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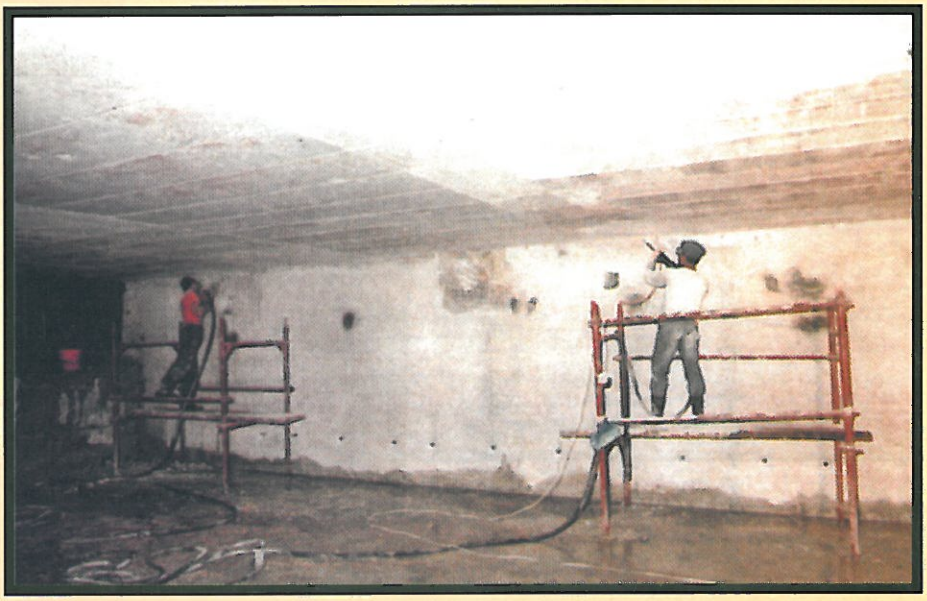
CONCRETE NEWS

ACI- Kuwait Chapter



ACI - Kuwait Chapter
Kuwait Society of Engineers - KSE
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CALENDAR OF EVENTS 1999

April	1999	Field visit - Marine Base Project
10 - 13	May 1999	CONCREX'99
11 - 13	May 1999	Technical Seminars & Demonstrations CONRCEX'99
19	October 1999	Seminar : " Coarse Aggregates in Concrete Construction "
25	October 1999	Seminar : " Galvanic Protection System "
2	November 1999	Social Event : (Dinner) at K.S.E.
22	November 1999	Seminar : " Producing Durable Concrete Structures in Kuwait "
7	December 1999	Election Day - Dinner at KSE

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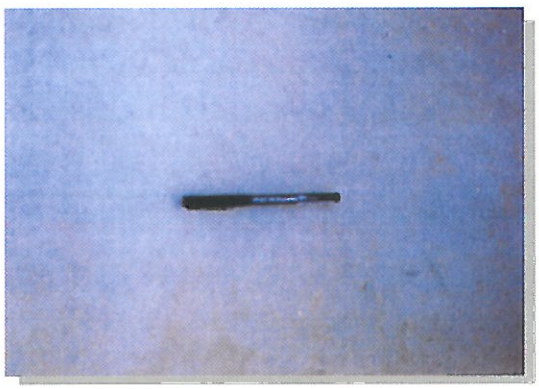
Engineering Development Company Demonstrates the use of Fibermesh in KNPC and PAHC projects .

The polypropylene concrete micro-reinforcement system of Synthetic Industries (USA) is largely used all over the world to enhance the performance of concrete and minimize shrinkage craking caused by accelerated surface evaporation. It is known now as a substitute for commonly used shrinkage reinforcement, reducing cost and time while increasing impact and abrasion resistance.

As part of its effort to introduce and demonstrate the advantages of using fibermesh in concrete construction, the Engineering Development Company carried out two demontrations for both Kuwait National Petroleum Company (KNPC) and the Pulic Authority for Housing Care (PAHC).

A local gas station was selected by KNPC as a pilot project demonstrating the use of fibermesh. Abou-Halifah gas station was paved with 12 concrete slabs casted with and without fibermish. The other demonstration was carried out in Oum-Al-Hemah government housing project of the PAHC. Fibermesh concrete was used in the roof construction as an alternative to tile, mortar, and sand filter fabric. Fibermesh was used also in the external plastering. Both demonstrations were carried out in the month of August and further monitoring was done. Significant reduction was achieved in the sections constructed with Fibermesh concrete where shrinkage cracking was reduced by 95% compared to traditional concrete. A similar work was previously carried out in a study with Kuwait Institute for Scientific Research where experimental slabs were casted in an exposure site and monitored for propagation of shrinkage cracking. Results showed a tremendous reduction in shrinkage cracks with enhancement of abrasion resistance.

1. *Kuwait National Petrol Co.* / Abu-Halefa gas station,
Slab on ground, (Date cast: June 20th , 99).

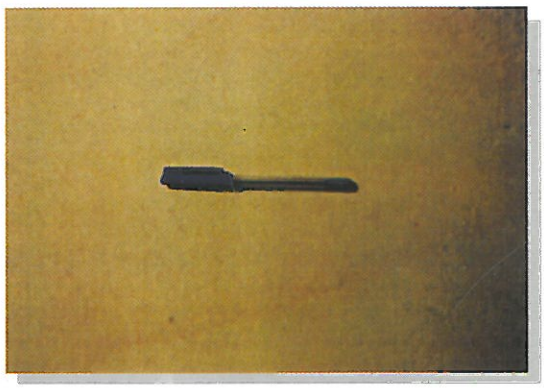


With Fibermesh

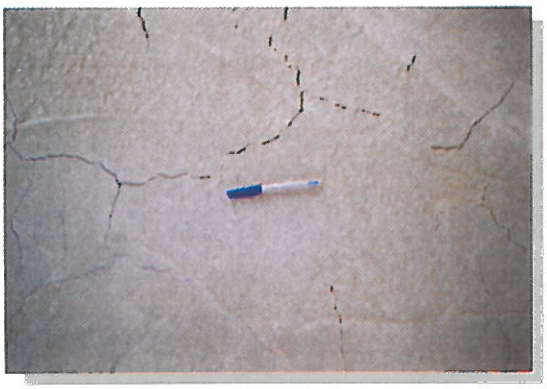
Plain

2. Public Authority for Housing welfare / Oum Al-Heman:

Fibermesh Roof, (Date cast August 16th , 99) (Alternative to tile morter sand & filter fabric).



With Fibermesh



Plain

Coarse Aggregates in Concrete : Classifications, Properties and Testing

Dr. Moetaz El-Hawary , Eng / Tariq El-Sayed
Kuwait University

Aggregates are essential to concrete as they reduce volume changes, improve durability and reduce cost of concrete. Different methods exist for aggregate classifications. Aggregates may be classified according to size where particles larger than 5 mm are considered coarse and less than 5 mm are fine. Fine aggregates may also be divided to sand between 5 mm and 70 --- , silt to 2 --- , and clay of less than 2 -m . Silt and clay are not recommended as they are usually contaminated and their properties are variable. In geological classification aggregates are divided to their geological origin as Igneous, Sedimentary or Metamorphic. In petrographical classification aggregates are divided according to their main mineral composition. In ASTM the main mineral groups are silica, feldspar, ferromagnessian, micaceous, clay, zeolites, carbonate, sulphate, iron sulfide and iron oxides. Aggregates may be also classified according to shape as rounded, angular, irregular, elongated, flaky or elongated flaky and according to texture as glassy, smooth, granular, rough, crystalline or honeycombed. According to weight aggregates are divided to heavy weight aggregates such as metals, normal weight aggregates and light weight aggregates which may be divided to natural such as diatomite, pumice, scoria and tuff and artificial such as expanded clay, shale, slate, expanded blast furnace slag and fly ash aggregates.

Tests of concrete aggregates as per ASTM

Test	Code
Density	BS 812 : Pt. 2
Practical size distribution	BS 812 : Sec. 103.0
Flakiness index	BS 882 : Sec.105.1
Elongation index	BS 882 : Sec.105.1
Shell content in coarse aggregate	BS 812 : Pt. 106
Moisture content	BS 812 : Pt. 109
Crushing value (ACV)	BS 812 : Pt. 110
Ten percent fines value (TFV)	BS 812 : Pt. 111
Impact value (AIV)	BS 812 : Pt. 112
Abrasion value (AAV)	BS 812 : Pt. 113
Polished stone value	BS 812 : Pt. 114
Water soluble chlorides salts	BS 812 : Pt. 117
Sulfate content	BS 812 : Pt. 118
Drying shrinkage	BS 812 : Pt. 120
Soundness	BS 812 : Pt. 121
Alkali silica reactivity (concrete prism method)	BS 216

The physical and mechanical properties of aggregates include compressive strength which may be determined by aggregate crushing value, toughness which is resistance to failure by impact, hardness which is resistance to wear, attrition which is determined by Los Angles Test, specific gravity bulk density, moisture content, porosity and absorption, deformation, soundness which is expansion by moisture thermal expansion, drying shrinkage, shell content and grading and fineness modulus.

In the Gulf the common problems with aggregates include poorly graded sand, relatively soft aggregates, high water absorption, variation of properties and sulphate or chloride contamination. The aggregates sources in the Gulf include beaches, duricrust, surface gravel, quarries, sand dunes and wadis and gravel plains.

The common types of contamination reactivity of aggregates in the Gulf include clay, silt and fine dust which contain sulphates and chlorides and increase water demand, organic matter which affect set time and strength , chlorides and sulphates and alkali-aggregate reactivity.

Due to its impact on ecological balance and environment, coarse aggregate quarrying was banned in Kuwait which necessitates importing aggregates may be contaminated or possess inferior properties. short and long term aggregate testing are needed. A list of important tests to determine the suitability of aggregates to concrete work is included.

Tests of concrete aggregates as per ASTM

Test	Code
Unit weight and voids in aggregate	ASTM C29
Soundness of aggregates by the use of sodium sulfate or magnesium sulfate	ASTM C88
Materials finer than 0.075 mm (No. 200 sleve) in mineral aggregates by washing	ASTM C117
Lightweight pieces in aggregate	ASTM C123
Resistance to degradation of small-size coarse aggregates by abrasion and impact in the Los Angles machine	ASTM C131
Sieve analysis of fine and coarse aggregates	ASTM C136
Clay lumps and friable particles in aggregates	ASTM C142
Potential alkali reactivity of cement-aggregate combinations (Mortar bar method)	ASTM C227
Potential reactivity of aggregates (chemical method)	ASTM C289
Potential volume change of cement aggregate combinations	ASTM C342
Resistance to degradation of large-size coarse aggregates by abrasion and impact in the :os Angles machine	ASTM C535
Potential alkali reactivity of carbonate rocks for concrete aggregates (Rock cylinder method)	ASTM C586
Resistance to rapid freezing and thawing	ASTM C666

Glimpse on the Construction Business in Kuwait

Prepared by Eng. Moh'd Harb Sayed

Details of the following five tenders may be obtained from Central Tenders Committee, P.O.Box 1070, Safat 13011, telephone 2401200, fax 2416574

*** Booster station construction**

Tender no T/199/61. (Open to prequalified contractors only). Construction of new booster station no 131 and connecting it with gathering centres and booster station no 130 for Kuwait Oil Company. A per-bid meeting will be held on 25 October. Bid bond is 2 1/2 per cent of tender price.

*** Material handing works**

Tender no 2810/C.A. (Open to prequalified contractors only). Carrying out store materials handling works and associated works for Kuwait National Petroleum Company's Mina Ahmadi refinery. Bid bond is 2 1/2 per cent of tender price.

*** Landscaping**

Tender no PA/AA/11/99-2000. (Open to prequalified contractors only). Carrying out landscaping work in Al-Rabiah, phase four, for the Public Authority for Agriculture Affairs & Fish Resources. A per-bid meeting will be held on 20 October. Bid bond is 5 per cent of tender price.

*** Landscaping**

Tender no PA/AA/12/99-2000. (Open to prequalified contractors only). carrying out landscaping work in southwest Jahra for the Public Authority for Agriculture Affairs & Fish Resources. A per-bid meeting will be held on 20 October. Bid bond is 5 per cent of tender price.

*** Electricity generator**

Tender no MEW/22-4/35-99/2000. Supply, installation, operation and maintenance of a 1,000-KWA, 415-V,50 oscillation-a-second diesel electricity generator and accessories, and carrying out associated civil, mechanical and electrical works including completion and maintenance of a diesel electricity generator room for the Ministry of Electricity a& Water. Bid bond is KD 15.000

Internet Stand

By: Tariq El-Sayed

Nothing can be said to further prove the importance of the Internet as a multi-purpose versatile media. Weather it is E-Commerce, information search, shear entertainment or any other service, the Internet will be most likely ready to fulfill the objectives of the user.

Here in the Internet Stand , we will review selected Internet sites that are of internet to the members of our chapter.

ACI Homepage

http://www.aci-int-org
This is the official site of ACI. It has the following sections:
About ACI
Bookstore
Certification
Committees
Conventions & Conferences
Education & Seminars
Periodicals and Research

The site is very well organized and is very user friendly. It is rich in information and services. Conference registration can be done on line in a simplified manner. The Bookstore section is based upon the Shopping Cart theme were the user searches for a book or a publication and when found is it added to your shopping cart. You can go on to search other titles and add them to your cart. The total purchase sum in $US is always displayed so keep track of your budget. When the user is done he can then submit only one purchase order for all the titles chosen

the site is designed to provide more online access to information and facilities on the site to ACI members. Rates for books and publications are also discounted to members only.

Vising the ACI site will be a very interesting experience to any person involved in concrete, not to mention ACI Kuwait chapter members

An alternative site to by ACI publication is:
http://www.dynasoftinc.com/BookStore/bs-aci.htm

On the above address you can find a listing of 80+ ACI publications. The actual purchase of any publication is done through Amazon.com one of the biggest book sellers on the net. Information on prices, estimated time of delivery and book availability are readily available on every title.

TEST METHODS FOR A.S.T.M. CONCRETE

Prepared by Eng. Moh'd Harb Sayed
Al-Ghanim Specialities

Whenever concrete is to be sampled from a transit-mix truck, for any of the following tests, it should be done in conformance with the following method which is excerpted from A.S.T.M. C172:

1. The sample shall contain not less than one cubic foot for strength tests. Small samples may be permitted for routine air and slump tests.

2. The sample shall be taken at three or more regular intervals throughout the discharge of the entire batch, except that samples shall not be taken at the beginning or end of discharge. Samples shall be done by diverting the stream completely so that it discharges into a container. The rate of discharge of the batch shall be regulated by the rate of revolution of the drum and not by the size of the gate opening.

3. The sample shall be transported to the place where the test specimens shall be molded or where the tests are to be made, and shall be completely remixed with a shovel the minimum amount to insure uniformity. The time between taking the sample and making the test shall not exceed 15 minutes.

A. Surface Moisture of Sand

The sample of sand is weighed and the water driven off by heating in an oven or upon a hot plate. The percent of total moisture is equal to the difference between the moist weight and the dry weight , expressed as a percentage of the dry weight. To determine the surface moisture, the percentage of absorption must be subtracted form the percentage of total moisture.

B. Slump Test (A.S.T.M. Designation C143)

The mold shall be dampened and placed on a level , flat, moist, nonabsorbent surface, free from vibration. The cone should be filled in three layers, each approximately 1/3 of the volume of the cone. Each layer is rodding 25 strokes with a 5/8 in. rod with a hemispherical tip. The rodding should be uniformly distributed and should penetrate about 1 in. into the underlying layer. The surface should be struck off level, all excess concrete removed from outside the base of the cone, and the cone carefully raised in vertical direction. The slump is measured by determining the average difference between the height of the slum cone and the height of the vertical axis of the specimen. when the specified slump is 3 in. or less, the allowable tolerance is plus or minus 1/2 in. When the specified slump is greater than 3 in. the tolerance is plus or minus 1 in.

The operation of raising the mold shall be performed in approximately five seconds by a steady upward lift with no lateral or torsional motion being imparted to the concrete. The entire operation from the start of the filling through removal of the mold shall be carried out without interruption and shall be completed within an elapsed time of 1 1/2 minutes.

If two consecutive tests on a sample of concrete show a falling away or shearing off of a portion of the concrete from the mass of the specimen, the concrete probably lacks necessary plasticity and cohesiveness for the slump test to be applicable.

C. Kelly Ball Test (A.S.T.M. Designation C360)

The Kelly Ball is another method of determining the consistency of the concrete. One inch of penetration by the Kelly Ball represents approximately the same consistency as a 2 in. slump. The concrete to be tested should have a minimum depth of 8 in. The sample is struck off level and the Kelly Ball placed on the surface of the concrete. the handle is then released, care being taken not to twist or jolt the ball, and the penetration is read directly on the handle. The control nut should be adjusted before the test starts so the guide will be on zero. Three or more tests should be taken to give representative reading. The Kelly Ball may be used to determine consistency of concrete in a concrete bucket or in the forms.

D. Yield and Unit-Weight Test (A.S.T.M. Designation C 138)

A cylindrical container, with a volume of exactly 1/2 cubic foot or 1 cubic foot, is filled in three equal layers as previously described for slump and strength tests. Each layer is rodded unfiformly over the surface of each layer with 25 or 50 strokes, depending on whether a 1/2 or 1 cubic foot container is used and the container tapped on the sides to remove large bubbles of air. After the cylinder has been filled, the surface of the concrete should be struck off with a straight edge, taking care to leave the measure just level full. The container is weighed and the weight per cubic foot of concrete is determined. The weight of all the ingredients of the batch divided by the weight per cubic foot of concrete will give the number of cubic yards per batch. The cement factor can be calculated by dividing the number of bags of cement in the batch by the number of cubic yards so calculated.

E. Air Determination by the Pressure Method (A.S.T.M. C231)

For air entrained concrete, it is essential that the quantity of air in the mix be carefully controlled. The air volume should be as indicated in Table 3, and is usually measured by means of a pressure-type meter. There are many suitable air meters on the market and by following carefully the manufacturer's directions. air content can be quickly and accurately determined. Note: Air contents of lightweight concrete should be measured by the volumetric method described in A.S.T.M. Designation: C173.

F. Compressive Test Cylinders (A.S.T.M. Designation C31)

The concrete sample should be taken in the same manner as for the slump test and should be at least one cubic foot in volume . Care should be taken to mix the sample thoroughly in a wheelbarrow, to insure homogeneity. In molding test specimens, the concrete should be placed in the cylinder mold in three layers. Each layer should be rodded 25 times with a 5/8 in. rod with a hemispherical tip. The strokes should just penetrate the layer below, and be distributed uniformly over the surface of the layer. After the top layer has been rodded, the surface of the concrete is struck off level and the cylinder covered to prevent evaporation. The cylinder should not be moved except at the time of casting, and all movement should be held to a minimum.
The test specimen must be job cured for the first 24 hours at temperatures between 60 and 80 degrees F. Special care should be taken to prevent evaporation.After 24 hours the specimens should be stored under laboratory conditions at a temperature of 65 to 75 degrees F. and in such a manner that free water is maintained on curing surfaces at all times. If stored in water, a saturated lime solution shall be used to prevent leaching. Specimens shall not be exposed to a steam of flowing water. Test specimens should be handled with extreme care, and in transit to the laboratory, should be securely packed to avoid damage.

G. Compressive Strength of Hardened Concrete Determined by the Impact Hammer

the hammer employs a spring driven plunger and the rebound of the plunger after impact with the concrete surface is measured on a built-in scale. The amount of rebound is directly related to the hardness of the concrete surface, and theoretically, the harder the surface, the greater the compressive strength of the concrete. Judgment must be exercised in interpreting test results. Such factors as moisture content of the concrete at the time of test, smoothness, whether or not the surface has a hard trowel finish, type of aggregate, etc., will affect the relationship of rebound readings to concrete strength.

H. Determination of Coarse Aggregate Proportions

A convenient method of determining optimum blends of coarse aggregate employs a 0.5 cubic foot container and a scale of at least 60 lbs. capacity. A 60 lb. sample of the smaller size is weighed out and additional increments of the larger size added mixed thoroughly and the dry-rodded weight determined in accordance with A.S.T.M. Designation C29. The following Table illustrates the procedure to be used.

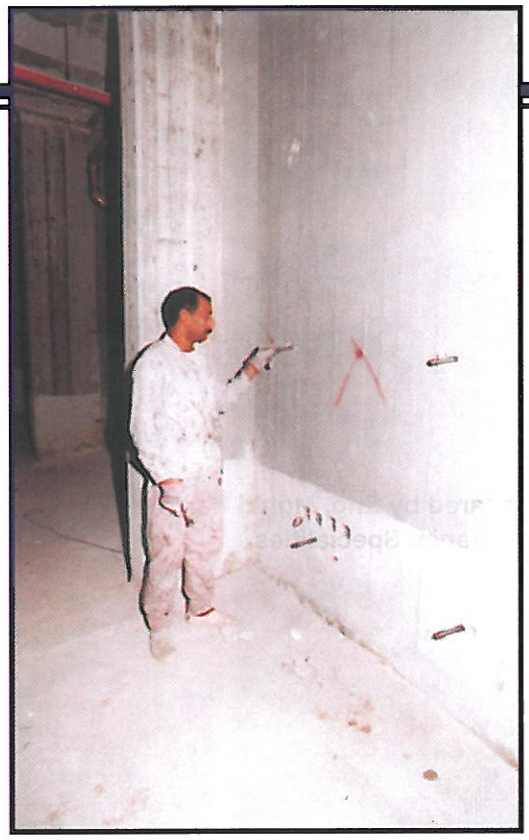
DETERMINATION OF COARSE AGGREGATE PROPORTIONS
60 lb. Sample of Small Size

Add'l Increments Of Large Size		Dry Rodded Weight 0.5 Cu. Ft. Lbs. Per.			
%	lbs.	Gross	Net*	Cu. Ft.	
30	25.7	58.0	45.0	90.0	
40	14.3	60.0	47.0	94.0	
50	20.0	62.0	49.0	98.0	
60	30.0	65.0	52.0	104.0	(optimum)
70	50.0	63.0	50.0	100.0	

*Tare weight of container = 13.0 lb.

For example, to the 60 lb. smaller size aggregate, add 25.7 lbs. of the large size, mix thoroughly, and determine the dry rodded weight. Return the test sample to the original pile, add 14.3 additional lbs. of the larger size, remix thoroughly and determine the dry-rodded weight. Continue this process by adding the indicated pounds of larger size aggregate until a maximum weight is recorded , which indicates a minimum void content. In this instance, it was determined that 60% of the larger size and 40% of the smaller size provided the optimum blend.

Expoxy For Injection



Eng. Moh'd Harb Sayed

In civil engineering applications, for more than 35 years, epoxies have become widely used and have given excellent performance, in such applications as coatings, adhesives, crack sealants, for protection of piles in water and rebars in concrete (for corrosion), for repair of cracked concrete for bonding new and old concrete etc.

* Does the epoxy weld cracks back together?

Yes, within minutes, epoxy can be injected (9) feet deep into cracks as small as 0.002 inch wide. Within hours, this same epoxy will surpass the compressive and tensile strengths of the surrounding concrete. Such effective and easily attained results make epoxy injection one of the most common ways of repairing narrow cracks

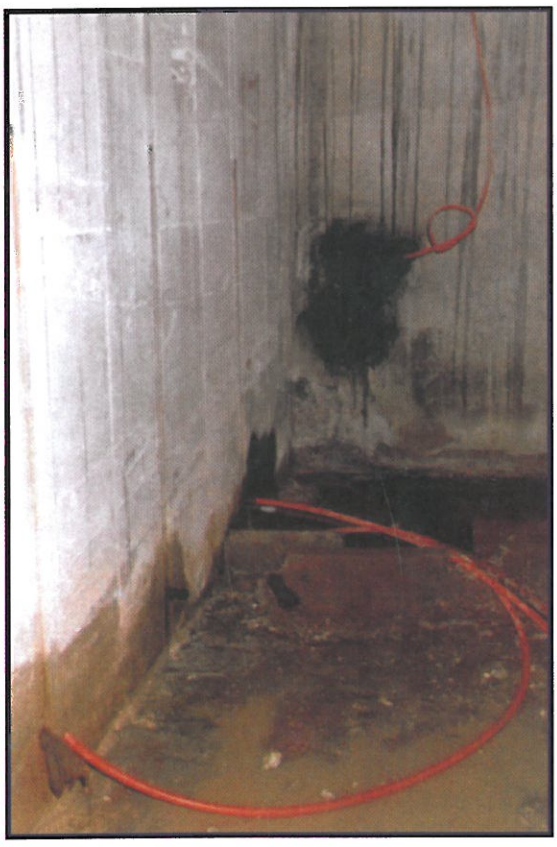
* It has been used to repair cracks in building, bridges and dams. But, to achieve such good results, you have to require the proper materials and injection techniques and an understanding of what epoxy injection can and cannot do.

What is the limitations ?

Actually the epoxy injection alone cannot solve every crack problem, as you have to know the type of the crack (active or dormant), if a crack is an active crack which continues to open or close, then the cause of the crack movement must be removed or a control joint must be constructed in the area of the crack. Otherwise, the concrete will crack again nearby after the crack cracks which are actively leaking and cannot be dried out should not be injected with epoxy unless the epoxy is formulated to be insensitive to water which is now available in the market.

How to select an epoxy for crack injection?

Epoxies used to inject cracks in concrete should meet ASTM C881, Type I requirement which is designed for bonding hardened concrete to hardened concrete. Three grades based on viscosity and consistency and three classes based on the range of temperatures for which they are suitable are available (table I) Viscosity is the property which can most effect the case extent of



injection lower viscosity epoxies are thinner and can penetrate smaller cracks. Viscosity is measured in centipoises (cps). very fine cracks 0.010 inch wide or smaller should be injected with an epoxy of 500 cps (light weight oil) or less. The water viscosity, in comparison is 100 cps. While viscosity is important, it's not the only important property. Because moisture is presenting many faults and is usually difficult to remove, the epoxy that's used should be insensitive to moisture pot life, min curing temperature, and color are also concerns. For the most part, once epoxies have cured, the only variation in performance is in the amount of elongation they can withstand. Unmodified epoxies permit less than 1% tensile elongation, but the more commonly used modified epoxies permit 1 to 5% . Flexural, tensile and compressive strengths are usually important because they almost always exceed the values attainable by concrete.

Cracked concrete that remains at high temperatures must be injected with epoxy that can withstand these high temperatures without softening. The deflection temperature (HDT) is a measure of a plastic's ability to perform at elevated temperatures. Now there is an epoxies are available have HDTs greater than 150 degrees F.

How we inject the epoxy?

Coming in the next issue of Concrete News.

Grade I	Max. viscosity	20 poises
Grade 2	Min. viscosity	20 poises
	Max. viscosity	100 poises
Grade 3	max Consistency	1/4 inch

Class "A" . For use below 40 degrees F
Class "B" . For use between 40 - 60 degrees F
Class "C". For use above 60 drgrees F

Min. gel Time 30 minutes
Bond strength 2 days (dry are 2000 PSI
Bond strength 14 days (moisture are) 2000PSI
Max 24 hour absorption 1.5%
shrinkage passe ASTM C883

Research : Concrete Corrosion Testing on Ground Granulated Blastfurnace Slag Concrete

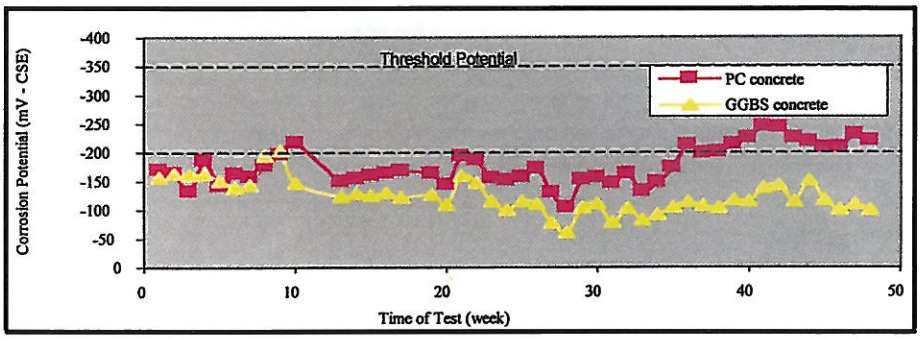
This study was carried out to assess the performance of slag concrete under the local environmental conditions of Kuwait. Therefore, to obtain technical data to support a large-scale engineering construction project (The Scientific Center) that employed ground granulated blasfurance slag (GGBS) as supplementary cementing material to partially replace the ordinary Portland cement (PC) in the concrete used for construction of reinforced concrete structures.

The data generated under this part of the investigation represent the extent of corrosion activities monitored for period of one year to determine the performance of 50% cement replacement by GGBS with respect to PC. The corrosion potential of steel reinforcement, corrosion current density on steel (I corr), and concrete electrical resistivity, were used as measurable parameters and bases for this evaluation.

The results showed significant improvement in the corrosion risk assessment of concrete when 50% cement replacement by slag is employed. Results of time-to-corrosion and corrosion rate testing indicated that slag concrete can provide requirements for high level of corosion protection in coastal areas and marine facilities under the local environment of Kuwait. On the other hand, poorly placed, un-compacted and inadequately cured slag concrete showed unfavorable characteristic, as poor as any ordinary prepared concrete.

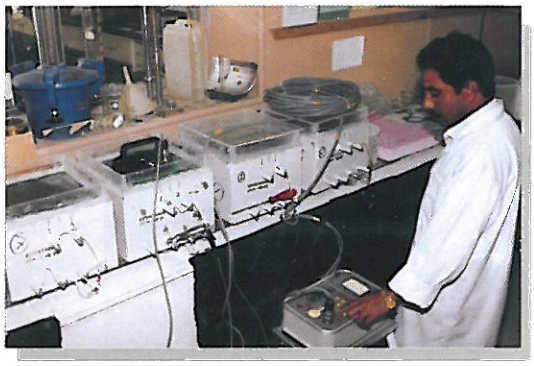
The findings will be presented in Sydney, Australia during 21-24/11/1999.

The technical paper was preparedby Eng. Safaa Abdul/Salam; Eng. Hassan Karam; Eng. Suad Al-Bahar and Dr. Adel Hussain .



Corrosion Potential vs. time for steel bar in PC and GGBS concrete specimens after time-to-corrosion test.

Weekly cycle for corrosion activity measures of the time-to-corrosion test.



Useful Links

American Concrete Institute: http://aci-int.org/

American Society for Testing and Materials: http://www.astm.org/

The World of Concrete: http://www.worldofconcrete.com/

American Society of Civil Engineers:http://www.asce.org/

Building Research Establishment: http://www.bre.co.uk/

Synthetic Industries, Inc. - Fibermesh: http://www.fibermesh.com/