

Volume 1/ No. 3
December 1998

CONCRETE NEWS

ACI-Kuwait Chapter



ACI - Kuwait Chapter

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Calendar of Coming Events

Local

- December 14, 1998 Nomination/Social committees Annual General Meeting and elections. Followed by Social gathering for members: Dinner Banquet.
- May 10 -13, 1999 Concrete Design, Materials & Construction Exhibition "CONCREX'99"

International

Troubleshooting Concrete Construction	12/16/1998	American Concrete Institute (ACI)	Weslaco, TX
Concrete Repair Basics	04/01/1999	ACI International	Birmingham, AL
Concrete Repair Basics	04/29/1999	ACI International	Philadelphia, PA

ACI Kuwait Chapter Committees

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Publicity Committee	Dr. Mohamad Terro	4811188 Ext. 5753
Social Committee	Ms. Shaikhah Al-Arfaj	4820411/22

- **Calendar of Coming Events.**
- **ACI Committees.**
- **Editorials.**
- **Technical Articles.**
- **Seminar on "Corrosion Inhibitors for Steel Reinforcement in Concrete Structures".**
- **CONCREX'99.**
- **Building, Water and Municipality Services Exhibition.**
- **ACI Seminar at Kuwait Society of Engineers.**
- **Social / Fun.**
- **Glimpse on the Construction Business in Kuwait.**

Editorial Board

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 Mohamed Harb Sayed (4812145)
 Humayun Kabir (4811188 Ext. 5728)

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Announcements by the Membership Committee

1. All members are reminded to submit the following to produce the membership directory:
 Name, Address, Email, Tel. & Fax numbers, Job title, Job description, and a Passport size photograph.
 This information can be submitted to Mr. Tareq AbdulJalil, Civil Engineering and Building Department, Kuwait Institute for Scientific Research, Room # 1822.
2. Members should be prepared to renew their membership during the general assembly meeting, on the 14 December 1998.
3. Membership certificates for individual members are available and could be collected from the membership committee for a charge of KD. 1.0.
4. Finally, members are requested to send their review comments on the guidelines to damage assessment and mixing and curing reports, published by the technical committee. Comments should be sent to Dr. Essawy on Fax: 4817524.



**ACI
(KUWAIT)
WANTS
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PUBLICITY COMMITTEE

Editorials

Dear Colleagues,

On the behalf of members in ACI Kuwait chapter, we welcome you to our third issue of **Concrete News**. This is our first volume after the summer vacation where many of our members were out of Kuwait. We hope all of you have enjoyed this vacation and that you have come back with enough energy to take you through this coming year. The publicity committee is waiting for interesting developments and stories from you of social or professional nature. The last few months have witnessed quite a number of technical activities, despite the fact that many people were just returning from their long summer vacations. We are also expecting lots of major events in the coming year including the concrete exhibition between 10 and 13 May 1999. Moreover, our general election is due in December 98, and we are looking forward to your attendance and active participation in this election. Your cooperation in the previous issues was of great value, especially in the puzzle section where we received a large number of replies and we had a winner. We encourage you to contribute to our newsletter and in particular to the technical section. The importance of the technical section lies in the fact that it constitutes a forum to share scientific engineering knowledge, both theoretical and experimental, amongst the readers. Finally, as usual, we would like to re-encourage all our readers to join the chapter and benefit from the many privileges that are offered to our members.

Seminar

"Corrosion Inhibitors for steel reinforcement in Concrete Structures (M.C.I - Products)"

A seminar on corrosion Inhibitors for steel Reinforcement in concrete structures was held at the Kuwait Society of engineers on November 15, 1998.

AL-Ghanim specialites company sponsored this event.

The technical committee of A.C.I. Kuwait chapter was responsible for the administrative and various preparation of the event.

Mr. Chuck Suchy, Sales Manager, construction products of cortec corporation U.S.A, an expert in this field, presented the seminar.

During the seminar, several questions were posed and a healthy technical discussion about the subject was held.

42 attendees were present in this important events.

We urge members of our chapter to take advantage of such valuable technical and scientific events that will be coming in the future.

prepared by eng. *Mohamad Harb Sayed*.



Kuwait International Fair



Concrex 99

Concrete Design, Materials & Construction



Kuwait Chapter

Concrex'99 Exh. **Concrete Design, Materials & Construction** **10 - 13 May 1999**

Under the sponsorship of ACI, (American Concrete Institute) - Kuwait Chapter, Kuwait International Fair Company the leading exhibitions organizer in the State of Kuwait will organize the CONCREX'99 Exhibition from 10th to 13th May 1999, in Hall No.(7), at the Int'l Fairs Ground, Mishref.

The exhibition will be one of the specialized exhibitions on the schedule of our fairs & Exhibitions.

Concrete is the main if not the absolute building material used extensively in the Arabian Gulf region. CONCREX'99 is expected to be the most relevant exhibition related to concrete in the area. The Exhibition will be attracting quality suppliers manufacturers, contractors and consultants firms from regional and international contributors.

Kuwait International Fair will do a big advertising campaign and a wide coverage of the event as well. Seminars and Press Conferences are also being planned to take place during the exhibition period.

We take the pleasure of inviting you to participate at the above-mentioned exhibition.

Four Further information and participation, please contact:

Mr. Ali H. Chehimi

Kuwait International Fair Co.

Fax 5393872 - 5396123 - Tel. 55387100 Ext. 112

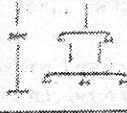
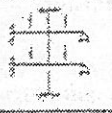
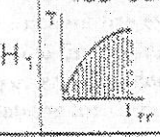
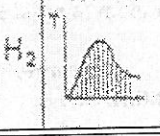
P.O. Box 656 Safat 13007 Kuwait

FIRE RESISTANCE OF BUILDING STRUCTURES

Mohamad J. Terro

*Associate Prof of Civil Engineering
Kuwait University*

In currently available building regulations on fire resistance, structures should satisfy the following requirements (1): "The building shall be so constructed that, in the event of fire, its stability will be maintained for a reasonable period". The Approved Document (2), in support of the Building Regulations recognizes that it is current practice to test single elements of structure in isolation. However, the extrapolation from single components to a whole building can only be justified if a relation between real fires, building performance and furnace tests is established. The currently available methods for studying the behavior of building structures under fire have been classified by Pettersson (3) in a structural/thermal model matrix shown in the figure below.

Model for structure	S ₁		
	Element	Substructure	Complete structure
Model for thermal exposure			
	ISO-834  H ₁	test or calculation (deterministic)	calculation exceptionally testing (deterministic)
real fire  H ₂	calculation (probabilistic)	calculation (probabilistic)	calculation (probabilistic) in special cases and for research

Natural Fires

Fire is a complex phenomenon involving chemical and physical reactions, which are mainly dependent upon the fuel content and environmental factors including availability of oxygen. Fire in a compartment is, therefore, controlled by its fire load (amount of combustibles), the geometric and material properties of its boundaries and ventilation conditions.

Structural fire safety is mainly concerned with the containment of fire within the compartment where it was initiated (compartmentation). This is achieved by ensuring that the structure exposed to fire remains integral and that heat flow through the boundaries of the fire compartment is kept within acceptable limits. In this context, it is the ability to contain the fully developed fire that is important.

Standard Furnace Fire

In a standard furnace fire test, the specimen under study is placed in a furnace and exposed to a controlled heating regime. The temperature of this standard furnace fire, which is described in ISO834 and BS476 part20, follows the equation below:

$$T_f = 345 \log_{10}(8t+1) + T_0$$

Where t is the time in minutes, T_f is the furnace temperature at time t in °C, and T_0 the initial furnace temperature in °C.

Fire resistance is then defined as the time elapsed before a fire limit state is violated. Three fire limit states are defined in BS476: Insulation, Integrity and Load-Carrying Capacity. Fire resistance should not be regarded as a measure of the time taken by a structure to collapse in the event of a real fires. It is rather a quality measurement that should ensure satisfactory performance of the structure in real fires. The definition of satisfactory performance is usually outlined in building fire codes and it depends on the importance of the structural member under study and the role this member has to play in the event of fire, e.g. to contain a fire or to structurally protect a means of escape.

Equivalent Fire Exposure Time (EFE)

Extensive research work has been devoted to find a scientific correlation between real-world and standard furnace fires. This correlation is manifested in the concept of "equivalent fire exposure" (EFE). EFE is defined as the time taken, under standard furnace fire testing, to produce an equivalent destructive effect on the structure as that experienced under real-world fire conditions. It should be stressed that most developed relations for EFE are of empirical nature and that the determination of such a correlation should be carried out by people with a certain degree of expertise in the fire field due to the large number of factors involved in the calculations.

References

- 1 - **The Building Regulations 1985**. S.I. 1985 No. 1065.
- 2 - **Approved Document B2/3/4: Fire Spread**. The Building Regulations 1985. Department of the Environment and The Welsh Office.
- 3 - **Pettersson O.:** "Analytical Determination of Structural Fire Behavior and Resistance- State of the Art" Document ISO/TC92/SC2/WG2 N163. Lund Institute of Science and Technology. Lund, Sweden. March 1990.

EFFECT OF TEMPERATURE ON THE MECHANICAL BEHAVIOR OF RESIN CONCRETE

Moetaz M. El-Hawary, Hisham Abdel-Fattah
Assistant Professors, Kuwait University, Kuwait.

The investigation of the mechanical behavior of resin concrete is becoming important, as the types of resins are increasing and the use of resin concrete is no longer limited to repair works. The structural use of resin concrete requires accurate design that can be achieved through the utilization of the Finite Element method which requires a complete constitutive model and full understanding of the mechanical behavior of resin concrete. The investigation of stress-strain relations under repeated loading for resin concrete cylinders, prepared using different types of resins and different ratios of resins to aggregate and subjected to different temperature stations was carried out. Three types of resins (two epoxy and one polyester) available in the market were used at three different percentages of resins of 9%, 12% and 15% by weight to cast the cylinders. The cylinders were then subjected to three different temperature stations of 20, 100 and 200°C and then tested in compression using six cycles of loading and unloading to get the stress-strain relation for each case. Compressive strength, tensile strength, toughness and modulus of elasticity were also evaluated.

The heating and cooling cycles causes hardening in the polymer and increase in its strength. The effect is coupled. However, with the deterioration and loss of strength of the polymer concrete as is the case in any other type of concrete. The two factors together reduce the effect of temperature on polymer concrete. In general a slight increase in compressive strength due to temperature increase may be detected. The

maximum increase is about 200% for 12% of epoxy type I. The increase in the amount of polymer increases the compressive strength, in general. The maximum increase is 164% between 9% and 15% of polyester at 20°C. Large difference in compressive strength is noticed between the concrete made using the two types of epoxy which indicates that the strength depends on the type of epoxy and on the manufacturer.

The same conclusions may be drawn for the toughness of polymer concrete as an increase in toughness was noticed with temperature. The maximum increase is 175% for 9% of epoxy type II and the maximum increase due to the increase in the amount of polymer is 325% between 9% and 15% of epoxy type II at 20°C.

A low modulus of elasticity was noticed in all cases. This is probably due to the low workability of the mix which increased the amount of voids and allowed for larger strain. It is recommended to add fly ash to polymer concrete to reduce the voids and increase the modulus of elasticity. Almost no change in modulus of elasticity due to temperature was noticed except for epoxy I where an increase in the modulus was detected.

A reduction in tensile strength due to temperature was noticed. The maximum reduction is 41% for 15% polyester. The maximum increase in tensile strength due to the increase in the amount of polymer is 77% for epoxy II at 200°C. No tensile strength was determined for specimens made with 9% polyester as they were very brittle and were crushed at the clamps.

Specimens in the cyclic loading test were loaded in cycles to loads varies between 20% to 80% of the ultimate load determined from the static compressive test, mentioned before. The permanent-retained-displacement was determined after each cycle. The displacement was found to converge to a constant after the sixth cycle, in general. The ratio between the displacement, at 20% loading, after the convergence to that at the first cycle D was determined.

A reduction in the ratio with temperature was noticed. This is due to the hardening of the polymer the maximum reduction is 52% for 12% of epoxy type I.

Development of Corrosion Inhibitors for Protection of Concrete

By Eng. Mohamad Harb Sayed

The major causes of corrosion of steel in concrete structures have been discussed in the previous issue of Concrete News. A history of the development of corrosion inhibitors, their commercial names, and their chemical and physical properties is presented in this article:

Period	Technology	Companies/Method
1970's	Calcium Nitrite Epoxy Coated Rebar	W.R.Grace - DCI Several
1980's	Organic Inhibitors Cathodic Protection High Performance Concrete	Cortec -MCI -2000 Master Builders - Rheocrete Sika (Cortec Tech.) Armatec Several Several companies using: Microsilica, Fly Ash, G.G.B.S, Low w/c ratio, more concrete cover.
1990 - date	Exotic Rebar Reinforcing Fibers Re-Alkalization Desalinization Improved Organic Inhibitors	Carbon Composite, Galvanized, stainless steel, Fiber Glass. Several Several Several Sika- Ferrograd 901/903, Cortec - MCI-2005/2006/2020,2021/2022

Manufacturers of the Protection Materials

Company	Technology	Trade Name
W.R. Grace	Calcium Nitrite	D.C.I
Master Builders	Butyl Oleate	Rheocrete 222
Sika	Cortec technology	Ferrograd 901
Other Manufacturers	Various Names	---
Cortec Corporation	MCI's	MCI 2000 Series

Calcium Nitrite/Sodium Nitrite

• *Accelerator*

Requires change in mix design to compensate for acceleration, especially in hot climates.

• *Dosage Rate*

2 to 6 gallons per cubic yard, depending on guessed estimate of chloride. Requires change in mix design to compensate for liquids being added which could accelerate corrosion.

If chlorides exceed guessed estimate they could overwhelm DCI and accelerate corrosion.

• *Inorganic Chemicals*

Calcium or sodium nitrite are carcinogenic, may leech from concrete into ground and ground water.

• *Protection*

Anodic only.

Butyl Oleate

• Affects slump and air entrainment which in turn affects concrete durability, and mix design has to be changed to compensate.

• Dosage rate:

One gallon per cubic yard

• Very little testing has been done

MCI Series

• Name recognized as a leader in corrosion control

• Does not change the physical properties of the concrete mix design

• Protection: Anodic or cathodic

• Dosage rate: 1 pint (0.620 liters)/m³

• Protects steel reinforcing bars from corrosion in the presence of chlorides. The protection is based on the same time proven chemistry of Cortec VCI's (vapor corrosion inhibitors) which has solved the corrosion problems of many industrial plants.

• MCI's are safe, easy to use, and cost effective

• Recent studies by SHRP (strategic highway research projects, National Research Council, 1993) have shown that application of MCI slows or stops corrosion activity dramatically, even in severely corroding environments.

Advertising in

"Concrete News"

This space could be working for you.

For further information and advertising costs please contact Eng. Mohammad Iqbal at 4804693 or

Dr. Mohamad Terro at 4811188 Ext. 5753.

Bulletin

This space is reserved for bulletins by members.

Please contact

Dr. Mohamad Terro at 4811188 Ext. 5753 for further information.

Announcements

The ACI, Kuwait chapter will be publishing a directory for its members. All members are requested to supply the following:

- a) One passport size photograph,
- b) Address, telephone & fax numbers,
- c) Educational background information,
- d) Job description in ten keywords.

Please contact:

Dr. Humayun Kabir (4811188 Ext. 5728)

Building, Water and Municipality Services exhibition



ACI Kuwait (Chapter) have participated in the local Building, Water and Municipality Services exhibition held in Kuwait during October 10-16, 1998. The Chapter's stand displayed information on concrete construction in addition to introduction on the Chapters goals and activities. The main purpose of the participation was attracting new members to join the Chapter and ACI international. Kuwait Chapter is currently in the process of planning a regional exhibition for concreting in the Arabian Gulf "CONCREX 99" which will be held in May 1999.

ACI Seminar at Kuwait Society of Engineers:

The technical committee of ACI-Kuwait Chapter held a seminar on October 20th, 1998 entitled "Proposed Guidelines for Concrete Works in Kuwait". This event was co-sponsored by FOSROC and ACI-Kuwait Chapter. All members were invited to attend at the Kuwait Society of Engineer.

The seminar included:

1. "Damage Assessment and Repair of Concrete Structures". Presented by Mr. Abdul Hamid Darwish from KEO International Consultants.
2. "Proper Concreting Practices Part 1: Mixing and Curing". Presented by Mr. Abdul Wahab Rumani from Kuwait British Readymix Co.

Various technical discussions were held between the lecturers and the 55 ACI members who attended this seminar.

Announcements

It was with deep regret that the members of ACI Kuwait Chapter received the news of the untimely demise of Dr. Yousef Shuhaibar. His inspiration and diligence was a source of constant strength for his colleagues of ACI and he will be sadly missed. His fellow directors and all members of ACI Kuwait Chapter extend their deepest sympathy to his family.

PUZZLES

1 - Five couples were present at a dinner party. One of the men asks the others how many times everybody shook hands. He receives the following answers: 8, 7, 6, 5, 4, 3, 2, 1, and 0 times.

How many times did the man's wife shake hands?

2 - There is a 10 km-long army marching at a constant speed. There is one general marching at the front of the army and another one at the back of it. The general at the front sends a cavalier with a message to the one at the back. The cavalier meets the general at the back and brings back a reply to the general at the front. How long is the total distance travelled by the cavalier if, by the time he meets the general at the front, the whole army has moved 10 km??



Please fax you answers in writing to M. Terro at 4817524.

Prizes will be given by draw for correct answers (courtesy of Al-Ghanim Specialties)

JOKES

Scene: public executions by guillotine

First condemned person steps up, a minister. Switch is pulled. Blade doesn't come down. Minister cries out: "God knows I am innocent!" He's pardoned.

Second condemned person is a revolutionary agitator. Switch is pulled. Blade doesn't come down. Guy cries out: "The revolution cannot be stopped!" He's pardoned.

Third condemned is an engineer. Same deal. He looks up, points up, says, "I think your problem is that the cable is binding right here..."

Retired engineer

There was an engineer who had an exceptional gift for fixing all mechanical things. After serving his company loyally for over 30 years, he happily retired. Several years later his company contacted him regarding a seemingly impossible problem they were having with one of their multi-million dollar machines. They had tried everything and everyone else to get the machine fixed, but to no avail. In desperation, they called on the retired engineer who had solved so many of their problems in the past.

The engineer reluctantly took the challenge. He spent a day studying the huge machine. At the end of the day he marked a small x in chalk on a particular component of the machine and proudly stated, "This is where your problem is". The part was replaced and the machine worked perfectly again.

The company received a bill for \$50,000 from the engineer for his service. They demanded an itemized accounting of his charges. The engineer responded briefly:

One chalk mark \$1

Knowing where to put it \$49,999

It was paid in full and the engineer retired in peace.

Glimpse on the Construction Business in Kuwait

Details of the following tenders may be obtained from Central Tenders Committee.

- Construction and maintenance works.

Tender no 3392998 (open to prequalified Contractors only) Carrying out Construction, Completion and maintenance works for the ministry of Defence. A pre-bid meeting will be held on 14 Nov. and a site visit will be held on 15 Nov.

Bid bond is K.D 300,000. Details on payment of K.D. 5,000.

CD 8 Dec.

- Tender no 6211897 (open to prequalified Contractors only) Carrying out Construction, Completion and maintenance works for the defence ministry. Bid bond is K.D. 30,000 details on payment of K.D. 800.

CD 29 Nov.

- Road works and Services.

Tender No. 3422998 (open to prequalified contractors only) Construction, Completion and maintenance of roads and provision of external Services for the defence Ministry. Bid bond is K.D. 26,000 Details on payment of K.D. 800.

CD 29 Nov.

- Tender no 3402998 (open to prequalified Contractors only) Carrying out Construction, Completion and maintenance works for the defence Ministry. A pre-bid meeting will be held on 17 Nov. and a site visit will be held on 18 Nov. Bid bond is K.D. 260,000.

Details on payment of K.D. 5,000

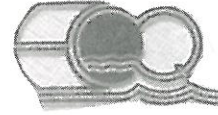
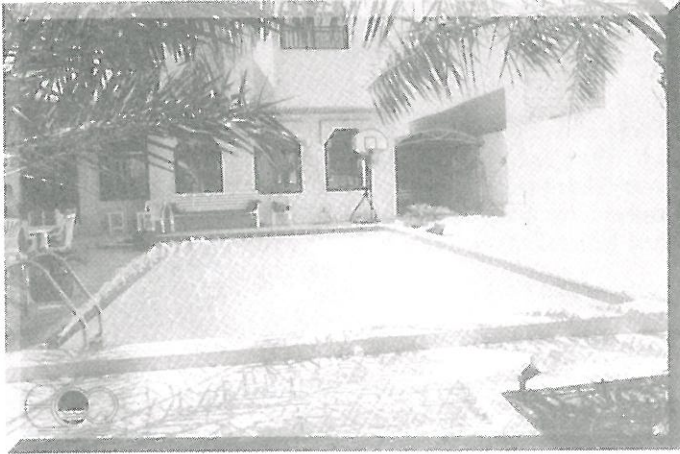
CD 8 Dec.

- Crude oil line.

CD extension. Tender No MEW/22/4/42-97/98 Repair and replacement of a 12-inch-diameter Crude oil line for the Duha Western and Eastern feeding Stations for electrical power generation and Water distillation for the Ministry of Electricity & Water.

New CD / Dec.

Prepared by Eng. Mohd Harb Sayed



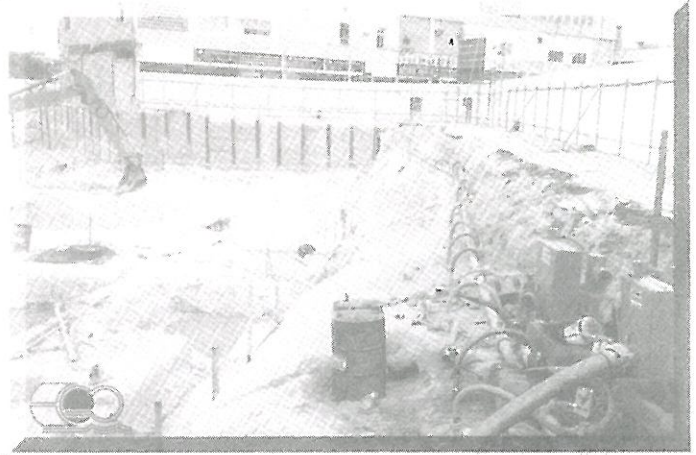
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SWIMMING POOLS

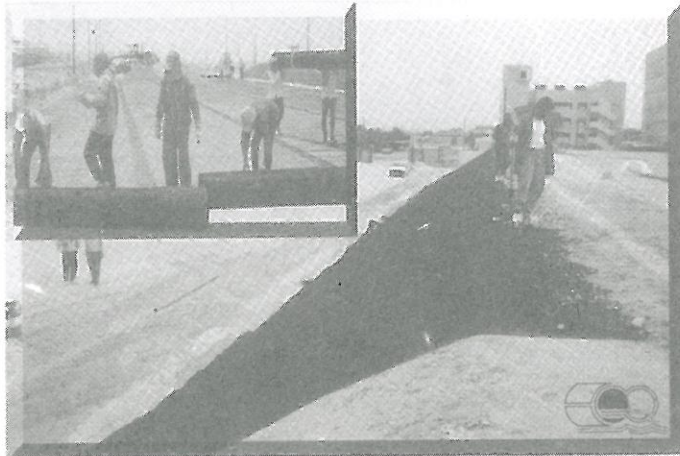
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DE-WATERING WORKS

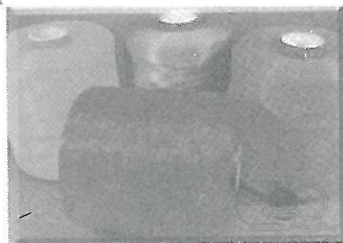
HUDIG SYSTEMS (GERMANY)
VARISCO SYSTEMS (ITALY)



(NEW PROJECT)

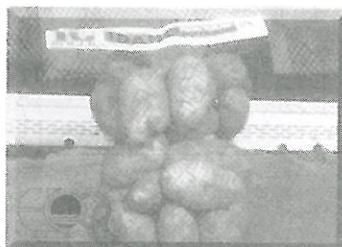
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