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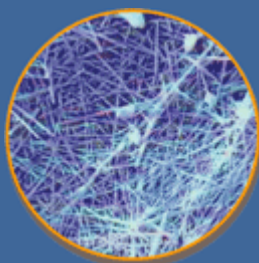
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## FAST FACTS

Penetron products  
prevent alkali silica  
reaction



## Internal Waterproofing for Concrete

Penetron® Industry Newsletter

December 2008

**We wish all our readers a merry Christmas and a successful 2009 !!**

Another exciting year is coming to a close – 2008 saw many of us crisscrossing the world tirelessly in support of the Penetron global distribution network. Some of the results of our worldwide team efforts are on display under [Penetron worldwide](#).

Alkali-Silica Reaction continues to be a headache for many of you and we thought it important to point out again how Penetron products help to eliminate ASR under [Penetron feature](#). Last but not least, we had a new champion at this years National Concrete Canoe Competition.



2010 World Cup Stadium, Cape Town, South Africa, waterproofed with Penetron Admix

## Penetron® Feature: Penetron Prevents Concrete Cancer – Alkali-Silica Reaction (ASR)

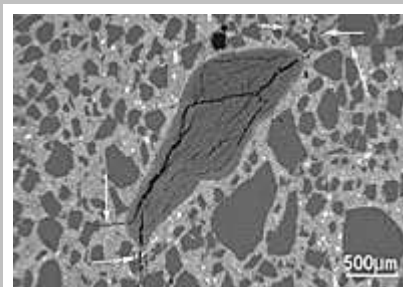
Alkali-silica reaction (ASR) can cause serious expansion and cracking in concrete, resulting in major structural problems and sometimes necessitating demolition.

ASR is caused by a reaction between the hydroxyl ions in the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate (e.g. chert, quartzite, opal, strained quartz crystals). A gel is produced, which increases in volume by taking up water and so it exerts an expansive pressure, resulting in failure of the concrete.

The conditions required for ASR to occur are:

- A sufficiently high alkali content of the cement (or alkali from other sources)
- A reactive aggregate, such as chert
- Water - ASR will not occur if there is no available water in the concrete, since alkali-silica gel formation requires water

The best way to avoid ASR is to use non-reactive aggregates, but these are not always readily available. In this case, the concrete mix designer should be made aware of the Na<sub>2</sub>O -equivalent (in %) of all products he intends to use in the concrete mix in order to ensure that Na<sub>2</sub>O equivalent value does not exceed the acceptable amount per m<sup>3</sup> (usually set around 3.5 kg / m<sup>3</sup>).



Scanning electron microscope image of chert aggregate particle with numerous internal cracks due to ASR; cracks extend into the adjacent concrete

[\(click to enlarge image\)](#)

An intricate web of insoluble crystals forms in the presence of Penetron® and H<sub>2</sub>O creating a permanent protective seal



Witness Penetron's crack sealing ability



Send to a friend or colleague.

A simpler way to reduce the risk of ASR is to incorporate a mature crystalline admixture, such as Penetron Admix, into the concrete mix. This will ensure the concrete is waterproofed in-depth and deny the ASR the necessary water for the reaction to take place. Penetron Admix has shown in a test at the MFPA-Leipzig (U 2.2/05-185) that cracks will self-heal upon when presented with water. Many other tests have proven the ability of Penetron crystals to waterproof the capillary structure inside concrete. Further, Penetron Admix is certified by the MPA-Stuttgart (90 16788/P-2008-1/BI) to correspond to DIN V 18998 and as such has no negative influence on the embedded steel. (= Ü-Sign).



Detail of aggregate showing alkali-silica gel extruded into cracks within the concrete. Ettringite is also present within some cracks

[\(click to enlarge image\)](#)



Example of ASR



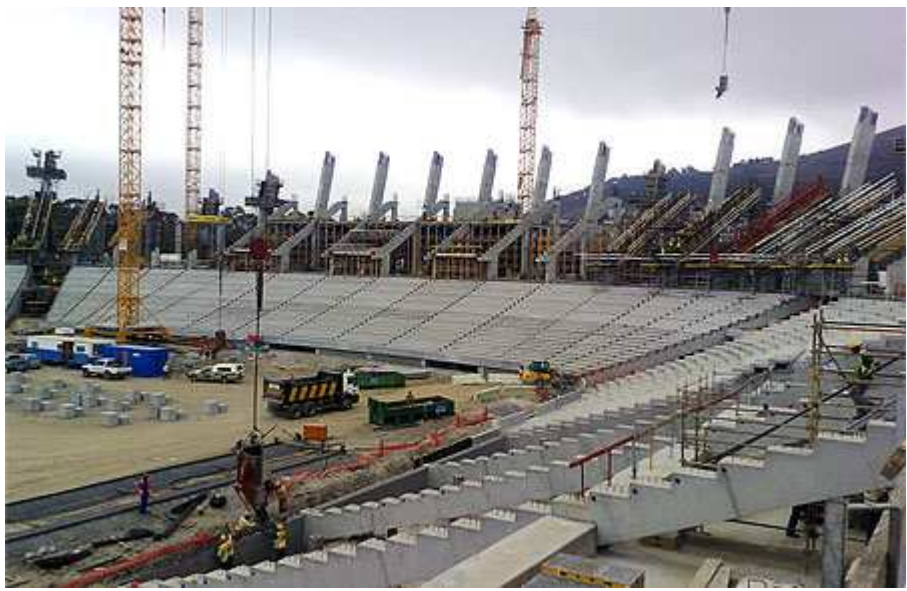
**Penetron® Worldwide: Focus on South Africa**



**South Africa - Green Point Stadium – 2010 World Cup Stadium, Cape Town**

Located in Cape Town's central Green Point district, a stone-throw away from Victoria & Alfred Waterfront, Green Point Stadium is scheduled to host five first round matches, one second round, one quarter-final and one semi-final in the 2010 Soccer World Cup in South Africa. Once the transformation is completed, Green Point Stadium – also known as the African Renaissance Stadium – will be an all-weather, multi-purpose, environmentally sustainable, modern, technologically advanced, world class stadium holding 70.000 people complying completely with FIFA™ Match Stadium requirements. This 287 million USD project was created by GMP Architects, Louis Karol Architects and Point Architects and consists of five levels and the roof, including sport team rooms, VIP reception, parking levels, media areas, FIFA™ offices, fan shops, business club, a multi-purpose hall, security and police offices, kitchens and VIP lounges.

In order to effectively protect and waterproof the concrete of the seating stands Penetron Admix was selected to treat the stitching between the precast seating. Therefore a total of 1100m<sup>3</sup> of concrete treated with Penetron Admix was poured on this project site of national importance to the country.



Green Point World Cup Stadium, Cape Town



### South Africa - The Boulevard, Cape Town

With 36.000m<sup>2</sup> of commercial space, the Boulevard enriches the Cape Town skyline with the latest triple-A grade office space on the periphery of the CBD fronting Eastern Boulevard and Searle Street in Woodstock. Designed by DHK in conjunction with Peerutin Architects this development is offering superior views for office workers in a prime location. Instead of being a monolithic block the project incorporates seven individual units all constructed on a podium under which three super basement levels will provide one of the highest parking ratios in Cape Town (with 4 bays/100m<sup>2</sup> ). Further this 75 million USD project will feature restaurants and coffee shops for the convenience of office workers.

Already on the way of becoming a major landmark at the gateway to Cape Town, 8100m<sup>3</sup> of concrete on the “The Boulevard” site are successfully protected by Penetron Admix against water ingress.



### Greece – Arahova Conference Center

Located at Parnassos Mountain, Arahova is a well known winter sports destination near the Greek capital Athens. The city council decided to build a new commercial center to accommodate the needs of the city. This project encompasses a conference center, a mini-mall and an underground parking garage for 500 vehicles. The designer chose to use Penetron Admix and Penebar instead of PVC waterproofing membranes, because of the Penetron system's cost effectiveness, reliability and simple application.



The contractors, a joint venture of Kourtidis S.A. and Gatzoulas S.A., followed the recommendations of the designer, supported by the Technical Department of Penetron Hellas for waterproofing the basement slab and walls. Penebar SW-45 Rapid was used in order to waterproof the cold joints between the basement slab and vertical concrete walls. The percentage of Penetron Admix used was 1% by cement weight. The total amount of concrete was about 4.500 m<sup>3</sup>. More than 1500 meter of Penebar SW 45 Rapid Type A was used on this project.



## Australia - Bundall Corporate Centre II

### Description:

- Development and Construction of an 8,000 sqm office building
- Client – Corporate Centre Joint Venture Pty Ltd
- Value - \$35,270,000.00;
- Completion – February 2009
- Architects – ML Design;
- Structural Engineers – Robert Bird Group;
- Builder – Hutchinson Builders



### Challenges:

- 2 levels of basement car park below the water table;
- Acidic / sulphate soil conditions
- Needed a watertight raft slab to ensure that water and chemical ingress does not corrode the steel reinforcement and cause concrete cancer;

- The use of pre-cast panels as retaining walls posed further challenges as all vertical joints between the panels also needed to be watertight;



After an extensive evaluation of various waterproofing systems and contractors, Penetron Australia was selected as the preferred contractor due to their proven track record in waterproofing below water structures. The Penetron Admix was incorporated into the concrete mix design batched by Hansons Concrete and used in the raft slab, all precast panels and on the suspended podium deck. Penebar SW45 rapid and Penebar SW55, a swellable hydrophilic waterstop also supplied by Penetron Australia was selected to waterproof all construction joints. Over 4000m<sup>3</sup> of concrete has been treated with Penetron Admix and 1200 linear metres of Penebar has been installed to construction joints.

Concrete test results taken during construction have shown that concrete dosed with Penetron Admix have a significantly higher compressive strength after 7, 14 and 28 days compared to standard concrete.



#### Penetron® news: ASCE – National Concrete Canoe Competition

ICS Penetron International Ltd. continues their involvement with the American Society of Civil Engineer's annual Concrete Canoe Competition, a challenge in which students put their expertise to the test through determination, teamwork and innovative application of engineering knowledge gained in the classroom. The NCCC incorporates various aspects of hands on learning and growth for the participating students, in addition to promoting teamwork and spirit. The entries are evaluated based on the use of creativity, innovation, technical skill and planning which is assessed through the submission of a technical design paper, oral presentation and a Q&A session led by a panel of judges comprised of industry professionals. The masterpieces birthed by countless hours of labor and love are presented through a project display as well as put to the real life test of being raced up and down the Olympic basin.



Rightfully winning this year's title, their 19.5-foot-long, 160-pound, white canoe with blue and silver stain battled relentlessly against worthy opponents from top engineering schools from across the country. An exciting turn of events as the 21<sup>st</sup> NCCC welcomes a new champion, the University of Nevada, Reno with their canoe the "Argentum."



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