres per m³ and a high-range water reducing superplasticiser conforming to EN934-2:2009 tables 3.1 and 3.2 to reduce the water requirement by at least 20%.

The added water requirement is to be adjusted to allow for the action of the superplasticiser and the water content of the admixture components.

Trial Mixes

Where requested by the structural engineer, or as required by the ready-mixed concrete supplier's Quality Management System, the concrete supplier, with Cementaid present, shall mix and test a trial mix of concrete with the Everdure Caltite System ingredients to confirm that the enhanced concrete conforms to strength, consistence and any other requirements.

Concrete suppliers

Not all concrete suppliers are approved for supplying EVERDURE CALTITE SYSTEM quality concrete. The contractor should check with Cementaid for approved suppliers before ordering concrete. Cementaid approval does not remove responsibility for basic concrete quality, in respect of its compressive strength or minimum cement content, from the concrete producer or the contractor.

Site attendance

A representative of Cementaid is to be in attendance at the batch plant and on site as necessary to record where the Caltite concrete is placed and the placement details.

Cementaid is to be notified by the contractor at least seven working days before the first intended placement of Caltite System concrete and, thereafter, at least 24 hours before each placement. Site attendance does not constitute supervision, nor does it imply that the concrete placed will be free of defects. The correct placement and care of the concrete remains the responsibility of the contractor.

Specification details (CONTINUED)

Placing

Concrete shall not be placed at concrete temperatures below 5°C, nor above 30°C, and must be placed according to current codes of practice and Cementaid recommendations.

Concrete received from the batch plant which cannot be placed free from honeycombs shall be rejected by the contractor. Care shall be taken to fill every part of the forms, to force concrete under and around reinforcement without displacing it, to work back coarse aggregate from the face and to remove all air bubbles and voids.

Compaction shall be assisted by a sufficient number of appropriate immersion type vibrators. These shall not be held against forms or reinforcing steel, nor used for spreading into place. Vibrators shall not be held in one place so long as to result in segregation of concrete materials or formation of laitance on the surface.

NB. Except as specified by the structural engineer, pour sizes must not exceed the limits agreed by Cementaid.

Finishing

All concrete to be properly finished according to the architect's or structural engineer's specification.

Curing and cooling

Proper curing shall be carried out in accordance with good concrete practice. For slabs, curing should start immediately after finishing and as soon the concrete can withstand a man's weight without marking. For larger slabs, curing should be done in sections as the concrete is finished. This is especially the case with power-float finishes where commencement of curing must not be delayed.

For walls, the top surface must be appropriately covered as soon as finishing is complete.

Curing of the walls themselves must commence immediately the formwork is removed.

All concrete surfaces to be protected from direct sunlight and frost by appropriate covering during the curing period. The curing time should be for a minimum period of seven days after placement or longer as specified. If a spray-on curing membrane is to be used, it must be rated 90% efficient and the instructions for use carefully followed. NB the use of a spray-on curing membrane is just one small part of the curing process.

Loading

Loading of the structure is not permitted until either the concrete has reached the strength specified by the structural engineer or the structural engineer's approval has been given.

Final inspection

Following completion of the Caltite concrete works, the contractor shall arrange a final inspection of the works with Cementaid. Where the Caltite concrete is to be covered or obscured, this inspection should be carried out as early as possible before this is done. If necessary, or where there is an extended lapse of time between the placing of Caltite concrete, the final inspection can be done in stages.

Section thickness

The minimum section thickness of Caltite System concrete guaranteed by Cementaid is 200mm.

Specifying Everdure Caltite in documentation

In specifying Everdure Caltite System concrete, we we would suggest that, in addition to showing the extent of the Caltite concrete on the drawings, additional wording is included as follows:

"… concrete to incorporate Cementaid Everdure Caltite and a high-range water reducing superplasticiser dosed in accordance with the manufacturers' detailed specifications. The concrete shall have a corrected 30 minute water absorption of not greater than 1% as measured in accordance with BS 1881 part 122, except that the age at test shall be 7 days (note that oven drying starts 4 days before test), and shall have an absorption value of less than 25% of control when tested in accordance with EN480:5, tested for 28 days after 90 days curing. Construction joints and service penetrations in Caltite System concrete to be in compliance with, and sealed in accordance with, Cementaid requirements. For further information or advice, contact Cementaid on (UK) 01293 653900 or (Ireland) 01 676 0134."

In the tender documents, we would suggest the use of Everdure Caltite is specified to include the design intent of the specification as follows:

"Structural concrete which is required to be waterproofed to prevent the transmission of water, moisture and dampness through the concrete and to protect the steel reinforcement from corrosion shall, where specified, incorporate Everdure Caltite and a high-range water reducing superplasticiser (EN 934-2:2009 tables 3.1 and 3.2) dosed in accordance with the manufacturers' detailed specifications. The concrete shall have a corrected 30 minute water absorption of not greater than 1% as measured in accordance with BS 1881: part 122: 2011, except that the age at test shall be 7 days (note that oven drying starts 4 days before test), and shall have an absorption value of less than 25% of control when tested in accordance with EN480:5, tested for 28 days after 90 days curing.

Any proposed alternative must conform to the water absorption requirement above and meet the following criteria:

1. *The waterproofing admixture must be shown by by an independent authority to have had no reduction in performance after field exposure to hydrostatic pressure for a minimum of 15 years*
2. *Must not contain any chlorides or any other substances which may be detrimental to the long term performance of the concrete*
3. *As a minimum, the manufacturer must supply a 12 year water-proofing guarantee for the concrete structure containing the additive, inclusive of construction joints*
4. *Must be CE marked in compliance with EN934 part 2 as a water resisting admixture.*
5. *The expected or proven efficacy of the waterproofing admixture for at least 60 years without deterioration, is confirmed in writing by an EOTA approved organisation such as the British Board of Agrément.*

The following Cementaid specifications are appended:

- *Specification for construction joints and service penetrations*
- *Specification for sealing tie-bolt holes"*

The above specification, together with details relating to construction joints, tiebolt sealing and service penetrations, is available free of charge in various word-processing formats or PDF and in NBS format for inclusion in the appropriate section of the specification.

For further details, please call Cementaid on:

UK: 01293 653 900
Ireland: 01676 0134
If dialling from overseas: 44 1293 653900

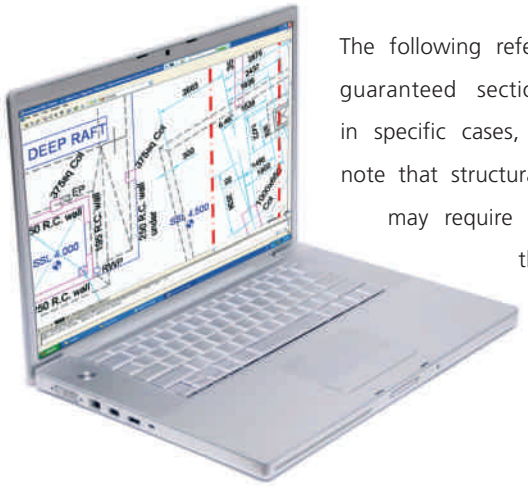
Design considerations when specifying Everdure Caltite

Everdure Caltite does not make poor concrete good; it makes good concrete waterproof and corrosion resistant. Furthermore, there are certain design considerations which need to be incorporated to ensure that the design is sympathetic to the use of Everdure Caltite System concrete.

Section Thickness

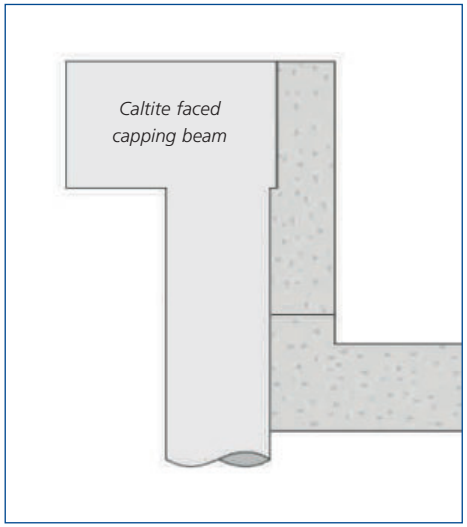
The minimum section thickness we will guarantee is 200mm. Where anchors or fixings penetrate the concrete, the minimum thickness of undisturbed Caltite System concrete we will guarantee is 150mm.

In terms of the water vapour resistance requirements for habitable Grade 3 basements in BS 8102 and the British Board of Agrément certificate for Everdure Caltite, the BBA have carried out tests which confirm that Everdure Caltite concrete conforming to Cementaid's specification meets this requirement.



The following refer to minimum guaranteed section thicknesses in specific cases, though please note that structural requirements may require greater section thicknesses.

- **Walls (against sheet piles or bored concrete piles)** - minimum section thickness of Caltite concrete guaranteed by Cementaid is 200mm. *Note: Where possible, we recommend that pile capping beams are 'faced' with Caltite concrete as part of the lining wall (see below). This avoids a potentially difficult construction joint seal to the underside of the pile capping beam. Where this cannot be achieved for structural reasons, please consult Cementaid for an approved alternative method.*



- **Composite monolithic slab** - where a layer of Caltite System concrete is cast on top of underlying superplasticised ordinary concrete whilst the ordinary concrete remains workable (plastic). Minimum section thickness of Caltite concrete guaranteed by Cementaid is 250mm

- **Composite layer slab** - where the underlying layer has been cast separately and allowed to harden. Minimum section thickness of Caltite concrete guaranteed by Cementaid is 200mm. Note, there should be a minimum period of seven days between casting the separate layers.

Condensation

Caltite concrete should be treated like ordinary good quality concrete when considering the risk of condensation and, as with all basement construction, expert advice on avoiding condensation should be sought as appropriate.

Design considerations when specifying Everdure Caltite (CONTINUED)

Reinforcement

In addition to the requirements of EN 1992-1 (Eurocode 2) (formerly covered under BS 8110-1:1997) for reinforced concrete design, the following issues must also be considered during the design stages:

1 All design calculations should be in accordance with current codes of practice and standards.

2 For deep and large sections, heat generated due to cement hydration must be considered to control early age thermal cracking.

3 Where different section thicknesses of concrete are to be poured monolithically, additional reinforcement at the intersection should be considered to minimise the risk of cracking due to differing heats of hydration.

Construction and movement joints

Construction or day joints shall conform to the details supplied by Cementaid. Movement or isolation joints are permitted but their performance is not guaranteed by Cementaid unless the proposed joint construction details are agreed by Cementaid in writing and these are acceptable to the structural engineer.

The design of these joints must allow for concrete movement, during and after construction, due to temperature changes, drying shrinkage and differential settlement of foundations if any.

Anti-crack corner bars

Where internal angles occur in the concrete, four bars of at least 10mm diameter and at least 800mm in length (or as long as practicable given the circumstances) must be placed across the angle at 45°. Two bars attached to the underside of the top reinforcement and two attached to the top face of the bottom reinforcement. The nearest bar to the 'corner' to be about 50mm out from the corner and the next 'corner' bar about 200mm away from this first bar.

Note – This includes the corner angles where the concrete is placed around columns penetrating through a slab.

Roof decks and podium level slabs only

Due to the risks of differential movement between these building elements and those to which they are attached caused by temperature changes and weather conditions, both in service and during construction, the Cementaid warranty will only apply where Cementaid has been given all necessary information to assess the risks and such comments made by Cementaid have been incorporated into the design. To reduce the risk of cracking in these elements we recommend consideration of the following:

1 The effects of expansion and contraction due to thermal changes must be considered in the design which must also take into account exposure of such sections **during the construction phase.** Appropriate measures should be incorporated to reduce stresses caused by end and edge restraint in the reinforced concrete due to such movement to achieve, as far as is possible, a crack-free structure (for example, see guidance from IStructE manual for the design of reinforced concrete structures).

2 In general, it is always advisable to use smaller diameter bars with reduced spacing.

3 Due allowance should be made for movement due to elastic deformation or settlement. See 'Construction and movement joints'.

4 The aspect ratio of pours should be kept as close to 1:1 as possible and the m^2 area of any single pour should be limited.

5 Premature removal of falsework must be prevented and back-propping specified where necessary to cater for use of the roof by the contractor during further construction works.

6 Design of steel reinforcement should be calculated to limit the crack width of the concrete to a maximum of 0.2mm without the addition of Everdure Caltite or any other admixtures.

Construction joints

Introduction

No water or moisture will penetrate through properly placed and compacted EVERDURE CALTITE SYSTEM concrete. Therefore, only joints or holes through EVERDURE CALTITE SYSTEM structures need to be sealed. The materials described are available from Cementaid. The following construction joint and penetration details form part of the EVERDURE CALTITE SYSTEM. Their performance is guaranteed in Caltite structures where, as part of the system, the works are attended by Cementaid site personnel.

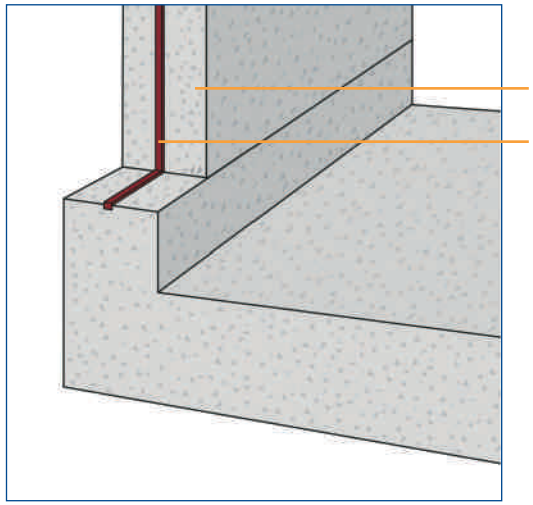
Specification

All construction joints in or through Cementaid EVERDURE CALTITE SYSTEM concrete are to be constructed in accordance with details supplied by Cementaid. Joints must not be scabbled. Unless agreed otherwise in writing*:

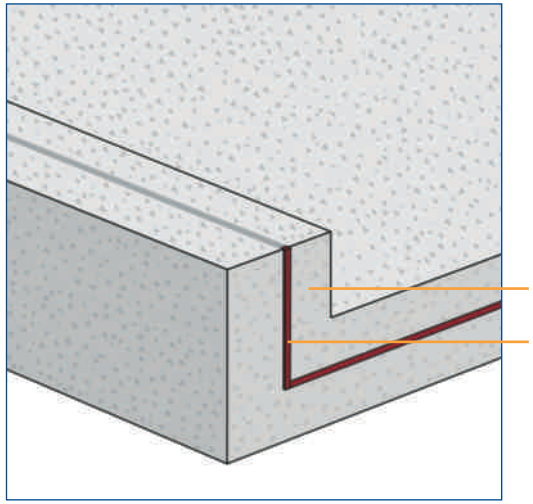
- Everdure joint-strip shall be placed and secured in a pre-formed rebate (approximately 10mm deep x 25mm wide) in the centre of all day joints.
- All day joints are to be prepared by application of a surface retarder which shall be jet-washed to fully remove retarded cement paste 12 to 24 hours after casting.
- Prior to gluing the joint-strip into a pre-formed rebate, the joint surface must be brushed or blown clean of all loose material and debris.
- After gunning a continuous bead of adhesive along the bottom of the formed rebate, push the Everdure joint-strip firmly onto the adhesive, **removing** paper backing as the joint-strip is placed.

  NB: The joint strip size is 20mm x 25mm. It is the shorter 20mm side that is pushed onto the glue. Once placed, the joint-strip should stand proud of the concrete by about 15mm.
- Prior to placing the concrete, the joint-strip must be protected from water to prevent it from swelling. ***If the joint-strip swells prior to concrete being placed, it will have to be taken out and replaced.***
- For continuity of the joint-strip from one pour to the next, the previous pour's joint-strip must be located and butt-jointed. New concrete is to be placed directly against joint and properly compacted.

** Alternative approved jointing systems may be appropriate for kickerless slab to wall joints, for horizontal joints in roof decks and in joints under capping beams. Details are available from Cementaid.*



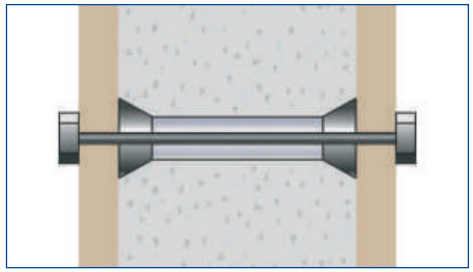
Wall and kicker joint - typical detail



Horizontal slab with kicker joint

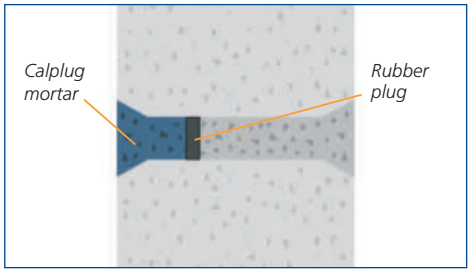
Systems for sealing tie-bolt holes

Procedure for filling tie-bolt holes

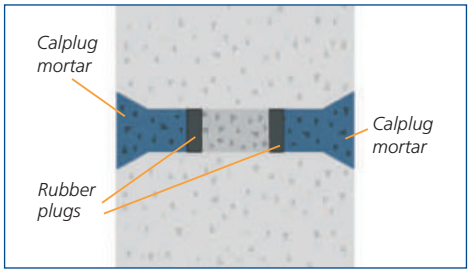


1 Tie bolt through formwork placed in a plastic sleeve with a cone attached at each end.

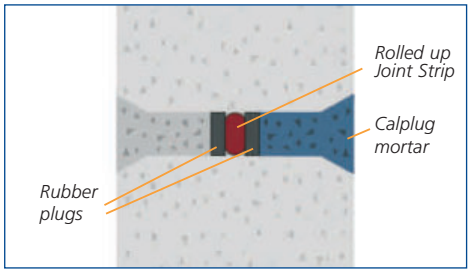
2 Formwork removed leaving hole through Caltite wall with plastic sleeve still in place. Remove cone from each end of plastic sleeve and clean hole of any dirt or debris.



3 External side of wall (If not accessible, see 5 below): A rubber plug of the appropriate size should be inserted to a depth of 75mm into the end of the plastic sleeve from the external face. The concrete surface where the cone was should be wetted and, whilst damp, the hole should be filled and made good using Calplug Mortar ensuring full compaction with timber drift and neatly finished.



4 Internal face of wall: a rubber plug of the correct size should be inserted into the plastic sleeve to a depth of 75mm. The concrete surface where the cone was should be wetted and, whilst damp, the hole should be filled and made good using Calplug Mortar ensuring full compaction with timber drift and neatly finished.



5 If access to the external face is not possible, a rubber bolt-hole plug of the correct size should be inserted into the centre of the plastic sleeve. A small piece of Everdure Joint-strip should be rolled into a ball and pushed in against the plug. A second plug should then be inserted and pushed against the Joint-strip. The concrete surface where the cone was should be wetted and, whilst damp, the hole should be rendered up and made good using Calplug Mortar ensuring full compaction with timber drift and neatly finished.

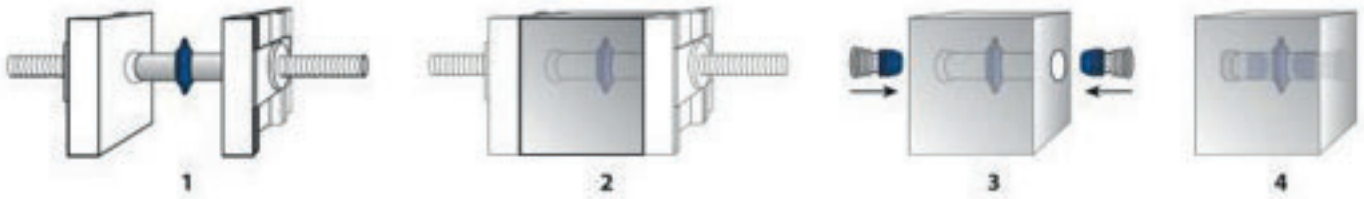
As an alternative, when double-sided shutters are used, the Cementaid CalSealed tie-bolt sealing system may be used as described on the following page

Tie-bolt hole sealing system

1. The CalSealed waterproofing system for tie-bolt hole sealing consists of three components as follows:
a water-reactive 'Collar' which goes around the tie-bolt tube; a 'Plug' with a water-reactive section,inserted into each end of the tie-bolt tube and Calplug waterproof mortar for infilling the rebate.

2. Installation instruction:

2.1 Overview



2.2 Place 'Collar' centrally around the pre-cut tie-bolt tube and install the tube.

2.3 Insertion of plugs. Following placement of the concrete and subsequent striking of the formwork, remove the plastic cone from each end of the tie-bolt tube, remove any residue of concrete that may have entered the tube and then insert 'Plugs' into the holes and tap into place with a hammer.

2.4 Finally, the section where the Dividag cone has been removed needs to be neatly filled to profile with Calplug Mortar.

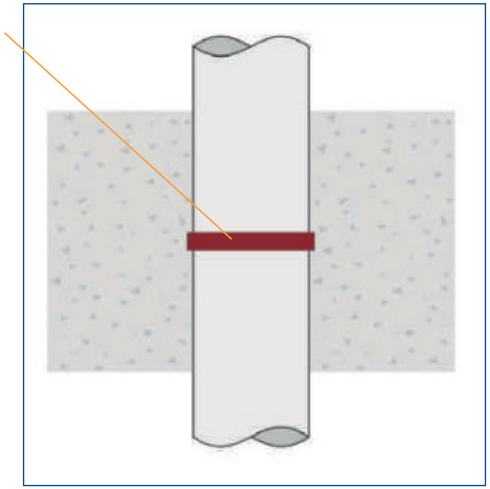
3. The tube 'Collars' are supplied in bags of 50 and the 'Plugs' in bags of 100 to fit tube sizes of 22mm or 26mm.

Penetrations

Penetrations cast in place (wall or slab)

- Services may be simply cast in place with a single strip of joint-strip wrapped around penetration and secured with tie wire. Caltite System concrete is then cast around the service pipe and thoroughly compacted. Care should be exercised to avoid dropping concrete directly on top of a pipe penetration which could potentially dislodge the Jointstrip.

Everdure Jointstrip wrapped around penetration and tied in place with wire



Service penetrations through pre-formed openings

All penetrations through Caltite System concrete should be sealed using a proprietary mechanical system such as those provided by Doyma UK Limited Hawke Transit System and Max Frank Limited who provide guarantees accordingly.

The specific product to be used must be suitable for the application and must provide appropriate water vapour resistance and other properties, for example fire resistance, as specified.

Prior to commencement of the Caltite concrete works, the contractor should seek advice from the system manufacturer - please see their respective web sites at:

www.doyma.co.uk
www.hawke-hts.com
www.maxfrank.co.uk

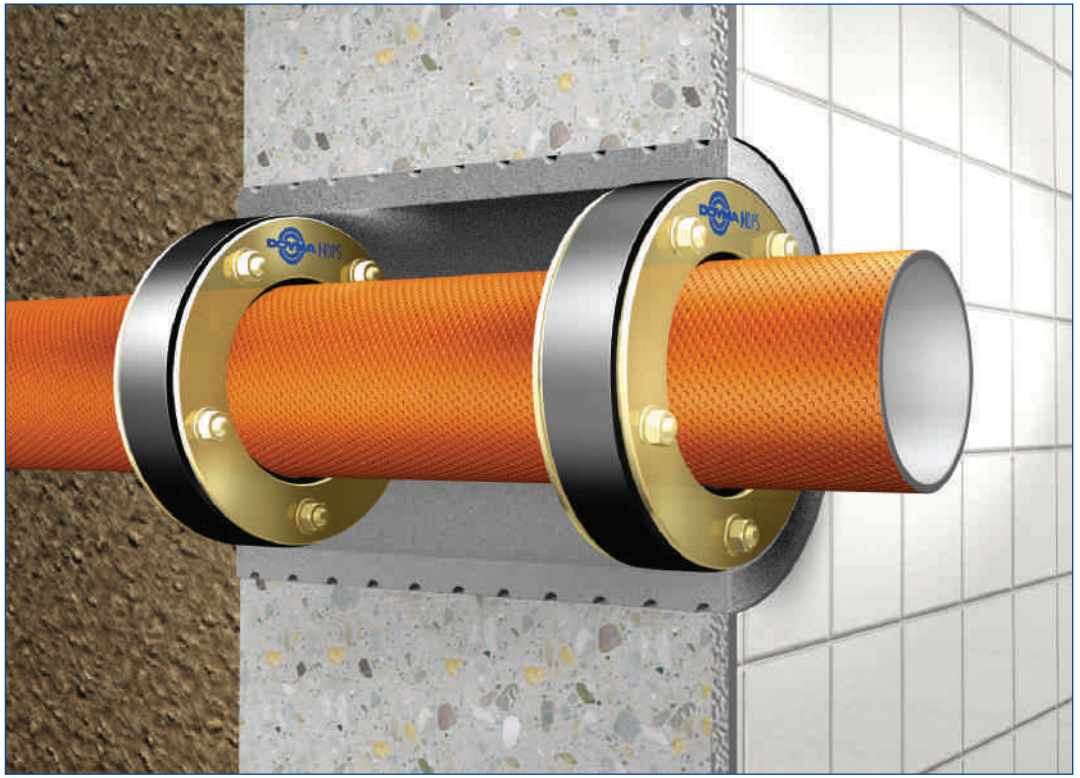


PHOTO COURTESY OF DOYMA UK LIMITED

Tests and certifications

In 1985, the Building Research Establishment carried out tests on nine integral 'waterproofing' products on behalf of the British Standards Institution with a view to producing a British Standard. Five out of the nine products were shown to have worse water absorption characteristics than the ordinary control concrete with no additive. Only one product outperformed the 'control' mix in all the tests and provided superior performance over all the others tested and is the only one still used today - EVERDURE CALTITE.

BBA

A British Board of Agrément Certificate gives an independent assessment of a construction product and the level of performance it may provide including safety, installation, durability and other essential requirements.

Stringent testing and appraisal of Caltite System Concrete and, uniquely, visual examinations of aged installations were carried out. These verified the suitability of the System to provide 'Waterproof Concrete' and significantly, that there was no reduction in its waterproofing or durability enhancing performance over a 30 year period in actual site conditions.

That was back in 1993 and since then the BBA, as the UK representative in EOTA, the body that co-ordinates the issue of European Technical Approvals across the EU, have confirmed in writing their opinion that Everdure Caltite will perform undiminished for at least 60 years.

Cementaid was awarded BBA certificate no. 93/2888 in March 1993.

BSI

BSI states that 'one of the prime objectives of ISO 9001:2000 is to achieve customer satisfaction'; a goal which has always been at the forefront of Cementaid's ethos. It requires that a Quality System is operated and supported by well defined and structured documentation so that you, as a valued client, can be assured that all manufacturing processes are stringently controlled leading to consistent high quality standards.

Cementaid operates a BSI approved quality management system which complies with the requirements of BS EN ISO 9001:2008 for the manufacture of Everdure Caltite System admixtures.

CE mark

CE marking for concrete admixtures under the Construction Products Directive became a legal requirement for trade within Europe in April 2003 following the implementation of BS EN 934-2:2001. For waterproofing/water resisting admixtures this simply means that they must comply with laid down performance criteria. Providing they do, manufacturers selling their products within the European Union must display CE marking on their products and accompanying literature. Where a New Approach Directive is in force, it is an offence to place a material on the market without CE marking. Very importantly then, the constituent materials of the Everdure Caltite System (Everdure Caltite & Superplastet) meet with EC directive 89/106/EEC which attests that all provisions concerning factory production control and procedures described in European Standard EN 934-2 are met.

Everdure Caltite is attested by the BSI approval body as compliant with BS EN 934-2 (table 9, water resisting admixtures) and all containers are CE marked accordingly.

Cementaid was awarded Certificate no 0086-CPD-470878 in December 2002.

What the industry says

On chemical attack

"Our EVERDURE CALTITE Joint-free acid proof floor is now 19 years old in constant use which compares extremely well with the life of our ordinary earliest floors *(conventional concrete floors lasted 6 months in this harsh environment)*."

Hardman Hydrochloric Acid Plant, Australia

"I can advise that your EVERDURE CALTITE SYSTEM concrete is still in a satisfactory condition. Surrounding bases cast using a grade 30N/mm^2 concrete with SRC are now showing extreme degradation due to continuous acid attack."

Coal Products Limited, UK

"We are pleased we used your CALTITE and other additives for these (fertiliser) floors and we must compliment you on a product that more than lives up to your specification."

Gudgeon, Mott, Hay, Anderson, Singapore

"The CALTITE specimen exhibited significantly less acid attack in terms of both depth of attack and area of deterioration."

Sandberg, UK

On water penetration

"The water repellency of CALTITE concrete was found to be unaffected by tidal immersion over a period of up to 17 years."

Taywood, UK

"This mix (containing EVERDURE CALTITE) is thus recommended to make concrete 'water-tight'. "

National University of Singapore

"The mix containing EVERDURE CALTITE admixture showed a marked improvement in the ability of concrete to endure severe environments."

(University of Toronto)

"Amongst the three modified concretes covered in this paper, CALTITE concrete was observed to be the most efficient in reducing the water permeability."

Queen's University, Belfast

"The 30 minute absorption (BS 1881 pt 122) figures for series 3 tests range between 0.33% and 0.41% (representing a five fold reduction compared to control mixes) and complies with ÖNorm B4710-1 (EN 206-1) RRS rating (which designates concrete with greatly reduced shrinkage)."

Innsbruck University – Dept Concrete Technology

On chloride penetration

"(EVERDURE CALTITE) can be of enormous benefit in sustaining and prolonging the life of a concrete structure."

Engineering and Water Supply Department, Australia

"Recent inspection shows the CALTITE concrete to be still quite sound, whereas the normal concrete shows severe aggregate exposure and areas of cracking due to steel corrosion."

City of Glenelg, Australia

"Cores taken from CALTITE concrete exposed to tidal immersion for up to 17 years showed no signs of corrosion of the embedded reinforcing bar and little surface erosion of the cement matrix."

Taywood, UK

"The EVERDURE CALTITE mix meets the performance expectations of a latex modified concrete with regard to chloride penetration."

TROW, Canada

"Intrusion of chlorides by diffusion of seawater transport is diminished by the use of CALTITE."

Institute TNO, Netherlands

On other properties

"We have carried out exhaustive laboratory tests on concrete containing CALTITE and have found it to have no detrimental effects on strength development."

Ready Mixed Concrete, Hong Kong

"The expansion of the prisms of CALTITE concrete under freeze-thaw conditions was considerably lower than that of the control at all times during the 50 cycle test; the visible spalling was also considerably less and occurred later than on the specimen of control concrete."

Sandberg, UK

"Petrographic analysis of concrete containing a known reactive aggregate showed no reaction in concrete containing the EVERDURE CALTITE System when subject to wetting and drying cycling." [1]

"The System has no detrimental effects on the properties of the cured concrete." [1]

"Significantly greater resistance to carbonation." [1]

"Site observations and other data show that the properties of concrete containing EVERDURE CALTITE have been maintained for up to 30 years." [1]

[1] *British Board of Agrément*

"a big thank you to you and your staff for all the help given to us during the construction of ……. Your staff were at all times very helpful and easy to work with. Many thanks."

N F Bourke Construction – Nov 2005

"Re: Cementaid Caltite. We have successfully used Caltite Concrete on a number of projects over the past 4 years. We completed our first Caltite Concrete r.c. structure early in 1997 during particularly difficult weather conditions. We have utilised the product on 5 contracts since that time. In each case, it has proved to be successful."

Stradform Chartered Building Company – March 2000

"Re: Everdure Caltite. I confirm that Waterman Partnership have now specified Everdure Caltite within concrete for use as the prime waterproofing to basement construction on a number of projects. These projects have now been completed and occupied and all areas where Caltite was used are performing as required with no reported water ingress or dampness and Watermans continue to specify this additive as appropriate."

Waterman Partnership – August 1999

University research

University of Surrey

A time-to-corrosion study was conducted in the Department of Civil Engineering on concretes with and without EVERDURE CALTITE. The specimens were cast with reinforcing bars at 10mm, 25mm and 40mm covers and cured for seven days. These were subjected to one week ponding in a 5% sodium chloride solution followed by one week drying, before re-ponding and so on for 17 cycles. Potentials were measured with a 'Saturated Calomel Electrode' (SCE). Reinforcement at 10mm and 25mm covers in the Control were depassivated after 8 and 14 cycles respectively. The reinforcement in the EVERDURE CALTITE specimen, on the other hand, remained passive throughout the test. This indicating that chlorides had not been able to penetrate the cover thickness during the test period.

University of Liverpool

A storage barn for road de-icing salt near Nottingham, U.K., was constructed using pre-stressed concrete panels incorporating EVERDURE CALTITE. The University of Liverpool is monitoring the concrete's performance. Strengths of over 80 N/mm^2 were achieved at 28 days (comparable to normal concrete produced by the supplier). However, EVERDURE CALTITE (HPI) was far less permeable to both air and water and had a higher electrical resistivity.

Queen's University

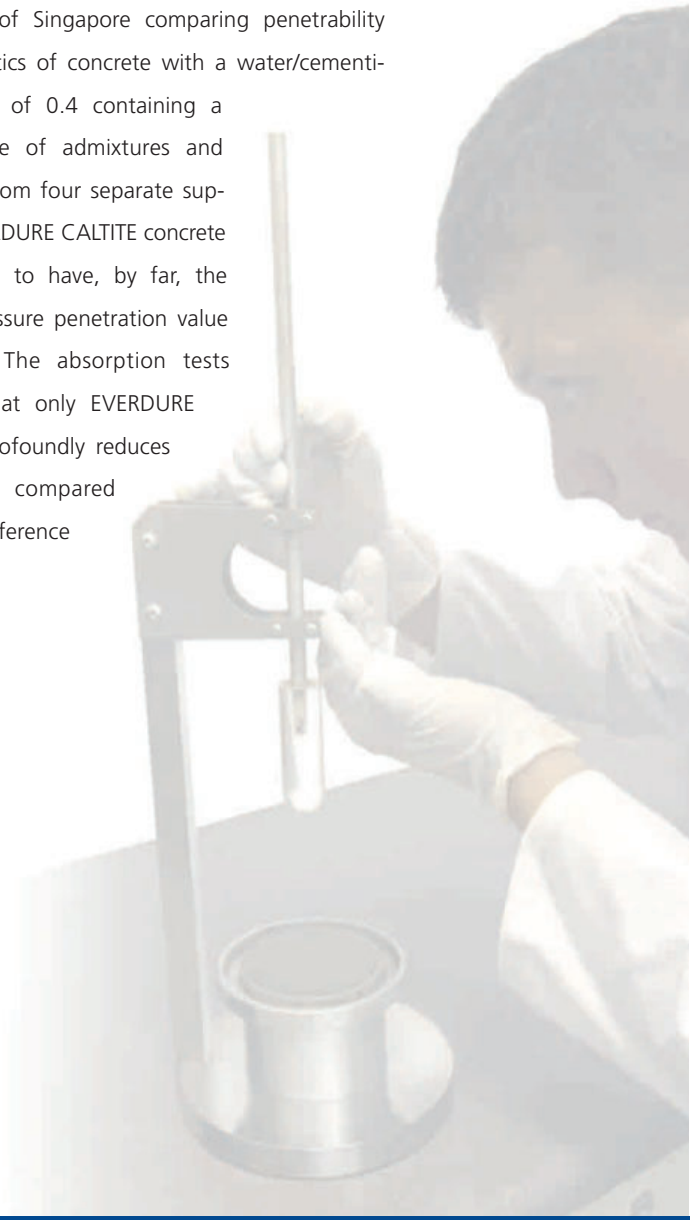
Queen's University Belfast examined concretes modified with 10% and 20% silica fume and EVERDURE CALTITE using various in-situ test procedures. EVERDURE CALTITE was found to be more effective in reducing surface abrasion and permeability than silica fume, the latter by a factor of ten compared with the control. EVERDURE CALTITE gave comparable compressive strength to the control while somewhat improving tensile strength.

University of Dundee (Division of Civil Engineering)

Concrete Structures with Everdure Caltite admixture out-perform those with ordinary Portland cement concrete by all available means… Corrosion initiation does not occur in Caltite System Concrete until after about 26 years compared with just 6 months for those with ordinary concrete (representing a 52 x improvement in corrosion resistance)… Corrosion in concrete structures with the Everdure Caltite admixture only reduces the load carrying capacity of the structures by 2% after 50 years exposure… The laboratory tests carried out clearly indicate that Everdure Caltite will greatly increase the service life of concrete structures in marine and other areas which are subject to reinforcement corrosion due to the presence of chlorides.

National University of Singapore

Experiments were conducted at the National University of Singapore comparing penetrability characteristics of concrete with a water/cementitious ratio of 0.4 containing a wide range of admixtures and additives from four separate suppliers. EVERDURE CALTITE concrete was found to have, by far, the lowest pressure penetration value obtained. The absorption tests showed that only EVERDURE CALTITE profoundly reduces absorption compared with the reference concretes.



Properties of Everdure Caltite

Compressive strength

Independent studies confirm that EVERDURE CALTITE has no detrimental effect on compressive strength. The Technical Manager of Ready Mixed Concrete wrote that "both as a result of laboratory tests and extensive work tests, this company is satisfied that when EVERDURE CALTITE is used in our concrete, its properties in terms of denseness and compressive strength are enhanced."

Tensile strength

EVERDURE CALTITE SYSTEM enhances tensile strength when compared with reference concretes. Queen's University found that while compressive strength was comparable with the control, the EVERDURE CALTITE concrete had a 23% higher pull-off tensile strength. Unisearch found EVERDURE CALTITE concrete to have an 8% increase in tensile strength relative to the control. Sandberg reports (2007) show that direct tensile strength at 3 days is double that of a control mix without Caltite which will provide greatly enhanced resistance to cracking during the early curing stages when concrete is most vulnerable.

Shrinkage

EVERDURE CALTITE significantly reduces the drying shrinkage of concrete by as much as 50%. This appears to be due to both reduced heat of hydration and the change in surface tension within the cement paste.

Absorption

Absorption is the major component contributing to water and moisture movement when there is a humidity differential across a concrete section such as in basements, tunnels, pools and roofs. Independent comparative studies of products have shown EVERDURE CALTITE to be superior to all other waterproofers, pozzolanic materials, etc. Compliance testing of EVERDURE CALTITE concretes confirms that the absorption is consistently less than 1.0% in typical field concretes compared to 4-6% (by weight) for ordinary concrete (BS 1881-122).

Permeability

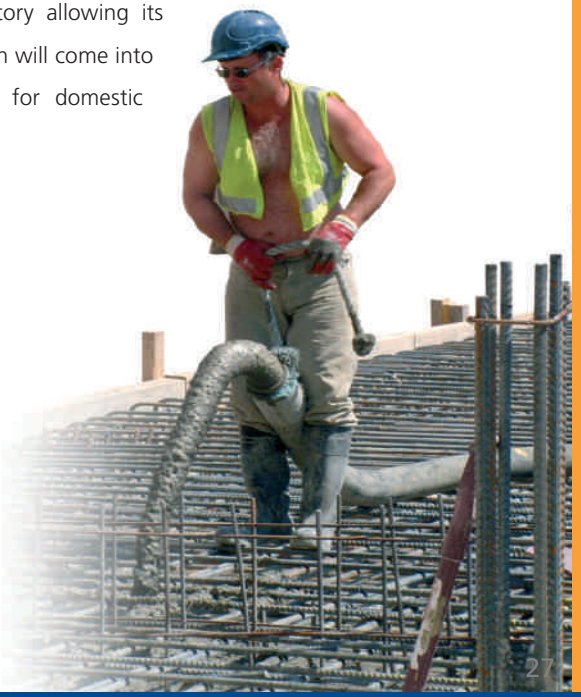
EVERDURE CALTITE has been found to reduce permeability by a factor of ten compared with an unmodified concrete. Queen's University, Belfast, conducted tests on concretes with water/cementitious ratios of 0.4 and 0.7. Concretes containing no additive, silica fume at 10% and 20% replacement and EVERDURE CALTITE were compared. The results showed that EVERDURE CALTITE gave a full ten fold reduction in permeability for both concrete qualities. The EVERDURE CALTITE concrete had significantly lower permeability than the silica fume concretes at the lower water/cementitious ratio.

Water vapour transmission

Imperial College London conducted tests on water vapour transmission with liquid water on one face and 0% relative humidity on the other. Water vapour transmission resistance was 100.5 MN.s/g for 50mm thick section equivalent to 603 MN.s/g for a 30Omm section, comparing favourably with quality membrane products.

Water quality

The EVERDURE CALTITE System has been tested according to BS 6920:2000 to determine its effect on water quality. As a result, EVERDURE CALTITE is approved by WRAS and listed in the Water Fittings and Materials Directory allowing its use in concrete which will come into contact with water for domestic purposes.



Everdure Caltite - a global presence

The Cementaid Group has offices in Europe, North America, the Middle East, the Far East and Australasia - a global company offering local solutions.

Cementaid is a truly global organisation well placed to advise on virtually any construction project, anywhere in the world requiring truly damp-proof and corrosion resistant concrete.

Whatever challenges your project may present, whether geographical or environmental, Cementaid will almost certainly have the expertise and experience to overcome them and offer you solutions relevant to specific local conditions.

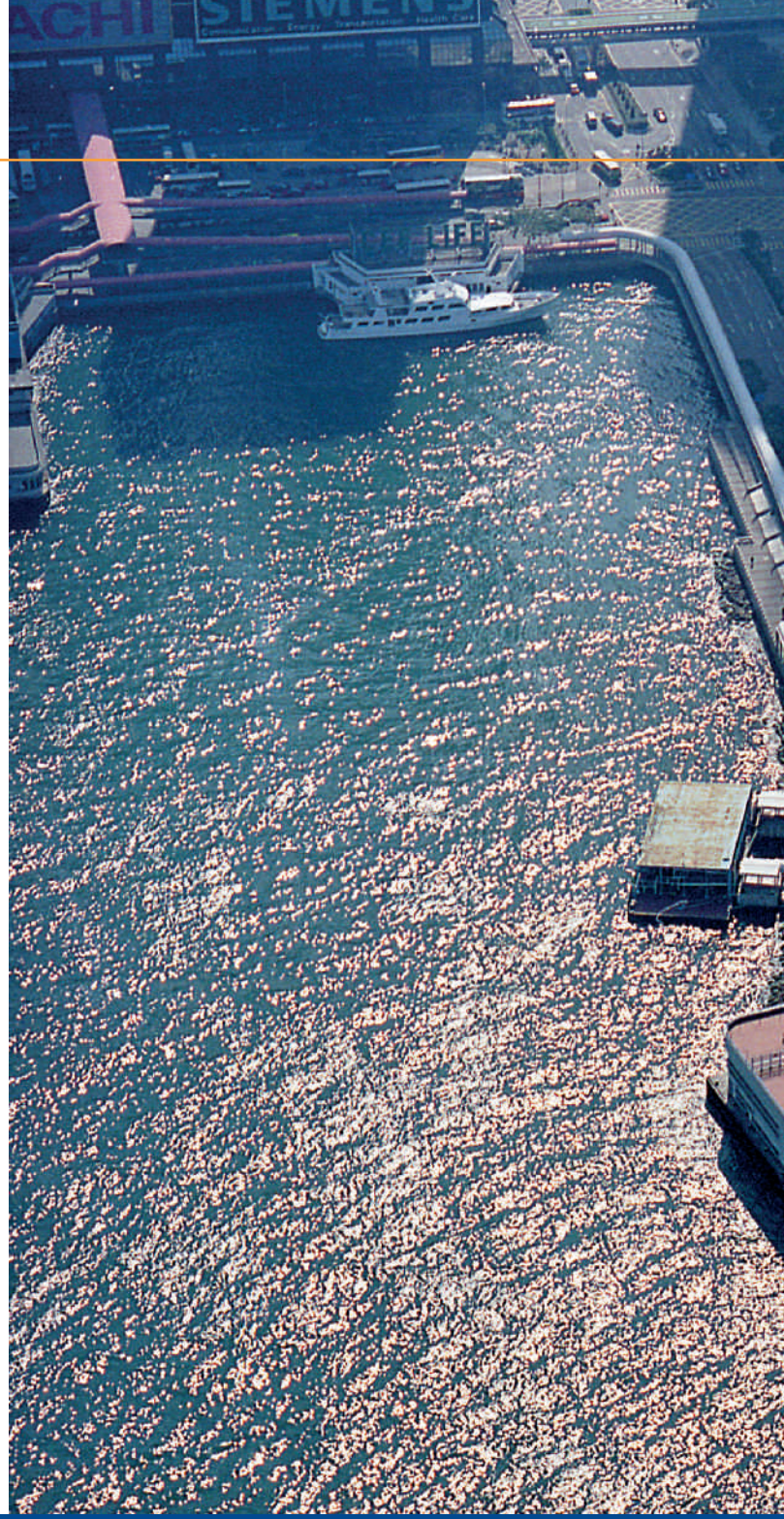
The unique properties of EVERDURE CALTITE enable durable concrete structures to be built in a diverse range of aggressive environments.

In the deserts and coastal regions of the Middle East, Far East and Australia, extremely high temperatures coupled with high levels of naturally occurring chloride and sulfate salts causes rapid deterioration of ordinary reinforced concrete structures.

In Canada, even as far south as Toronto, temperatures can drop below -30°C, causing freeze-thaw durability problems in addition to the damage caused by the high use of de-icing salt which results in chloride induced corrosion of the reinforcement.

The EVERDURE CALTITE SYSTEM is equally able to protect structures at both these extremes.

Wherever you are in the world, whatever the conditions, you can RELY on Everdure Caltite.



HONG KONG CONVENTION & EXHIBITION CENTRE
The extension to the Hong Kong Convention and Exhibition Centre (right) was constructed on a reclaimed 6.5 ha island site. Remarkably, the project took only 48 months from reclamation to completion, due in no small part to the time savings offered by the use of 17,091.5 m^3 of Everdure Caltite System concrete to waterproof the basement up to sea-level.

Architectural Consultants and Consulting Engineers:
Wong & Ouyang - Architects and Engineers (HK) Ltd

Architectural Design:
Skidmore, Owings and Merrill

Contractor:
Hip Hing-DTP JV with Dragages et Travaux Publiques

Where Caltite is used

LOMOND HOUSE
GEORGE SQUARE
GLASGOW, 1996
Architect:
Glass Murray Architects
Structural engineer:
Crouch Hogg Waterman

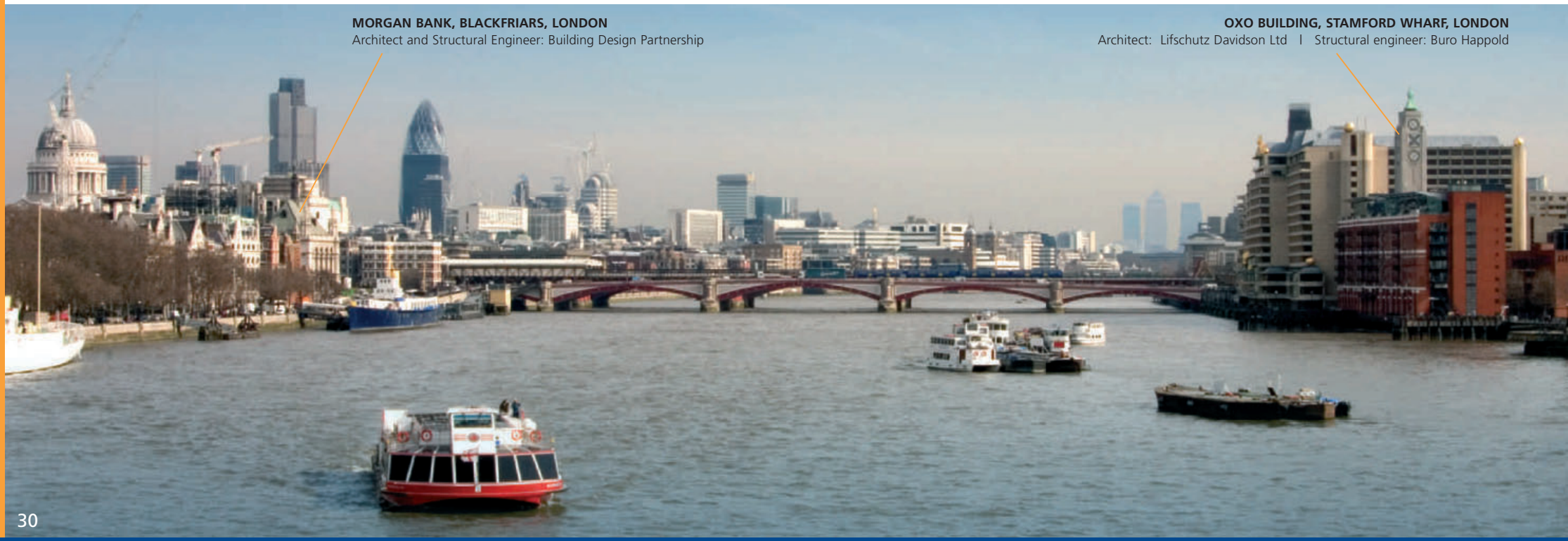
1 GEORGE SQUARE, 2009
Architect:
Cooper Cromar
Structural engineer:
Woolgar Hunter
Main contractor:
McLaughlin & Harvey
Concrete contractor
Dunne Group

Basements

Arndale Shopping Centre, Wandsworth, London
Astra Zeneca, Luton
British Museum
BskyB, Chilworth
Civil Justice Centre, Manchester
Debenhams, Guildford
Dundalk Town Hall, Dundalk
Eden Quay, Dublin
Gatwick Airport, Pier 6
Gun Wharf, Portsmouth
House of Fraser, Croydon
HSBC, Faversham, Kent
Marks & Spencer, Drake Circus, Plymouth and 17 other M&S stores
MBNA, Chester
Royal Botanic Gardens, Wakehurst Place, Ardingly
Southern General Hospital, Glasgow
Tesco Clapham and 26 other Tesco stores
Tittenhurst Manor, Wentworth
The Villiers, Isle of Man
Wales Millennium Centre, Cardiff
Waterfront Plaza, Belfast
W London-Leicester Square Hotel
Woolwich Crown Court, Woolwich

MORGAN BANK, BLACKFRIARS, LONDON
Architect and Structural Engineer: Building Design Partnership

OXO BUILDING, STAMFORD WHARF, LONDON
Architect: Lifschutz Davidson Ltd | Structural engineer: Buro Happold



Where Caltite is used (CONTINUED)

OVERGATE, DUNDEE
Architect: Keppie Design Ltd
Structural Engineer: WA Fairhurst & Partners

WELSH ASSEMBLY BUILDING, CARDIFF
Architect: Richard Rogers | Structural Engineer: Ove Arup

ROYAL IRISH YACHT CLUB, DUN LAOGHAIRE
Architect: Design Strategies | Structural engineer: O'Connor Sutton Cronin

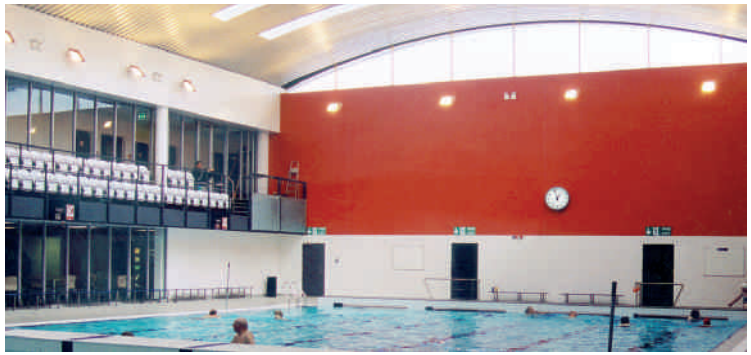
CAERNARFON MULTI-STOREY CAR PARK
Structural Engineer: Adams Consulting Engineers

Roofs

Coin Street, London
Glaxo, Greenford, Middlesex
Oxford Science Park, Cowley, Oxford
Sainbury, Gillingham Street, London
St Lawrence Centre, Drogheda
Stonegate Walk, York
The Pavilion, Dun Laoghaire

Pools/tanks

Cheltenham General Hospital
De Montfort University, Leicester
Dunnes Store, Coleraine
East Sussex National Golf Course
Great Ormond Street Hospital
Heathrow Airport, Terminal 5
Hotel de France, Jersey
London Irish RUFC, Sunbury
Mandarin Oriental Hotel, Knightsbridge
National Maritime College, Cork
Sportlink, Santry, Dublin
Tate & Lyle, Canary Wharf, London



GALPHARM STADIUM, HUDDERSFIELD
Architect: Lobb Partnership | Structural Engineer: Modus

Where Caltite is used (CONTINUED)

LYCEUM THEATRE, STRAND, LONDON
Architect: Holohan Gar & Associates
Structural engineer: Thorburn Colquhoun

BRITISH MUSEUM, LONDON
Architect: Foster & Partners | Structural Engineer: Buro Happold

ROYAL MUSEUM OF SCOTLAND, EDINBURGH
Architect: Benson & Forsyth
Structural Engineer: YRM

Theatres, museums and libraries

Brighton Library
Boscombe Library
Bournemouth Arts Institute
Brentford Musical Museum
Cork County Library, Cork
Grand Opera House, Belfast
Greenwich Maritime Museum
Glyndebourne Opera House
Leicester Theatre complex, Leicester
National Gallery, Dublin
New Forest Museum, Lyndhurst
Plymouth University library
Royal Court Theatre, London
Royal & Derngate Theatre, Northampton
Royal Festival Hall, London
Sadlers Wells Theatre, London
Scarborough Museum
St Luke's Library, London EC1
Tennis Museum, Turnstile Building, Wimbledon
Unicorn Children's Theatre, London
Waterworks Museum, Hereford
Westminster Theatre, London

Where Caltite is used (CONTINUED)

BRITANNIC ASSURANCE, WYTHALL GREEN
Architect: T P Bennett | Consulting Engineer: White Young Green

ATLANTIC HOUSE
HOLBORN VIADUCT
LONDON
Architect: Rolfe Judd
Structural Engineer: WSP

WATLING HOUSE
CANNON STREET
LONDON
Architect: Arup Associates
Structural Engineer: Ove Arup

Office buildings

Corn Exchange, Mark Lane, London, EC3
Cunard House, London
158-176 Great Portland Street, London, W1
DSS Longbenton, Newcastle
DSS Waterview Park, Newcastle
Lloyds Registry of Shipping, London
Palestra, London SE1
235 Regent Street, London
The Point, Paddington Basin, London

PATERNOSTER SQUARE
LONDON
Architects: Allies & Morrison, MJP, Rolfe Judd, Sheppard Robson
Structural Engineer: Waterman Partnership

Where Caltite is used (CONTINUED)

Industrial

Airbus Industries, Cheshire
Honda Factory, Swindon
Miswa Chemicals, Northampton
Motorola, Bathgate
Poolbeg Power station, Edenderry
Powell Dufferin, Purfleet
Ringsend Power Station, Dublin
Rolls Royce aero engines, Bristol and Derby
Seagate Technologies, Limavady

EDENDERRY POWER STATION, CO.OFFALY, IRELAND
Designer: IVO Energy
Structural Engineer: Project Management Limited

Hotel and catering

Bridge Restaurant, Putney, London
Bailey's Hotel, Gloucester Road, London
JD Wetherspoons, Capel Street, Dublin
Killarney Plaza Hotel, Killarney
Landmark Place, Slough
Radisson SAS Hotel, Galway

Healthcare

Institute of Cancer Research, Sutton
London School of Hygiene and Tropical Medicine
Nuffield Park Hospital, Oxford
Royal Alexander Children's Hospital, Brighton
Royal Albert and Edward Infirmary, Wigan
Royal Sussex County Hospital, Brighton
Stoke Mandeville Hospital

UNIVERSITY COLLEGE LONDON HOSPITAL
Architect: Llewellyn Davies
Structural Engineer: Clarke, Nicholls & Marcel

SÄID BUSINESS SCHOOL, OXFORD
Architect: Dixon Jones | Structural Engineer: Whitbybird

Educational

Bio-Medical Sciences building, Imperial College
Coombe Dean School, Plymouth
De La Salle College, Jersey
Freeman Centre, University of Sussex
Haberdashers Aske School, Elstree
Leicester University
Lincoln College, Oxford
Marlborough College, Marlborough
Marlborough College, Swindon
Moira House School, Eastbourne
Napier University, Edinburgh
National University of Ireland, Galway
Oratory School, Reading
Royal Grammar School, Guildford
St Anne's College, Oxford
St Hilda's College, Oxford
South Bank University, London
Surbiton High School, Surbiton
Winchester College
Yehudi Menuhin School, Stoke D'Abernon

BLUEWATER SHOPPING CENTRE
Architect: B D G McColl
Structural Engineer: Waterman

1,675 cubic metres of Caltite concrete was used in the Southern Village cinema complex, suspended ground floor slabs, stairwell and external upstand walls.

WIMBLEDON No.1 COURT
Architects and consulting engineers:
Building Design Partnership

12,500 cubic metres of Caltite concrete was used to waterproof the basement structure and tunnels.

*You can **rely** on*

CEMENTAID

the way to better concrete

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