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Mimarlık Bölümü

ÇALIŞMALAR

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KKTC MEB Projesi
Dönem: Temmuz 2008

Kıbrıs'ta çağdaş kerpiç yapı teknolojisi

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Özge Özbekoğlu: Kıbrıs'ta kerpiç yapı
Tuğşad Tülbentçi: kerpiç teknolojisi
Serkan Abbasoğlu: yapının fiziksel özellikleri
Mete Mutlu Balkıs: Kıbrıs'ta kerpiç yapı
Nilgün Aydın: Kıbrıs'ta kerpiç yapı

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"Kıbrıs'ta çağdaş kerpiç yapı teknolojisi"

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- 4.1 mekanik ve fiziksel özellikler
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1.1 Projenin Yürütülüşü

"Kıbrıs'ta çağdaş kerpiç yapı teknolojisi" 2008 Proje başvurusu i.Amaç, ii.Kapsam, iii.Yöntem, iv.Beklenen yararlar, ve v.öneri sahipleri bölümlerinden oluşmuştur.

Amaça uygunluk:

KKTC'nin kültür mirasını korumak konusu üçüncü bölümde incelemiştir. Kerpiç yapıdaki mekan konforu ve çevre kazanımlarını sürdürmek: dördüncü bölümde incelenmiştir. Yeni kerpiç yapı uygulamasına gerekli teknik beşinci ve altıncı bölümlerdedir. yasaların teorik hazırlığını yapmak üzere yararlanılacak standartlar yedinci bölümde yer almaktadır.
Sonuç ve öneriler sekizinci bölümde açıklanmış tır.

Kapsama uygunluk:

Bilgi dayanışması için kapsamda söz edilen çalışmalar izlenmiştir.

Yönteme uygunluk:

- Kerpiç yapı teknolojisini, Kıbrıs ve uluslararası kaynaklardan incelenme; Alan çalışması ile bilgi toplama; Uygulama projesi ve projenin uygulanması; Bilgilerin derlenmesi ve yayınlanması konularına uyulmuş

Dış bağlantılı konularda

- Uluslararası kerpiç okulu için fiziksel ortam hazırlamak konusunda yeterli ilerleme kaydedilememiştir.
- Kavramsal ortam hazırlama konusunda: uluslar arası temaslar Fransada: CRATerre, ABD'de: Getty, Almanya'da: Dachverband Lehm, Ingiltere'de: ICOMOS gibi kuruluşlarla yürütülmüştür.

Beklenen yararlar:

Zamana bağlı olarak yararlar sağlanmış olacaktır.

Öneri sahipleri:

Yürütücü Doç Dr Bilge IŞIK, görevine devam etti. Çalışma, Danışmanlar Prof Ruhi Kafesçioğlu ve Mimar Cengiz Bektaş'ın desteği olmadan yürütülebildi.

Yardımcı araştırmacılarda süre içinde değişiklikler oldu.

Önerilen Yardımcı Araştırmacılar

1 Hülya Yüceer

3 Batuhan Bayramoglu;

4 Meray Talug;

5 Nezire Özgece;

6 Nail Özlüsoylu;

Çalışmaları yürüten araştırmacılar

1 Çiler Kirsan Yükselen: genel koordinasyon

2 Özge Özbekoğlu: Kıbrıs'ta kerpiç yapı

3 Serkan Abbasoğlu: kerpiç yapının fiziksel özellikleri

4 Mete Mutlu Balkıs: Kıbrıs'ta kerpiç yapı

5 Nilgün Aydın: Kıbrıs'ta kerpiç yapı

Konularını hazırladılar.

1.2 Elde edilen sonuç ve kazanımlar

Sürdürülebilir kalkınma, ekonominin bilgiyle, çevrenin sevgiyle ve sosyo-kültürel hayatın sorumlulukla yönetilmesi anlamına gelir. Çevrenin korunamaması durumunda ekonomi veya sosyo-kültürel hayat ta kalmaz. Ada ülkesi olarak Kuzey Kıbrıs kaynaklarını sürdürülebilirlik kriterlerine göre yönetmelidir. Sürdürülebilirlik kriterleri SIDS (Gelişen Küçük Ada Ülkeleri Birliği) tarafından da detaylı olarak belirlenmiştir. Çevreyi kirleten sektörlerin içinde %50 ile en büyük pay yapılı çevreye aittir. İnsan eliyle yapılaşan çevre, doğal alanların yapıyla örtülmesi, doğadan malzeme alınması, malzeme üretimi ve inşaat aşamalarında çevreyi yüklemektedir. Alker yapı malzemesi yüksek ısı depolama kapasitesi, yüksek ısı direnci (λ=0.4 W/mK) ile soğutma ve ısıtma enerjisi kullanımını Kıbrıs şartlarında ortadan kaldırabilir. Kıbrıs kendi kültür özgünlüğü ve toplum hafızası ayrıca

ekonomik ve çevre sürdürülebilirliği açısından yeni konut yapılarını kerpiç malzeme ile yapmalıdır.

1.2.1 Konferans yürütülmesi:

KKTC'de kültür kimliği olarak kerpiç mimarlığın belirlenmesi amacıyla "kerpic08-learning from earthen architecture in climate change" uluslar arası konferansı düzenlenmiştir. Proje hazırlıkları ile 2008 Mart ayında duyurusu yapılan uluslar arası konferans 4-5 Eylül 2008 tarihinde Lefkoşa-Haspolat'ta Uluslararası Kıbrıs Üniversitesinde yürütülmüştür. 72 bildiri özeti www.kerpic.org/2008 sayfasında ilan edilmiştir.

1.2.2 Uluslar arası atölye yürütülmesi

Atölye: Konferans katılımcıları için Kerpiç malzeme üretimi
Kerpic'08 EARTHEN CONSTRUCTION ALKER (gypsum stabilized earth) September 6, 2008, Saturday

1.2.3 Bildiri kitabı yayınlanması:

"Kerpic08- learning from earthen architecture in climate change" başlıklı bildiri kitabında 16 ülkeden 50 bildiri ISBN 978-975-6002-07-0 numarası ile yayınlanmıştır. Kıbrıs'tan katılan 10 bildiri ise projenin birinci bölümüne kaynak teşkil etmektedir.

1.2.4 Proje kapsamında sunulan uluslararası bildiri

6

[96] B1 ISIK B., (2009) "Earthen architecture revival as brand building project in Cyprus; While investigating the seismic measures on historical structures" 1st Mediterranean Conference on Earthen Architecture 13-16 March 2009, Cagliari Italy, Theme.4 Research about architecture, town planning and cultural landscape

5

[95] B1 HABİB F., ISIK B., (2008) "The role of cultural values in developing place marketing and branding" Marketing Cities: Pace Branding in Perspective, Georg Simmel Center for Metropolitan Studies; Berlin, City Hall, 4-6 December 2008,

4

[94] B1 ÇINI N, TULUN T, IŞIK I, (2008) "An Archaeometric Study on a Hımış Type Old House from Central Anatolia" kerpic08, Learning from earthen architecture in climate change International Conference, Cyprus International University, Lefkoşa / Northern Cyprus 4-5 September 2008

3

[93] B1 BİNİCİ Hanifi, KÖSE M. Metin, TEMİZ Hüseyin, **IŞIK Bilge, (2008) "Mechanical Properties of Clay with Fibers Used in Mud bricks",** kerpic08, Learning from earthen architecture in climate change International Conference, Cyprus International University, Lefkoşa / Northern Cyprus 4-5 September 2008

2

[92] B1 ISIK B., (2008) "Branding earthen architecture in northern Cyprus as cultural capital", kerpic08, Learning from earthen architecture in climate change International Conference, Cyprus International University, Lefkoşa / Northern Cyprus 4-5 Sept 2008

1

[91] B1 ISIK B., ÇAKIR S., HACALOĞLU A.,, (2008) "Energy Efficient Building in Cyprus: Proposing earthen envelop & steel interiors" kerpic08 - Learning from earthen architecture in climate change International Conference, Cyprus International University, Lefkoşa / Northern Cyprus 4-5 September 2008

1.3 Öneriler

Kıbrıs'ta mimari miras olan kerpic yapıların korunması, ekolojik kazanımlar amacıyla yeni kerpiç teknolojisinin cesaretlendirilmesi amacıyla, mart 2008 döneminde önerilen ve temmuz 2008 tarihinde başlatılan proje 8 ay süre içersinde hedeflediği faaliyetleri yürütmüştür. Ancak Kıbrıs'ın ihtiyacını karşılamak üzere yeni hamlelere ve çalışmalara ihtiyaç vardır.

Uluslar arası faaliyetler:

1.uygulama atölyesi, 2.yüksek lisans ve doktora alanlarında yaz okulu, 3.bilim insanı kolokyumu, 4.tekrarlı konferanslar Uluslar arası kazanımları sağlayacaktır.

Kıbrıs'a yönelik faaliyetler:

- örnek teşkil etmek üzere PİLOT YAPI inşa edilmesi,
- Kıbrıs Mimarlık okullarında haberdar olma seviyesinde müfredata alınması,
- resmi kurumların uygun yapıları kerpiç ile yapmaları,
- tarihi bölgelerdeki restorasyonların yerel yönetimler tarafından i.yıkılmaması, ii.restore edilmesi,
- restorasyonda kullanılacak kerpiç blokların endüstriyel üretimi ve hedef kitlenin haberdar edilmesi

Projenin yürütülüşü

BÖLÜM 1.5
Sonraki projeler

1.4 Sonraki projeler

1.4.1 Kerpiç+ Hafifçelik Pilot yapı projesi

Çalışmada alçı katkısı ile nitelikleri iyileştirilmiş (alker) kerpiç yapı, çağdaş teknoloji ile desteklenip inşaat teknolojisine kazandırılmak üzere hafif çelik yapı ile karma olarak tasarlanmıştır. Tasarlanan yapının iç mekanının sağlık şartlarına katkıda bulunmak amacıyla, dış duvarda alker malzeme kullanılmıştır. İç duvar, döşeme ve çatı elemanlarında hafif çelik kullanılmıştır. Böylelikle iç mekanlarda yer kazanılmış ve yapım süresi kısaltılmıştır. Farklı sistemlerin beraber projelendirilmesi sırasında tasarım sınırlamaları tanımlanmış ve çözülmüştür.

Karma Yapının Plan Özelliği: Yapı iki katlı olup kerpiç dış duvarlar 45 cm kalınlığındadır. İçerdeki mekanları birbirinden iki yüzü alçı levha kaplı, taşıyıcısı hafif çelik profilden duvar ayırmaktadır. Alt katta antreye bağlı merdiven evi, misafir tuvaleti, mutfak, 24 m^2 salon; üst katta ise merdiven holü, üç yatak odası ve banyo bulunmaktadır. Yatak odalarından birinde alan büyütmek amacıyla ile cumba yapılmış, cumbanın HÇ duvarları dıştan yeterli derecede ısı izolasyon ile korunmuştur. Mekanlar için pencere yerine balkona tipi kapılar yapılmıştır. Yapının giriş katı **Şekil.5** te ve yatak katı **Şekil.6** da görülmektedir.

Karma Yapının Kesit Özelliği: Taşıyıcı duvarların altındaki sürekli temel derinliği inşaat yerinin zemin özelliğine göre tayin edilecektir. Temelin betonarme perde olması tavsiye edilmektedir. Kerpiç malzeme duvar kalıbının içine tokmaklama tekniği ile yerleştirilecektir. Kalıba yerleştirme aşamasında aşağıdan yukarıya her 60 cm de bir geo-grid malzemeden donatı yerleştirilecektir. Her kat hizasında betonarme hatıl bulunmaktadır. Betonarme hatılların dışa baka yüzü ısı izolasyonu ile korunmuştur. Döşeme HÇ kirişlemesi için 20 -25cm yüksekliğinde bükme profil kullanılmıştır. Çatı düz döşeme şeklindedir ve yeterli ısı izolasyonu ile donatılmıştır. İnşaatın bölge özelliğine göre eğimli çatı da kullanılabilir. **Şekli.7** giriş kapısından kesiti göstermektedir.

Karma Yapının Detay özelliği: Yapının cumbasına ait HÇ duvar ile yapının kerpiç dış duvarının birleşme noktası detay olarak **Şekil.9** da görülmektedir. Üst katın yatak odalarına ait Fransız balkonu eşik detayı ise **Şekil.10** da görülmekte. İçerden balkon için dışarı çıkan döşeme HÇ kirişlemeleri ısı izolasyonu ile korunmalıdır.

Karma Yapının cephesi: Yapının cephesi uygulanacak bölgenin özelliğine göre tasarlanabilir. **Şekil.8** yapının giriş cephesini göstermekte. Bu cephede düz çatısı etkisi görülmektedir. Giriş

kapısının üstünde yatak odası için yapılan cumba bulunmakta. Üst kattaki yatak odalarının yeterince ışık ve havadan yararlanabilmesi için pencere yerine uygulanan Fransız balkonu gözükmekte.

Hafif çelik yapı teknolojisi

Yurt dışında konut yapımında yoğun olarak kullanılan hafif çelik sistemin Türkiye'deki uygulamaları henüz yakın tarihte başlamıştır. İzmit'te 1999 depreminde yaşanan büyük can ve mal kaybından sonra, yapı sektörü mevcut yapı sistemlerinin yerine alternatifler aranmaya başlanmış, hafifçelik sistem bir çözüm olarak görülmüştür.

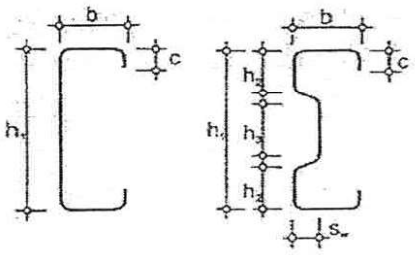
Hafif Çelik sisteminin tanımı

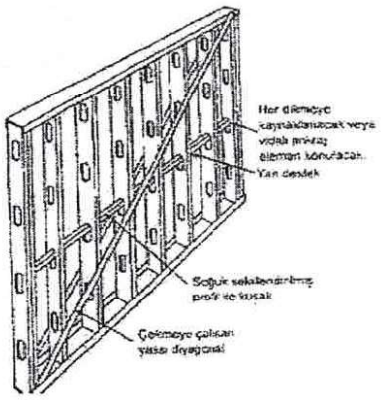
Çelik yapı, genellikle taşıyıcısı çelik-NP'den (normal profil) kurulan "çelik iskelet yapı" anlamına gelir. Normal profil sıcak çekme tekniği ile elde edilir; mukavemeti yüksektir; profilin metre ağırlığı kesitine de bağlı olarak fazladır. Çelik yapılard duvarlar örme ise "ağır", levha kaplama tekniği ile elde edilirse "hafif" olabilir.

Hafif çelik (HÇ) yapılarda kullanılan profiller çelik levhadan soğuk-bükme tekniği ile elde edilir. Çeliğin taşıyıcı sistem içinde az kullanılması, "çelik hafif yapı" yerine "hafif çelik yapı" olarak tanımlanmıştır.

Duvar veya döşeme için, çelik saçtan bükülerek üretilen profillerden önce ızgara inşa edilir. Duvar veya döşeme ızgarasının üstüne iki tarafından taşıyıcı levhalar kaplandıktan sonra yapı parçası taşıyıcı olur. Yapı parçaları birleşerek taşıyıcı sistemi oluşturur. **Resim.3'de** hafif çelik yapıda kullanılan bükme profil ve **Resim.4'de** duvar taşıyıcı ızgarası görülmekte. Duvarın içinden geçecek tesisat için ızgarayı meydana getiren profillerde yeterli delik bırakılabilir. Yanal kuvvetleri karşılamak için ise duvar düzlemine köşegenler yerleştirilmelidir.

HÇ ile Hızlı ve Rasyonel Üretim: HÇ soğuk bükme profiller belirli standartlara uygun olarak üretilir. Sistemi destekleyen bilgisayar programları ile yapının yük altındaki davranışları hesaplanır. Elemanlar fabrika ortamında projeye uygun olarak kesilir ve birleşme detayı hazırlıkları yapılır. Proje özelliğine göre 1.eleman, 2.yapı parçası veya 3.hücre şeklinde fabrika ortamında bitirilerek inşaat yerine sevk edilir. HÇ yapının üretim teknolojisi gerekli görüldüğü kadar hızlandırılabilir.





Resim.3 Çelik saçtan bükme profil

Resim.4 Duvar halinde taşıyıcı hafif çelik sistem

Yapının değişik oranlarda fabrikada üretilebilir olması, kalitesini ve hassasiyetini arttırır, yapının değişik atmosfer şartlarında inşa edilmesini sağlar. Sonuç olarak toplam inşaat süreci rasyoneldir.

HÇ ile hafif yapı: HÇ yapıda kullanılan profiller çelik saçtan bükülerek elde edildiğinden taşıyıcı sistem hafiftir. Hafif yapıların temelleri daha sadeleşir. Deprem bölgelerinde, düşey yükün azalması sonucu yatay yük de azalacağından, hafif yapılar deprem bölgelerinde daha çok kullanılır olmuştur. Ancak İstanbul'da tarihi bölgede 1999 depreminde görüldüğü gibi tekniğin gereklerini yerine getiren yığma dahil her tür yapı deprem bölgelerinde uygulanabilir.

HÇ ile kazanımlar: Hafif çelik yapılarda duvar kalınlıkları, taşıyıcı profillerin genişliği ve çift taraflı uygulanan kaplamaları ile beraber (12cm den başlamak üzere) incedir. Diğer yığma veya iskelet yapıda ortalama kalınlığı sıvalar ile beraber 23cm (19 + 4 =) civarındadır. Kerpiç yapı teknolojisinde iç duvarlar 30cm dış duvarlar 45cm'dir. Hafif çelik uygulandığında iç duvarlar 30cm den 12 veya 15cm ye inebilmektedir.

HÇ Teknolojisinin Dikkat Edilecek Özellikleri

HÇ taşıyıcılı sistemlerde kullanılan profillerin saç kalınlıkları genellikle 0.8 ve 1.2 arasındadır. Profillerin fiziksel ve mekanik davranışları göz önüne alınmalıdır (**Hacker, J.H., Gorges, J. A., 1997**). Çelik profillerin ve yapının mekanik özellikleri mühendislik hizmeti olarak sağlanmaktadır. Fiziksel özelliklerin ise mekanik özellik gibi göz önünde tutulduğu söylenemez.

HÇ de Yapı fiziği: Ülkemizde yapı alışkanlığı kargir malzeme ile olduğundan HÇ yapı teknolojisinin farklı yanları "yaşa ve gör" sürecinden önce tanımlanmalıdır.

HÇ de Ses ile ilgili konfor: HÇ yapılarda duvarlar ve döşemeler, bir zorunluluk yoksa, hafif ve kuru sistem olarak inşa edilir. Hafif yapıların zayıf olduğu konulardan biri ses iletkenliğidir **(Işık B., 2005).** Akustik konforun sağlanması bitirme malzemesi ve uygulama tekniği seçimi aşamasında göz önüne alınır.

HÇ yapıda akustik konforunun sağlanması için, önerilen bazı önlemler aşağıdaki gibidir:

1. Dış sesten korunmak için az gürültülü yer seçilmeli
2. Arazinin ses koruma özelliklerinden (ağaçlandırma ve tepe) yararlanılmalı
3. Arazide önlem alınamıyorsa açık alan ses bariyeri yapılmalı
4. Yapıda her türlü açıklık uygun şekilde kapatılmalı
5. Yapı boşluklarında ses yutucu ve/ veya izolasyonu ile donatılmalı
6. Taşıyıcılar şaşırtılmalı
7. Duvar yüzeylerinde ses yutucu levha kullanılmalı
8. İki katmanlı duvar kaplaması ile duvar ağırlaştırılarak ses korunumu arttırılmalı
9. Hafif duvarlara titreşimi arttıracak ilaveler yapılma-malı
10. Duvarlara ses yutucu ilave tasarımlar yapılabilir
11. Alçı levhalar şok-yutucu olarak kullanılmalı
12. İki duvar birleşmesinde aralık bırakarak ses iletilmesi önlenmeli
13. Duvar kaplamaları arasındaki boşluğa ses yalıtkan malzeme yerleştirilmeli
14. Sert döşeme kaplamasının altına ses yalıtımı yerleştirerek yüzer döşeme yapılmalı
15. Duvarlarda ses yutucu yüzeyler kullanılmalı
16. Duvarlara ses üreten aletler monte edilme-meli
17. Döşemeden ayrı olarak asma tavan kullanılmalı

HÇ de Isı ile ilgili konfor: Çarpıcı farklılıklardan biri çelikteki ısı geçirimliliğinin ahşaba göre 450 defa daha fazla olmasıdır (ısı geçiş katsayısı λ [W/m^2K] $\lambda_{ahşap}$ =0.14 ve $\lambda_{çelik}$=60.00). Bu farklılık ısı yalıtımı hesaplarında ve detaylarında göz önünde bulundurulmalıdır. Dış duvarda kullanılan C biçimindeki hafif çelik profillerin iki başlığından biri duvarın dışına diğeri duvarın içine bakar. Duvarın taşıyıcı HÇ profilleri 60cm aralıkla ızgara gibi kullanıldığı düşünülürse, yaklaşık 6cm genişliğindeki başlık cephenin yaklaşık %10 unu çelik ile kaplar.

Isı izolasyonu çelik ızgarayı dış yüzünden örtmezse, taşıyıcıların başlıkları, 1-ısı kaybına, 2-yoğuşma ve ıslanmaya 2- yoğuşma sonucu duvarın içinde ve kaplamalarının yüzünde ıslanma, renk değişimine, küflenme gibi mikro organizmaların yaşamasına sebep olur. Yoğuşma konusuna **sağlık**

açısından bakıldığında: bakteri, mantar ve diğer mikro-organizmaların oluşması, astım, alerji, vb. sağlık sorunlarını başlatır veya etkisini arttırır. Dış duvarların iç mekana bakan yüzlerinin soğuk olması mekan içinde sağlığa zararlı hava akımlarına sebep olduğu gibi soğuk (veya sıcak) iç yüzey mekandaki insanları radyasyon ile etkiler ve hastalığa sebep olur. Sonuç olarak konforsuzluk bir sağlık probleminin habercisidir. HÇ yapıların dış yüzleri, sıcak veya soğuk iklim ayırt etmeden, ısı izolasyonu ile mantolanmalıdır.

HÇ de Durabilite: Çeliğin korozyonu (paslanma) durabilitenin konusudur. HÇ yapı profilleri için ince (genel olarak 0.8 ve 1.2) galvanizli saç kullanılır. Hadde veya özel ağır çelik profillerden farklı olarak bu ince profiller korozyondan daha kolay zarar gördüğü kesindir. HÇ yapıda korozyon, profillerin özellikle bağlantı noktalarını zayıflatarak taşıyıcılığı etkiler. Yapı kabuğunda, bünyesinde ve iç mekanlarında dolaşan su veya buharı korozyona sebep olur. Suyun yapıya geliş şekli 1-yoğuşmaya (kondenzasyon), 2-dış kabukta ve iç ıslak mekanlardaki su izolasyonunun yetersiz olmasına, 3- yapı elemanları içindeki tesisat kaçağına, 4-yapının kullanımına bağlıdır. HÇ yapılarda diğerlerinden farklı olarak tekniğine **uygun ısı izolasyonu** yapılmazsa, duvarın dış yüzlerinde ve duvar kesiti içinde yoğuşmaya sebep olur. Yoğuşma hem iç veya dış kaplamaların yüzeylerinde hem de kesit içindeki ses izolasyonu gibi malzemelerin ıslanmasına sebep olur. **Taşıyıcılık açısından** yoğuşmanın etkisi: çelik profillerin paslanması sonucu yapının taşıyıcılığı tehlikeli hale gelir.

1.4.2 Kerpiç'in endüstriyel üretimi projesi

"Endüstriyel kerpiç blok üretimi" bir sonraki proje olarak KKTC - MEB kapsamında Mart2009 döneminde önerilmiştir.

Proje kapsamı:

- Uygun toprak belirlenmesi
- Beton parke taşı tesisinde blok üretimi
- Elde edilen ürünün uygunluğunun sağlanması
- Elde edilen ürünün teknik özelliklerinin (mekanik ve fiziksel) belirlenmesi
- Hedef kitleye duyurulması

1.4.3 Kerpiç duvarın sarsma tablası araştırması

Küçük numune üzerinde elde edilen bulguların sarma tablasında gerçek yapı boyutunda sınanması.

Proje ortağı: Ankara, Afet işleri Gn. Müdürlüğü

BÖLÜM.2

Gerekçe ve dayanaklar

BÖLÜM.2
Gerekçe

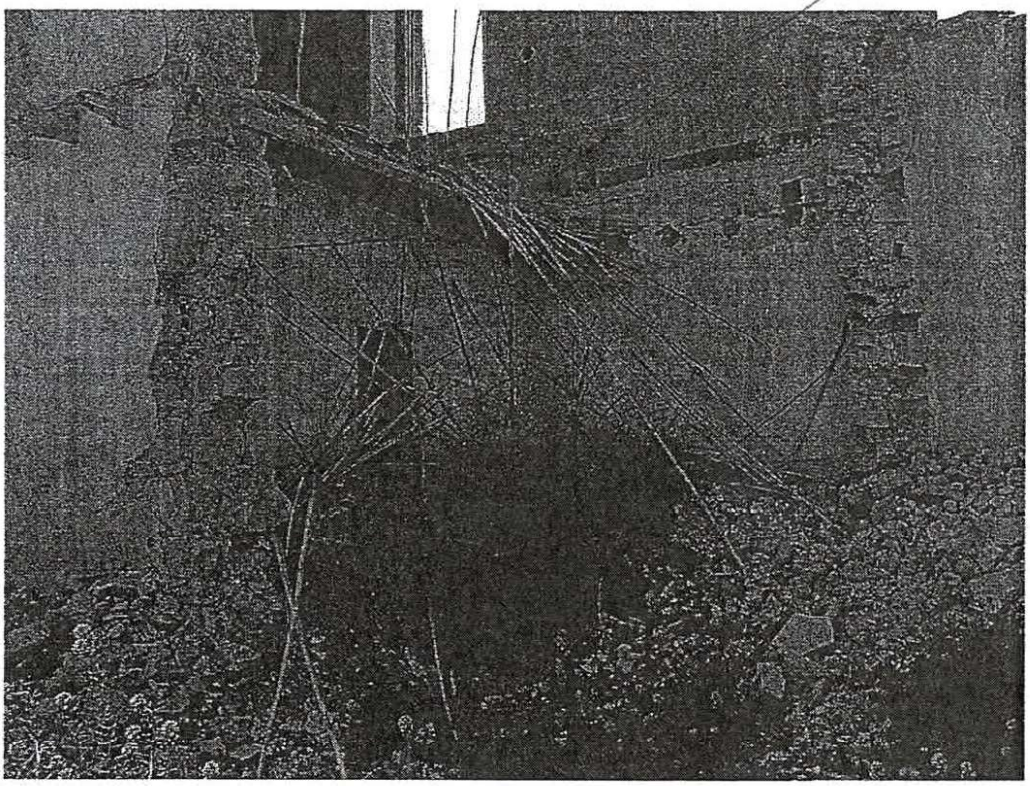
Neolitik dönemden bu yana iskân edilen Kıbrıs'ta bölgenin **iklim** ve **sosyo-kültürel** verilerine bağlı olarak kerpiç ve taş mimari gelişmiştir. Mimari miras tarih içinde toplumlara ait bilgi aktaran bir kaynaktır.

Tablo.1 Kıbrıs tarihi (Wikipedya)

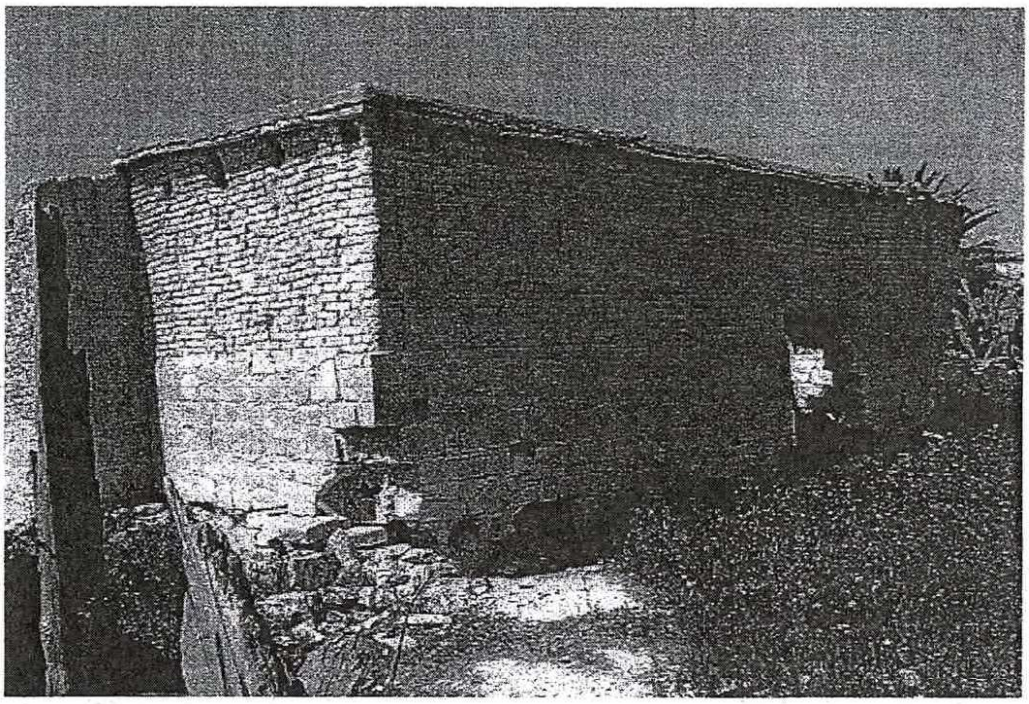
- 9000 - 3800 BC: Early Age of Stone,
- 3000 – 1450 BC: Age of Bronze
- 1450 – 700 BC: The Egyptian Empire takes control of Cyprus
- 700 – 545 BC: Cyprus falls under Assyrian Rule
- 545 – 345 BC: Voluntary submission to King Cyrus of Persia
- 350 – 290 BC: Hellenistic period (Alexander the Great takes over), architectural styles are adopted
- 290-58 BC: Roman occupation: important temples, amphitheaters and baths are constructed
- 58 BC – 395 AD : Roman period, St Paul converts the proconsul Elymas of Paphos from the worship of Aphrodite to Christianity
- 330 - 700: Division of the Roman empire marks the start of the Byzantine era
- 700 - 1191: Periodical Arab raids on Cyprus
- 1191 - 1192: Richard the Lionheart arrives in Limassol, proceeds to capture Cyprus and becomes its effective ruler
- 1192 – 1498: Lusignan takes control of Cyprus (cathedrals of Famagusta and Nicosia)
- 1489 - 1571: Venetian forces decide to take control
- 1571 - 1878: Turkish Ottoman empire captures Cyprus (Othello from Shakespeare 1564–1616)
- 1878 - 1960: British rule
- 1960 – 1974: Cyprus republic
- 1983: "Turkish republic of Northern Cyprus" not recognized by the international community

Kerpiç yapı malzemesinin mekanik ve fiziksel özellikleri zayıftır. Doğadaki sıcak soğuk farkı, su ve rüzgâr etkisi, diğer yandan bitkiler, hayvanlar ve insanlar dünya mirası olan kerpiç yapılara zarar vermektedir. Eğitim siteminde son yüzyılda kerpiç teknolojisinin yer almayışı, yeni yapıların endüstrileşmiş yapı malzemeleri inşa edilmeleri sonucu, insanlar içinde yaşadıkları yapıları dahi onarmayı başaramamışlardır.

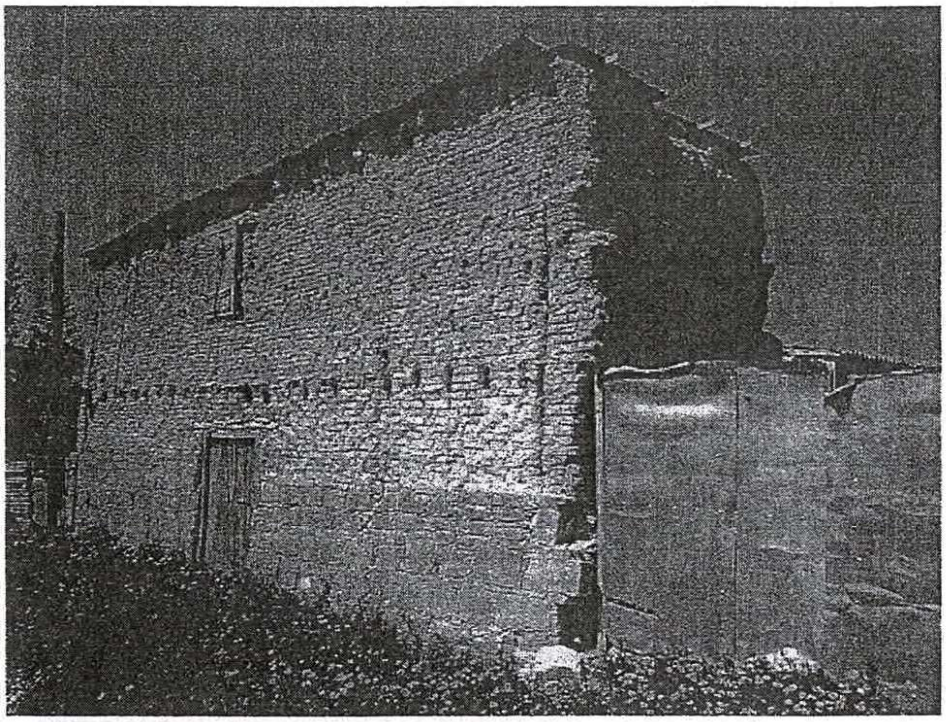
Ekolojik denge ve mimari kültür mirasının korunması amacıyla kerpiç yapı teknolojisi araştırmaları sürdürülmelidir.



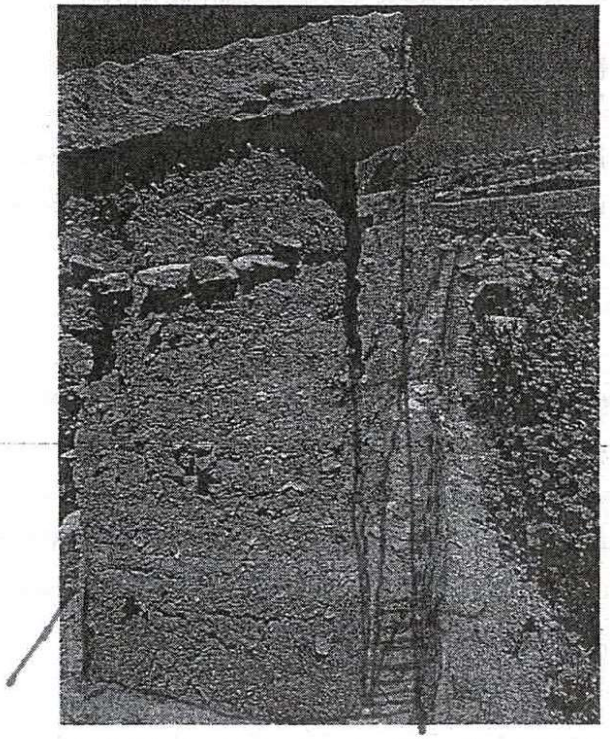
Şekil.1 İnsan eliyle tahribat, Akıncılar köyü (B:I)

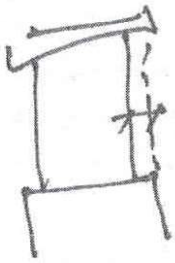


Şekil.2 İnsan eliyle tahribat, Akıncılar köyü (B:I)



Şekil.3 Doğa olayları ile tahribat, Akıncılar köyü (B:I)





Şekil.4 doğa olayları ile tahribat, Akıncılar köyü (B:I)4

Dünya üzerinde hayatın devam edebilmesi için kara, hava ve su kaynaklarının korunması gerekmektedir. "İmar edilen çevre" veya "yapma çevre" hayatın devam etmesi için gerekli temel kaynakları kirletenler'in arasında en büyük paya sahiptir. Tablo.2 yapılaşmanın dünya kaynaklarını

kullanma oranlarını göstermekte (1). İmar edilen bölgeler ulaşım, diğer faaliyet ve hizmetler ile beraber dünya enerji kaynaklarının %75 ini tüketmektedirler. "Eğer çocuklarımıza yaşanacak toprak, su, hava bırakmaktan sorumluysak, hemen bu gün yeni kirlenmenin oluşmasını engellememiz gerekir"(1)

Tablo.2 Yapılaşmanın dünya kirlenmesindeki oransal payı (1)

Enerji kullanımının %50 si
Ham madde kullanımının %40 ı
Ozona-zararlı kimyasalların kullanımı %50 si
Tarıma uygun arazinin kaybı %80i
Kullanma suyunun %50si

Deprem kadar kısa sürede etki etmek yerine, bozulan çevre şartları nesiller geçtikçe kararlı ve kötü sonu getirmektedir.

Depremle yaşayan ülkemizde, sağlam yapıların gerekliliği anlaşılmakla beraber sağlıklı yapı ve sağlıklı çevre fikrinin yerleşmesi için çaba sarf edilmesi gerekmektedir. Eco-köy veya eco-kent çalışmaları bu amaçla yürütülmektedir. Bu sunuşun amacı, 1978 ten bu yana İTÜ'de yürütülmekte olan alker duvar malzemesi çalışmaları ile GAP Bölgesindeki Ekokent projesinin çevre korumaya katkısının gösterilmesidir.

Dünya'da ekolojik önlemler

Ekoloji, canlıların yaşama biçimleri, yaşama ilişkileri, yaşama ortamı ile ilgilenen bilim dalıdır. Düyada hiçbir madde kaybolmaz, katı, sıvı, gaz hallerinde şekil değiştirir. Bütün canlılar ise sürekli devinim içindedirler. Değişim birbirini destekliyorsa döngü adını alır. İnsan eli ile yürütülen, diğer bir değiş ile doğal olmayan fiziksel mekanik, kimyasal şartlar döngüyü etkilenirse, ekolojik denge bozulur. Ekolojik dengenin bozulması iklim değişikliği, global ısınma, sel baskınları, deniz seviyesi değişmesi, asit yağmuru gibi bölgesel ve global sonuçlar yaratır.

Ekolojik dengenin korunması amacı ile ulusal ve uluslararası yasalar hazırlanmaktadır. Global Çevre Bilinci doğrultusunda yapılan çalışmalar Tablo.3 (2) de kısaca görüldüğü gibi çok yakın tarihte başlamıştır.

Tablo.3 Çevre bilinci çalışmaları (2)

1972 Stockholm insan çevresi konferansı

1979 Cenevre hava kirliliği kongresi (UN)

1992 Rio çevre toplantısı (UN)

1992 Maastricht andlaşması

Gelişmelere paralel olarak Türkiye'de de Çevre Bakanlığı kurularak yasa ve yönetmelik düzeyinde önlemler alınmaktadır (3,4). Ancak burada Avrupa birliği ve global çevre yasaları üzerinde durulacaktır. Avrupa topluluğunun belirlediği ve Ülkemizi de etkileyecek olan çevre kiriliğini önleme prensipleri kısaltılmış olarak şöyledir

- Kirlilik yerinde önlenmeli
- Kirleten çevre hasarını öder
- Çevre yasaları ekonomik ve sosyal yasalar ile entegre edilmeli
- Teknik planlama ve karar aşamasında çevrenin gelişmeye olan etkisi göz önünde bulundurulması
- Çevre bilgisi güçlendirilmeli
- Bir ülke diğer bir ülkenin çevresine zarar vermemeli
- Avrupa topluluğu çevre politikasının global etkisi hesaba katılmalı
- Çevrenin koruması bütün Birlik üyelerinin sorumluluğudur
- Kirliliğin tipleri ve seviyeleri belirlenmelidir
- Birlik üyeleri arasında ortak politika oluşturulmalıdır
- Arupa Birliği politikaları ülke politikaları ile uyumlu kılınmalıdır

(Kaynak: The European Community and the Environment (3.Edition) European Documantation 3, 1987, Office of Official Publikations of the European Community)

Yapılaşmanın çevre etkisi göz önünde bulundurularak Birlik tarafından değişik dönemlerde yasalar hazırlanmıştır. Avrupa topluluğunda İnşaat sektörüne yönelik yasa öncüsü 1986 da "çalışma şarlarının iyileştirilmesi ve çevre politikalarının uyarlanması" konusundadır. 7 Şubat 1992 de

imzalanan Mastrich andlaşması ise inşaat sektörüne yönelik aşağıdaki maddeleri yürürlüğe koymuştur.

Tablo.4 Mastrich adlaşmasının inşaat sektörüne yönelik maddeleri

- Çevre politikası genişletilmeli
- Yenilenir enerji cesaretlendirilmeli
- Çevre ve sosyal politika entegre edilmeli
- Sürdürülebilir gelişme uygulanmalı
- Kirleten temizler prensibi uygulanmalı
- Kirlilik kaynağında önlenir prensibi uygulanmalı

1952 den bu yana kurumlaşan Avrupa Topluluğu Mastrich andlaşmasından önce de inşaat sektörüne yönelik yasalar çıkartmıştır. Tarih sırasına göre bazıları Tablo.5 da görülebilir.

Tablo.5 Avrupa topluluğunun inşaat sektörü için çevre alanındaki yasaları

Gürültü kontrolu	1986
Yapı malzeme ve ürünleri	1991
Malzemelerde eko-etiket ödülü	1992
İş yerinde ion ve radyasyondan korunma	1976
Asbest'e maruz kalma	1975-87-90
Hava kalitesi ile ilgili	1980 den başlayarak
Hava kirliliği, SO_2 sınırı, klor-flor karbon oranı	1980
Ormanların hava kirliliğinden korunması	1986
Su kalitesi, toksikler	1978-80
Endüstriden kimyasal atıklar	1982
Geriye dönüşümlü malzemelerin cesaretlendirilmesi	1975

Çalışmalara bakıldığında çevre, sağlık ve güvenlik Avrupa Topluluğunun (şimdi:Birlik) en önemli yasalarını oluşturmaktadır. Avrupa Birliği üyeleri, kendilerine ait

- Şehir ve bölge planlama
- Yapı yönetmelikleri
- Sağlık ve güvenlik

Alanlarındaki yasalarını, bir an önce Avrupa Birliği yasaları ile entegre edeceklerdir. Mastrich adlaşması bir yandan "enerji etiketlemesi" ve "karbon vergisi" gibi müeyyideler getirirken (2) diğer yandan da çevre ve enerji gibi konularda meslek adamlarını yetiştirmek üzere üniversitelerin yeniden yapılanmasını, ayrıca araştırma merkezleri ve üniversitelerde yürütülecek araştırmaların desteklenmesi üzerine yasalar oluşturmuştur.

Yapılaşmanın çevre yükü ve azaltılması

Dünyanın artan nüfusuna yeterli yiyecek, giyecek, mekan ve diğer teknik altyapının sağlanması amacıyla endüstrileşmeye ihtiyaç duyulmuştur. Çevre dengesini bozan da endüstrileşmedir. Endüstrileşme doğal kaynakları tüketir, katı, gaz ve sıvı atıklarla çevreye zarar verir. Böylelikle önceleri fark etmeden, yüzyıllarca kaynaklar hızla tüketilmiştir.

Tablo.6 Avrupa Birliği Ülkelerinde CO_2 emisyonu, Milyon t (1993'de15 ülke, kaynak: Eurostar(3))

Termik Santral	940.4
Trafik	810,9
Evsel kullanım	665,2
Diğer Enerji	142,7
Endüstri	555,5

Tablo.6'te konut sektörünün ısınma ve diğer servislerde kullandığı enerji sonucu ortaya çıkan CO_2 emisyonunun diğer sektör kirlilikleri ile karşılaştırılması görülmektedir.

Yapılaşma evsel kullanım dışında inşaat amaçlı da enerji kullanır. Ancak bu gün için büyük enerji ile üretilen alüminyum, çelik, tuğla, çimento vb yapı malzemelerini kullanmadan inşaat yapmak imkansız gözükmektedir. Diğer yandan malzeme üretimi için doğal kaynakların kullanılması, yol ve benzeri sebeple yeryüzünün örtülmesi, bitkisel yüzey toprağının telef edilmesi, şehir alt yapısı, yani temiz su gelişi-kirli su dönüşü ve diğer tesisler, katı ve gaz atıklar, uygulanan her türlü teknoloji v.b. konular ekolojik yük getirmektedir.

BÖLÜM.3

KKTC'de kültür kimliği olarak kerpiç mimarlık

Kıbrıs evleri 3.1

Kırsal mimari 3.2

Sürdürülebilirlik 3.3

Restorasyon örneği 3.4

ICOMOS ilke ve hedefleri 3.5

BÖLÜM.3
KKTC'de kültür kimliği olarak kerpiç mimarlık

3.1 Kıbrıs evlerinin iklimsel özellikleri

Zeref Birsel

1 INTRODUCTION

Cyprus Island is very important because of her location she is in the middle of the cultural and economical routes of the Europe, Asia and Africa. The Island has been attracting the interest of prevailing rulers throughout the ages by her strategic position. Certain world authorities such as rural, Egyptian, Assyrian, Persian, Helen, Roman, Byzantine, Arab, Frankish, Genoese, Venetian, Ottoman, and the British, respectively, ruled and settled in the Island. After the British colonization period, the Greek and Turkish Cypriots held the chance to rule themselves independently for only three years that ended up with a political dispute that still exists. Mostly in the urban areas of the build environment, multicultural accumulations of different dominances was reflected [i]. The dominant influences of the prevailing different cultures on the formal architecture in terms of administrative, religious, public and militaristic structures in the forms of Egyptian, Hellenistic, Roman, Islamic, Byzantine, Gothic, Renaissance, Ottoman Turkish and British Colonial Styles. On the other hand, domestic

architecture in the urban context was moderately influenced by the mentioned styles. This context mostly represented the medieval-Ottoman synthesis [ii–iii].

On the other hand, the environmental factors especially natural, climatic, and socio-economical parameters has given the shape of the traditional rural architecture. The traditional rustic forms were developed according to the response of the agrarian lifestyle, available local building materials and climatic conditions. In general terms, the climate of Cyprus is Mediterranean with local variations. The central part is drier whereas the coastal areas are more humid. Chapman classifies the climate of the Mesaoria region as continental [iv]. It has long hot summers, moderately cold winters with little cloud cover and very high summer aridity with less than 350 mm of rainfall per year. These weather conditions provided the right conditions for the development of adobe architecture in the region.

Climatic conditions taken to the consideration during the designing of the houses, starting from the street pattern and continue on the building design. The shaded narrow streets, bay windows (cumba), thick adobe walls, high ceilings, pitch roof structures and their overhangs are all the expression of the climatic design considerations pertaining to that period [10]. The plan schemes of the houses are also formed in accordance with the climatic conditions. The rooms of the houses are mostly organised around open courtyards.

2 THE CLIMATIC CONTEXT OF CYPRUS

Cyprus lies between 34◦33_ and 35◦41_ North latitudes and 32◦30_ and 34◦35_ East longitudes. It has a Mediterranean climate characterized by cold and wet winters and hot summers with some variations in the coastal areas. Local tradition divides the year into four seasons summer, autumn, winter and spring of which spring (March–May) and autumn (September–October) are very pleasant. Climate shows some differences according to the location:

- Inland Areas which named Mediterranean Continental Climate
- Costal Areas which named Mediterranean Marine Climate
- Mountainous Areas which named Mediterranean Mountainous Climate

Mediterranean Continental climate, which effect on the inland areas, has strong wind. In this climate the days are very hot and the nights are cool. Relative humidity shows some variables and the vapour pressure is low.
On the other hand Mediterranean Marine climate, that effective on the costal areas, has low wind velocity. Vapour pressure is higher then the Mediterranean Continental climate.
Therefore Mediterranean Mountainous climate that affects the mountain ranges of the island has stronger wind velocity, and stronger rain with its stronger winter seasons.

Accordingly Lefkosa has Mediterranean continental climate characteristics. Regarding its location and the results of bio climatic chart it is represent the inland climate, which is hotter than the other regions and named as Mediterranean Continental climate. During the summer the city had the highest temperature. During the hot periods of year the humidity level is also

high. Finally it can be said that Nicosia had dry and humid weather during the summer period and wet and warm weather during winter season.

2.1. Design considerations regarding to climate

Solar radiation is very strong in Cyprus and this is the very first cause which has been taken to consideration. The major discomfort is high temperatures during the summer. Shades is important requirement for the thermal comfort and not only for the space also for the building elements such as walls and the roofs is important, to avoid the heat gain by the solar radiation. Diurnal variations in temperature around the year are between 9 and 11°C and therefore some stability of temperature indoors are required for comfort. In the coastal areas where humidity is high airflow is needed for comfort. For comfort in the winter months the opposite is true and solar radiation is welcome and protection from cold winter winds is needed. The environmental requirements for comfortable occupancy for winter and summer are therefore contradictory to each other and make it difficult to achieve both in one building. In spring and autumn the outdoor conditions are conducive for comfort during the daytime and some heat is required at night only. The use patterns of these houses reflect the way users negotiate with climate and adapt to its variations through space use.

Since both the winter and summer seasons require indoor conditions to be either cooler or warmer than the outdoors the building envelope design has to be of protective nature. In the comfortable seasons (autumn and spring) most activities are performed outdoors during the day. In this situation the use of thermal mass, with some shading is a possible approach in this climate and that seems to be the primary consideration in the design of Mesaorian houses.

Environment modifying features

The Mesaorian houses without exception are of heavy weight earth construction to mitigate both the effect of the hot summers and cold winters in the summers to keep out the heat and in the winters to keep it in.

Orientation

Orientation of the houses placed in the north south direction in almost in all cases. All houses has an open arcaded hall which is always on south and proportioned in such a way that keeps away the high

summer sun while letting in the low winter sun. Orientation of the openings organised due to the wind. Mostly openings are on the west wall of the houses because of the predominant direction of the wind and there are no any openings on the north.

Form and layout

In most cases these house have a single room depth and the rooms are arranged in a linear manner adjacent to each other. Some variation of this occurs in the typology with the inner halls. In all cases any room has at least two walls, which are in contact with the exterior environment the corner rooms have three. The houses with upper floors have more contact with the environment and are comfortable in summer because of the wind exposure and for sleeping at night time when outdoor temperatures are lower. The inner rooms with less exposure are cooler during the day in summer and therefore contain the most common functions.

Materials

These buildings are of the adobe variety. Thick mud wall construction creates a level of protection with the exterior resulting in moderated and slow transfer of heat to the indoor during summer. In the winter months they help preserve the indoor heat provided by fires or human and animals. Roofs are multi layered, timber frame, which supports bamboo rafters, covered with bamboo mats or dried reeds and finally plastered with mud. This offers good insulation from heat as well as from the cold.

Others

The most prominent climate-modifying element in some of these houses is the arcaded hall, which is located on the south without exception. This protects the inner spaces form direct solar radiation in the summer. Windows are located on western walls to take advantage of the prevailing breeze when needed whilst openings are avoided in the north on account of the cold wind in winter.

3 THE EARTHEN HOUSES IN LEFKOŞA

3.1 Construction materials and techniques

The effect of physical situation of the region and the presence of the construction materials are reflected in the vernacular architecture of the Mesaoria region. Earth, is the most plesantl resource in

the region. The most common wall material is sun dried earth blocks (adobe). These are made of earth, gravel, clay and water mixed with straw, grass or hairs of livestock as binders left as a mixture overnight and then made into blocks and dried in the sun. The blocks are used for constructing the load bearing walls. The original mixture is used as mortar as well as for plastering. Earth is also used as a plastering material for the final layer of the roof.

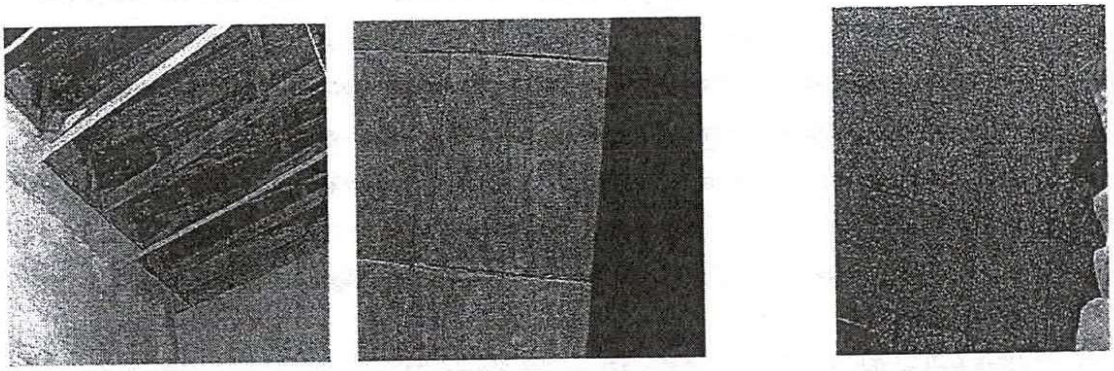


Figure1. Some material which is used in the buildings - Lefkoşa

Timber is used to support the roof structure. Hill suggests that the island had heavily wooded areas for most of its history. The most common types for construction purposes were oak, juniper, pine and cypress with the possible use of the date palm, olive and reed. The load bearing earth walls supported a timber roof frame on which were placed reeds, straw and finally plastered with mud on top. Timber is also used as lintels door and window frames and panels.

Another constructional and structural material is stone the use of which increased near the mountains because of availability, mostly used as a foundation, base course, arch, floor and pavement, and sometimes as frames for the openings.Gypsum was widely used as the plastering material and also for decorations and utilitarian purposes. Gypsum plaster provides a characteristic color to the houses. It was also used to make running shelves along the walls, used for displaying decorative artefacts and for keeping household items.

3.2 Lifestyle and space use

The activities mostly take place in the open air in Mesorian houses. This is because of the climate and the lifestyle of the people. The climatic conditions made people to orient their life towards to the outdoor activities in rural houses, such as cooking, laundering, and leisure. The roofs are used for drying the agricultural products, and often as a place to rest and sleep, especially during summer time. The uses of indoor spaces are limited to that of storage and domestic use relating to need for privacy. Indoor spaces are used when the climatic conditions do not make outdoor activities possible (during hot summer days, during rainy periods and cold winter nights). The houses consist of open, semi open and indoor spaces allowing flexibility of use as the need or the climate demands.
As in the whole island and in Mesaoria region south direction had an important role in the orientation of the dwellings. Houses mostly face south to take advantage of the sun. The
arcades or the semi-open spaces are mostly located towards the south.

3.3 Spatial components of the Mesaorian house and multiplicity of use hall

The hall is the main space of the Mesaorian house. This is the generator of all domestic activities. The hall has many functions the common ones being, hosting of guests, resting, sleeping, laundering, cooking, eating etc. Besides all these the hall is also the circulation spine for the house as it connects all other spaces. Halls can be found both in the central and/or the peripheral parts of the dwellings. As it provides a multi-functional atmosphere, it is the stimulus for all domestic activity.

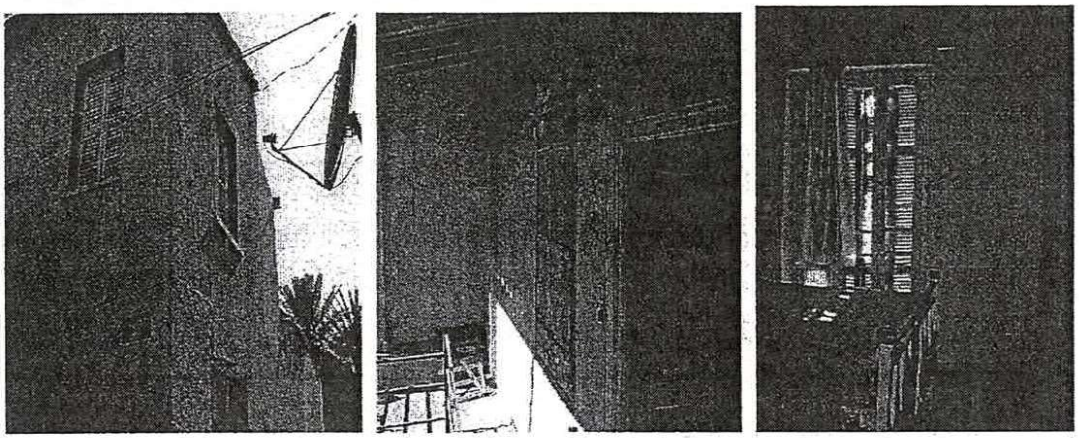


Figure2. Traditional earthen house in Lefkoşa (B.I)

3.3.1 The living unit

The living unit can be one single space or divided into a number of sub spaces. The flexibility in the formation of spaces can be observed as a result of structural and constructional modularity. For instance, the large space is usually separated by an arch or post and beam in the middle of the unit, forming two sub-spaces. These may sometimes also have corresponding level changes. These flexible spaces can be used as bedrooms that include parts for parents and children, or a bedroom and a living room, or a kitchen and a storage area. The hearth is usually located here at one end.

Sometimes a loom may be kept here if the householders did their own weaving. The living unit is mostly at the ground level. However, when there is an upper floor it can be at both the ground and the first floor. During the summer periods, the first floor is preferred since it has a more comfortable environment. In this case the flat roof worked as an extension of the living

unit and its functions such as sleeping space on hot summer nights. The living unit upstairs could also be used for storing food vulnerable to humidity and vermin.

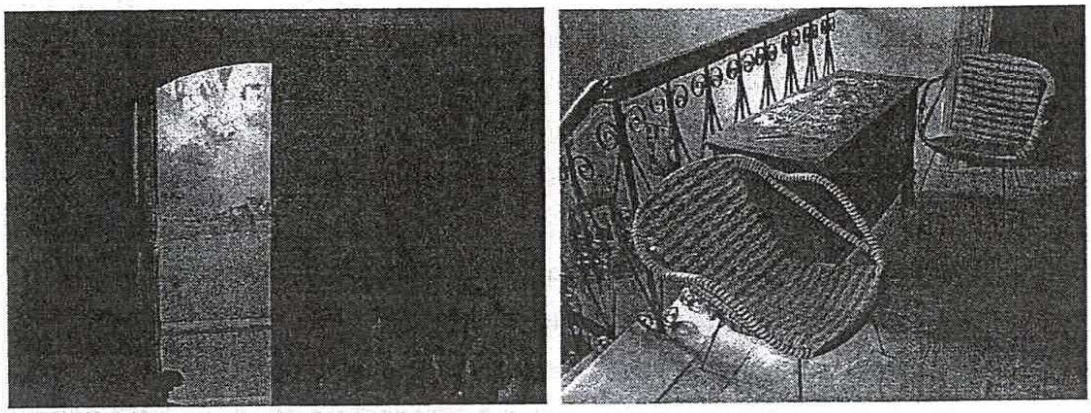


Figure.3 Hall of the traditional building in Cyprus (BI)

3.3.2 Storage

Although storage function could take place anywhere in the house, there was always a specific closed space allocated particularly for large-scale storage of grain, straw or other animal feed. Given the means of livelihood of the people it can be considered as the most important part of the house. Depending on purpose and the wealth of the owner there could be several storage spaces. They are located in a large space where they can have partitions for different purposes. Almost always the storage space had a mezzanine floor (sende in Turkish) made of stone and covered by gypsum, which prevents humidity, and pest attacks. Besides being used as a place for storing products, they were also

used to keep the agricultural equipment. These storage spaces have small openings at higher levels to allow air circulation.

3.3.3 Kitchen

Although most of the cooking activities take place outdoors, many of the houses have an indoor kitchen. The most important part of the kitchen is the hearth, used for cooking and heating water and is located in the corner of the room. In the spatial organization, there is
strong relationship among the kitchen, the open areas and the hall. For functional reasons the kitchen needs to be close to the storage.

Sometimes there may be a special storage space adjacent to the kitchen connected with it by a low height door. This special storage space is windowless to keep it cool to preserve certain kind of food. In all houses, without any exception, the kitchen is located in the ground level of the house. In most of the houses there is a sink in the kitchen. If there is no bathroom in the house, as if often case this sink could be used as a bath.

3.3.4. Bathroom

A few Mesaorian houses have separate bathrooms. The presence of a bathroom in the house, if any is also an indicator of the Turkish background of the owner. Unlike the public Turkish baths (Hamam in Turkish) these bathrooms are private and smaller, consisting of two chambers only. The first part of the bathroom (sogukluk in Turkish) serves as a dressing room, which also helps to regulate the body temperature after having a bath. The second part is the main section of the bathroom, where the bath activity takes place. This part has a distinctive dome structure and it is smaller than the first part.
In such bathrooms water is warmed outside which can be carried with a pot into the bathroom or connected with pipes to the tap of the bathroom. In a more sophisticated version the heat from the fire outside may be carried into the bathrooms via pipes under the floor to warm up the space as well.

3.3.5. Toilet

The structure of the toilet is simple. It is located individually away from the main living units in the yard. In some houses, the location of the toilet might be defined where the toilet is maintained regularly. In other houses its location may change periodically as pits get filled up and the location is

changed. These toilets were a health hazard and a source of disease. Since the mid 1930s modern sanitary facilities were introduced, initiated by the British. Since then toilets began to be a part of the main house with proper sanitary facilities.

3.3.6. Shelters for domestic animals

Like the storage spaces, shelters for domestic animals were an integral part of the Mesaorian houses. The location size and characteristics of these shelters depend on the type of animals, their use and habits. They could be either open, semi open or closed spaces. Oxen were important animals given their importance in agriculture and they were housed in rooms specially made for them. These may sometimes have connection with the storage space.

4 CONCLUSION

The traditional rural architecture was developed as an appropriate answer to the environmental factors especially natural, climatic, and socio-economical parameters. The traditional rural forms were developed according to the response of the agrarian lifestyle, available local building materials and climatic conditions.

'Ecological Building' has recently been introduced into the architectural literature and in fact ecological building is being taught as a separate course in some schools of architecture. Subjects given below immediately come to mind, irrespective of their order of priority, when ecological building is mentioned. Those (subjects) are harmony with nature and utilization of nature for the purpose of obtaining maximum energy for air conditioning.

Harmony with nature means that materials used in constructions are not harmful to the environment and can easily eliminated by the environment in short periods (1). Some materials used in buildings such as sand and gravel are obtained from river beds or by breaking mountain rocks. This way of production damages the environment. Best example of this can be seen in Beşparmak mountains which is the symbol of Cyprus

On the other hand in countries whose economies did not reach their optimum levels, there is either shortage of energy or this problem is eliminated by compensating from other

investments areas. As we know the electricity, in general, is produced by hydroelectric, thermal and nuclear power stations. These type of energy production systems also damage the natural stability. Particularly, the 1986 Chernobyl disaster is still in the minds of many.
Air conditioners are abundantly used for cooling and heating in closed living spaces despite the fact that the medical world emphasizes their harm on human health.
Many countries import air conditioners and many other construction materials despite their economic deficiencies. Selling air conditioners by installment payment system may seem very ordinary but future generations are burdened with by the debt incurred by the country.
The objective is not to open a fight against technological devices or to prevent them from being used completely. Such technological devices will be used when necessary but should be used as little as possible.
Insulation against heat is presented as a solution to the problem described above but I believe this approach is partially correct. When the question how friendly the insulating materials are ecologically and economically is asked, the picture changes because commonly used insulation materials contain petroleum or chemical compounds and are expensive.
Correct solutions to these problems lie in the production of traditional rural residences.

3.2 Kırsal yerleşmeler

Turgay Salihoğlu

3.2.1 RURAL AREA RESIDENCE ARCHITECTURE IN CYPRUS

Considering evolution process of earth and the fact that Cyprus is an island, I assume that early people sailed and settled on the island at later periods. In fact archeological excavations to present day prove this assumption is true and it is thought that the first people who arrived on the island during the Neolitic period (10000 B.C) were from Mesopotamia and Egypt. Settlement of that period is Akrotiri but remnants of residences was never found in excavations. Therefore those settlements are believed to be a collection of cottages.

Neolithic settlements are well known. When the first and the most important settlement of that period Khirokia is analysed it is found that the settlement is founded on the slopes on the southern side of the hills in order to avoid the cold north winds of winter. When we look into the air conditioning of houses we see that their doors face south. Also the floor furnishings are 0.5 m below the doorstep level. In some houses this level is as low as 1.7m. I am assuming this implementation is used for climatization purposes. Walls were made of adobe and mud bricks obtained by drying limestone blocks accumulated on stone surfaces, dark color gravel collected from riverbeds and earth mixed with hay under the sun. Stones outside and adobe inside are sometimes laid on top of each other. Exterior and interior side of walls are plastered with whitish earth (3).

Good examples of natural climatization techniques of this period are also seen in other settlements. Another interesting climatization technique was found in the village of Varysi which was the capital city in late Neolithic period according to sources. In this settlement the houses are connected to each other with corridors that are thought to be built for climatization purposes (4).

What we see in the village of Lemba houses, a later settlement, are good examples of the use of various natural climatization methods of Calcolithic period utilizing metals in addition to stone tools. Entrance to houses face south for maximum benefit from sunlight instead of west where sea breeze comes from (5).

Buildings with courtyard system begin in the Bronze Age. An example of this can be seen in the farm house of Alambra village belonging to Early Bronze Age. This house consists of two rooms which have doors opening to the courtyard facing south. The foundation of the residence is composed of natural rock and artificial stone walls. Walls are made of adobe and their interior side is plastered with mixture of sand and lime. It is assumed that exterior of the walls are also plastered with the same mixture or adobe mud. The main idea however is the use of lime based plaster. The reason of this idea is that this house is the first example of the Traditional Rural Area Residences of Cyprus. There were no roof materials found and consequently it is believed that the roof was covered with a mixture of hay and clay (6).

Details of climatization of buildings in rural areas for later periods will be dealt extensively in the statement, therefore I will not dwell on the details on the climatization of other settlements of this period or the Iron Age and post Iron Age houses. In fact the construction

system of the farm house of Alamra is thought to be continued in a more developed form in rural areas during the periods of Lusitanians, Venetians as well as this period.

Rural area houses built during the Ottoman's period were continued until recent times. Rural area houses of this period started with 'One Room Plan' type and developed into 'Hanyalı Plan' type to accommodate developing life syle and to achieve maximum benefit from natural climatization.

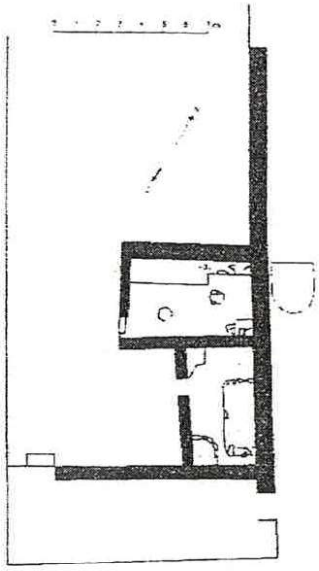


Figure.1 Farmhouse Plan in Alambra. (from E. Gjerstad)

Wind is the main factor effecting planning of houses. While it is effective and beneficial in the climatization of spaces, it also presents a disadvantage by blowing dirt and creating pollution during dry seasons. To prevent this negative effect of wind, courtyards are surrounded with walls to create a calmer and cleaner environment.

Efforts have been put for benefiting from shade. Specifically openings on the exterior facade, such as doors and windows, were minimized.

Dominating winds were the main factors in settlements. Settlement locations were selected to benefit from the 'North-West' and 'South-East' winds dominant in summer and winter months. In addition, windows and air ventilation ducks were constructed to allow wind to get in and out easily (1)

Roofs are usually flat and covered with earth. This construction has emerged due to specific climate conditions. The roof exposed to sun and external atmospheric events is insulated against heat by using thick layers of earth. Inclined roofs have been designed to allow the rain waters to flow into gutters at the end of the walls. Because of inefficient construction systems and lack of materials, roofs were built only wide enough to prevent rain from falling on the wall. Those gutters had no function of creating shade for the walls. Instead they are mostly built constructively. In some cases, roofs are constructed with an inclination, covered with earth and traditional tiles in order to allow rain water to flow in the right direction.

Block heights were 4.00m. This height allowed heated air to move up inside the building meanwhile achieving natural climatization at the lower levels in the space. To push the heated air that rose to higher levels out, the venting holes have been opened facing west below the roof level to facilitate air circulation.

Since the block is designed to face west and height is kept at 4.00m, courtyard will benefit from the morning sunlight while it is protected from the afternoon sun rays.

Therefore all houses in rural areas are constructed with a 4.00m high block (1).

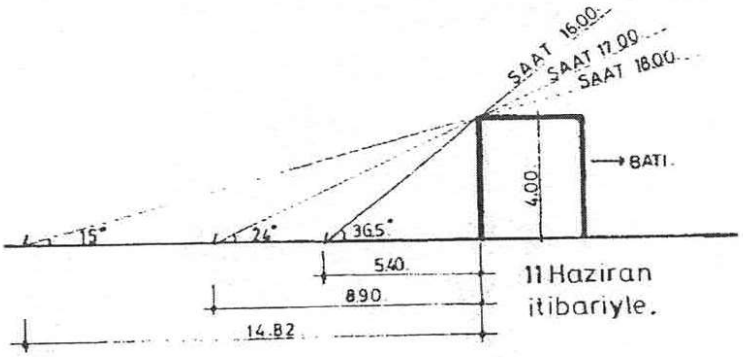


Figure.2 The length of shade the block casts on the yard according to hours (from T. Salihoğlu)

In addition to natural air conditioning, sun rays were utilized in winter particularly by doors opening southwards with two wings. However the interior spaces were not protected from the sun rays during the summer. Thus a continuous effort has been put for more protection and utilization of sun light. As a result of these efforts, a porch has been

constructed in front of the living room for protection from the direct effects of sun rays and their utilization.

Because sun rays hit the surface with 77° angle in summer and 35.1° angle in winter in Cyprus (8), the living spaces utilize the sun rays in the winter. However the living space has been protected from the direct effects of sun rays in the summer.

In central Mesaria region, the yard where house wives worked on their daily tasks and also used as children's playground and guest reception area was not used in rainy and sunny hours. With the construction of the porch, these activities can be carried out there in sunny and rainy hours.

In Karpaz villages, the porches have generally become the area where all life activities happened. While in other regions the night was spent on the roof or the yard, in Karpaz region, porches were used for sleeping.

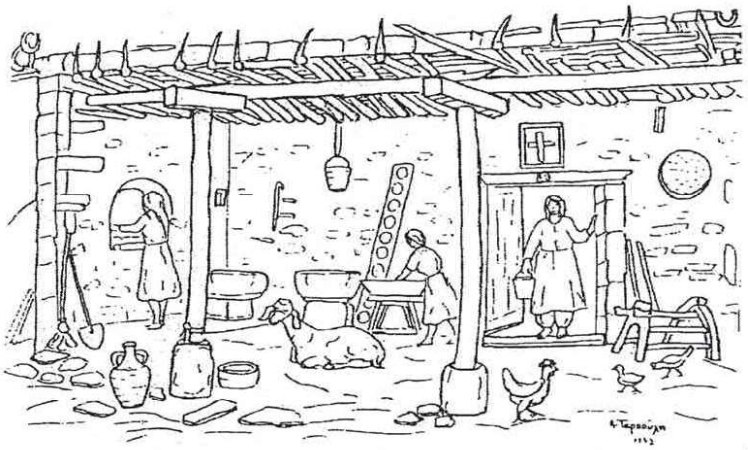


Figure.3 A view of a porch from the Dipkarpaz village (from A. Tassuly)

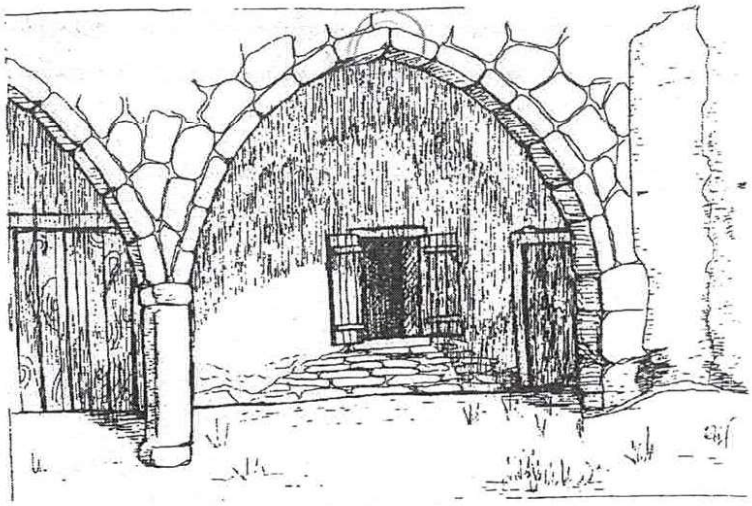


Figure.4 A view of a proch (from T.Salihoğlu)

We see that Entrance Hall plan types are used as frequently as Porch plan types in rural areas. In earlier types, the residence was accessed from the yard by an entrance hall with an arc. The entrance hall is also a sitting area. The open arc in the entrance hall protects the house wives from the wind and utilizes the sun rays in windy and sunny days.

Figure.5 The view of the porch (from A. Tassuly)

Entrance plan types with niche have become a closed space where all life activities were carried out. Air circulation and natural air conditioning were achieved by opening the doors in the entrance hall facing each other.

Doors opening to the entrance hall from south or west has enabled the dominant wind to enter the interior space. However the entrance door has been shifted 1.10m back in order to block sun rays from entering the space directly.

Also Entrance Plan Type with niche has been the primary plan of some settlements in one period.

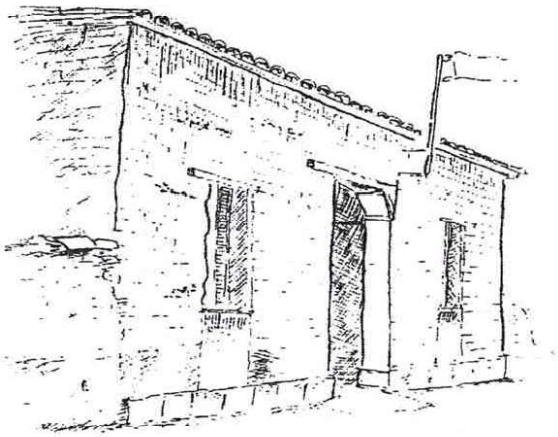


Figure.6 The view of the residence with Entrance Niche from the South (from T. Salihoğlu)

As seen in the drawing below, as the bedrooms were constructed at the top floor in Hanayli plan type, the principles in Entrance Hall plan type were implemented.

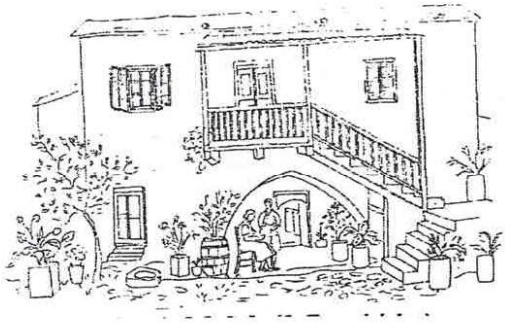


Figure.7 and 8 View of rural houses (from A. Tassuly) (from T. Salihoğlu)

3.2.2 RURAL RESIDENCE MATERIAL

In rural area residences, we see that functional plans have developed due to the climate and living style. In order for this plan to stand, a construction system based on materials has

been developed. We see adobe (sun dried brick) construction system in Mesaria region, natural stones on the coast and mountainous regions. There are also places where natural stones and adobe materials are used together. It is possible to see residences built by adobe construction system in residence areas with natural stones since construction and transportation of stone materials is more difficult than adobe.
Wooden construction material is however used minimally and generally in furnishings.

Adobe

Production of adobe: After one gauge of earth and half a gauge of hay are mixed, water is added until it reaches the density of mud. (It's often said that hay is always used in production of adobe. But when the walls are analyzed and adobe producers are interviewed, it is understood that the joints of wheat or barley called Gondilla in the folk language are preferred instead of hay in the production of adobe. Because hay is an animal feed and decays quickly, Gondilla was the first preference. In Nicosia and Magosa we see that goat hair is used instead of hay in some residences.) After the mud is stored for one night, it is poured into casts in two parts with 5x30x45 cm dimensions and trimmed with a wooden trowel. Adobe mud is used after being stored for three days in the cast during the summer. For the adobe brick to be straight and extracted easily from the place it's kept for drying, the plane is cleaned and some hay is scattered on the ground.
The earth should not be clay however. Therefore earth was collected from river beds in settlements where clay is abundant in soil. This cleaned the soil that accumulated in creeks by rain water.

Bricking System

To build the walls straight, 4 adobes were placed at the beginning and the end of the wall in order to keep it straight. The inner side of the walls was plastered with gypsum and sometimes with adobe mud. The latter was usually done by inhabitants of limited wealth. The exterior of the wall was usually plastered with adobe mud.

3.2.3 CONCLUSION

As a conclusion we can say that climate characteristics have been the major factor in residence land, use of functional relationships between spaces, planning, choice of construction system and materials in residential settlements. This characteristic has developed as a principle for people who built their own houses or the village craftsmen and it was transferred through generations as a tradition.

This tradition has continued in the British period as well. Despite that this was a colonial period, with the enacted laws, the old buildings were repaired by conforming to their original style and the new constructions reflected the old culture. In addition the local materials were used at the maximum level.

Today, we are building residences with a construction system and expensive imported construction materials that do not conform to our climate or life style.

I do not propose that we should use the same construction system and materials as those used in the past. However these materials have to be adapted to today's modern architecture. Scientists have done studies on this subject and produced Alker construction material by mixing earth with gypsum instead of hay. I believe that this product is the right material. Their use should also be encouraged by administrators in countries where economy hasn't reached the desirable level particularly in rural area residences.

3.3 Kıbrıs'ta sürdürülebilirlik

SIDS (Small Island Development States) Deklârasyonuna göre sürdürülebilirlik

Ada ülkeleri, ana karadan uzak yaşadıkları için kaynaklarını kullanırken kıta ülkelerine göre daha dikkatli olmak zorundadır. Güney Kıbrıs Devletini de üye olduğu **Küçük Ada Ülkeleri Birliği,** sürdürülebilirliği sağlamak amacıyla Birleşmiş Milletler-UN çatısı altında "**Small Island Development States-SIDS Barbados -94 deklarasyonu"**nu hazırladı. Deklarasyonun destek aldığı uluslararası anlaşma 1992-Rio kriterleri olup, zaman içinde Agenda-21 deki kriterlere göre 2002 de revize edilmiştir. **Agenda-21'in 7.Bölümü** sürdürülebilir insan yerleşmelerine yönelik tavsiyede bulunur. Bu bölümde sürdürülebilir kalkınma için planlanacak ve yönetilecek konular **a.**herkese eşit konut, **b.**insan yerleşmeleri yönetiminin güçlendirilmesi, **c.**toprak kullanımı, **d.**teknik alt yapı (çöp, su, drenaj,..), **e.**enerji ve ulaşım, **f.** insan yerleşmelerinin sismik güvenli alanda planlanması, **g.**sürdürülebilir yapılaşmanın cesaretlendirilmesi, **h.**insan yerleşmeleri için kaynak ve kapasite arttırılması. Birleşmiş

Milletler söz konusu tavsiye kararlarını yürütmek amacıyla hibe ve kredi programları ile destek vermektedir. Tavsiye kararları için hazırlanmış finansal destekler bildirinin dışında bırakılmıştır.

Kuzey Kıbrıs, bir ada ülkesi olarak bu kriterlerde belirtildiği şekilde "sürdürülebilirliğine" katkıda bulunmalıdır. Küçük Ada Ülkeleri Birliği (SIDS)'ne özel sürdürülebilirlik çalışma alanları:

1.Bio-çeşitlilik,
2.iklim değişikliği,
3.sahiller ve limanlar,
4.yenilenebilir enerji,
5.sürdürülebilir turizm , yerleşmeler, ticaret

gibi ana başlıklara ayırmıştır.

Ada şartlarında sürdürülebilirlik

Kaynakları dar ve dışa bağımlı olan ada şartlarında sürdürülebilirliğin tanımı SIDS'e (Small Island Development States) göre şöyledir: "coğrafi izolasyon, diğer ülkelerden uzaklık ve kırılgan ekolojik sistemine göre adalar çevrelerini koruyarak hayat standartlarını geliştirmelidirler"**[sidsnet.org]**.

Yapılaşma malzeme üretimi, inşaat aşaması, yapı ömrü, geri dönüştürme aşamaları ile insan faaliyetleri içinde çevreye en çok zarar veren sektördür. Kullanılan toplam enerjinin %50 sinsi yapılı çevre kullandığı için ozon zararlılarının da %50 sini oluşturmaktadır **[Edwards, b.,1996]**. Bu durumda yerleşmelerde sürdürülebilirlik çerçevesinde izlenmesi gereken yasa **[esa.un.org]**:

"1-enerjiyi koru, 2-dönüştürülen yapı yap, 3-toplumu bilinçlendir, 4-enerji tüketen malzemeleri azalt, 5-çevreyi koru, 6-durabiliteye önem ver, 7-sağlıklı yapı yap, 8-iş hayatını 'yeşil' yap"

1992 de Rio'da toplanan Dünya çevre konferansı ise konutlaşma alanında sürdürülebilirlik için şu şarları öngörmüştür:

"modern yerleşmeler ısı nem ve temiz hava açısından sağlıklı mekanlar hazırlamalıdır"

Kıbrıs'ta yapılaşma etkenleri

Kıbrıs'ta sürdürülebilir yapılaşmaya açısından sosyo-ekonomik, iklim ve mimari kültür varlıklarının etkisi kısaca incelenmiştir. Yapı malzemesi temini, yapı üretimi ve yapı kullanımı aşamalarında sağlanacak enerji tasarrufu ülkenin sürdürülebilirliğine katkıda bulunacaktır.

Sosyo-ekonomik yapının etkisi

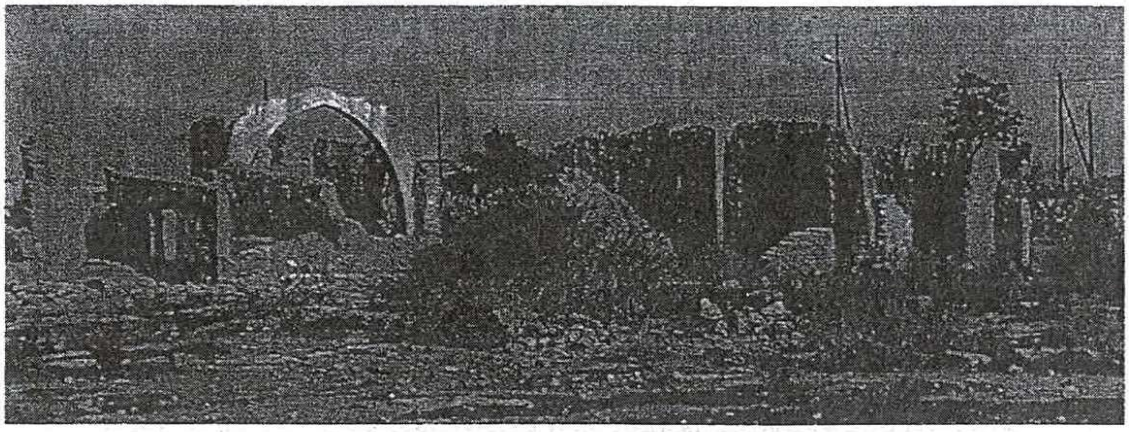
Akdeniz'in 3'üncü büyük adası olan Kıbrıs yüzölçümü 9,851 km^2 dir. Adanın yaklaşık 1/3 ü olan Kuzey Kıbrıs cumhuriyetinin hemen yarısını oluşturan dağlar iklim açısından ülkeyi destekler ve bölgeye su rezervi sağlar. Yine de su temininde %35 açık Türkiye'den sağlanmaktadır. Dağlık bölgede zengin bakır madenleri halen çalıştırılmamaktadır. Kuzey Kıbrıs'ın %57 ziraata uygundur. Ziraat gelirleri GSMH'nın %9.8 ini oluşturur. Sektörde nüfusun % 24.3'ü çalışmaktadır. Yapı malzemesi olarak kireç taşı, mermer, bentonit, kil, kum taşı bulunmaktadır.

İklim etkisi

Yapı kabuğunun istenen iç mekan konforunu sağlaması için iklim verilerini bilmek gerekir. Kıbrıs'ta iklim yazları sıcak kışları kuraktır. Temmuz – ağustos ayları ortalama sıcaklık 40^0C, ocak - şubat ayları ortalama sıcaklık ise 9^0C ölçülmektedir. Yıllık ölçülen yağmur ortalaması 397.6 mm/sene dir. Yazlık güneşlenme saati ortalama 12saat/gün, kışlık güneşlenme saati ise 5saat/gün olarak belirlenmiştir.

Kıbrıs'ta mimari kültür varlığının etkisi

Kıbrıs'taki yapı kalıntıları adanın Neolitik dönemden bu yana iskan edildiğini göstermektedir. Sırasıyla Mısır, Hitit, Asur, İran, Roma, Bizans, Venedik (1489-1571) egemenliğinde yerleşmeler kerpiç ve taş yapı malzemeleri ile kurulmuştur. Türk'lerin 307 sene süren (1571-1878) egemenliğinde yapıların zemin katının taş, oturulan üst katının kerpiç malzeme ile yapıldığı görülmektedir. İngilizlerin 52 sene süren koloniyal döneminde (1878-1930) daha çok taş malzemenin kullanılmıştır. Ada ülkesi olarak Kıbrıs çağlar boyu kerpiç ve taşı kullanarak mimari kültürü oluşturmuştur **(Şekil.1)**. 1940 tan bu yana betonarme yapılar **[Atun, 1996]** ve günümüzdeki inşaat sektöründeki global ticaret Kıbrıs'taki mimari kültür varlıklarını tehdit etmektedir **(Şekil.2)**.



Şekil.1 Lefkoşa'da tarihi kerpiç yapı **Sandallarda kırsal yerleşme yapısı 5**

Kıbrıs'ta sürdürülebilir yapılaşma örneği olarak kerpiç yapı

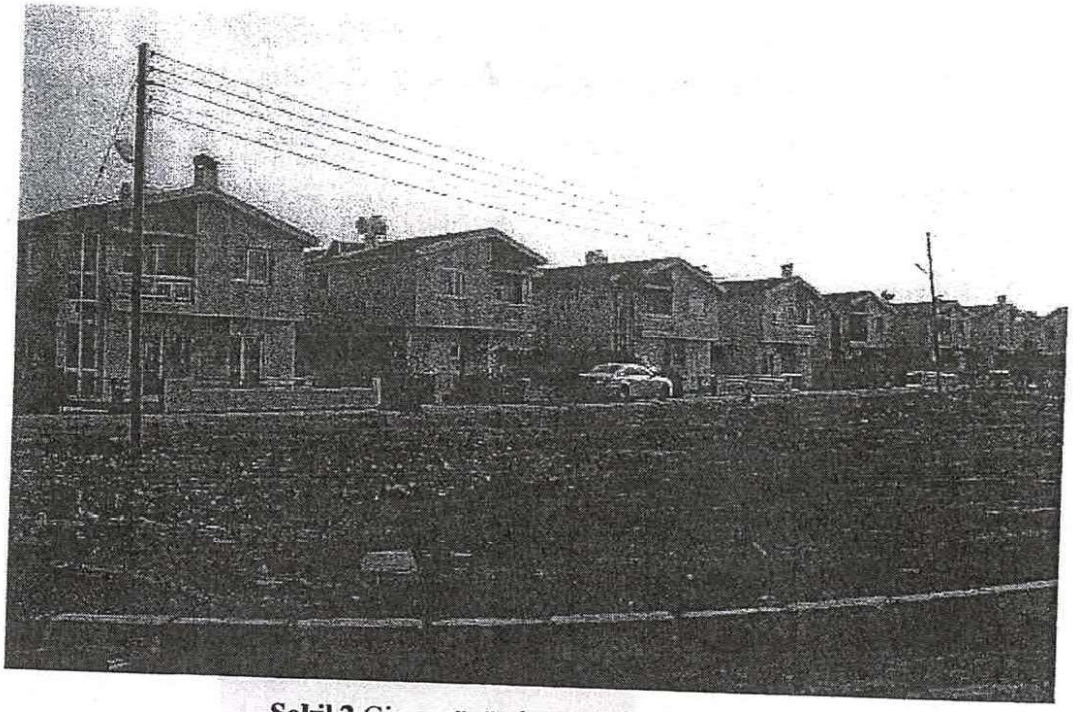
Yapılaşmada malzeme kararı sürdürülebilirliği doğrudan etkiler. Endüstriyel malzemeler doğadan çıkartılması, üretimi aşamasında çelikte, alüminyumda veya çimentoda olduğu gibi çok enerji

kullanır. Kerpiç yapı malzemesi üretimi için pişirme enerjisi gerekmez. Malzemenin ısı depolama ve ısı direnci özelliğine bağlı olarak kerpiç yapının ömrü boyunca enerji tüketimi azdır.

Lefkoşa, şehir yapısı , şehirde beton yapıya dönüşüm6 7

Kerpiç topraktan elde edilen yapı malzemesidir. Çakıl, kum, silt gibi dane boyutlarından yaklaşık eşit oranda olup %30 civarındaki kil ihtiva eden toprak kerpiç yapımına elverişlidir. Bu mertebede kili olan toprak ancak belirli ocaklardan temin edilir ve nakliyesi pahalıya mal olabilir. Kerpiç yapı malzemesinde kil bağlayıcılık görevini yüklenir. Harç suyunun kuruması sırasında iç gerilmeleri ve rötre çatlaklarını

önlemek amacıyla bazı yörelerde harman samanı katılır. Harç karıştırıldıktan sonra en az bir gün dinlendirilir. Dinlendikten sonra işlenebilirliği artan kerpiç el ile (yöreye uygun) kerpiç kalıplarına yerleştirilir. Kalıplama işi harman yerinde, düzgün toprak üstünde yapılır. Yerleştirme sonrası kalıp alınıp kerpiç yerinde bırakılır. Kalıp bir sonraki kerpiç üretiminde kullanılır.



Şekil.2 Girne yönünde yeni yapı örneği 8

Toprak üzerinde yeterli süre bekleyen kerpicin bir kısım harç suyu zemin tarafından çekilerek. Sertleşen kerpiç yanı üstü çevrilerek kurumaya bırakılır. Çok hızlı kurumamalı ve aşırı yağmur ile karşılaşmamalıdır. Kuruyan bloklar yanda istife kaldırılır, biriktikten sonra uzak ise inşaat yerine nakil edilir ve ikinci istife alınır. Blok halindeki geleneksel kerpiç üretimi zaman alıcı, emek yoğun, atmosferden etkilenen, geniş yere ihtiyaç duyan üretim şeklidir.

Geleneksel kerpiç su ile karşılaştığında kil daneleri arasına giren su, malzemeyi plastik kıvama getirir. Islanan kerpiç blokları mukavemet kaybederek şekil değiştirir, veya zaman içersinde erozyona uğrar. Tekniğine uygun üretilmiş kuru geleneksel kerpicin mukavemeti yapıya gereken taşıyıcılığı sağlar.

İnsanlar için kuşkusuz en sağlıklı mekanları kuran kerpiç yapı malzemesi çağdaş bilim ve teknoloji ile desteklenerek tekrar inşaat sektörüne kazandırılmalıdır. Kerpicin iyileştirilmesi ile dünya nüfusunun yarısı evlerinde depremden korkmadan uyuyabilecekler. Diğer yandan insan sağlığı, çevre sağlığı ve mimari kimliğin sürdürülmesi açısından kerpicin yeniden kullanılması anlamlıdır.

3.4. Lefkoşa'da restorasyon

Türker AKTAÇ

1.1 Publicity and History of the Building

The building is on Zahra Street facing Ledra Palas, on the Venetian walls in Arabahmet district, Nicosia. The 100 year old building which is a good example of typical Ottoman Turkish Civil Architecture was built as a two floor masonry building with the ground floor walls out of stone, first floor walls out of adobe, and interior walls out of lath.

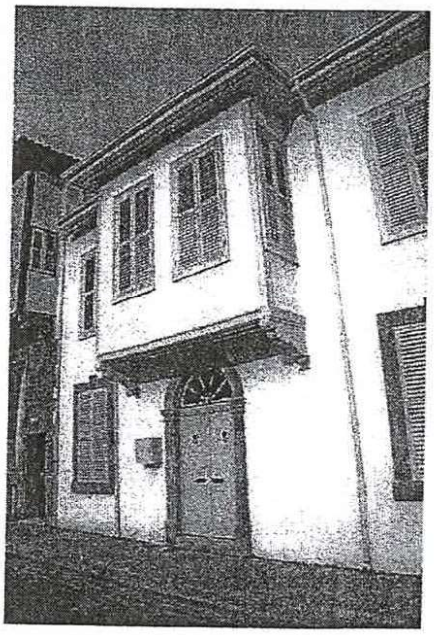


Figure1. Chamber of Architect office, earthen building after the restoration.

The building has a large entrance hall, two rooms, a kitchen, and a toilet on its ground floor, a large hall and a bay window, two rooms, and a relatively smaller third room on its first floor.

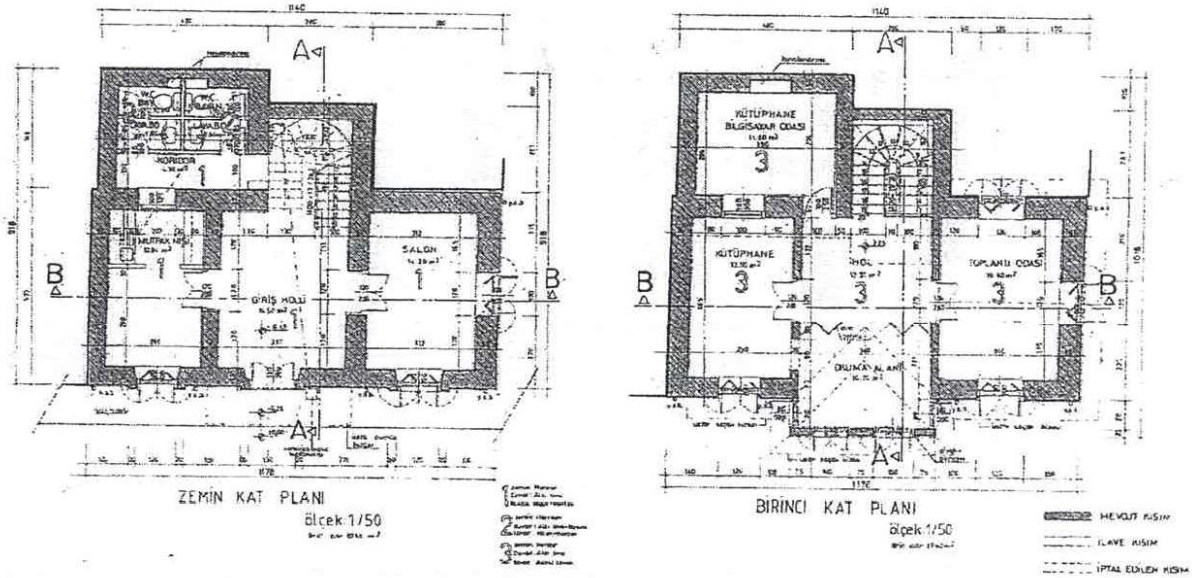


Figure 2. Plans of the building.

The bay window is built in the lath system with the windows facing the three sides having shutters and a guillotine system. The rest of the windows are built with shutters and an opening glass system. The entrance door and the windows on the ground floor are decorated with yellow stones.

The Foundation for the Preservation of the Turkish Cyprus Architecture was officially registered on December 28, 1993. The Board of Trustees of the Foundation is composed of the following people: Chairman- Behzat Aziz Beyli (authorized by the family), Vice-chairman- Chairman of the Chamber of Architects, Secretary- Secretary of the Chamber of Architects, Financial Secretary- Representative of the Chamber of Ancient Monuments, Member- Representative of the Foundation administration.

The building on Zahra street was registered in the land registry office as the asset of the Foundation for the Preservation of the Turkish Cyprus Architecture.

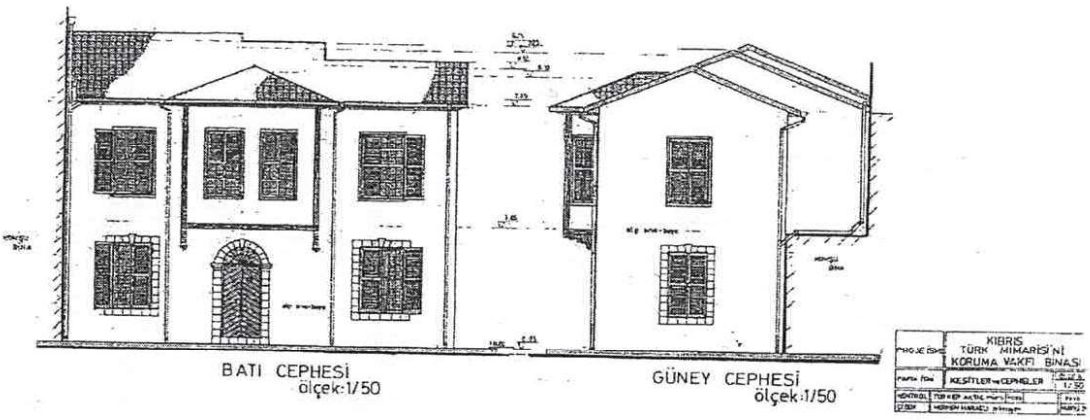


Figure 3. Elevations of old building.

The search for the restoration of the building started on this date. In this context, a survey and restoration project was prepared in 1995, the restoration decision was approved of on May 5, 1995 by the Higher Committee for the Restoration of Monuments, and the license was given on June 16, 1995 by the Nicosia Municipality.

On April 18, 1996 with a decision from the Board of Directors of the Foundation the building was planned to be turned over to the Nicosia Municipality for five years to be used for cultural purposes of the Turkish Cypriots on condition that the restoration of the building would be done with a financial aid from the United Nations. In the meantime, The Foundation for the Preservation of the Turkish Cyprus Architecture would be able to use the building as an office. However, nothing came out of this.

On a second try, the building was planned to be turned over to the Turkish Democracy Foundation for ten years with the condition that restoration would be carried out and the ground floor was to be used as the library of the Chamber of Architects. This could not be realized either.

In August 2000 some correspondence took place with UNOPS for the repair and restoration of the building, but this was not realized either.

Search contiued, but time was working against the building which was deteoriating every day.

Lastly, in December 2004 the repair and restoration of the building was opened for bids, an agreement was reached with a contractor on February 8, 2005, and the cost was aimed to be met with grants given to the Chamber of Architects and the Foundation.

In May 2005, the Board of Directors of the Foundation gathered and turned the usage of the building totally over to the Chamber of Architects.

Some changes and adjustments were made on the existing building project in order to make it more functional for the Chamber. These adjustments were approved of by the Board of Directors of the Foundation and the Board of Directors of the Chamber of Architects and the building was renovated with utmost care according to these changes. As of today, the construction of the building has been finished and the furnishing has been done with no extra expenditure.

The Chamber of Architects will be able to strengthen its modest position in the world architecture platform by hosting in this building several projects in the future.

1.2 The Restoration Stage (No Age for the Adobe)

Because the existing condition of the building was quite bad, a lot of construction elements were re-made using modern construction possibilities; however, great care was taken to use the undamaged parts from the building.

As can be seen from the pictures, the adobe parts of the building (the outer walls of the first floor) served both as an outer wall and a supporting wall. The existing adobe parts were kept with the damaged ones being replaced. The eastern wall was out of plumb and was inclined about 40 cm towards the outside. This wall was pulled to its plumb and cuffed with wooden lintels. The decayed lintels were renewed and the roof was remade with entirely new wooden elements. The existing wooden cantilevers of the bay window were supported with new wood and the system was made to work as a whole.

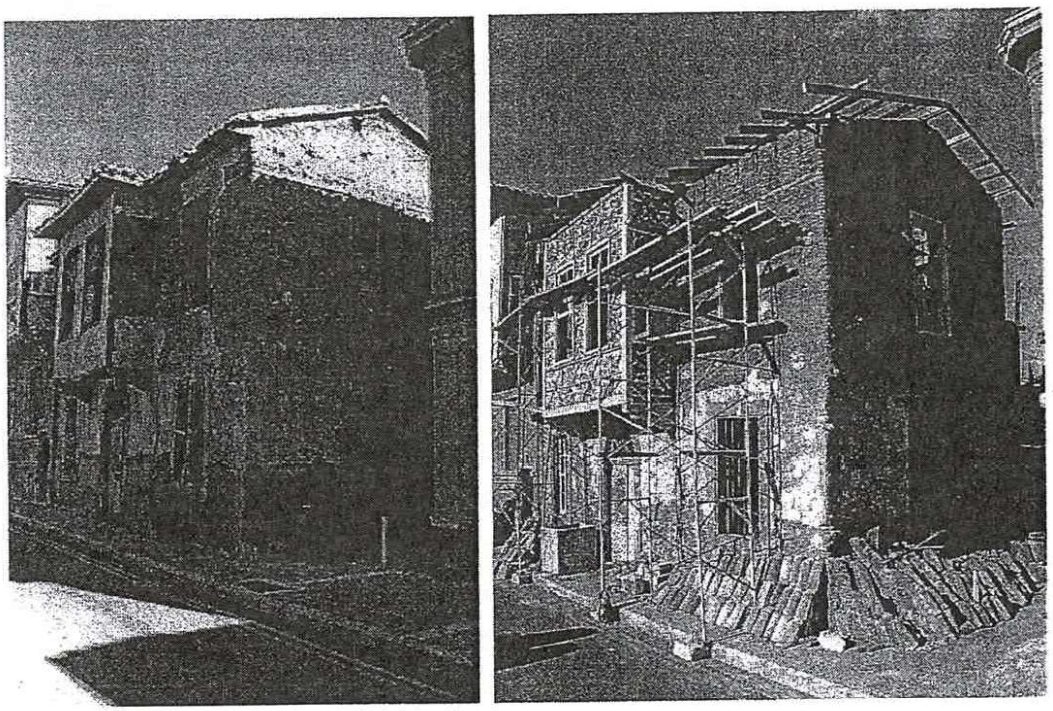


Figure 4. View from building before the restoration.

It was not right to build in reinforced concrete the central staircase with its free interlocking marble steps because it was necessary to maintain the freedom of motion and elasticity of the structure which was composed of different materials. Accordingly, we tried a different structure type by making the main frame out of twisted steel sheets and by leaning it partly against the existing stone wall and ground, partly against the rafter beam floor of the upper floor and thus formulated a system with an independent and yet flexible but not too rigid structure.

Being loyal to the existing design, the staircase railings were given a new interpretation. In the meantime, the newel post which was about to be discarded from the old Presidency building was mounted on this staircase and given a new life.

The wooden staircase with a delicate build and easy usage has been integrated with the building.

For the adobe to lead a healthy existence it is important to choose the right materials. For it to have a long life we plaster it; only, this cannot be any plaster. That is why we have chosen gypsum plaster.

The ground floor is natural stone, the first floor is adobe and the main walls are filled wooden lath. In all these, the gypsum serves as plaster for both inner and outer purposes and it also serves as the filling material for the wooden lath. Being a natural material, the gypsum plaster allows the adobe, the stone, and the wood to breathe and enables them to have a long life. No concrete was used in this building. The flooring on the first floor is a local material- marble. New joisting was made on the ground ceiling with the renewal of the cypress beams (also using some from the existing building) and the ceiling was covered with a straw mat.

Interlocking wood was used for the flooring of the first floor. The purpose here was to use a material, in this case wood, which will allow maximum elasticity in a structure with different natural materials.

2 CONCLUSION

In general, whatever the age of the adobe, if construction and restoration are carried out with the right method and with special care to some details, the final product will be healthy, natural, ecological, and will be long lasting.

Let us not forget that the average life of concrete buildings is about 50 years.Nowadays, we constantly hear these words: ecological, sustainable, healthy environment, natural, green house, etc. It is possible to have most of these qualities. We as architects who use this building are constantly aware of this fact.

There is a saying: "I am not interested in how many times the earth goes around the sun." There is similar one said for adobe: "Don't ask me my age." As far as I am concerned YOU DON'T ASK ADOBE about ITS AGE.

3.5 ICOMOS ilke ve hedefleri

Kültürel, sosyal ve hatta ekonomik kayıplara neden olan ve geri dönüşü olmayan bu durum karşısında **ICOMOS** (Uluslararası Anıtlar ve Sitler Konseyi) Venedik Tüzüğü'nü (mayıs 1964) tamamlamak üzere, tarihi kentler ve alanlara ilgili bir uluslararası tüzük hazırlamayı gerekli görmüştür (Washington Tüzüğü – 1987) . Bu tüzükle tarihi kentlerin ve alanların korunması ile ilgili ilkeler, hedefler ve yöntemler tanımlanmaktadır. Tüzük tarihi kent ve bölgelerdeki özel ve kamusal yaşam alanları arasında uyum sağlamayı ve bu alanlarda mütevazi boyutlarda da olsa, var olan ve insanlığın belleğini oluşturan kültürel değerlerin korunmasını desteklemeyi hedeflemektedir.

İLKELER VE HEDEFLER

1. **Etkili olabilmek için, tarihi kentlerin ve diğer tarihi kentsel alanların korunması tutarlı ekonomik ve sosyal gelişme politikalarının ve her düzeydeki kent ve bölge planlamanın ayrılmaz bir parçası olmalıdır.**
2. Korunması istenen nitelikler kentin veya kentsel alanın tarihi karakteri ile bu karakteri oluşturan maddi ve tinsel bileşenlerdir, özellikle:
   a) Parsel ve sokakların tanımladığı kent dokuları,
   b) Binalarla yeşil ve açık alanlar arasındaki ilişkiler,
   c) Binaların ölçek, boyut, üslup, yapım tekniği, kullanılan malzemeler, renk ve bezemeler ile tanımlanan biçimleri, iç ve dış görünüşleri,
   d) Kent veya kentsel alanın doğal ve insan yapısı çevresi ile arasındaki ilişki ve
   e) Kent veya kentsel alanın zaman içinde yüklendiği değişik işlevler.

Bu özellikleri tehdit eden olumsuz etkenler tarihi kent veya kentsel alanın özgünlüğünü zedeleyebilir.

3. Koruma programının başarısı, kentlilerin katılımı ve görev almalarıyla mümkün olabilir; bu nedenle halkın katılımı desteklenmelidir. Tarihi kentlerin ve kentsel alanların korunması öncelikle orada yaşayanları ilgilendirir.
4. Tarihi bir kentin veya kentsel alanın korunması sağduyu, sistemli yaklaşım ve disiplin gerektirir. Özel durumlarda çıkabilecek sorunlardan kaçınmak için katı yaklaşımlardan uzak durulmalıdır.

*www.mimarlarodasi.org.tr/mevzuatDocs%5C**Venedik_Tüzük**.*

BÖLÜM.4

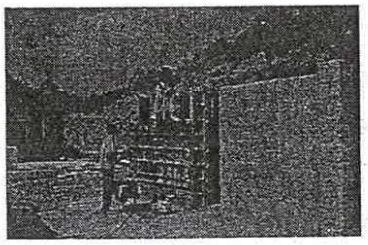
Kerpiç malzeme ve yapı özellikleri

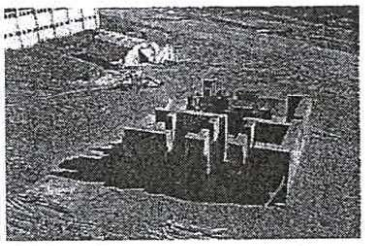
Mekanik ve fiziksel özellikler 4.1
Proje karar esasları 4.2

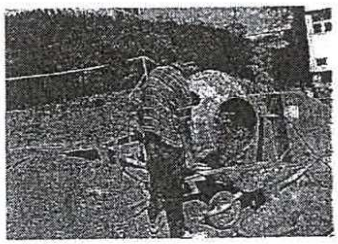
BÖLÜM.4

Kerpiç malzemenin mekanik ve fiziksel özellikleri,

Kerpiç insanlık tarihi boyunca ve bu gün en çok kullanılan yapı malzemesidir. Dünya nüfusunun halen 1/3ü kerpiç yapıda yaşamaktadır. Kerpiç yapılar, refah seviyesi yüksek ülkelerde ise sağladığı iç mekan konforu, yapı biyolojisi ve yapı ekoloji özellikleri ile tercih edilmekteler. Geleneksel kerpiç, %25-30 killi toprak, saman ve sudan oluşan harç ayakla yoğrulduktan sonra el ile kalıplara yerleştirilir, Kalıptan çıkan bloklara kerpiç denilir. Kerpiç pişirilmez, yağmursuz yerde kurutulur, sonra duvar örülür. Kerpiç malzemede bağlayıcılık, plak halındaki kil minerallerinin üst üste kuruması sonucu elde edilir. Kil plaklarının arasına tekrar su girdiği zaman bağlayıcılık sona erer ve kerpiç duvarda erozyon görülür.







Şekil.1, 2 duvar kalıbında kompaksiyon, yapının üstten görünüşü **Şekil.3 alkerin betoniyerde karıştırılması**

9 10 11

Alker malzemesi çalışmalarının tanımı ve ekolojik özelliği

Alker adı alçı ve kerpiç kelimelerinin kısaltılmasından meydana gelmektadir.

İTÜ Mimarlık Fakültesinde 1980de tamamlanan TÜBİTAK MAG 505 araştırması sonucu, kerpiç alçı ile stabilize edilerek alker adını almıştır. Alçı, alkerin su ile çözülmesini önemsiz seviyeye indirmiştir. 1995 te tamamlanan TÜBİTAK INTAG TOKİ 622 nolu araştırma ile alker malzemenin günümüz inşaat teknolojilerine uyumu sağlanmıştır. Tablo 5'te alker malzemenin geliştirilmesi amacı ile yapılan çalışmaların bir kısmı listelenmiştir. Belirtilenlerin dışında yüksek lisans tezleri kapsamında alker yapılarda kalite kontrolu, durabilite, deprem riski gibi deneysel araştırmalar yürütülmektedir.

Tablo.5 Alker malzemesi çalışmaları

1. 1980 TÜBİTAK MAG 505	Amaç: Kerpiç yapı malzemesinin alçı ile güçlendirilmesi
	Sonuç: kılcallık az, suya direnç iyi
2. 1983 1.deneme yapısı	Amaç: Alker'in inşaatta kullanılması
	Sonuç: emek yoğun yüksek nitelikli yapı
3. 1987 Isı kaybı çalışması	Amaç: 18 aylık ölçüm ile yapının ısıl davranışı
	Sonuç: malzeme ve yapının gerçek λ ve k değerlerinin hesaplanması
4. 1991 Sıva araştırması	Amaç :sıva durabilitesi, 5 sıva sanayicisi ile
	Sonuç: gözlenemediği için sonuçlanamadı
5. 1995 TÜBİTAK İNTAG TOKİ 622	Amaç: Alker'in inşaat makinaları ile kullanabilirliği
2. deneme yapısı	Sonuç: inşaatın rasyonelleşmesi
6. 1997 Altınoluk Projesi	Amaç: projenin topluma kazandırılması
3. deneme yapısı	Sonuç: kullanıcı referansı
7. 1999 İTÜ GAP Projesi	Amaç: yöresel malzemenin cesaretlendirilmesi
4. deneme yapısı	Sonuç: Alker üretiminde beton tesisinin kullanılması

4.1 Kerpiç malzemenin mekanik ve fiziksel özellikleri,

Tuğşad TÜLBENTÇİ

1 INTRODUCTION

Quality is not meaning the best, absolutely. A product or service quality depends on its function, using aim and price. Quality also depends on the quality of raw and auxiliary material, sources and technology. Unqualified productions not only decrease the exportable product or service quality but it prevents the expanding of facilities, the increase of living standards, and the welfare of the public and the development as well. Lack of quality also causes to the waste of work-power (man-power) and energy.

Nowadays, social life of society is affected by two fundamentals. As a result of introduction of electronics to the production technology, the data flow became easier and higher in level. This is the first fundamental. Expanding of the national markets to regional markets than to global markets caused a great competition among organisations and management. This is the reason that many

international organisations and management produce same products indeed. This can supposed to be the second reason. Consequently the meeting of the concepts and conditions of quality became more important as a reason of the improvement of technology and high-level competition. These two fundamentals are the reason of globalisation and these factors activated the improvement and development of quality. So it is more difficult to provide quality under these conditions.

Total Quality Management is a philosophy and quality process designed to prepare a manufacturer for world class competitiveness. Total Quality Management is a management approach to long-term success through users' satisfaction. Total Quality Management is a matter of survival organisations and management. That's why, Total Quality Management is a strategic management style in fact. Total Quality Management is a system of management that has users' satisfaction as its primary objective.

In Total Quality Management, the user is anyone within the supply chain that receives materials from a previous step in the supply process. Users can be both internal and external for the organisations and management and include those receiving raw materials, work in process or finished products. Total Quality Management systems begin with the top management commitment and leadership. Management determines the Total Quality vision and plans for the organisation, and must review and encourage its progress towards the achievement of Total Quality. It is well-known fact that the economic dimension of quality is one of the most important sides of Total Quality Management for upper management. All these activities are for the purpose of a better profitable firm in long range. In spite of all the studies about quality costs, the other side of quality and management's economy of the firm relationship has always been neglected. It is very astonishing to realise this fact because there seem to be a close connection between quality and income. As the quality of product increase, the income of management increases too. The behaviours of the users' are the other main factor occurring out of the organisation and affect the sales.

2. TRADITONAL ADOBE

Earthen buildings are not frequently preferred and favour of users in nowadays bacause of the reason that they couldn't keep abreast to the contemporary building construction systems. However, the indoor climatic conditions of earthen buildings are quite well and in quality. Traditional or gypsum stabilized adobe as a material supplies adequate conservation and heat insulation in consideration of its high thermal capacity in all kinds of climates. Satisfactory amount of usage of the adobe as a construction material due to the necessity to conservation of cultural heritages, will create energy

saving buildings at all. Besides these, it will be very beneficial in the way to design a healthy and natural environment. In conjuction with contemporary construction systems, improved construction materials, advanced management systems and total quality, arise in aesthetics, solidity, economy and increase in functional quality are observated. Although, increase of market share of adobe buildings will elicit the advanced construction technologies to be used more frequently (1-2-3).

Adobe buildings are the oldest building types of earth since 9000 years as it is known. Since the early history period up to nowadays, human-beings needed to build a shelter for themselves to keep their presence and sustain their generations. In order to succeed this, they used natural materials around such as stone, earth, wood etc. (4)

The main reason that the adobe buildings are not used and not built in improved buildings is that the adobe buildings couldn't correspond the users' expectations. In another words, the adobe buildings couldn't keep abreast to the contemporary building construction systems. That's the account of that usage of earth material depends on more man-power than usual and needs more time to work with.

The reasons of becoming researches about adobe prevelant can be explained as follows:

a) From the reason that adobe buildings are compatible to life standards and have ability to be equilibrated with nature,
b) From the reason that adobe materials give the most rational solution to the energy saving problem and pollution,
c) From the reason that the contemporary technology can easily improve and develope the faults of adobe buildings.

According to the result of researches about improving the properties of adobe material, it was seen that gypsum, lime and fibre wastes stabilized the physical and mechanical properties of adobe.
The gypsum which is added into adobe paste improved the properties of adobe paste and allow more time to be able to work on adobe. This is a big advantage for labour to create high quality product.

Applying the Total Quality Management to adobe building organization aim to decrease the costs of production and increase the quality product, efficiency and benefits. Besides all these, it supplies so

many advantages such as the satisfaction of users, improvement of the quality of environment, competition and market share power with efficiency.

2.1 Properties of Traditilonal Adobe Material

Adobe is a material which a hardpan (clayed soil) mixed and moulded with enough amount of water and hay, other fibres such as reed, herbs, hemp fibers, pine leaves, tree arms, excelsiors etc. and then replaced in moulds to be given a shape under sun (5-6-7). Adobe which is used for a building construction material, is a compound of different materials as a concrete. As the sand in clay is a structure skeleton of mixture, it creates cohesion so clay becomes a binder. The amount of clay in mixture is very important. Less or more than enough amount of clay compose important problems (8). Researches about adobe prove that the mechanical properties of clay is similar to concrete and these properties are considerably related with the occupancy-cavity rates. Beside all these, the calibration of appropriate garanulometry of particles which compose the ground is also very important for the quality of adobe (9-10).

There are infinity variants in the composition of grounds but they usually consist of granules which are sprinkled between sand, gravels and clay. Clay includes very tiny granules which their capacity to absorb water is very high. Water cause increase in volume and mass of clay by seperating granules from each other. Grounds include great amount of clay which its mass and volume varies very much in being dry and wet status (11-12-13).

The properties of grounds' properties and the ratios recommended by different reasearhers are given below (5):

1. French Army's Construction Department: 40% clay, 30% gravel, 30% sand in adobe,
2. In U.S.A, Researher About Adobe: 75%-80% Sand (thin-thick), 20%-25% clay and silt, humus and organic materials should not be exist in adobe.
3. Turkish Standards: 40% of the ground soil should be examined from 0.063 mm sift and there should not be gravel inside bigger than 3 cm.

When the clay included material which is shaped with water is left to drying, it looses water from its structure so a shrinkage cracks can be observed in its mass. The water inside the structure is kept in the spaces between granules.

The water inside the structure of adobe can be classified in 3 different phases;

1-Cappilary Water: This is the water which is lost from structure of adobe during drying phase,
2-Pore Water: This is the water remain after loss of capillary water,
3-Absorbed Water: This type of water exists in solid form inside the structure depending on the type and quality of clay. It is not possible to remove this water from the structure under normal climatic conditions. This is possible in temperature of 105 C^0.

2.2 The Physical Properties of Traditional Adobe

The base material of the adobe is clay, and it bonds the all kinds material as a paste. If the adobe is well-prepared and dried homogeniously, then it is compact enough to be used as a load bearing wall in buildings. It is easily dampen because of the reason that it has a porous structure. Because it's thermal capacity is very high, it elicits a good bio-climatic conditions at indoor sides. Besides, its mass is quite heavy and because of this, its sound insulation cappacity is also high enough to be used in buildings. When the adobe is dampen, its heat insulating capacity decreases while its sound insulating capacity increases. If it approaches to plastic consistency, then the building collapses.

2.3 The Plasticity and Contraction Properties of Traditional Adobe

The deformation of material without an elastic return and any refraction and cracking is called plasticity. (14-15). The content of water during the change of clay from viscosity to plastic phase is called "plastic limit" and the content of water during the phase change of clay from semi-solid to solid is called "shrinkage limit".

The increase in strength of adobe which is moulded in plastic phase occurs while the vapourisation of water inside the mixture. In well qualified adobe mixture, on condition of other properties to be remian firmed, change in volume should be less. Whether this property is not included in clay, it can be developed by stabilization (14).

2.4 The Mechanical Properties of Traditional Adobe Material

The behaviour of an adobe material under vertical and horizontal loads is called "mechanical properties" of adobe. The compression strength is also one of the mechanical property of an adobe as described below.

2.4.1.The Compression Strength

The adobe used in buildings as a construction material should have a compression strength more than a specific limit. Because of that an adobe consist of the mixture of different materials mixed at different ratios, the compression strength of adobe will depend on the properties of these materials independently.

In single or double floor buildings, the compression values will not be so high even the roof is made from compacted soil if the spaces compensated are not so big. That's why necessity of adobe against compression strength should not have to be considerably in big value.

2.5 The Strength of Adobe Material Against Climatic Conditions

Strength of an adobe material against climatic conditions represents the strength of this material against raining, wind and great changes at thermal conditions. This property of adobe effects the lifetime of adobe so it is very important for this material (14). In order to increase the strength of adobe material and stabilize it, fibrious materials, gravel, bitumen, cement, lime and other binders should be added inside the mixture. It is well- known process to plaster, paint or whitewash the surface of adobe to keep it from climatic conditions. Application of one or more methods mentioned above will increase the strength of adobe materials against climatic conditions.

2.6 The Workability Properties of Traditional Adobe Material

Whether all the processes are done before leaving adobe to drying, in other words to supply the workability for adobe material, the quality of adobe will be higher in result. The subjects which are very important and have to be taken into account are to be carefull against stress, camber and crack. The descriptions of all will be given below:

- Stress: The tensile stresses occurs in adobe mass at drying phase. The non-homogenous dryings of adobe, differentiations at inner mass and variations at water content of mixture are the reasons of stress of adobe material.
- Cambering: The changes in the shape of adobe while drying is described as cambering.

- Cracking: The adobe can deform without cracking when it is in plastic stage. There can be two different types of cracks while drying of adobe materials. One of them is very thin cracks over surface and it is the reason of the differentiation of inner materials and surface materials of adobe. Another reason of surface cracks may be the improper granulometry of different materials inside the mixture. Wide cracks can be a reason of production mistakes, from the smoothness of surface which adobe bricks are replaced on, mistakes during moulding and non-homogenous drying of adobe.

2.7 Drying and Keeping Techniques of Adobe

Adobe should be kept from direct sunrise and wind after moulding. In adobe production process, drying should be rather slowly so adobe doesn't crack easily. In the beginning of drying stage, if the evaporation is fast, then the surface cracks will be seen because of the over -drying and broiling of adobe. It is very important for the adobe to dry ratherly slow. In order to elicit slow drying, it is beneficial to warm the surface of adobe to prevent cracking and broiling, in the beginning of drying stage if the evaporation is more than enough. The amount of water in the mixture effect the workability of adobe very much.

2.8 Construction Technology of Traditional Adobe Buildings

The buildings which their foundations and if exists foundation walls are stone and walls are made from raw clay soil are called "adobe buildings" (16).In adobe building production stage, the energy types used clasiffied in two ways as "production energy" and "transportation energy".

Table 1. The Amount of Energy Needed For Different Materials to Produce a 20 cm Thick and 1 m^2 area wall (2)

Types of Construction Materials		**Energy Used (Kcal)**
Solid Brick		$1.406x10^5$
Perforated Brick		$1.210x10^5$
Reinfonced Concrete Wall		$1.018x10^5$
Adobe	%10 Cement added	$0.390x10^5$
	%10 Gypsum added	$0.0047x10^5$
	Pure	Sunlight

Adobe buildings were preferred and attractive since long time ago because of the properties such as strength, being easily serviceable and being endured again insects (1). The main reason to be preferred widely is economy. Because it can easiliy be found, easily transportable and its labour is cheap and easy, adobe is an economic material for construction.

Table 2. **An Investigation in Anatolia for the Technology of Adobe Construction (3).**

Season To Be Chosen	**End of Spring – Beginning of summer**
Soil to be chosen	When the mixture is left from 1m height, it should not be diffused. Its shape should change only.
Agent Material	Herbal treatments (fibrious, tree leaves), stone type treatment (gravel)
Excavating	The suitable soil types is found, it is removed and quarry is opened
Sieving	Granules which have dimension larger than 2 cm and foreign substances are sieved..
Preparation of adobe mortar	Pits are opened, the soil is moistened and tread until it reaches to plastic consistency. Agent materials are added..
Easoning of Adobe mortar	Mortar of adobe is seasoned and agent materials is seasoned together with agent materials for being katkı maddesi ile 1-2 gün mayalanması için dinlendirilir.
Moulding	Mixture is replaced in timber moulds. The replacement inside the moulds is done with manuel equipments.
Drying	Adobe is kept away from rain and sunlights, moulds are dryed in wind and shaded area.
Keeping	If the adobe will not be used at once, then they can be taken under cover in order to be dryied.
Transporting	Wheelbarrow or tractor can bu used according to the distance to site.

The climatic conditons of production area also effect the quality and production of adobe because adobe is a material which a hardpan (clayed soil) mixed and molded with enough amount of water and hay, other fibres such as reed, herbs, hemp fibers, pine leaves, tree arms, excelsiors etc. and then

replaced in moulds to be given a shape under sun. The production of adobe is suitable in all weathers except cold winter, rainy weather and cool weathers. Also very hot and sunny days are not suitable for adobe production because these kinds of weathers causes more evaporation of water inside the mixture. However, the most suitable weather for adobe production is end of spring and beginning of summer. The soil can be mixed easily in these seasons cause the soil absorbed enough amount of water from rainfalls.

2.9 Traditional Adobe Production Site

In site of traditional adobe production site, the adobe production is performed in three stages; preparing the adobe mud (mixture, paste), to embody (shape) the adobe and to dry the embodied adobe.

1. Preparation of Adobe Mud (mixture, paste): The designated amount of water, clay and other agent materials are mixed together and the mixture is let a rest for one day. The day after, the mixture will be ready to be mould (17).

2. Emboding (shaping) the Adobe: The mixture in suitable consistency is usually moulded in timber moulds. The mixture should be compacted inside the mould in order to prevent the space occupation in mould. Removing the adobe needs care while taking the moulds from same force and height. It will be usefull to shake mould to seperate it from adobe.

3. Drying the Adobe: Adobe is a material which is strengthen by loosing water (vapouring) in outdoor space without a chemical reaction in its structure. The movement of water in its structure depends on the water content in mixture and dimension of capillar tubes in its structure (11).

2.10 The Disadvantages of Adobe Material

The adobe material has disadvantages besides its advantages. Some of them are written below:

- Adobe can 't be produced in rainy weathers,
- The construction of building depends on climatic conditions,
- The surfaces of adobe are usually plastered with mud. When the mud dries, it produces dust on surface,
- The structure of soil buildings are very accurate against water and humid. The prevention should be taken against this threat,
- The soil buildings needs simple maintenances continously (9).

3. DEVELOPED (GYPSUM ADDED) ADOBE

3.1 The Properties of Developed (Gypsum Added) Adobe Material

The basic material for the adobe is soil. Some of the mechanical properties can be stabilized by adding some agent materials. Sometimes, it is not possible to find a suitable soil for adobe from nature. In this conditions, without increasing the cost, some agent materials are added into the structure of soil to develope its mechanical properties. Some of the methods for improving the mechanical properties of soil are given below;

1. Mechanic Stabilization (suitable granulometry): In this method, the strength against compression can be increased by calibrating the dimensions of granulometry and decreasing the space ratio in the structure of mixture.

2. Stabilization as a Result of Letting Mixture a Rest and Reaction in Its Structure: Sometimes it may be posssible to stabilize the soil in its structure. When the soil which include iron in its structure is mixed with organic soil and let a rest in humidity condition, as a result of chemical reactions of the acid in vegetable soil, will increase the binding ability of soil.

3. Stabilization by Adding Agent Materials to Soil. Trhese are;

- Cement Addition: Adding cement in soil increase the strength againt compression but also increase the cost too.
- Lime Addition: Adding lime into the soil effects the result positively when the adobe is used as a wall construction material.
- Bitumen Addition: When a bitumen is added into the soil in specific quantity, both the strength and water insulation capacity of soil increases.
- Gypsum Addition: The researches on gypsum added soil prove that the properties of soil to be used for wall construction, have a enough capacity to be a material for wall construction. The surfaces are smooth and easily cleanable. Gypsum addition decrease the accuracy of material against water in great amount and also initialize the dispersion of material inside the water (17).
- Addition of Some Industrial Wastes: There are binder materials inside the industrial wastes. For example, the materials added into soil which include cellulose in their structures, they increase strength and resistance of soil.

- Addition of Fibres and Vegetal Wastes: Hat, grass, reeds' wastes, timber fibres and wood shavings' addition increases the strength of soil. Addition of hay helps the homogenous drying of adobe so that it prevents the cracks in adobe.

3.2 Mechanical and Physical Properties of Developed (Gypsum Added) Adobe

The researches show that there are big differences and improvements in developed (gypsum added) adobe. The workability of adobe improved so that more time can be spend on adobe to work it as a result of stabilization with gypsum. This event supplies more time to work on an adobe so that better results can be obtained.

Table 3. Mechanical and Physical Properties of Developed (Gypsum added) Adobe (3)

Unit Weight	1.6-1.7 kg./lt.
Compression Strength	2.0-4.0 N/mm^2
Shearing Force	0.9-1.3 N/mm^2
Shrinkage Crack	%1.0-1.5

Some of the important properties of developed (gypsum added) material are given below:

- The stabilization of gypsum (soil's properties) abbreviate the construction duration.
- Constructing the outdoor walls in 45 cm thickness constitute as thermal property.
- The indoor load bearing walls are 30 cm thick.
- The ratio of wall spans is 25%.
- The foundation walls and tie beams are constructed from reinforced concrete.

Table 4. Some Properties of Developed (Gypsum Added) Adobe Related with Thermal Energy and Water (3)

Capacity to absorb water	Very low
To be exposed to water for a long time (except direct rain water)	No erosion
Thermal transfer value	0.4-0.5 kcal/mhC
Specific calory	1.0 kJ/kgK

3.3. Technology of Construction of Developed (Gypsum Added) Adobe

One of the reasearches in this subject is to use gypsum to develope and improve the properties of soil. Because of the reason that gypsum stabilizes the properties of soil in short time, it abbreviates the construction period. This gives chance to make an adobe production independent from climatic conditions. The aim of mechanised construction technology by using a soil which its properties are stabilized with addition of gypsum is to improve the local mass production at social housing (18).

Table 5. The Effect of Water Content on Workability Property of Developed (gypsum Adobe (3)

Water Content	Workability
%18-%29	It is beaten
%20-%22	Works as adobe block
%24 and more	Subsides (precipitates)

The compatibility of the soil as an adobe can be guessed from its colour. Then some tests can be done to confirm the usability of that soil. The soil should not be diffuse when it is compressed in palm and should not be broken into tiny pieces when left from 1m height. Another way of choosing a suitable soil type is to prepare sample of adobe blocks and drying them in open air away from water. If the adobe blocks are produced from suitable soil mixture, they don't give wide and dangerous cracks (18).

Table 6. The Ratios of Materials in Mixture of Developed (gypsum added) Adobe (3)

Material	Weight
Soil + Clay (%10) + Silt + Sand + Gravel (7cm)	100 kg
Water	20 kg
Gypsum	10 kg
Lime	2 kg

3.4.The Developed (Gypsum Added) Adobe Site

There are some processes which should be monitored. They are given below.

3.4.1.Preparation of Soil

The researches done before conveyed that the granules which have dimension bigger than 2 cm, decreases the strength of adobe. However, it is not needed to sieve the soil which is stabilized with 10% gypsum ratio. The result of experiments done in laboratories show that samples which were produced with big dimension agregate has 2 N/mm^2 compression strength. All the sieving processes cancelled after discovering that granules in 6 cm dimensions can easily be used in site. According to the results of experiments and tests, the mixture of gypsum added adobe is reduced to simple terms. The costs of labour and also production period with other costs all decreased. In order to supply a easy labour, the amount of material will be used in site, determined as 50 kg (approximately 1 wheelbarrow).

The lime is added to delay the set of gypsum. and it is added to water before gypsum and prevented the set of gypsum to start immediately. Because the set time of gypsum extended, the working period on adobe augmented. The ratios and the scales are converted into simplified units which the labour will understand easier.

Table 7. The Simplified Raitos and Scales in Gypsum Added Adobe (3)

50 kg. soil	1 full of wheelbarrow (0.06 m^3)
5 kg. gypsum	4 full of shovels
1 kg lime	2 normal shovels
Max. 2 kg. water	To dampen the soil
17 kg. water	2 types of cups were used in order to simplify the work. (cup for 9 or 8 kg). So that lime and gypsum estimated with these ratios

3.4.2.Moulding and Emboding (Giving shape)

While the concrete mixer mixes the mixture, two labour started to build the mould in place of wall. It is usefull to clean and oil the moulds to obtain a smooth surface. The mixture is carried with whellbarrows and replaced into mould. In every 20 cm unbeaten thickness, the mixture is compacted. The set of gypsum starts very soon in a mould when the lime is not added into mixture to delay gypsum's set.

3.4.3.Curing- Letting a Rest- Storaging- Transporting

In different countries, while traditional adobe production processes, the period between mixing, moulding and building production, curing are letting a rest, storaging and transprting take the most time. Specially curing and storaging needs wide spaces in site.

3.4.4.Wall Building (Erecting) System

The wall building (erecting) with soil and lime takes too much time in massive constructions for adobe wall productions. This phase increase both construction time and cost in production. If the surface of built wall is not homogenous, this composes different abrasion surfaces and plaster defects can be seen depending on this event. Specially the walls which were built with industrial and rational moulds and beaten regularly, give smooth plaster surfaces. This gives chance to make plaster in same thickness all over the surface so the lifetime of plaster extended.

3.4.5.Wall Casting System

In the phase of mixture preparation phase, four different methods were tried to find the most suitable mixture type. Besides, in order to prevent cracking while carrying mixtures in the mould to the site, 5 different techniques were improved.

1. 30-35 cm spaces left in every 1.00 m casted wall and it was let a rest during one day to finish its shrinkage. The next day, all the spaces (gaps) were filled with an adobe.

2. During one day period, for rational usage of mould modules, 3.00-4.00 m long moulds were used and big walls casted up to floor height. The day after, they continued casting wall from same point. Before starting to cast, the contact surfaces were dampened to enable more simple joining. However, this method was discarded because unwanted shrinkage space obtained and stepped wall built after destroying the previous wall.

3. It was obviously seen that the most rational method for building adobe walls is to cast the walls continously in moulds up to same level and then compacting them perfectly. All the shrinkage cracks were prevented by replacing galvanized reinforcemented grids in every 60 cm height.

4. In the regions along horizontally which vertical construction joints will compose, the walls finished as steps. In this type of application, no shrinkage cracks were seen in walls which were

casted in different times. In this process, for easier usage of compactor, the step wideness shouldn't be less than 50 cm.

5. The other method tried as an alternative to stepped wall was casting a sloped wall but it was meaningless cause the compactor was breaking the wall instead of compacting.

Table 8. The Processes of Construction Technology of Developed (Gypsum Added) Adobe (3)

Concrete mixer + soil + 2 kg water	2 mins. it was mixed in concrete mixer
Wheelbarrow + 18 kg. water + 2 kg. lime + 10 kg. gypsum	2 mins, it was mixed with hand
The mixture in wheelbarrow depleted into concrete mixer	3 mins, it was mixed
Then the mixture was depleted into wheelbarrow again and used in wall construction by beating	Not more than 15 mins.

The construction phase of developed (gypsum added) can be classified as below:

1. Foundation Tie Beams: Rope pier was set up according to the foundation plan of the project. Then a pit with dimensions 70 cm depth and 45 cm wideness was dig with excavator. A moulds for beams prepared and reinforcements replaced in a pit and 12 m^3 of concrete was casted and foundation construction completed.

2. Slab Filling and Compacting: After the casting of foundation beams, natural grade under the slab was compacted with a compactor and then 5 cm thick chipping (gravel) layer was spread under the slab

3. Slab Concrete: 7.5 m^3 and 10 cm thick concrete was casted over chipping (gravel) layer.

4. Water Insulation: After foundation beams' concrete and slab concrete's setings finished, then 2 base coat and 50 cm wide BTN Elastosol was daubted to all the surfaces of walls.

5. Earthquake Beam (Lintle): In research site, galvanized reinforcement grid with 2.5X8 cm spaces were used in adobe walls which will help to the adobe walls to be more resistant against earthquake. Reinforcement grids were replaced inside the walls with 2.40 m height. These reinforcement grids were replaced every 60 cm and at 3 different level of the wall to take the diagonal

loads. They were replaced continously as 30 cm at 40 wide outdoor walls and 20 cm at 30 cm wide indoor walls.

6. Lintle Over Walls: The buildings height reached up to 2.40 m including all the door and window openings. A reinforced concrete lintles replaced all over the building at this level.

7. The Upper-Level (Top) Slab: The studs needed replaced to the spaces after the lintles were replaced. 12 cm height beams were mounted on these studs. After the replacement of floor blocks replaced between these beams, then 11 m^3 concrete was casted over 16 cm height from floor lower level. This was the last process for up level slab.

Table 9. The Used Material Weight, Ratios Used in Developed (gypsum added) Adobe Construction Technology and the Pratic Scales Used in Site (3)

Ingredients	Weight Ratios (%)	Pratic Scales
Soil	100	2 wheelbarrows
Gypsum	10	4 shovels
Lime	2	1 shovel
Water	18-20	1 bucket

Researches done in the site of gypsum added adobe construction, the results can be summarized as given belowe:

- The gravels in 5-7 cm diameter were used so that there was no need to sieve the soil. This is an advantage for labour cost and area needed for site.
- The scales are converted to more simple units.
- The adobe wastes removed from concrete mixer should not be used in mixtures and have to be carried away from the site.
- Using the industrial moulds made moulding phase more rational.
- Homogenous wall surfaces were optained for plaster by using mechanical compactors in shaping stage.
- For independent adobe building, 4 or 5 labour are enough for all stages. Bacause most of the processes can be done at the same time, more labour effects the site negatively.

3.5 The Principles of Total Quality Management and Its Principles in Adobe Construction

The Total Quality Management applied in adobe building construction can't be succesfull without the support of organization. The rules and principles which should be applied for the success of Total Quality Management are given below:

1. To Increase The Total Quality Management as an Decisive Strategy: In adobe production method, distribution of products and improvements in servicing are basic policies. All the projects which come true should have an interest to build more secure and qualified system

2. To Heed the Expectations of Users: It should be the main aim to correspond the expectations of users.

3. To Make Right Work in Right Way and At Right Time: In every phase of adobe production, all the processes should be done in right way and right time.

4. Following the Chosen Method: The method chosen for adobe production should be understood completely. The way which will raise the quality of project done is to choose a method which its accuracy is proved.

5. To Benefit from Data Processing Engineering and Equipments: To be able to success a new adobe building project, the data processing engineering should be used.

6. To Use Planning Techniques in Data Processing Engineering Which Their Accuracy Have Been Proved: In order to make a plan which will succeed the adobe building production, the type of project should be determined. Experience is very important for the planning of adobe building.

7. Authorization of Employee During Development Stage: All the employee in adobe building production should be a part of development stage.

8. Education: In order to take maximum efficiency from employees, they have to be well educated.

9. Method Developing in Quality Measurement: Measuring gives chance to see and control the position off all working group. It determines the cost of corresponding the expectations of users.

10. Usage of The Suaitable and Dainty Inspection Techniques: Methodogical tests are complicated and needs repeats but it is very important to apply it for obtaining well qulified adobe buildings.

In order to get the best results from all these applications, their results should be observed, proved and reported regularly.

3.6 The Phases of Total Quality Manegement in Adobe Building Production

Total Quality Management in adobe building production is a term which organize the system to catch the raises in quality. Total Quality Management is not a program but it is a method which operate the business. The seven phases of Total Quality Management in building production can be expressed as below:

1. Vision and Values: Policy and philosophy are comprehensive expression of quality definition and two properties those the orgaziations which apply Total Quality Management have. Another property of that organization is strategic quality planning. Strategic planning prepares the organization to reach their aims with suitable strategies. In adobe building production, the general aims for management are joining the education with existing employee and manpower.

2. Stability and Participation: All the employees of the organization should participate all the processes which aim to produce high quality adobe buildings. Managers should observe and orient the employees and also share the results of decreases and increases in quality productions. The continously improvement and new suggestions which will raise the production quality are the responsibilities of managers.

3. Quality Measurement: All the dimensions of quality should carefully be measured and defined for improvement. The internal and external users' expectations determine the system of measurements. These measurements also define the risks of organization.

4. Continous Development:All the efforts shown to obtain better results from adobe building construction and determined aims, elicit the continous improvement. The organizations which apply Total Quality Management in their constitutions have to show continous developments for growing up.

5. Improvement of Employees' Skills: All the employees in organization should participate and take part in activities which aim to raise quality of adobe buildings. Besides, they have to be educated about the philosophy and techniques of Total Quality Management.

6. Technology and Systems: Information system is one of the systems which should be applied in adobe building construction organization. It is usefull to collect and evaluate the datas and results. Other system for these organizations is the communication system which declare the employees from results and reports. The data transfer is a necessity for the employees to keep working properly. Social-technique system is renewed design of production and man-power as a total performance. Efficiency and quality in adobe building can be maximized with social-technique system.

7. Awards: In order to catch the determined aims, the skills and methods of employees should be improved. Rewarding program effects the motivation of employees positively. Besides its success depends on;

- To participation of all employees,
- Standarts and aims,
- Employees' effciency and control of quality index,
- Incentiveness of continous improvement,
- Individual and crew performance,

4.TOTAL QUALITY MANAGEMENT IN ADOBE BUILDING PRODUCTION

All the employees and managers should completely do their assignments in Total Quality Management Organization in order to be succesfull enough. These are the factors which affects the success of Total Quality Management Organization:

4.1 Management's Commitment and Leaders

The constitution of the Total Quality Management in adobe building production depends on leaders properties. Leaders in these organization should be open minded, open to all kinds of developments and have to have conceptions about quality. They all have to orient and courage the employees, have to take decisions and observe the results.

4.2 The Representations (Roles) of Top Management

In adobe building production organizations, top management who has a authorization to take all kinds of decisions, should take all kinds of stratejic and politic decisions and forward these to all employees. Top management should improve a new management style and apply this in all organizations. The alternations (changes) should be started with top management and suitable ambiance should be created for middle managements to be able to give qualified decisions. All the departments should comminicate easily to share all the decisions, datas and reports. The top managers in adobe building production should support Total Quality Management by doing these as given below:

- To accept the financial investments in adobe building production for Total Quality Management,
- To know that Total Quality Management in adobe building will take long time and according

to this they should spare time for Total Quality Management,

- To participate in education and learn the Total Quality Management in adobe buildings,
- To get a consultancy support.
- To show their support against Total Quality Management in adobe buildings in production organization,
- To take part in national or local associations,
- To orient the quality department in adobe building construction,
- To determine the quality policy and develope the vision in adobe building production,
- To take the defiance into account and produce more alternatives,
- To build up the awarding system

Leadership is a necessity Total Quality Management in adobe building production and should be the preferential process for the top management.

4.3 The Represantations (Roles) of Other Managers

In adobe building production phase, all the decisions are taken by middle management. The four main elements of high qualified production are motivation, education, equipment and materials and all these are directed by middle management. They supply the communication between the top management and all employees and they are the leaders of projects which aim to modify all mistakes in production proceses.

4.4 Participation of All Employees

Participation off all employees to all processes in adobe building construction is one of the principle of Total Quality Management. All the problems in organization should be solved as crew and the responsibilities should be shared among crew. Bacause teamwork is very important in Total Quality Management.

4.5 Continous Improvement

One of the condition to elicit quality in adobe building construction is to obtain the continous improvement. In adobe building production, continous improvement can be obtained with complete

participation of employees in organization. Decelaration after reaching the determined aims prevent the continous improvement.

4.6 Flawless (Free of Error) Program

This program is applied to fix all the process mistakes in production phases. Motivation and taking precautions are the basics of this program. The employees should be motivated for decreasing their mistakes. In order to decrease the systematic faults which can be controlled is the principle of taking precaution. For more efficient flawless program, the employees should observe their works on the production. The aim of this program is to determine the faults and prevent the repetation of same mistakes. Besides, it also aims to make processes free of error in first attempt.

4.7 Education

Education in adobe building construction begins with the education of top management about the principles of Total Quality Management, quality improvement, needs and treatment. Education have to be programmed. Education in adobe production and programs prepared for employees have to aim to improve the skill of employees, to satisfy their individual aims, giving the fundementals of subject and make them understand their additions to adobe building productions. Besides all, this education program should treat the communication between all management levels.

4.8 Users' Satisfaction

In order to create the total users' satisfaction and elicit well qualified improvement for adobe building production organization, it should be possible to correspond all the expectations off all users' about quality, cost and delivery quality.

4.9 Cost of Total Quality Management in Adobe Building Construction

Quality is the priority for the adobe building production organizations to keep their presence. The other aim is decreasing the cost of production. When the first aim quality comes true, other aims will come true respectively.

Total Quality Management cost in adobe building construction can be defined as the cost of all processes which are necessary to be applied for this management system. The cost of Total Quality Management in adobe building productions consist of few sub-factors such as;

1. Payments Done for New Established Adobe Building Production Organization: This is the cost for the establishment of new organization for adobe building construction. This cost includes the employment and educations of employees, seminars and education booklets for employees. The establishments of quality circles and quality groups are included in this cost.

2. Payments for Existing Adobe Building Production Organization: This is the cost including the payments for existing employees' education, seminars, meetings, booklets etc. Also the payments done for establishing and appliying continous improvement and flawless programs.

3. The Effects of Obtained Good-Bad Results on Adobe Building Construction in Total Quality Management Costs: This cost include all the negative or positive effects of payments done for obtaining quality in adobe building construction. If the applications give positive result, this will decrease the cost of adobe building construction in Total Quality Management. The result whatever it is will reflect to the users.

4. Total Quality Control Costs in Adobe Building Production: Total Quality Management is a system which directs Total Quality Control so all the sub-systems, all the costs done for total Quality Conrtol will effect the cost of Total Quality Management. This cost also include measurement, valuation and processes for prevention of external or internal faults. The increase in cost of any factors defined above, will increase the cost of Total Quality Management too.

5. The Establishing and Improving the Cost System Which will Make Analyze of Adobe Building Production's Costs: Total Quality Management is a system that aims to build economic but high quality adobe buildings for users' so that costs are very important for Total Quality Management in adobe building production. The factors which will decrease the cost of Total Quality Management and will help to the establishing of system are given below:

- **Quality cost systems in adobe building construction aims the usage of quality costs for internal aims instead of using it for external aims.**
- **The quality cost systems give datas such as fault ratios, organizational successes for adobe building construction.**
- **Quality cost system is designed specially for every adobe construction system.**
- **The measurement of quality costs in adobe building production includes the accounting datas.**

- **Quality costs in adobe building production give possibility to compare the quality composing and improving programs and their results. This system guides to some equipments to take decisions according to these results. These equipments are:**

    1. Quality costs in adobe building production is an indicator.
    2. Quality costs in adobe building production is an equipment for quality process analyzing.
    3. Quality costs in adobe building production is a budgeting equipment.
    4. Quality costs in adobe building production is an approximation equipment.

Whether the quality cost system is designed as a management organ, then improved quality, high efficiency and better cost management systems will come true. Whether all the collected datas are evaluated carefully, one of the most important principle of Total Quality Management which is "decreases in costs" will come true.

As it is mentioned before, there are some functions to be corresponded. The production tehnologies effect not the conditions of execution of functions but form of functions. In another words, buildings work functionally in any case independent from their production technologies. They may be produced by traditionally or with high technologies, their functions doesn't change. These functions are given below:

4.9.1.Strength in Adobe Buildings

Adobe builldings should resist to both vertical and horizontal loads forces on them. Whether the comparison is made, then gypsum added (developed) adobe buildings have longer life than the traditional adobe buildings. Gypsum added adobe buildings are more strength against loads then the traditional adobe buildings. This is the reason of stabilized adobe with gypsum and lime added in its structure. The addition of lime and gypsum added into adobe will help the adobe buildings to increase their marketing ratios in near future.

4.9.2.Aesthetics in Adobe Buildings

Whether the durability of produced adobe buildings is not enough, then their outlook may be destroyed in a short time. This situation will not be good for their aesthetics. In adobe buildings, if the

visional quality is not good enough, then this will cause loss of ascendance among users. However, the developed (gypsum added) adobe buildings damages very less during their lifetime. Their accordance to environment and their natural materials are some advantages of adobe buildings in terms of aesthetic.

4.9.3.Economy in Adobe Buildings

The ecomomy of adobe buildings is related with the requirements need to be paid during their pre-production stage, production stage and usage stage. One of the biggest advantage for adobe buildings costs' when compared with other constructions types is their basic constructing material. Soil is basic material for adobe buildings and it can easily be found. In usage stage, its capasity to thermal insulation make them economic in energy saving. They don't need big and expensive cares after production so this is another advantage for adobe buildings to be economic. Another factors which make adobe buildings economic are their basic materials, low costs in labour and no special necessity to storage area for materials. All these are sum of the advantages which will increase the marketing share og adobe buildings because of their low costs.

4.9.4.Functions in Adobe Buildings

Buildings have to execute the needs and vital criters of users in best conditions. This is a reqirement for quality. The vital criters mentioned above are thermal, humidity, sound insulations and strength. The optimum indoor temperature should be between 18-22^0 C. Adobe buildings have high thermal insulation capasities so they can easily elicit these conditions. The optimum indoor humidity ratio is 50% and optimum indoor sound impetus is accepted between 35-45 dB. Adobe buildings all execute these conditions and besides all, they are strenght against fire in particular period. The application of Total Quality Management in adobe buildings give the results mentioned below:

4.9.4.1.Increse in Quality of Product and Service

Total Quality Management is a managing system which expose and abrogate the faults of processes so it submits qualified products and services to users'. In adobe buildings, processes can be restored in a short time by Total Quality Managment system and production processes correspond all the expectations of all users'.

4.9.4.2.Decreases in Costs

An effective application of Total Quality Management in adobe building production will increase the quality of products. Besides this, the costs will decrease and as a result, the marketing share of adobe buildings will raise.

4.9.4.3.Increase in Profits

Quality is the most important factor which effects the profitability. Return on investment and quality of products are usually strongly related with each other. When compared the high quality adobe buildings with low quality adobe buildings, it can easily be seen that high quality buildings are more profitable. The increase of profitability in adobe buildings with the efficient application of total Quality Management can be seen in 2 way. One of them is the increase of profitability with the decreases in costs, the other one is the increasing sells.

4.9.4.4.Increase in Productivity

In adobe building productions, the productivity can be increased with the quality performances. Application of Total Quality Management in adobe building production will modernize and restore all the processes so the sources of organization will be able to produce more buildings. This means increse in productivity.

4.9.4.5.Increase in Efficiency

Total Quality Management elicits the processes to be done correctly from first time. This is called organizational efficiency. Total Quality Management is the best management system to supply efficiency in adobe building production, because the substracture was built up before. The effects of Total Quality Management on organizational efficiency in adobe buildings can be described as given below:

- Collaboration between workteams and units. It enables the different workteams' efficiency and entegration,
- Elicits increase in communication by using common language,
- Indicates every processes' best application and improvement way,
- Encourage the employees to contribution so increase the working satisfaction of employees. This will decrease the employees to be out of job.
- Total Quality Management in adobe building production improve the relations between employees and managers. This is very important for any organization.
- In adobe building production organizations, it determinates the priorties so employees

motivate better on this priorities.

4.9.4.6.Comptetition and Increasing in Market Share

Total Quality Management is not only a process which aims the perfect but in industries which have strong competition aims continous success as well. As a result of Total Quality Management, developed adobe building productions are marketed with their processes and all the users were satisfied at the end. As a result of this, the market share of adobe buildings grows up day to day and the strength against competition raises.

4.9.4.7.External Users' Satisfaction

Organizations can't have profit, market share, investments, return on investments (ROI) without users and customers. The aims of Total Quality Management are to gain customers, satisfy the users so to establish a strong relationship between the organization and customers, design more functional products, answer the complaints of customers and decreasing the costs from unsatisfaction of the customers.

4.9.4.8.Environmental Quality Concept

Quality is very important for creation of value and enviromental entirety is a value which should be kept. Total Quality Management is the best managment system which takes the environmental entirety into account. Environment is related with adobe buildings too.

As a result, bacause the adobe material is very respectfull to environment, it is warm material and natural material, a great amount of development will be supplied in adobe building production by Total Quality Management. Whether these developments can completely be understood, adobe buildings will be one of the demanded house types all over the world.

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BÖLÜM.5

Kıbrıs için çağdaş kerpiç yapı teknolojisi

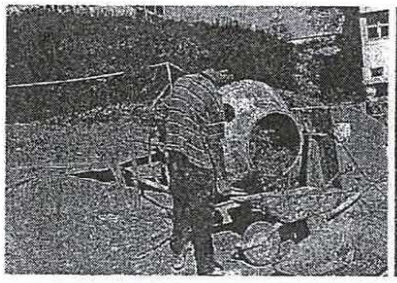
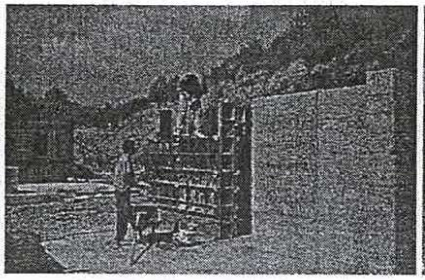
BÖLÜM.5

Kerpiç üretim teknolojisi, Çağdaş kerpiç yapılar ve standartlar

5.1 Kerpiç üretim teknolojisi,

Geleneksel kerpiçten farklı olarak alker makina ile işlenmeye uygundur. Karışımın içindeki %2 kireç mekanizasyona uyumu arttırır. Pilot yapılarda kullanılan **a**.betoniyer ile karışım ve duvar kalıbına tokmaklama tekniği, **b**.parke taşı tesisi ile kerpiç blok üretimi, **c.** Püskürtme makinası ile duvar kalıbına püskürtme teknikleri kısaca tanımlanacaktır.

Betoniyer ile karışım ve kalıba tokmaklama tekniği: Alker'in karıştırılmasında kullanılan betoniyer **Şekil.3'**de gözükmekte. Betoniyer ile karıştırılan harç el arabasına alınıp kalıplanacak yere götürülür. Kıvam konusunda deneyim kazanmak gerekir. Kuru olan harç kalıpta birbirine yapışmaz ve monolitik olarak çalışmaz. Su fazla olursa harç betoniyerin duvarlarına yapışır. Uygun kıvam için kullanılan toprağın doğal nemlilikte veya kuru olması tanımlanmalıdır. Ocaktan yeni çıkan toprakta nem bulunurken, önceden çıkıp kullanılmadan beklemişse oldukça kurudur. Harç suyu deney yolu ile %20-24 arasında seçilir. Betoniyer ile karıştırma 3 dakika sürmeli ve karışım 20 dakika içinde kalıba (**Şekil.5)** yerleştirilmelidir.


Şekil.3 betoniyer **Şekil.4** kerpiç duvar endüstriyel kalıbı **Şekil.5** duvara tokmaklama
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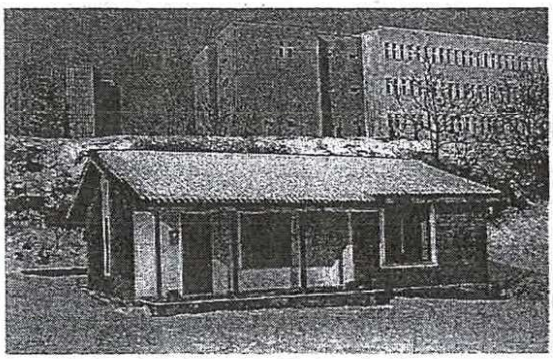
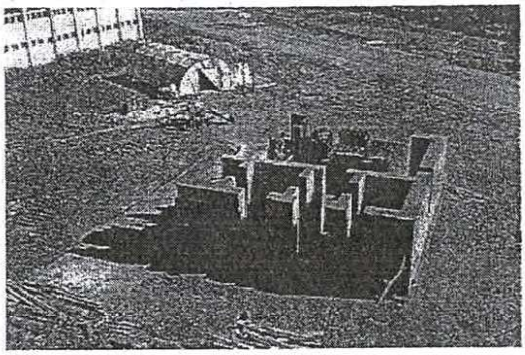
Aksi takdirde yerleştirme alçı priz yaptıktan sonra yapılırsa, hidratasyon ile elde edilen bağlayıcılık kopartılmış olur. Malzemenin priz yoluyla hızla taşıyıcılık kazanması, inşaatı sürecini geleneksel kerpiçten farklı olarak rasyonel ve hızlı hale getirir.





Şekil.6 622 nolu deneme yapısı **Şekil.7** 622 nolu yapı inşaat aşamasında

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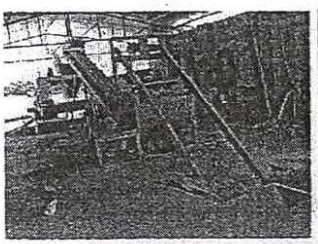
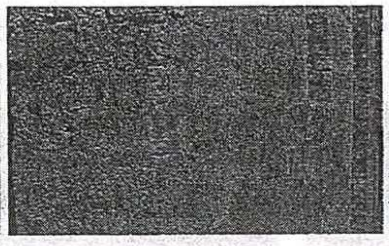
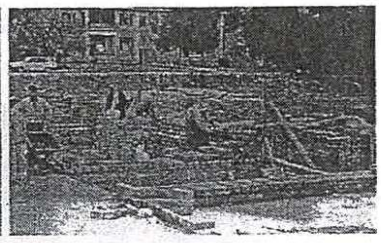
Düzgün yüzeyli endüstriyel üretilmiş, birleştirme ekipmanı olan kalıplar tercih edilirse inşaat hızlanır **(Şekil.4)**. Aynı iş sandık tipi küçük kalıplar ile veya yan iskeleye bağlı kalas kaydırma metodu ile de yapılabilir. TÜBİTAK-İNTAG-TOKİ 622 **(Işık, B., 1996)** nolu proje kapsamında inşa edilen deneme yapısında betoniyer ve endüstriyel kalıp kullanılmıştır. **(Şekil.6, 7)**

Parke taşı tesisi ile kerpiç blok üretimi: Beton parke taşı tesisi kerpiç blok üretimi için kullanılmıştır. İşlenecek toprağın rötresi küçük olmalı, 2cm gözü olan elekten elenmelidir. İmalat aşamaları dozajlama, su ile karıştırma ve presleme bölümlerinden meydana gelir **(Şekil.8)**. Prensipte zemin malzemesinin yerleştirilmesinde presleme







Şekil.8 Beton parke taşı tesisi **Şekil.9** kerpiç blok **Şerkil.10** Urfa'da duvar örgüsü

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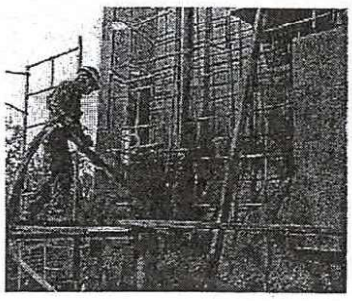
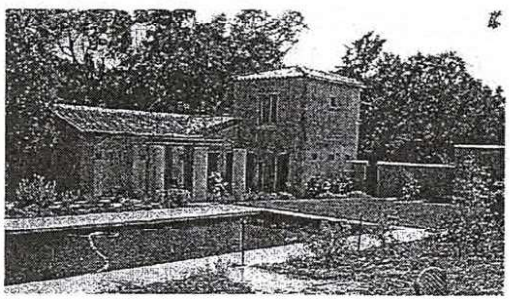
yerine darbe yani kompaksiyon daha etkindir. Yol yapımlarında zemin sıkıştırmasında da silindirin etkili olması için titreşimli silindir kullanılır. Kerpicin güçlendirilmesi için GAP Pilot yapısında çimento kullanılmıştır. Karışımın özelliğinden kaynaklanan işlenebilirlik kabiliyeti ile malzeme beton parke tesisinde işlenebilmiştir. Tesisteki presleme öncesi vibrasyon yapılır. Bir sefer preselemede 15 adet blok birden üretilmektedir. Urfa'da GAP Bölge Kalkınma idaresinin kullanacağı 4 adet lojman olarak inşa edilen iki katlı yapı için 60 000 blok üretilmiştir **(Şekil.9)**. Kerpiç bloklar tesisten şantiyeye getirilip yığma yapı tekniğine uygun örülmüşlerdir. **Şekil.10** Urfa'daki iki katlı kerpiç yapının duvarlarının örülüşünü göstermektedir.

Duvar kalıbına püskürtme tekniği: Kerpiç malzeme beton shotecrete makinası ile püskürtülebilir **(Şekil.11)**. Püskürtme işi için kompresörden basınçlı hava kullanılır. Shotecrete tekniğinde sulu karışım olmakla beraber, kerpiç için kuru malzemenin hortum ucunda su ile karışması uygun tekniktir. Malzeme püskürtülür tane boyutuna göre önceden hazırlanır, bağlayıcı ile karıştırılır, makinaya yerleştirilir. Püskürtme makinasının gücüne göre saatteki miktar 3-15 m^3 arasında değişir. Böylelikle 100 m^2lik bir evin 45m^3 duvar hacmi teorik olarak 15 veya 3 saat içinde püskürtülebilir **(Şekil.12)**. Kerpiç duvar için kullanılacak kalıp tek taraflı, açık kalıp olabilir. Kerpiç malzemesi açık olan taraftan püskürtülür. Gerekirse duvar kesitinde kalacak tesisat ve donatı püskürtme öncesi kalıp içine yerleştirilebilir. Kerpiç malzeme kalıba tanımlanan enerji ile vurduktan sonra yeterince sıkışmış olur ve o andan itibaren taşıyıcıdır. Sonuç olarak kerpicin kalıba yerleştirilmesi sırasında betonda görülen hidrolik basınç yoktur. Böylelikle kerpiç kalıbı daha az takviyeli ve ucuzdur. Hatta kalıp yüzeyi olarak çerçeveye tutturulan dokuma dahi kullanılabilir. Pencere boşlukları kalıpta önceden hazırlanmalıdır. Düzgün olmayan püskürtme yönü sertleşme tamamlanmadan mastara göre tıraşlanmalıdır.





Şekil.11 püskürtme makinası **Şekil.12** püskürtme tekniği ile kerpiç yapı (Easton.D)

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2.2 Kerpiç yapının yapısal özelliği

2.2.1. temel

2.2.2. duvar

2.2.3. çatı

2.3.4. pencere, kapı

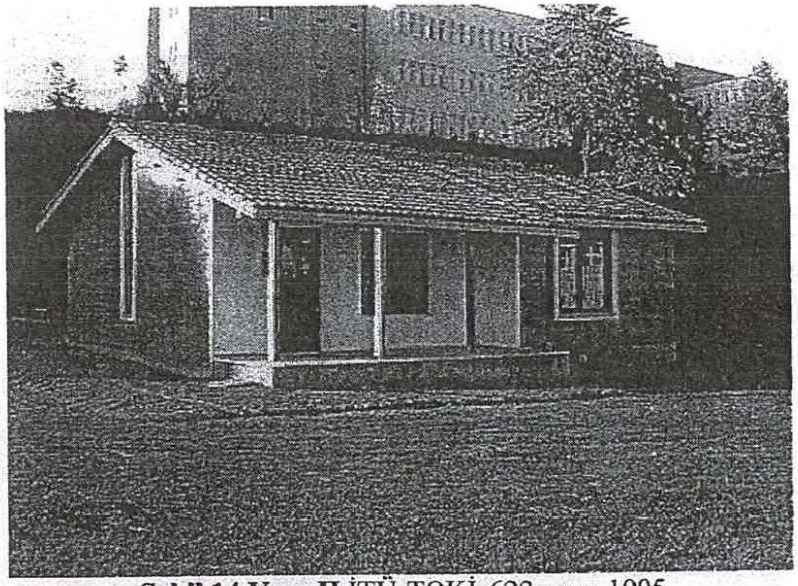
5.2 Çağdaş kerpiç yapılar

Kerpiç yapılar ekli belgelerde görüleceği gibi yığma yapı kurallarına uygun inşa edilirler. Durabilitesini arttırmak amacıyla, Alçı ile stabilize edilen kerpiç ile 4 Pilot yapı inşa edilmiştir.

Pilot Yapı I.: Alker malzemenin temel araştırması 1980 de tamamlandıktan sonra ilk deneme yapısı, **Tanrıverdi. C.,(1983)**'nin Ruhi Kafesçioğlu tarafından yönetilen yüksek lisans tezi kapsamında yapılmıştır. İTÜ'nün Maslak kampüsünde 1983 te inşa edilen yapı 9 sene boyunca Üniversitenin ana okulu olarak hizmet vermiştir. **Şekil.13** te yapının batı cephesi görülmekte.

Şekil.13 Yapı.I İTÜ-1983, Anaokulu 22

Pilot Yapı II.:İTÜ Maslak Kampüsünde 1995 yılında inşa edilen **(Işık, B., ve diğerleri 1996)** ikinci pilot yapının güney cephesi **Şekil.14** ve planı ise **Şekil.15** te görülmekte. Alker malzeme ile yığma yapı tekniği ile inşa edildiğinden deprem yönetmeliğinin ilgili kurallarına göre projelendirilmiştir. Duvarların altında sürekli temel bulunur. Tek katlı yapıda zemin uygunsa 80cm betonarme temel duvarı yeterlidir. Kerpiç duvar kalıba tokmaklama yoluyla yerleştirilmiştir. Duvarın içine her 60cm yükseklikte hasır çelikten yatay donatı yerleştirilmiştir.



Şekil.14 Yapı.II İTÜ-TOKİ-622, yapı 1995

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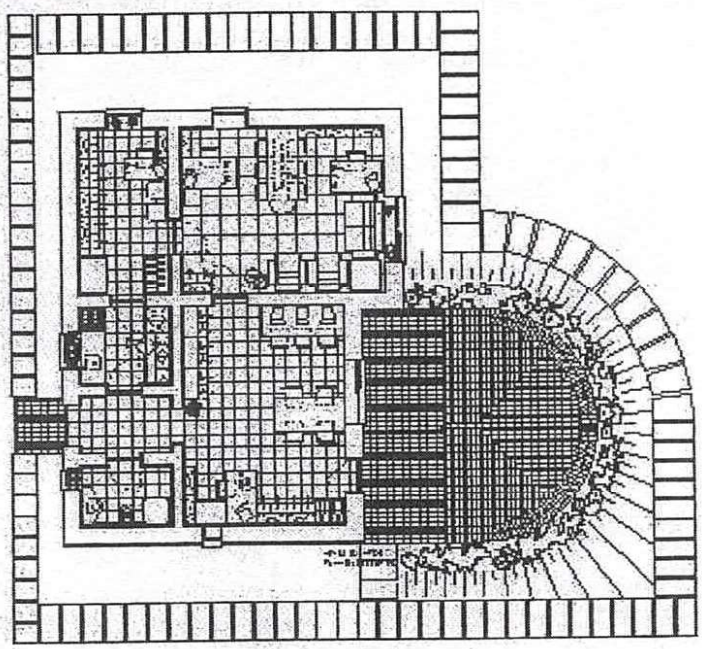
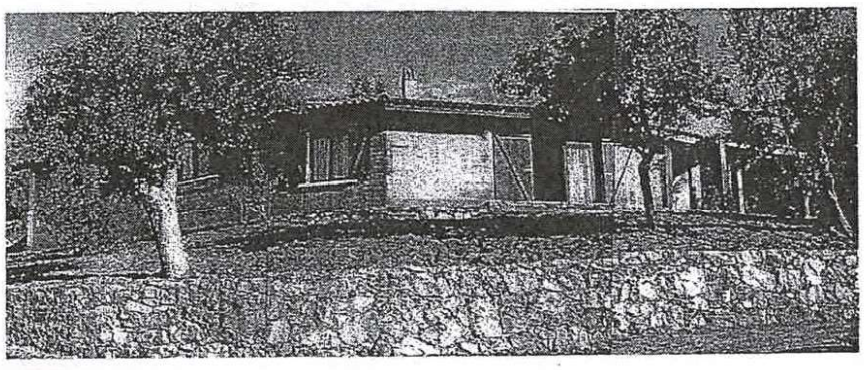


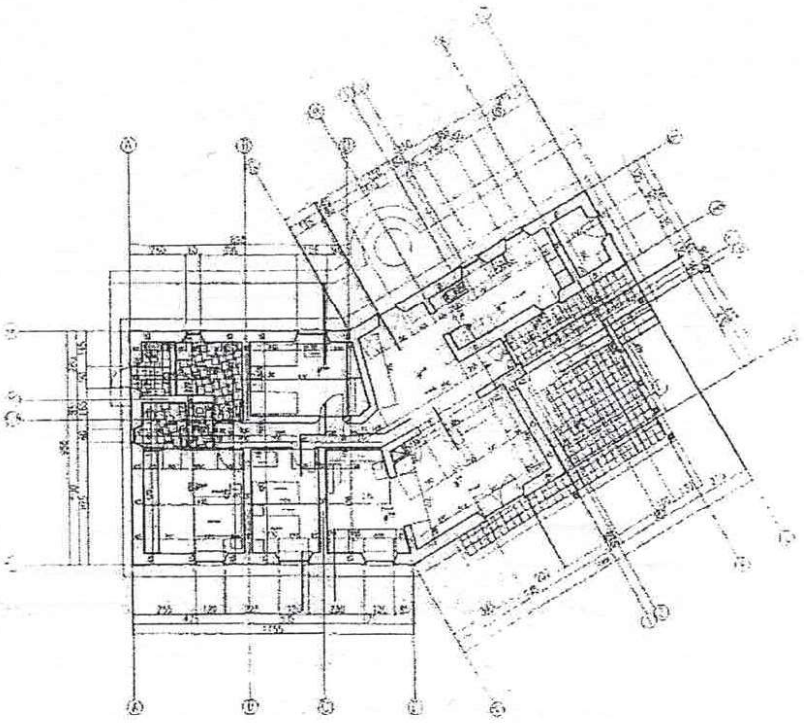
Şekil.15 İTÜ-TOKİ 622 yapının planı, 1995 24

Duvar üstünde kat hizasında betonarme hatıl dökülmüştür. Her iki binada da hazır kirişli asmolen döşeme kullanılmıştır . İlk yapının çatısı az eğimli plak üstü eternit örtülüdür. İkinci yapıda ise betonarme döşemenin üstündeki ahşap oturtma çatı alaturka kiremit ile kaplıdır. **(Şekil.14)**

Pilot Yapı III.: Altınolukta zeytinlik içinde 240 m^2 yazlık olarak inşa edilmiştir. Duvarlar için gerekli toprak eğimli arazide yapıyı oturtmak için yapılan hafriyattan elde edilmiştir. Duvarın kalıbı yerinde kurulan iki taraflı iskelede kaydırılan kalas şeklindedir. Bir kalas yüksekliği (35 cm) tokmaklama tekniği ile doldurulduktan sonra kalaslar iskeleden gevşetilerek yukarıya kaydırılmaktadır. Sıvasız dış yüzde kalıp izleri desen oluşturmaktadır.



Şekil.16 Yapı.III, 1997, Altınoluk 25

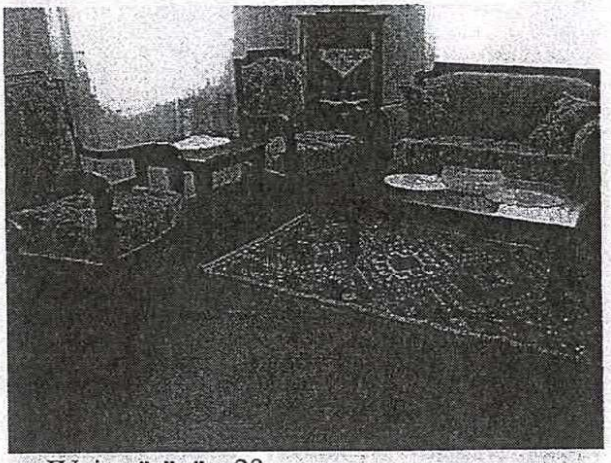


Şekil.17 Üçüncü kerpiç yapı planı, 1997, Altınoluk 26

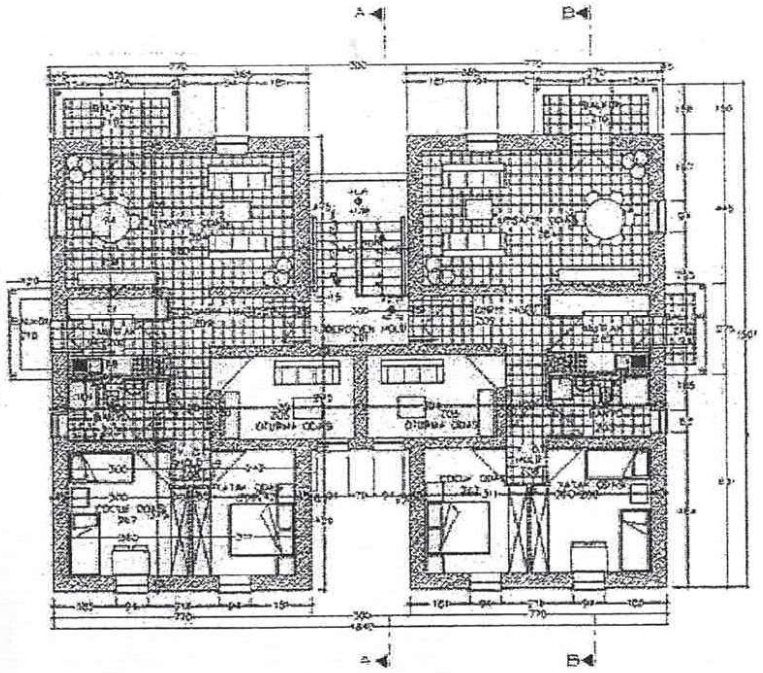
Üçüncü yapı (240 m^2) salondaki tek soba ile ısınmaktadır. Başlangıçta doğal gaz kombi sistemi ile ısıtılması projelendirilen ve her odasında radyatör bulunan merkezi sistemin kullanılmasına ihtiyaç kalmamıştır.

Pilot Yapı IV.: 1999 yılında Urfa'da GAP Bölge Kalkınma İdaresine lojman olarak yapıldı **(Şekil.18, 19, 20)**. Bölgede Birecik barajından etkilenen nüfusun iskan sorununa çözüm önerisi olarak yapılmıştır. İki katlı binanın örme duvarları için 60 000 adet kerpiç blok üretilmiştir. Blok üretiminde Urfa tüneli kazı malzemesi olan marn kullanılmıştır. Marn kalker esaslı olduğu için malzeme alçı ile stabilize etmek yerine çimento ile stabilize edilmiştir.

Şekil.18 Yapı.IV, Urfa 2000 27



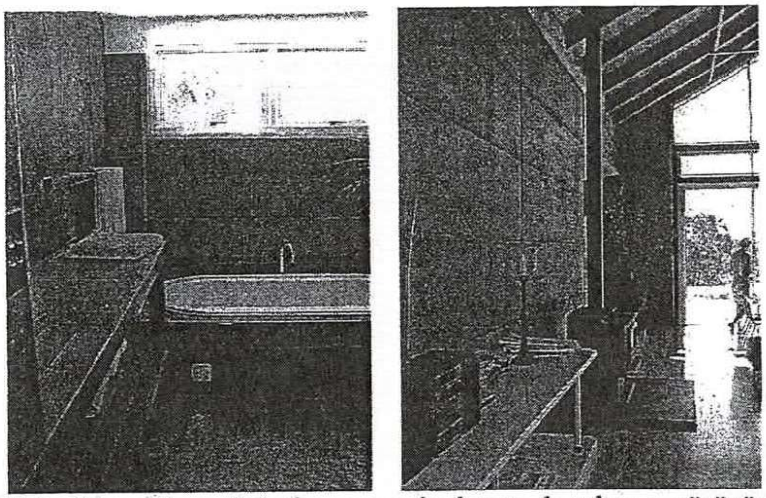
Şekil.19 Kerpiç yapı IV, iç görünüş 28



Şekil.20 Kerpiç yapı IV, iki katlı, 100m^2 lik 4 daire 29

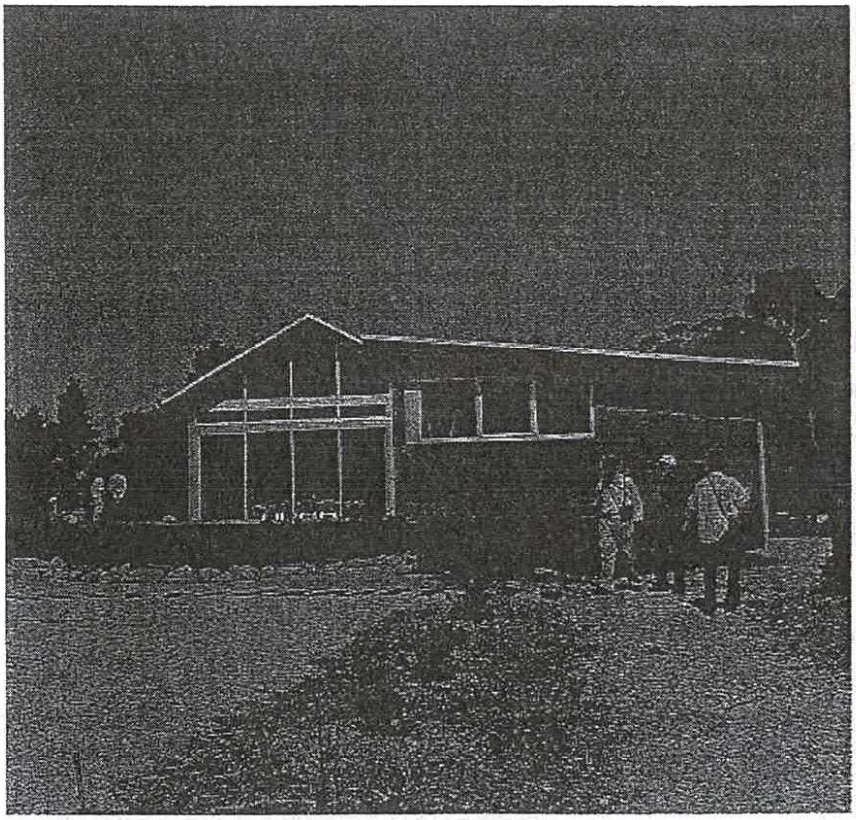
Günümüzden kerpiç yapı örneği

Dünya üzerinde kerpiç yapıya olan ilgi artmaktadır. Birçok ülkede entelektüel insanın çevreci ve prestij yapısı olarak inşa edilmektedir. Örnek **(Şekil.21 a, b, c)** Avustralya Sydney yakınlarında tokmaklama tekniği kullanılan hafta sonu evini göstermekte.

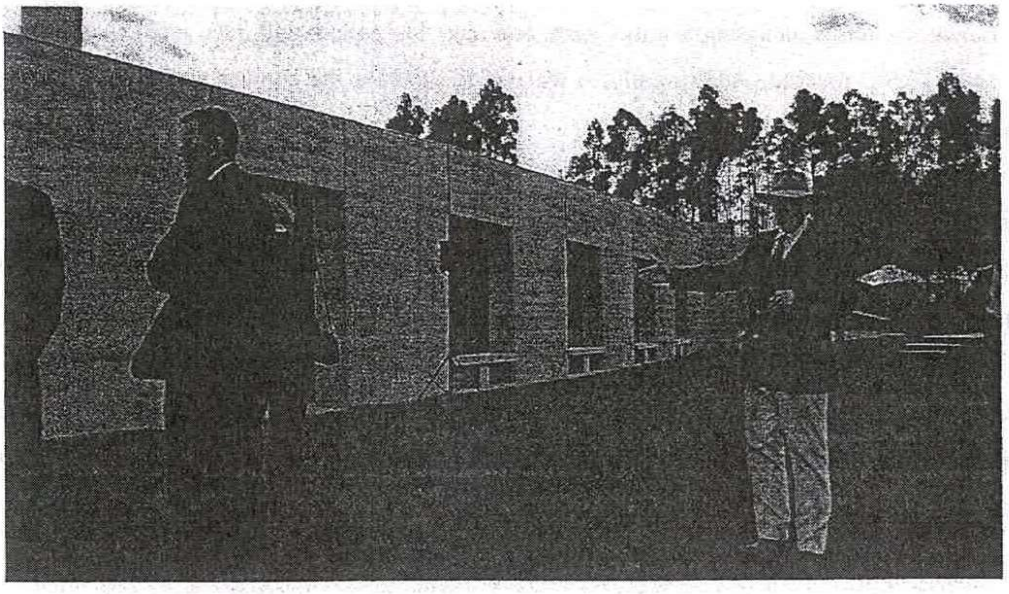


Şekil.21 Sydney yakınında hafta sonu evi a-banyo, b-salon, c-görünüş, 2005

30 31



Şekil.21 Sydney yakınında hafta sonu evi 32



, Museum of art, Victoria –Avustralya 33

5.3 Kıbrıs'ta çağdaş kerpiç teknolojisinin eko-turizm de uygulanması

Özge Özbek EMINOĞLU

1.1 Karpaz Bed and Breakfast Project

Office for Tourism Planning decided to start the restoration process of 5 historical buildings and construction of 9 new bed and breakfasts in Tatlısu, Buyukkonuk, Mehmetçik, Kumyalı, Dipkarpaz situated at Karpaz peninsula of North Cyprus. This project is financed through funding from Turkey not only to help increase the awareness for eco and agro tourism but also to give the local people an opportunity to own their businesses.

Financial aspect of this project is authorized by Development Bank in January of 2007 where 14 bed and breakfasts are planned to be in operation in 2008. A non-profit firm is established to help with the advertisement of eco tourism, education of local people and to give logistic support to tourists. This is an important step to guarantee the financial success of the project.

Since agro/eco tourism is increasing its popularity in the world, it is believed that with a pilot project on agro/eco tourism in Karpaz peninsula, TRNC tourism will find its rightful place among other Mediterranean countries including South Cyprus and also this project will have a positive impact on the status of TRNC tourism. Additionally, it will aid to increase the choices available to incoming tourists to North Cyprus.

Successful completion of this project will help Karpaz peninsula to prosper not only economically but also culturally where it will be a thriving example for other parts of the North Cyprus that wish to implement agro/eco tourism in their locality.

This paper is about one of the projects discussed above and it distinguishes itself among others thorough usage of Adobe and Alker (gypsum mud brick) as a building material which has not been used in North Cyprus in the last 50 years. This courageous step is due to the faith and trust between the land owner, the architect and the contractor.

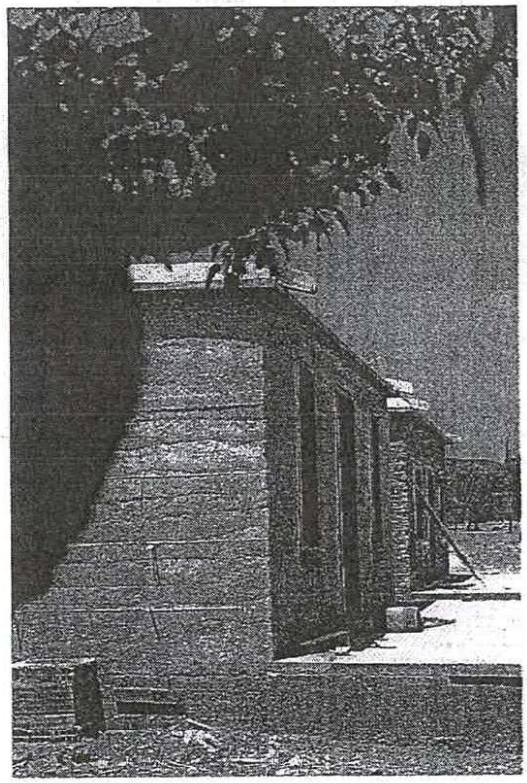


Figure 1: (Ay.Phodio Guest House), Buyukkonuk, Komi Kebir, Ozge Ozbek Eminoglu, 2008

This is the FIRST NEW ADOBE/ALKER building group in last may be 50 years in North Cyprus.

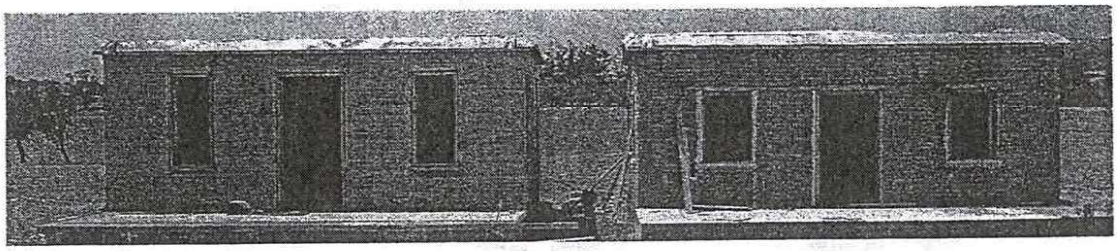


Figure 2: Ay.Phodio Guest House (New Alker and Adobe Buildings), Buyukkonuk, Ozge Ozbek Eminoglu, 2008

2 PROJECT DESCRIPTION

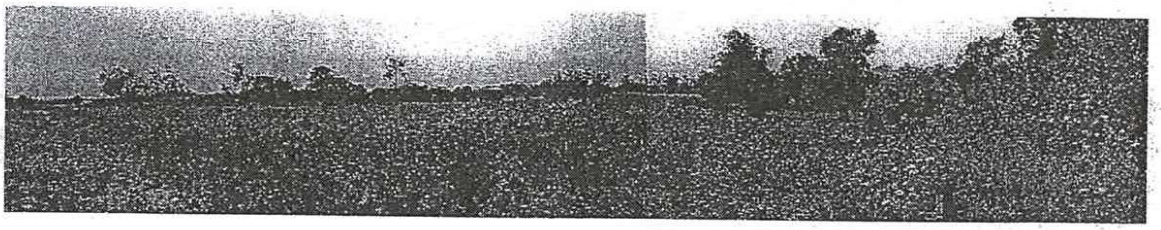


Figure 3: before construction of Ay.Phodio Guest House, Buyukkonuk, Ozge Ozbek Eminoglu, 2008

Client: Gulay, Sadiye Komili

Location: Buyukkonuk

Function: Eco-Tourism Village Guesthouse Project at Buyukkonuk
(Ay.Phodio Guest House)

Building area: 450sqm2, Land area: 2519sqm2.

Construction Date: 2007

Design Team: Ozge Ozbek Eminoglu (Architect), Mehmet Eminoglu (Civil Engineer)

Contractor: Umay Construction, Huseyin Umay

Control: Tourism Ministry

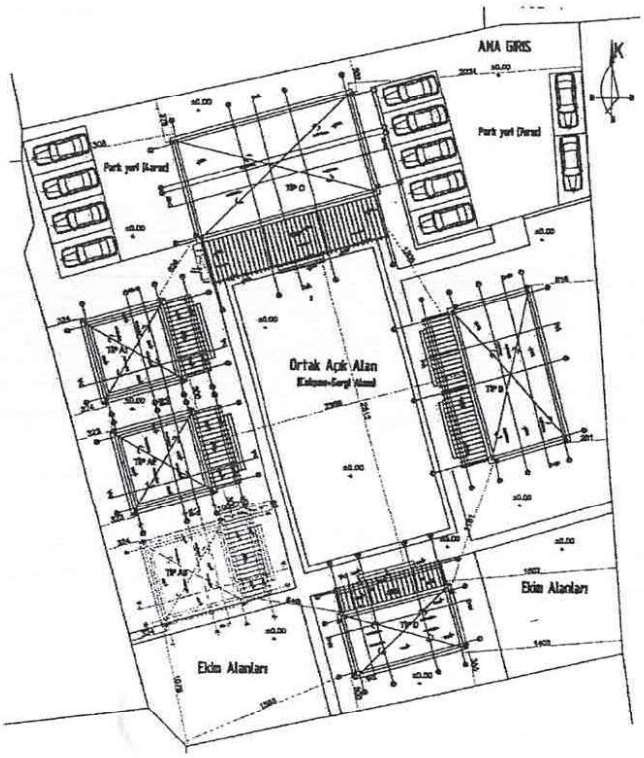


Figure 4:
Site Plan of Ay.Phodio Guest,
Ozge Ozbek Eminoglu, 2007

Whole project is in village of Buyukkonuk which nestles on the foothills of the Five Finger Mountain Range at the start of the narrow panhandle of Cyprus called Karpaz. This geographic location results in a pleasant combination of both hilly terrain and fertile flat lands, with close proximity to both seashores, to the north and the south.

The project includes 3 bungalows, 1 double bungalow, 1 restaurant and 1 soap workshop with well designed landscape area which includes land for organic farming.

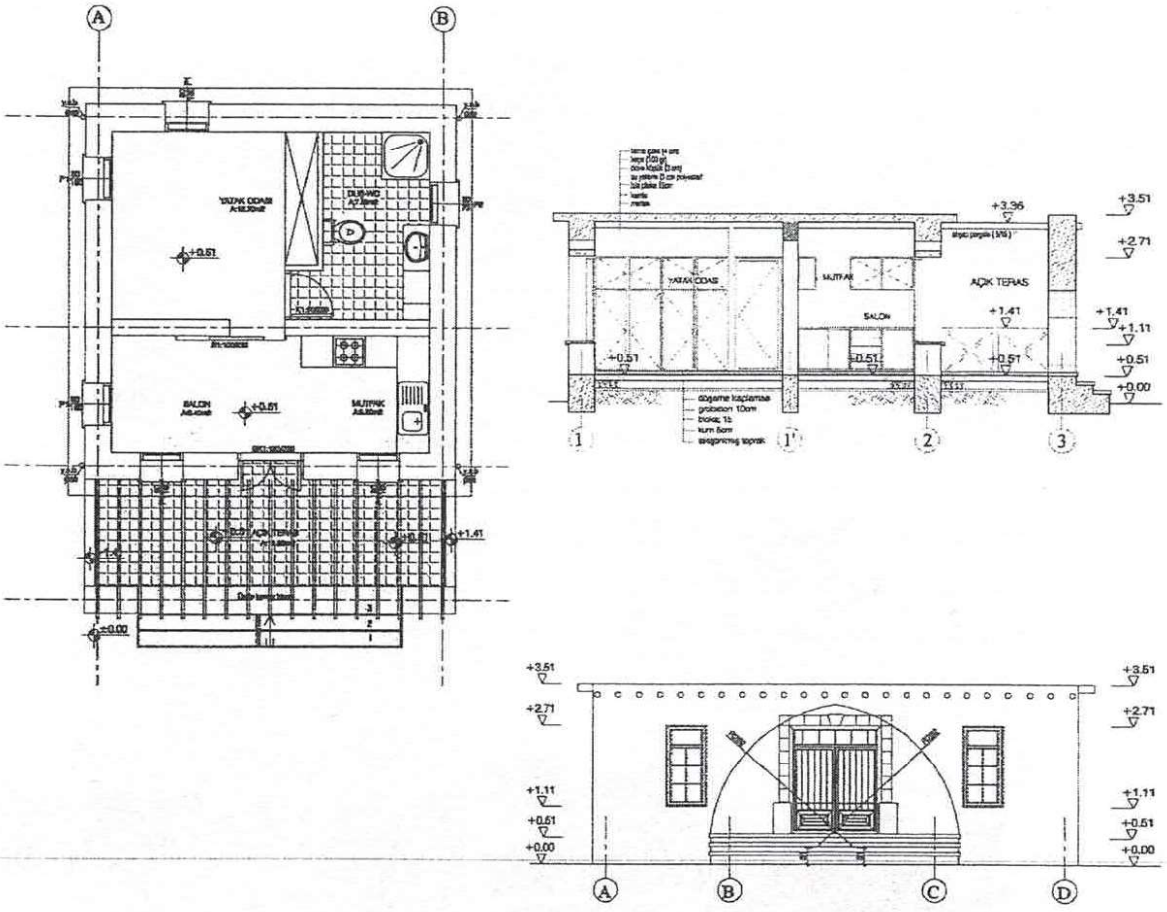


Figure 5: Drawing samples of the Project, Ozge Ozbek Eminoglu, 2007

3 CONCEPT OF THE PROJECT

In this project, client is aware that responsible travel to natural areas not only conserves the environment but also improves the well-being of local people.

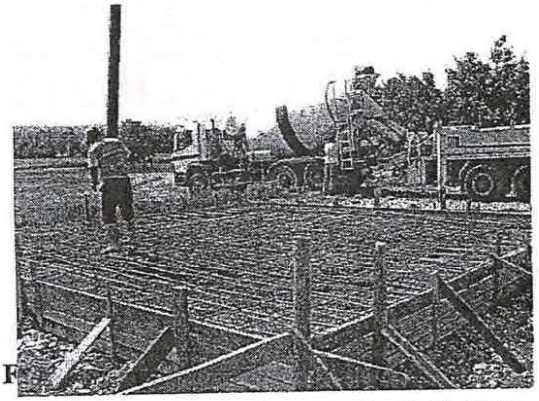
This means that those who implement and participate in responsible tourism activities should adhere to these ecotourism principles:

- minimize impact
- build environmental and cultural awareness and respect
- provide positive experiences for both visitors and hosts
- provide direct financial benefits for conservation
- provide financial benefits and empowerment for local people
- raise sensitivity to host countries' political, environmental, and social climate

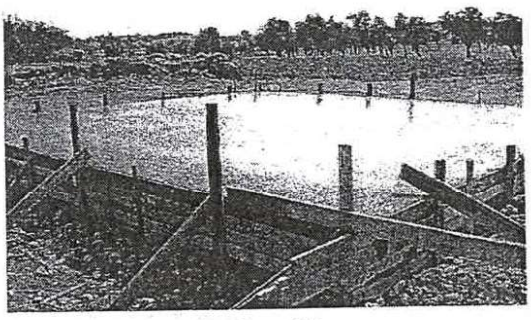
Although the above might seem formidable task, ecotourism is basically about creating a balance to achieve a 'win-win' outcome that will benefit for all concerned but particularly the local communities. Because of this opinion, the client approved to build with ADOBE and the technological Adobe, ALKER.

CONSTRUCTION Structural

To begin with, project designed as "Load Bearing Construction System". The material was Alker which is similar with Adobe with added lime and gypsum. When the project submitted to get permissions, according to the Earthquake Regulations there isn't any description about "Alker". Because of this, the system is changed as a "Reinforce Concrete System" and structural system is designed with radial foundations, RC columns, beams and roof. Alker is just used as a wall material. Later, client decided to use both Alker and Mud brick as a wall material.



F
Huseyin Umay(Umay Construction Ltd), 2007



Source: Huseyin Umay(Umay Construction Ltd), 2007

4.2. Preparation of MUDBRICK:

Exterior walls of the restaurant building and the two bungalow buildings are "Mud brick" which is normally used as the restoration material. This project is the first set of buildings where "Mud brick" is used in a new construction as a construction material. Firstly, land is cleaned and the soil is selected from the closest available area for the Adobe. Soil had been chosen from closest existing area because the local area soil and new abode building group should be the same color. Additionally, it is more economical. Approximately 25% of Mud brick soil should be clay. Straw had been selected from the same area where 1 year old straw used to for binding. After all this selection process is completed, two pools are dug out for kneading the soil, straw and water.

Figure 8

Figure 9

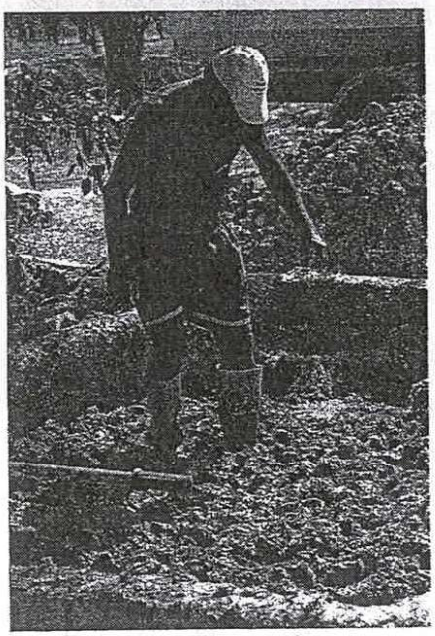


Figure 10

Figure 11

Figure 8, 9 10: Preparation of Mud brick for Ay.Phodio Guest House, Ozge Ozbek Eminoglu, 2007
After the kneading is finished, there is a minimum 2-3 days waiting period. When the mud is ready, the moulds are going to be prepared. Our moulds were 20x40cm. This dimension is consistent with the existing mud brick buildings from local area buildings.

It is good to cover the floor with plastic paper (nylons) before putting the mud inside the moulds. Otherwise the soil gets the water from mud very easily and this will cause to dry quickly without good proportion. Also you can put straws to the floor. This process will ensure that mud will not stick to the floor. After Mud brick is removed from the moulds, these blocks are organized as a triangle shape for drying. This will help Mud brick blocks get aerated from all side.

Figure 12: Mud brick with moldings
Umay Construction Ltd, 2008

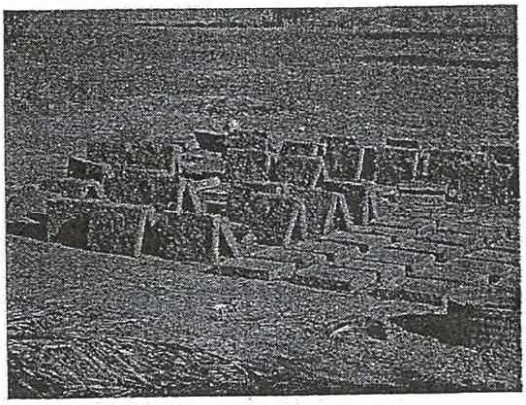


Figure 13: Mud brick with moldings
Umay Construction Ltd, 2008

4.3. Preparation of ALKER (Gypsum Adobe):

In this building group "Alker (Gypsum Mud brick)" is used only for one building unit. The difference between Alker and Adobe is that Alker includes gypsum and lime with less clay soil. Gypsum and lime are mixed to the soil to enhance the properties of the material. The gypsum stabilized soil sets in a short time, which makes the production time shorter and the curing unnecessary. Additionally, this process also makes the production period independent from the rainy days. Since the material is porous, it has good insulating properties.

The mechanized construction technology for the gypsum stabilized earthen construction aims to improve the local construction material for mass-housing. It will also contribute to preserve the natural sources and save funds for the country.

Proportion of the Alker*:

Earth: 100 kg (100%)

clay (app. %10) + silt + sand + gravel (7 cm)

Water: 20 kg (20%)

Gypsum: 10 kg (10%)

Lime: 2 kg (2%)

Soil is not necessary to be 25% clay. In this project the soil is from the wells which dig because of mechanical facilities. At Alker, moulds are inserted and completed layer by layer. Every 60cm pine leaves are inserted because of dividing load.

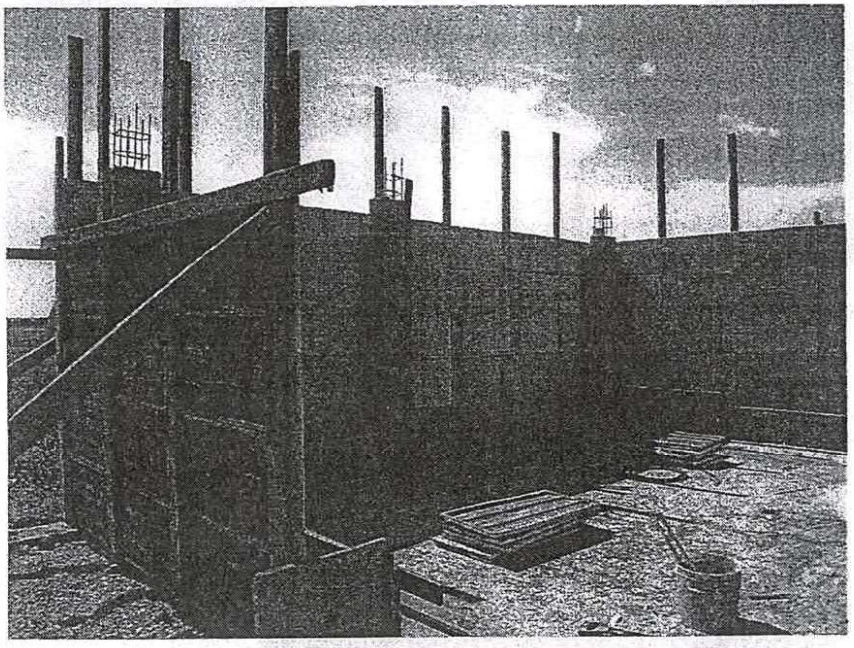


Figure 14: Moldings for Alker

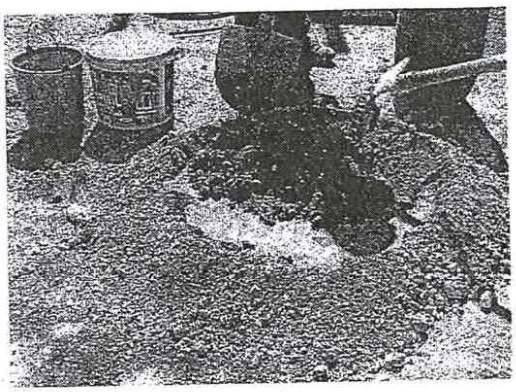


Figure 16: Mixed up with water

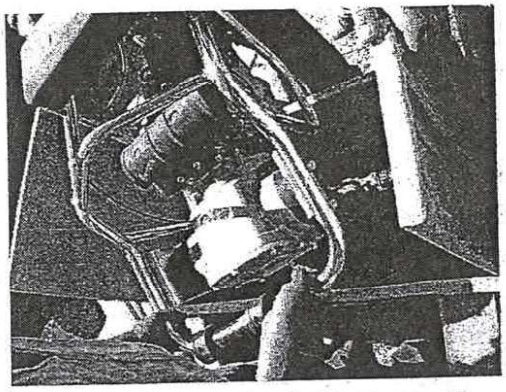


Figure 17: Compression inside the mould

Figure 15: Alker mixing with Lime& Gypsum

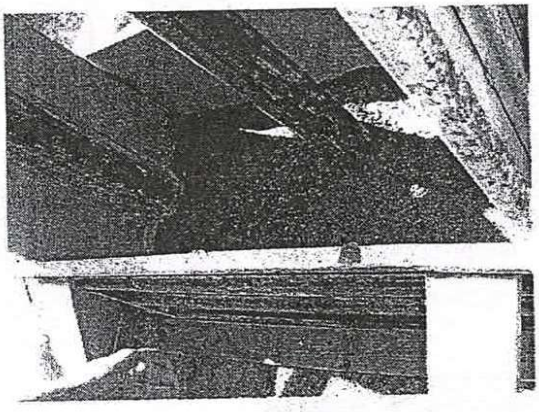


Figure 18: Putting pressure

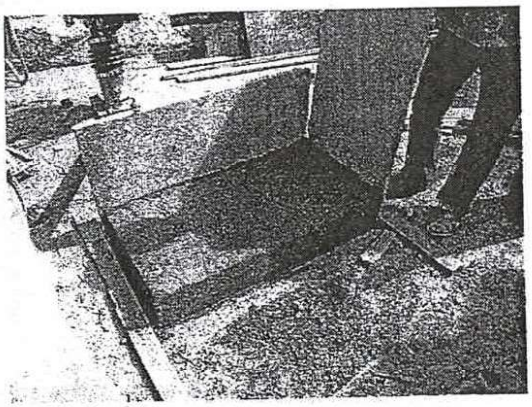


Figure 19: Sample of Alker is ready

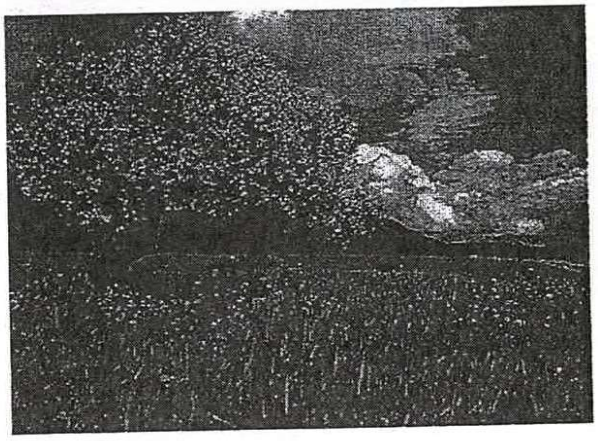


Figure 20: Spring in Cyprus. Try to SAVE IT!, Ozge Ozbek Eminoglu, 2006.

4 CONCLUSION

Adobe, mud-brick buildings are an ancient technique dating back at least to Jericho (8300 BC). The oldest continually inhabited structures in the world are adobe. But it doesn't mean that they can not be use in 20th century. Mud bricks are probably the simplest and easiest form of earth building with serve as a significant heat reservoir. In this paper earth structure is not the restoration material or it is not a historical building material. It used in a new building complex in a hot country which is "Cyprus" in 2008.

In this paper shows the conscious and awareness of local people who are the ones receive the strongest impacts; they are naturally the group of people who are more suitable for monitoring as well as evaluation of changes in cultural tourism and heritage and environment than anyone else. Because of the awareness, faith and effort it realized.

Raising awareness of cultural heritage is one of the most important issues to conserve our heritage for future generations.

5 REFERENCES

[1] Işık, B. *Earthen Architecture*, I.T.U. Mimarlık Fakültesi, 2008

[2] www.kerpic.org/alker_technology.htm

5.4 Kerpiç teknolojisinde standartlar

Ekte verilmiştir.

TS 537 30.10.1985;

Cement Treated Adobe Bricks

This standard specifies the classification, proporties, sampling, testing and marking of cement treated adobe bricks for walls

TS 2514 03.02.1977

Adobe Blocks and Production Methods

This standard specifies the classification, proporties, sampling and testing of adobe blocks and production methods

TS 2515 03.04.1985

Adobe Buildings and Construction Methods

This standard specifies the adobe buildings construction methods.

T.C. BAYINDIRLIK VE İSKAN BAKANLIĞI

AFET BÖLGELERİNDE YAPILACAK YAPILAR HAKKINDA YÖNETMELİK

Bu yönetmelik, Resmi Gazete'nin 2 Eyül 1997 tarih ve 23098 sayısında yayınlanarak yürürlüğe girmiştir. Ağustos 1998 tarihinde yönetmeliğin bazı maddelerinde yapılan değişiklikler dikkate alınarak, 'yönetmelik metni' Nejat BAYÜLKE tarafından güncellenmiştir.

BÖLÜMLER

BÖLÜM 5-Amaç, Genel İlkeler ve Kapsam

BÖLÜM 6-Depreme Dayanıklı Binalar İçin Hesap Kuralları

BÖLÜM 7-Betonarme Binalar İçin Depreme Dayanıklı Tasarım Kuralları

BÖLÜM 8-Çelik Binalar İçin Depreme Dayanıklı Tasarım Kuralları

BÖLÜM 9-Ahsap Binalar İçin Depreme Dayanıklı Tasarım Kuralları

BÖLÜM 10-Yığma Kargir Binalar İçin Depreme Dayanıklı Tasarım Kuralları

BÖLÜM 11-Kerpiç Binalar İçin Depreme Dayanıklı Tasarım Kuralları

BÖLÜM 12-Temel Zemini ve Temeller İçin Depreme Dayanıklı Tasarım Kuralları

BÖLÜM 13-Son Hükümler

6.12. BİNA TÜRÜ OLMAYAN YAPILAR

Bina türü olmadığı halde, deprem hesabının bu bölümde verilen kurallara göre yapılmasına izin verilen yapılar ve bu yapılara uygulanacak *Taşıyıcı Sistem Davranış Katsayıları* **(R), Tablo 6.8**'de tanımlanmıştır. Deprem yükü azaltma katsayıları ise **Denk.(6.3)**'e göre belirlenecektir.

Gerekli durumlarda, **Tablo 6.3**'de verilen *Bina Önem Katsayıları* bu yapılar için de kullanılacaktır. Ancak **Tablo 6.7**'de verilen *Hareketli Yük Katılım Katsayıları* geçerli değildir. Kar yükleri ve vinç kaldırma yükleri dışında, depolanan her türlü katı ve sıvı maddeler ile mekanik gereçlerin ağırlıklarının azaltılmamış değerleri kullanılacaktır.

10.2. GENEL KURALLAR

10.2.1 - Yığma kargir binalar için bu bölümde verilen tüm kurallara uyulması durumunda, **Bölüm 6**'ya göre ayrıca deprem hesabı yapılması gerekli değildir. Ancak, deprem hesabı yapılması durumunda, bu bölümde verilen kuralların tümüne uyulması koşulu ile, $\mathbf{S}(T_1) = \mathbf{2.5}$ ve $\mathbf{R_a}(T_1) = \mathbf{2.5}$ alınarak **Bölüm 6**'da 6.7'de verilen hesap yöntemi uygulanacaktır.

10.2.2 - Aşağıdaki **10.5.2**'de belirtilen durum dışında, yığma kargir binalar için yapımına izin verilen en fazla kat sayıları, deprem bölgelerine göre **Tablo 10.1**'de verilmiştir.

10.2.3 -**Tablo 10.1**'de verilen en fazla kat sayıları, zemin kat ile üstündeki tam katların toplamına karşı gelmekte olup bunlara ek olarak, brüt kat alanı temeldeki bina brüt alanının %25'inden az olmak koşulu ile, tek bir çatı katı ve ayrıca tek bir bodrum katı yapılabilir. Minimum %25 koşulunu sağlamayan çatı katı, tam kat olarak sayılacaktır. Birden fazla bodrum yapılması durumunda ise, **Tablo 10.1**'de verilen en fazla kat sayısı bir kat azaltılacaktır.

10.2.4 - Yığma kargir binalarda her bir katın yüksekliği, döşeme üstünden döşeme üstüne 3 m'den fazla olmayacaktır.

10.2.5 - Yığma kargir binaların taşıyıcı duvarları, planda olabildiğince düzenli ve ana eksenlere göre simetrik veya simetriğe yakın biçimde düzenlenecektir. Kısmi bodrum yapılmasından olabildiğince kaçınılmalıdır.

10.2.6 - Tüm taşıyıcı duvarlar planda mutlaka üst üste gelecek biçimde yapılacaktır.

BÖLÜM 11 - KERPİÇ BİNALAR İÇİN DEPREME DAYANIKLI TASARIM KURALLARI

11.1. KAPSAM

Deprem bölgelerinde yapılacak olan ve hem düşey, hem de yatay yükler için tüm taşıyıcı sistemi kerpiç taşıyıcı duvarlar ile oluşturulan kerpiç binalar'ın boyutlandırılması ve donatılması, bu konuda yürürlükte olan ilgili standart ve yönetmeliklerle birlikte, öncelikle bu bölümde belirtilen kurallara göre yapılacaktır.

11.2. GENEL KURALLAR

11.2.1 - Kerpiç binaların boyutlandırılması için bu bölümde verilen tüm kurallara uyulacak ve **Bölüm 6**'ya göre ayrıca deprem hesabı yapılmayacaktır.

11.2.2 - Kerpiç binalar bütün deprem bölgelerinde, bodrum katı hariç olmak üzere tek katlı olarak yapılacaktır. **Bölüm 6**, **Tablo 6.3**'e göre Bina Önem Katsayısı **I=1** den büyük olan kerpiç bina yapılamaz.

11.2.3 - Kerpiç tek katın yüksekliği, döşeme üstünden döşeme üstüne 2.70 m'den fazla olmayacaktır. Bodrum kat yapılması durumunda ise, bu katın yüksekliği 2.40 m'den fazla olmayacaktır.

11.2.4 - Kerpiç binalar planda dikdörtgen olacak ve taşıyıcı duvarlar, ana eksenlere göre simetrik veya simetriğe yakın biçimde düzenlenecektir. Kısmi bodrum yapılmayacaktır.

11.3. TEMELLER VE TAŞIYICI DUVARLAR

11.3.1. Temeller

11.3.1.1 - Temeller, bodrumsuz binalarda en az 50 cm, bodrumlu binalarda ise en az 60 cm kalınlıkta moloz taş duvar olarak yapılacaktır.

11.3.1.2 - Temel derinliği, don derinliğinin altında olmak üzere, en az 80 cm olacaktır. Temel duvarları, dış zemin yüzeyinden en az 50 cm yukarıya çıkacak şekilde yapılacaktır.

11.3.1.3 - Temel duvarlarında harç malzemesi olarak çimento harcı (*çimento/kum hacımsal oranı=1/4*) veya çimento takviyeli kireç harcı (*çimento/kireç/kum hacımsal oranı =1/2/9*) kullanılacaktır.

11.3.2. Taşıyıcı Duvar Malzemesi

11.3.2.1 - Taşıyıcı duvarlarda kullanılacak kerpiçlerin üretimi TS-2514'e göre yapılacak ve duvar yapımında dinlendirilmiş kerpiç harcı kullanılacaktır.

11.3.2.2 - Normal kerpiç boyutları, cm olarak, 12x30x40 (*ana*) ve 12x19x40 (*kuzu*), ya da 12x18x30 (*ana*) ve 12x25x30 (*kuzu*) olacaktır.

TABLO 6.3 - BİNA ÖNEM KATSAYISI (I)

Binanın Kullanım Amacı veya Türü	*Bina Önem Katsayısı (I)*
1. Deprem sonrası kullanımı gereken binalar ve tehlikeli madde	

içeren binalar **a)** Deprem sonrasında hemen kullanılması gerekli binalar (Hastaneler, dispanserler, sağlık ocakları, itfaiye bina ve tesisleri, PTT ve diğer haberleşme tesisleri, ulaşım istasyonları ve terminalleri, enerji üretim ve dağıtım tesisleri: vilayet, kaymakamlık ve belediye yönetim binaları, ilk yardım ve afet planlama istasyonları) **b)** Toksik, patlayıcı, parlayıcı, vb özellikleri olan maddelerin bulunduğu veya depolandığı binalar	**1.5**
2. İnsanların uzun süreli ve yoğun olarak bulunduğu ve değerli eşyanın saklandığı binalar **a)** Okullar, diğer eğitim bina ve tesisleri, yurt ve yatakhaneler, askeri kışlalar, cezaevleri, vb. **b)** Müzeler	**1.4**
3. İnsanların kısa süreli ve yoğun olarak bulunduğu binalar Spor tesisleri, sinema, tiyatro ve konser salonları, vb.	**1.2**
4. Diğer binalar Yukarıdaki tanımlara girmeyen diğer binalar (Konutlar, işyerleri, oteller, bina türü endüstri yapıları, vb)	**1.0**

11.3.2.3 - Bodrum katlardaki moloz taş duvarlarda harç malzemesi olarak, birinci ve ikinci derece deprem bölgelerinde çimento takviyeli kireç harcı (*çimento/kireç/kum hacımsal oranı=1/2/9*) kullanılacaktır. Üçüncü, dördüncü derece deprem bölgelerinde kireç harcı (*kireç/kum hacımsal oranı=1/3*) kullanılabilir.

11.3.3. Minimum Taşıyıcı Duvar Kalınlıkları

11.3.3.1 - Taşıyıcı dış kerpiç duvarlar en az 1.5, taşıyıcı iç kerpiç duvarlar ise en az 1 kerpiç boyu kalınlığında olacaktır.

11.3.3.2 - Bodrum katlardaki moloz taş duvarların kalınlığı en az 50 cm olacaktır.

11.3.4. Taşıyıcı Duvarların Minimum Toplam Uzunluğu

Planda birbirine dik doğrultuların her biri boyunca uzanan taşıyıcı duvarların, pencere ve kapı boşlukları hariç olmak üzere, toplam uzunluğunun brüt kat alanına (konsol döşemeler hariç) oranı **0.25** m/m^2'den daha az olmayacaktır.

11.3.5. Taşıyıcı Duvarların Maksimum Mesnetlenmemiş Uzunluğu

Herhangi bir taşıyıcı duvarın, planda kendisine dik olarak saplanan taşıyıcı duvar eksenleri arasında kalan mesnetlenmemiş uzunluğu, 4.5 m'yi geçmeyecektir.

11.3.6. Taşıyıcı Duvar Boşlukları

Taşıyıcı duvarlarda bırakılacak boşluklar için aşağıdaki kurallara uyulacaktır:

11.3.6.1 - Bina köşesine en yakın pencere veya kapı boşluğu ile bina köşesi arasında bırakılacak dolu duvar parçasının plandaki uzunluğu 1.0 m'den az olmayacaktır.

11.3.6.2 - Bina köşeleri dışında, pencere ve kapı boşlukları arasında kalan dolu duvar parçalarının plandaki uzunluğu 1.0 m'den az olmayacaktır.

11.3.6.3 - Pencere veya kapı boşluklarının her iki kenarına ikişer adet 10 cm x 10 cm kesitinde ahşap dikmeler konulması durumunda, **11.3.6.2**'de verilen minimum dolu duvar parçası uzunluğu 0.80 m'ye indirilebilir. Konulacak ahşap dikmeler pencere altı hatılına ve pencere üstü lentosuna bağlanacaktır.

11.3.6.4 - Bina köşeleri dışında, birbirini dik olarak kesen duvarların arakesitine en yakın pencere veya kapı boşluğu ile duvarların arakesiti arasında bırakılacak dolu duvar parçasının plandaki uzunluğu 0.50 m'den az olmayacaktır.

11.3.6.5 - Kapı boşlukları yatayda 1.00 m'den, düşeyde 2.10 m'den fazla olmayacaktır. Duvara dik olarak saplanan taşıyıcı duvarların eksenleri arasında birden fazla kapı boşluğu bırakılmayacaktır.

11.3.6.6 - Pencere boşlukları yatayda 0.90 m'den, düşeyde 1.20 m'den fazla olmayacaktır.

11.4. LENTOLAR VE HATILLAR

11.4.1. Lentolar

11.4.1.1 - Kapı üstleri ile pencerelerin alt ve üstlerine ikişer adet 10 cm x 10 cm kesitinde ahşap kadronla lento yapılacaktır.

11.4.1.2 - Pencere ve kapı lentolarının duvarlara oturan kısımlarının her birinin uzunluğu 20 cm'den az olmayacaktır.

11.4.2. Hatıllar

11.4.2.1 - Temel duvarlarının ya da bodrumlu binalarda bodrum duvarlarının üzerine, aşağıda tanımlanan betonarme veya ahşap hatıllar yapılacaktır.

(a) Betonarme hatıllar, duvar genişliğinde ve en az 15 cm yüksekliğinde olacaktır. Kullanılacak betonun kalitesi en az **C14** (**BS14**) olacaktır (minimum dozaj: 250 kg/m³). Hatılın içine en az üçü altta, üçü üstte olmak üzere **6Ø 10** boyuna donatı ile birlikte en fazla 25 cm ara ile Ø **8**'lik etriye konulacaktır.

(b) Ahşap hatıllar, 10 cm x 10 cm kesitinde katranlanmış iki adet kadronun dış yüzleri iç ve dış duvar yüzeyleri ile çakışmak üzere yerleştirilmesi ile yapılacaktır. Bu kadronlar 50 cm'de bir 5 cm x 10 cm kesitli dikine kadronlarla çivili olarak birleştirilecek ve araları taş kırıntısı ile doldurulacaktır.

11.4.2.2 - Kerpiç duvarların üzerine çatı seviyesinde yapılacak hatıllara ilişkin kurallar aşağıda tanımlanmıştır.

(a) Çatının ahşap makas veya aşağıdaki **11.5.2**'ye göre toprak dam şeklinde yapılması durumunda, çatı hatılları **11.4.2.1**'in **(b)** paragrafı'na göre ahşap olarak yapılacaktır.

(b) Çatının betonarme plak olarak yapılması durumunda, en az 20 cm yüksekliğinde betonarme çatı hatılları yapılacaktır. Kullanılacak betonun kalitesi en az **C14 (BS14)** olacak (minimum dozaj: 250 kg/m³), hatılın içine en az **4Ø 10** boyuna donatı ile birlikte en fazla 25 cm ara ile **Ø 8**'lik etriye konulacaktır.

11.5. ÇATILAR

11.5.1 - Kerpiç binaların çatıları, dış duvarları en fazla 50 cm aşacak şekilde saçaklı olarak ve olabildiğince hafif yapılacaktır.

11.5.2 - Birinci ve ikinci derece deprem bölgelerinde toprak dam yapılmayacaktır. Üçüncü ve dördüncü derece deprem bölgelerinde ise toprak damın kalınlığı 15 cm'yi geçmeyecektir.

11.5.3 - Kerpiç binaların çatıları, ahşap makas veya betonarme plak teras çatı şeklinde de yapılabilir.

BÖLÜM.6

Kıbrıs kerpiç mimarisinin enerji etkinliği

Kıbrıs'ta iklimsel etkenler 6.1

Kıbrıs yapısının iklimsel davranışı 6.2

Kerpiç yapıların genel davranışı 6.3

BÖLÜM.6

Kıbrıs kerpiç mimarisinin enerji etkinliği

6.1 iklimsel etkenler, çevre beklentileri

kerpiç yapıların enerji kullanımı (Serkan Abbasoğlu)

2.3.1. Kıbrıs'taki iklim şartlarının belgelenmesi, (son 10 yıl ortalaması, yıllık değişim, günlük değişim= tablolar ve haritalar) [5 sayfa]

2.3.2. Bu şartlarda 1-tarihi yapıları 2- yeni piyasa yapılarının PERFORMANSI [5 sayfa]

2.3.3. Yeni yapılardan ısısal beklenti (TS 825 i özetleyen) [5 sayfa]

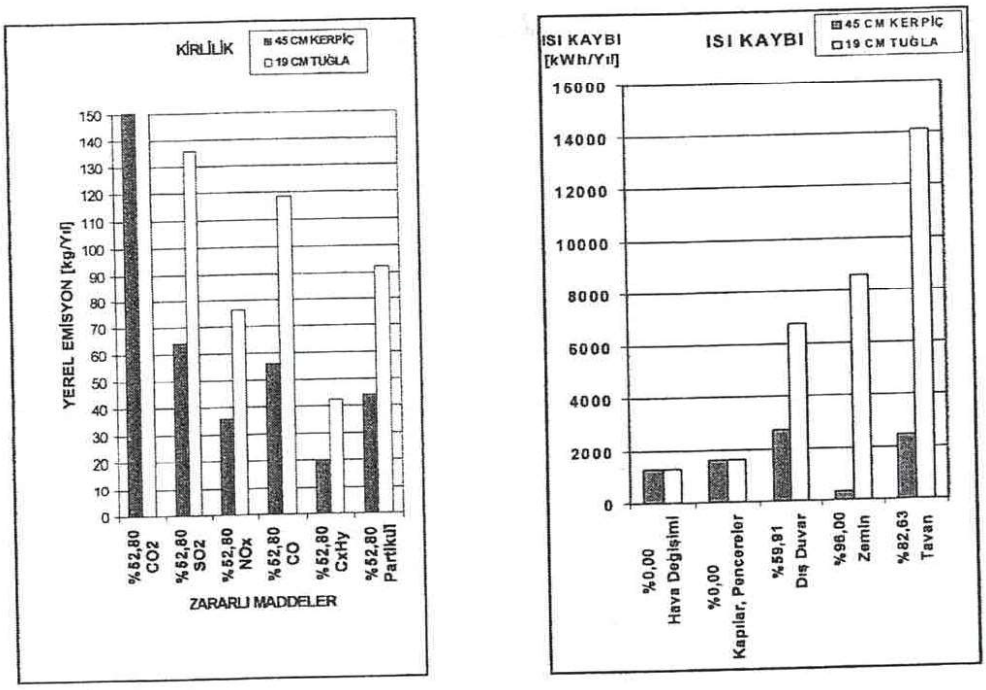
2.3.4. Yeni kerpiç yapının sağlayacağı performans [5 sayfa]

2.3.5. Environmental philosophy

2.3.6. Heating/cooling needs

Alçılı Kerpiç ile sürdürülebilirliğe katkı

Mukavemet, durabilite, çevre: Karışımda bulunan alçı 20 dakika gibi kısa zamanda priz yaptıktan sonra malzeme kullanılmaya başlar. Kerpiç malzeme harç suyunun kuruması ile gözenekli hale gelir. Ortalama olarak 2.2 t/m^3 olan toprağın birim ağırlığı, alçı ile karıştıktan sonra 1.7 t/m^3 şeklinde hafiflemiş olur. Gözeneklilik alkerin geleneksel kerpice göre özelliklerini iyileştirir. Alker yapı yanal yüklerde daha sünek davranır Yapının depremde ivme alacak kendi yükü azalır. Malzemenin ısı direnci geleneksel kerpiçten yüksektir. Dünya alçı ile stabilizasyonu tanımamakta, çimento ile stabilizasyon yapmaktadır . Çimento ısı geçirgenliğini arttırır ve kırılganlık verir. Bu durumda çimentolu kerpiç çevreci değeri kaybetmiş olur.



Şekil.22a, b, Enerji kullanımına bağlı tuğla ve kerpiç yapının karşılaştırması

Alçının hidratasyon sırasında kil mineralleri ile kimyasal reaksiyona girmesi sonucu alker suyu bünyesine daha az çeker. Bunun sonucu olarak: geleneksel kerpiçte olduğu gibi sudan zarar görüp plastik kıvama girmez; 1.mukavemetini sürdürür, 2.durabilitesi artar.

Alkerin ısı geçiş katsayısı 1987 de 1.yapı üstünde yapılan ölçümlerden alınan verilere göre λ=0.4-0.5 W/mK olarak hesaplanmıştır. Bu verilere dayanarak, GAP- Birecik Bölgesinde çevre kirleticilerinin azaltılması amacıyla tuğla ve kerpiç duvar arasında karşılaştırma yapılmıştır. Hava kirleticiler: çevre, yapı özellikleri ve yakıt türüne göre "Enerbed" programı ile hesaplanmıştır. Karşılaştırma tuğlaya oranla alker yapıda CO_2, SO_2, NO_x, ve benzeri kirlilik unsurlarının %52.8 azaldığını göstermektedir. **Şekil.22a** CO2 emisyonunun **Kerpiç'te** 11160,828 kg/yıl CO2 **Tuğla'da** 23645,136 kg/yıl olduğunu göstermektedir.

6.2 Kıbrıs kerpiç yapısının iklimsel analizi

Serkan Abbasoğlu

Thermal Properties of Mud Bricks: the Example of Gypsum-Stabilized Adobe

Kuzey Kıbrısta Genel olarak Uygulanan Tuğla esaslı Duvarlarla Kerpiç Duvarların Isı Kayıbı açısından Karşılaştırılması

1. Giriş

Yaşam mekanlarında konfor şartlarının sağlanması konusunda önemli noktalardan birisi sözkonusu mekandaki ısı kayıbı/kazancı miktarı diğeri ise nem oranıdır. Literatürde yapılan araştırmalar neticesinde geleneksel yapı malzemelermizden biri olan kerpicin aşağıda belirtilen nedenlerden ötürü bu konuda önemli bir noktada olduğu anlaşılmaktadır:

- Nefes alan duvarlar

Yapı sistemi emsallerine göre büyük farkla bu özelliğini korumuştur. Ortam koşullarında, nem dengesini mükemmel korur, oda içerisindeki nem yükseldikçe fazla nemi bünyesinde toplar, ortamın nemi azaldığı zamanlarda ise bu nemi dışarı vererek doğal osmozu sağlar. Ayrıca Yoğuşma yapmadığıda belirtilmiştir.

- Sıcak/soğuk dengesi

Yaz-Kış iklim değişikliklerinin başladığı bahar mevsimlerinde ani iklim değişikliğini hisstermeyen bir malzeme çeşididir. Oda koşullarını "Kademeli ikimlendirme" sağlayarak mevsim geçişlerindeki ısı eşiğini hissetmemenizi sağlar. Bu özelliği birçok hastalığın önlenmesinde etkin değer taşır.

- Enerji Tasarrufu

Enerji darboğazına girdiğimiz bu günlerde, tüketimimizi en alt seviyelere düşürme çabalarımıza cevap verme özellliğini taşır. Minumum ısıtma giderleriyle, maksimum ısınmayı sağlar.

- Isı Köprüsü

Enerjiyi iç/dış ortama taşıyan elemanlara sahip değildir. Ortamda açığa çıkarılan ısı enerjisi hiçbir yolla dış ortama taşınmaz (veya dışarıda oluşan enerji iç ortama taşınmaz), bu geçişimi sağlayan malzemeler kullanılmadığı için ısı ortamda kalır.

Sözkonusu çalışmada yukarıdaki bilgiler ışığında ülkemizdeki güncel yapı malzemeler ile kerpicin termal özellikleri açısından karşılaştırılması ve ayrıca çıkacak sonuçların çevreye etkileri açısından değerlendirilmesi hedeflenmektedir.

2. Isı kayıbı Hesapları ve Karşılaştırma Tablosu

Bu bölümde güncel inşai uygulamalarda karşımıza sıkça çıkan 30 cm.'lik Tuğla duvar (2 cm iç sıva-25 cm delikli tuğla-3 cm dış sıva) ile 45 cm kalınlığındaki kerpiç duvar uygulamasının karşılaştırılması yapılacaktır. İlgili duvar kesitleri şekillerde gösterilecektir. Bu karşılaştırma için 15 m^2'lik bir duvar yüzeyi ele alınacaktır. Sözkonusu hesaplarda kullanılan değerler aşağıdaki tabloda verilecektir.

3. Çevresel Etkiler

Bu bölümde elektrikle ısıtılan bir Tuğla duvarlı hacim ve ayni alana sahip bir Kerpiç hacim ele alınacak ve santralda yapılacak enerji tasarrufu ve santralda ortaya çıkan emisyonlardaki değişim incelenecektir.

6.3 kerpiç yapısının iklimsel analizi

Kafesçioğlu, R. Prof., İTÜ, Architecture Faculty 1987

1. Introduction

This paper is a part of a research carried out by the members of the Building Materials Department of the Faculty of Architecture of the Technical University of Istanbul. During the first stage of the project, the qualities of adobe were improved in order to make it an adequate building material for contemporary necessities. The stabilization of adobe with gypsum - a material for found abundantly in Turkey and easy to use- proved to be successful. The gypsum-stabilized adobe has been given the name ALKER, and it has been produced on site and used for the construction of a test building. The building has been used as a nursery for the children of the faculty members for the last three years. This paper is based on the observations and measurements taken on this building. Asst. Prof. Dr. Erdal Gürdal and Asst. Bilge Işık have assisted in the preparation of this paper.

2. Definition of the project

It is established fact that to try to solve housing and nutrition problems in developing countries by importing methods from developed ones present major difficulties in terms of implementation. Solution must be found that make use of the local resources and potential. The points to be considered while selecting the method, can be stated as follows:

- The amount of energy needed for the construction and operation of the building must be reduced. That is, the energy spent in the production and transportation of materials and elements of building, and the energy spent for heating, repairing and service life of the building must be as low as possible.

- Regional resources such as materials and labor force must be utilized.

- The technology of construction must not be alien to the region. It should be based on regional technology, that is, a developed model of it that can be learned and applied by the local population.

- Saving measures should be implemented while, at the same time, it should be possible to produce large amounts of material in a relatively short time.

Clearly, the material that would fulfill the conditions best stated above while providing bio climatic comfort conditions must be earth-based. By choosing earth-based materials, the appropriate technology can also be found. In this sense, earth can be considered as a contemporary building material. Once its qualities have been improved, earth has been shown to be an adequate material for the social economic conditions for our day and which can help to solve the housing problems of many developing countries.

After outlining the studies carried out to improve the properties of earth as a building material, we shall concentrate on our main subject and present the findings and evaluations of the thermal properties of earth-based materials.

The reasons for the use of gypsum to produce improved earth are as follows:

- Its abundance in Turkey;
- The techniques for its production and use are well know by the rural population;
- Its production is simpler and easier than cement;
- The amount of energy consumed during its production is less than in the production of cement;
- Its helps to improve the performance of buildings.

During the first stage of the research, an examination was made of the conditions required to obtain a mixture of earth and gypsum possessing the qualities needed for construction. After obtaining positive results in the laboratory, ALKER was produced on site and use for the construction of the test building.

3. Gypsum-stabilized adobe, ALKER -adobe with improved properties

(a) Definition of ALKER

Materials used in ALKER production

The first step to produce a good mud-brick is to choose the appropriate type of earth. The granulometric structure of earth samples is important in this choice. Figure 1 shows the ideal granulometric curve /1/ and the curves of the samples used in this study. The gypsum used for the stabilization process is $CasO_4$ 1/2 H_2O, which is produced in the first stage of gypsum processing at 160^0-200^0 C. The material-know as simple gypsum in standards-fulfills the requirement for ALKER production. It was found that the addition of 10 per cent (dry weight) of gypsum was sufficient achieve the improvement. The amount of water to be added was determined in accordance with the plasticity limit of the mud. Its was also found that the addition of 22.5 to 5 per cent of lime slightly decreased the pressure resistance. Depending on the amount of gypsum and lime in the moisture, the drying period may take up to 20 minutes.

Structural properties of ALKER

Mechanical and physical properties of adobe are improved considerably when gypsum is used as stabilizer.

Very small pores homogeneously distributed and fine capillary vessels constitute the structure of ALKER. This structure can be explained as follows: after the gypsum

has been mixed with earth of an appropriate granulometric composition, its forms a rigid homogeneous skeleton within the mud which still maintains its plastic condition. The clay that fills this skeleton would tend to shrink but the skeleton reduces the extent of the shrinkage. Thus, while good non-stabilized clay present 5 to 6 per cent of shrinkage, ALKER shrinks by only 2 per cent. At the same time, unit weight decreases from 1.7 kg/ Lt. to 1.5 kg/ Lt. Inner tensions are formed in the structure of the material. The interaction between the shrinking of the clay and the rigid gypsum skeleton explains the increase in pressure resistance and the decrease in the unit weight. The increase in water resistance can be explained by a chemical reaction that takes place as result of mixing clay, gypsum and lime.

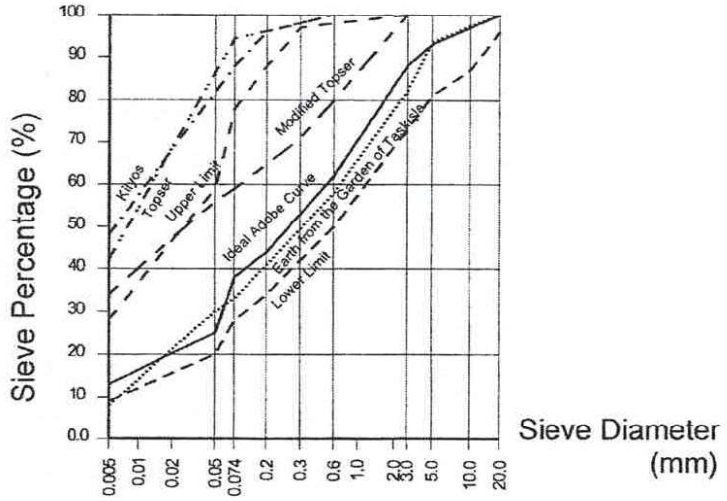


Fig. 1. Granular composition of soils suitable for manufacture of adobe

1. Kilyos clay
2. Topser clay
3. Improved Topser clay
4. Clay from the garden of Taşkışla

(b) Mechanical properties of ALKER

The mechanical properties of the material were determined using samples produced in the laboratory and on site. Some of the results obtained with the addition of

gypsum have been stated above. It was observed that the addition result in increases in pressure, rigidity and in the module of elasticity, as well as a decrease in deformation. By adding 10 per cent of gypsum, a pressure resistance of 4.5 MPa was obtained. The bending resistance also increased by 300-800 per cent.

(c) Physical properties of ALKER

Unit weight

It was found that earth samples with earth samples with granulometric composition close to the ideal show a decrease in unit weight and that the addition of gypsum also contributes to this decrease (see figures 1 and 2). The main reasons for the decrease in weight are structural changes and decreased shrinkage of the new material. ALKER presents the lowest heat permeability when compared with other materials of similar unit weights i.e. 1.4000-1.500 kg/m^3. Thus, an shrinkage, and an increase in porosity.

Shrinkage

The extent of shrinkage in natural clay is considerably high, especially in clay with fine grains. Shrinkage decreased in those samples with granulometric composition suitable for the production of mud-bricks. Figure 3. shows that the addition of gypsum decreases shrinkage considerably in relation to the granulometric composition of the earth samples. Changes in scale and deformation are also greatly reduced.

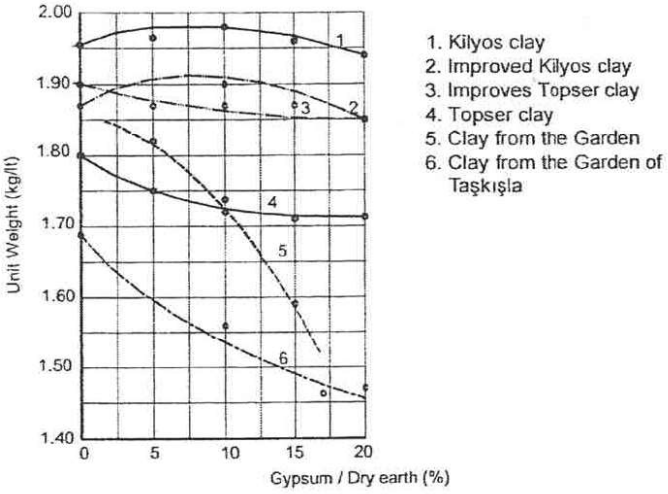


Fig. 2. Unite weight of soil used for the tests and the changes after gypsum was added

Moisture permeability

It was indicated above that ALKER has a structure with open pores and capillary vessels and thus it is vapor permeable. Test result showed that samples with 10 per cent of gypsum have a vapor permeation resistance factor of □=13 which forms a balance with the heat conversion property of ALKER. The ability of material to diffuse vapor in short periods of time makes it possible to keep the desired level of humidity in the interior of the building.

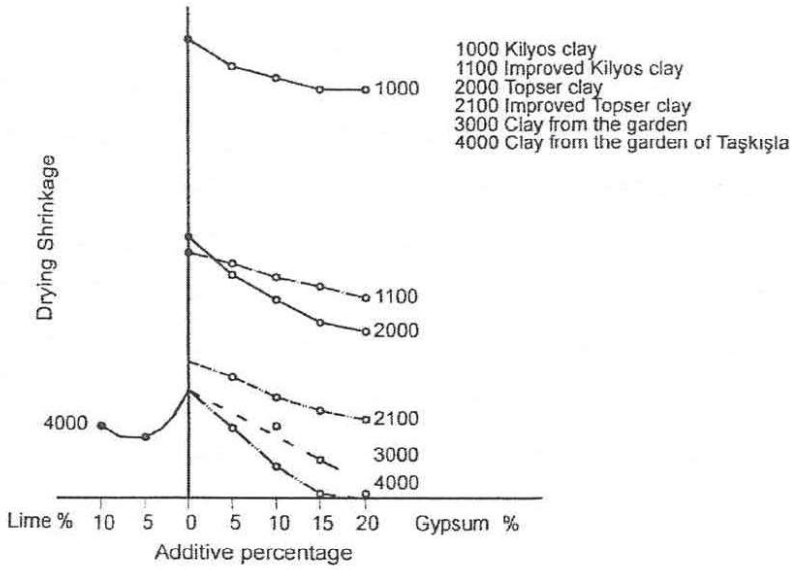


Fig. 3. Result of shrinkage tests

Water absorption

Owing to its structure, ALKER can be absorb water faster than regular adobe For this reason, ALKER walls should be situated on the foundation walls to guard them against moisture from the ground.

It was observed that samples with 10 per cent or more of gypsum showed no trace of dissolution but regular adobe samples completely dissolved in water within four hours.

Tests for rain resistance showed that samples with 5 per cent gypsum or no gypsum at all loose around 3.3 per cent of weight and wearing out of corners and the surface of blocks was observed. On the other hand, samples with 10 per cent gypsum and 2.5 per cent lime showed almost no signs of wear. A sample with 10 per cent gypsum and no plaster was left outdoors for four winters and no deterioration was observed.

Heat transfer value

Experiments for heat transfer value could not be carried out efficiently in our laboratories. Some experiments ware conducted with specially made samples one cm in width. The heat transfer value of these samples was found to beλ= 0.40 kcal / mh^0C or 0.46 W / mK. This value was for used for the planning of the test building. In previous publications, the same value is given for straw-added adobe. However, as is shown below, the thermal properties of the test house, electricity consumption and heating measurement calculation seem to indicate that the real value is lower than the one obtained from the experiments.

Specific calorific value

The specific calorific value used for used for measuring the heat accumulation capacity of the material and the heat differences of the walls could not be calculated trough experiments. The previously accepted value of 0.30 kcal/kg^0 C (1.254.kj / kg^0K) was used.

Expansion and effect of heat

Experiments in the laboratory were carried out at temperatures ranging from 20 to 500^0C. Around 160^0C some shrinkage was observed but at 280^0C, the samples expanded to their original size. As the temperature approached 500^0 C, the samples without gypsum continued to expand while those with 10 per cent of gypsum kept their original size. Shrinkage was observed in samples with 15 to 20 percent of gypsum.

Evaluation of the thermal properties of ALKER

The physical structure of the material is similar to that of a good handmade brick because both have fine capillary vessels and open pores and, therefore, their reaction to physical effects are also alike. However, heat accumulation and heat transfer values of handmade bricks are considerably higher. Heat transfer values of earthen materials are generally lower and the addition of straw in traditional adobe decreases these values and the unit weight even further but it also results in a vapor diffusion resistance value of four. This situation affects the balance between heat diffusion and moisture diffusion and, at the same, time decreases the resistance to pressure and increases sensitivity to moisture.

ALKER overcomes these disadvantages to a great extent. The homogenous pores in the structure bring the unit weight close to that of hollow bricks while decreasing the heat transfer value. A wall ca n be built with a thickness of up to 50 cm for a very small increase in cost, thus creating the possibility of keeping heat accumulation value and phase differences at the desired levels with no significant extra expense. Among the building materials for walls such as bricks, concrete, lime and sand stones, ALKER is only one with a unit weight of 1.400-1.500 kg/m^3 heat transfer value of 0.40 kcal / mh^0C or 0.46 W / mK and a vapor diffusion resistance factor 0f 13. In addition, the production technique is very simple. Other points which have to be considered are: all materials other than ALKER have to be produced in factories

And therefore, require time, capital and a great amount of energy for production and transportation.

4. The ALKER test building

After obtaining positive results in laboratory experiments on ALKER, it was decided to continue the studies on site. A rural house of 80 m2 living room, two bedrooms, a kitchen, a bathroom and an entrance was designed (see annex I for and sections).

(a) Construction possibilities with ALKER and description of the test building

A series of experiments were carried out in order to determine methods for the production of ALKER on site and the properties of the resulting blocks.

It was found that several variants may be introduced, such as the use of manual and/or mechanical mixing and pouring. The method used will depend on site condition, number of buildings planned and the quality of the project. In order to make various evaluations, different methods were used in the construction of the test house: block of 45 cm wide, in situ pouring with intervals, and continuos in situ pouring (see figure 4, 5 and 6).

The roof and the ceiling of the building were made together. Ready-made blocks of fired earth were placed between the reinforced boards of the roof; a 3 cm thick layer of concrete was poured over it, and this was covered with a 2.5 cm thick insulation of Heraklite and corrugated asbestos-cement plates (see figure 7).

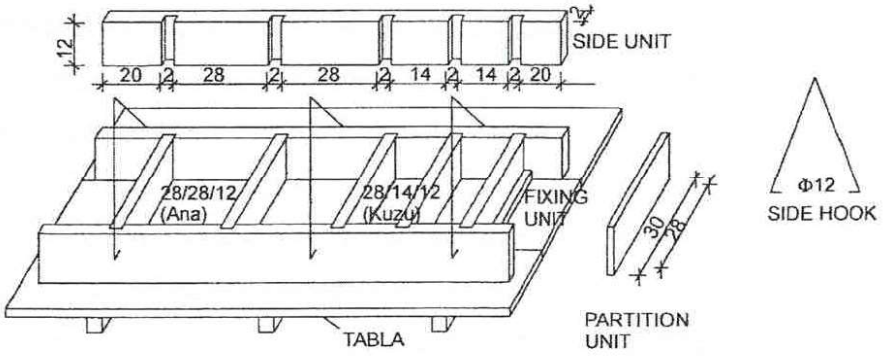


Fig. 4. Mould used for making blocks

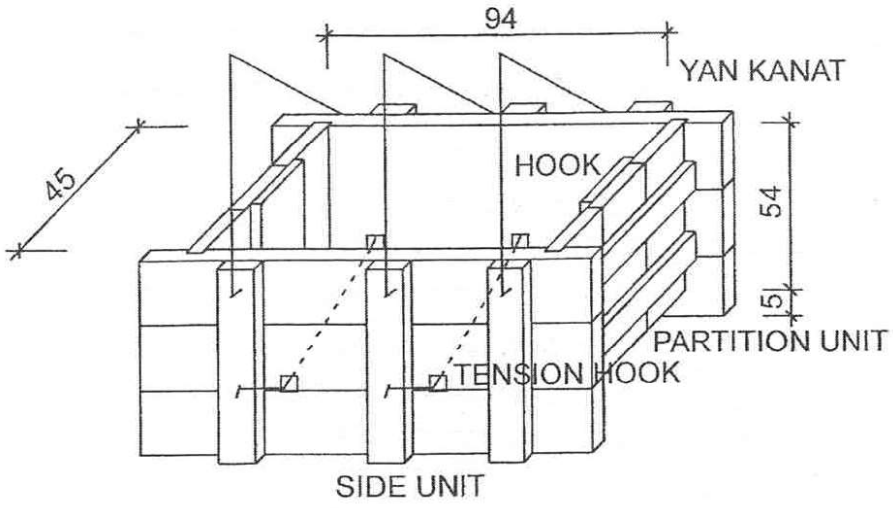


Fig. 5. Mould used for in-situ pouring

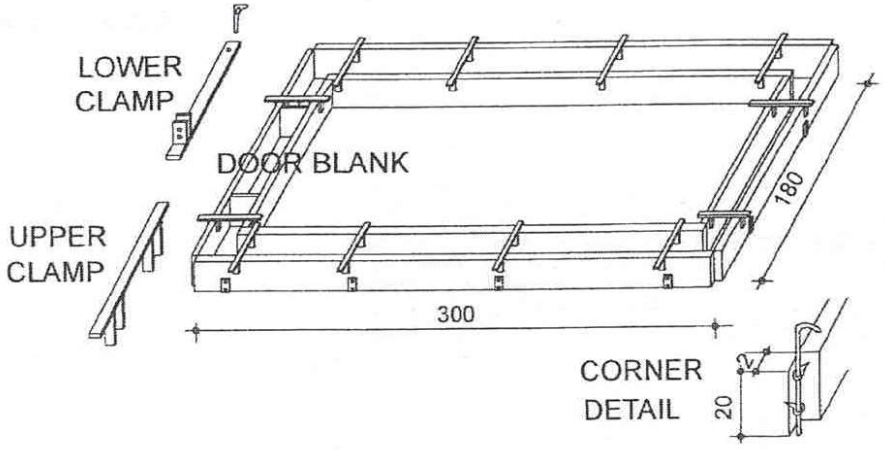
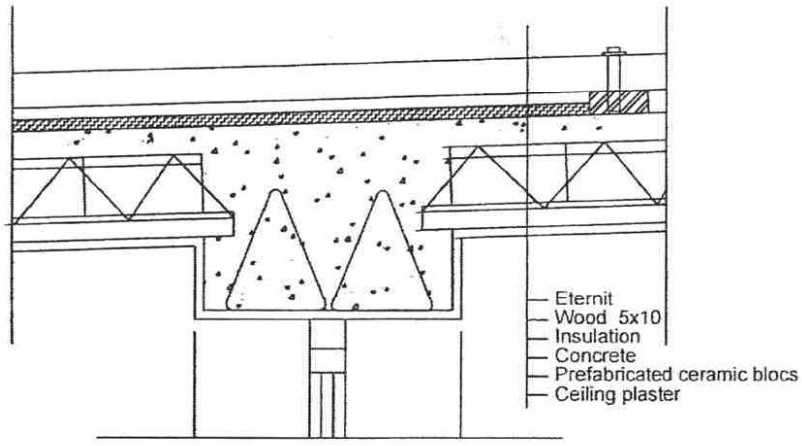
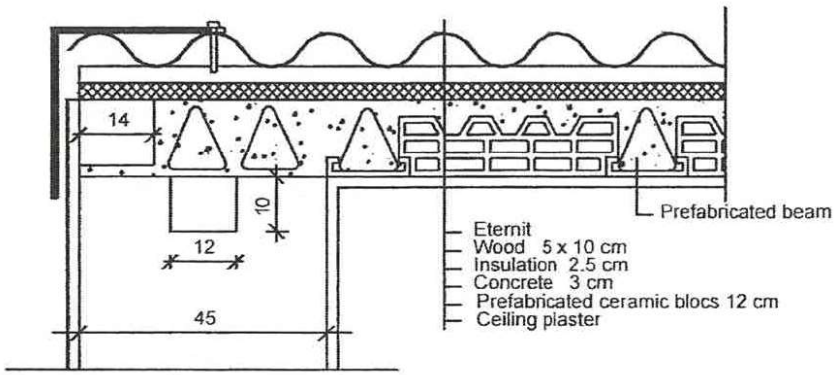


Fig. 6. Mould used for continuos pouring



Cross section



Transverse section

Fig. 7. Details from the roof of the test building

The rubble filling for the floor was covered with concrete. A 2.5 cm layer of alum (to keep moisture permeation) , 2 cm of styropor, underground heating system and ceramic floor covering were used.

Gypsum plaster was used in the interior. The outside plaster was made of earth with four different percentages of additives. Faience was in the bathroom provides heat for the underground heating used for the walls in the kitchen and bathroom, and wooden frames were used for the windows. An electric heater system. The heater has two resistances of 2.000 W which can be used either independently or together according to weather conditions.

(b) Measurements on the building

The test building was subjected to constant observation and measuring for three years. The measurements were carried out with rather simple methods, aimed at determining the thermal properties of the building.

Energy spent for heating

The amount of energy spent on heating buildings in Turkey is quite large and, therefore, one of the main objectives of this research was to study the possibilities of saving energy. Despite its higher cost, the electric heater was chosen because the energy expenditure can be determined much more accurately trough it. This type of heater is normally used for heating water in bathrooms but in the case of the test building it was used for heating the whole house through water pipes located under the floor. The electricity consumed by the heater was measured every day and it was found that on the oldest days of winter a temperature of 22-23^0 C could be maintained with an energy expenditure of around 45 kW (see annex II for heating project and measurements). Energy expenditure was recorded from February 1986

through to June 1987 with measurements being taken day and night. As shown in annex III, energy expenditure, which was 40-45 kW/day and 1.7-1.8 kW/hour in the cold days, could drop to 0.5 kW/ hour in warmer days. This amount is one fourth of the average expenditure on heating in Turkey.

Heat values in the interior and exterior, and measurement of relative humidity values.

Measurements recorded during the period when the test building was being used as nursery show important results in terms of the thermal behavior of the building. However, as was indicated above, rather simple methods were used.

The interior and exterior temperatures and relative humidity values were noted in weekly diagrams from the winter of 1986 to the summer 0f 1987. The superimposed diagrams of seven sample days are given in annex IV. Comparison of these diagrams with the table in annex II gives the following results:

- The interior heat balance and humidity considered appropriate for daily comfort were not affected by exterior condition.

- The building housed 15 to 20 children aged two to six years from 9 a.m. to 5 p.m. In winter the children spent all of their time inside the building, while in summer most of their time was spent in the garden. In winter, the increase of 2^0 C in temperature and the humidity of 50 to 60 per cent coincided with the hours the children were in the building. No other climate regulating system was used, as the building is able to set its own heating and humidity balance. In annex IV, it can be seen that during the vacation period of 27 and 28 February, when nobody was in the building, the heat and humidity values did not change.

- At the beginning of winter, on days when the weather was not too cold, it was observed that although the interior climatic condition did not change, the amount of energy spent on heating decreased considerably.

- The climatic comfort conditions of the building remained stable also during the summer. During August the ideal humidity value of 60 per cent was kept in spite of daily changes of 10^0 C temperature and of 40 per cent in humidity.

- During the summer season, the children were constantly going in and out of the building and, therefore, doors were left open with the consequent increase in temperature in the interior. If it had been possible to control the opening and closing of doors the interior would have been cooler. In countries with hot climates, this kind of building could provide comfortable conditions without artificial climatic regulator.

- The difference in temperature between the surface interior wall and the interior was 2-2.5^0 C which was considered suitable for the people using the building and for the building itself. This also means that comfortable conditions
- can be maintained even lower heating temperatures and, thus, more energy can be saved.

(c) The importance of saving energy on heating in Turkey and in countries with similar climatic condition

It has been shown that, in the ALKER building, the most suitable bioclimatic conditions could be achieved with the least amount of energy. In developing countries, the proportion of energy needed for development to the total energy consumption of the country is an important indicator. In countries where a certain amount of energy is needed for heating during the winter, the amount of energy consumed has to be subtracted from the energy need of the industrial sector. If the

country is importing energy, the problem will have major consequences. A developing country with a high rate of population growth and housing problems must seek solutions other than those of developed countries. The importance of this approach has been clearly set by recent official studies in Turkey. It is now know that between 1970 and 1985, the energy spent on heating could have been decreased by 40 to 50 per cent. According to the same sources, this number should be 35 per cent in 1986 and 18 per cent in 2010. In the coming 25 years, Turkey `s population is expected to double, thus increasing the need for appropriate housing /2/. The saving measures for the production and usage of housing are implemented.

5. Thermal properties of the ALKER test building

In this section we will try to determine the thermal properties of the test building constructed with ALKER by using the evaluations of the measurements and observation recorded. The main point is to work not only theoretically using the figures from previously published material, but also to reach conclusion based on the measurements taken from a building that is being used.

(a) Heat transfer, heat accumulation capacity and difference 'n phase in an ALKER wall

The test building was constructed according to the project in annex I. Some of the values used for the calculations of the building are shown in table 1.

Table 1. Values used in the design of the test building

External wall surface	94.75 m2
Door and window surface	10.02 m2
Opaque wall surface	84.73 m2
Ceiling surface	82.24 m2
Total heat loss surface	166.97 m2
Transparency ratio	0.12
External wall width	0.50 m
Weight/surface ratio of external wall	750 kg/m2

The same temperature was found on the internal surface of the north and south walls and on the ceiling. In the calculations made at this stage to determine the behavior of the building, it was assumed that there was no heat loss from the floor and that heat loss from other surface was equal. It was found that the heat transfer coefficient was very close to the real value. For thermal consideration, external walls were built with of 45 - although it was possible to build them with a width of 30 cm like the internal walls. For the calculation the wall was considered as a homogeneous single layer element with a width of 50 cm and an equal amount of plaster on both sides.

The heat transfer coefficient of the internal surface was accepted as α_1 = 6 W/m^2 K and α_a = 23 W / m^2 K after comparing the calculation on the building and the values in the literature. Heat conservation values of the ALKER wall were calculated according to the energy spent and according to the internal and external atmosphere and surface temperatures. The overall heat transfer coefficients found were very close to each other.

In order to minimize error, the calculations shown below were based on electricity consumed on 12 February - the day when maximum energy was spent - at a time when the buildings was - between empty - between 5 p.m. and 9 a.m.

The electricity consumed in a period of 16 hours was 31.4 kWh.
The heat loss value of the building was taken as Q = 31.4 W
Internal heat at 9 a.m. was t_i = +21^0 C
Internal wall surface heat at 9 a.m. was t_1 = + 19^0 C
External heat was t_a = + 4^0 C Δ_t = 17^0 C
Overall consumption in one hour was 31.4/16 = 1.962 KW/h
Total heat - losing surface of the buildings was 167 m^2
Heat loss from areas unit was q = 1,962/167 = 11.75 W/m^{2}h
Using the formula q =k_m. t, k_m q/Δt=11.75/17= 0.69 W / m^{2}K

The internal wall surface temperature according to this k_m value is

$$t_1 = t_i - \delta t_1$$

$$t_1 =$$

$$t_1 = 1.6/1.44 \text{ X } 17+1,96$$

$$t_1 = 21.00 - 1.96 = 19.40^0c$$

As the internal wall surface is 19^0 C and the difference with the internal heat is 2^0 C, km can be calculated using the t formula

$1/K_m = (\Delta t/ \delta t_1) \times (1/ \alpha_1) = (17/2) \times (1/6) = 1.417\ m^2K/W$ and $k_m = 0.70\ W/m^2$

The values of 1.449 and 1.417 found by two different methods justify the evaluations made above. The thermal conductivity coefficient can, then, be calculated according to these as

$$\frac{d}{(1/k - (1/ \alpha + 1/ \alpha_a)}$$

$$\frac{0.50}{1.449 - 0.210} = 0.40\ W/mK$$

In the laboratory this value has been found to be 0/46 W /m K using a small sample. We are of the opinion that in precise measures made on the building the real values of ^ will be less than 0,40 W/mK. The fact that a material with a density of 1,500 kg/m3 has such a low I is very relevant for the saving of energy spent on heating and achieving bioclimatically comfortable condition. The relationship between density and heat transfer coefficient values is well illustrated by the available literature./3/. These studies show that the increase in density has positive effects for almost all climatic regions.

The increase in the external wall mass results in a considerable decrease in the k value of the wall which helps to keep the interior of the building cool end delays the heating process in hot-dry climates where the temperature changes noticeably between day in the night. It has also been observed that continuous heating in building whit denser walls helps in saving energy. The values of k and λ found on the building were lower that those found in the laboratory.

The thermal properties of the building can be determined using the heat and humidity diagrams in annex IV and the surface temperatures of the walls.

- The internal climatic conditions remained constant without being affected by external conditions throughout the year. The internal temperature diagram shows little variation in spite of temperature differences with the exterior of 10-14^0 C.

- The difference in the wall surface temperatures on 2 February and 7 July 1987 (coldest and hottest days respectively) present the same characteristics.

- In periods of seasonal change (when heating is initiated or stopped), the decrease in external temperature can be overcome by an energy expenditure of 11 to 13 kW per day. In winter the daily average is 35 - 40 kW.

- Despite the great difference in external wall temperature during winter and summer, the temperature of the internal wall surface changed only 1^0 C.

- In winter and summer, the internal wall surface temperature differs from the interior atmosphere temperature by $\pm 2^0$ C. In all spaces within the building and on all wall surface, same values were found; the heating system also helps to maintain a constant temperature.

- No condensation occurs because of the balance between heat conservation and humidity diffusion of the wall and, therefore, it is constantly dry (see figure 8).

- In winter, the presence of about 20 children and 4 adults in an area of 57 m^2 - a volume of 142.5 m^3 - increases the temperature and humidity although these increases are limited to 2^0C and 5 to 6 per cent, respectively.

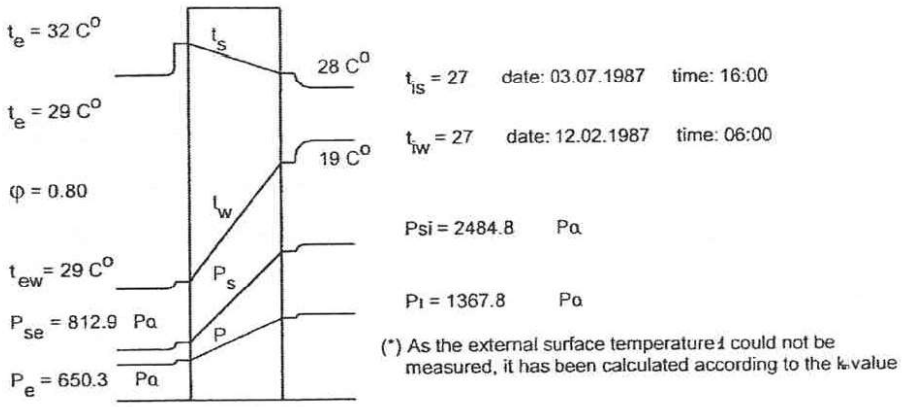


Fig. 8. Temperature and humidity values on the wall in the hottest and coldest days

In view of the previous points, it is possible to conclude the following:

1. The heat conservation value of the building itself is sufficient for saving energy and for attaining bioclimatically comfortable conditions.

2. The building works as a regulator by keeping the internal climate et the desired level when changes in external temperature and humidity occur.

3. Despite the relatively low heat transfer coefficient of 0.69 - 0.70 of the walls, a density of 750 kg /m^3 provides a high level of heat accumulation while

decreasing the amplitude and time required for the transfer of the external wall temperature to the interior.

4. After taking precise measurements to determine the specific heat 'c' and the heat transfer coefficient λ, the values of S_{24}, k_m, Φ and h can be determined according to the climatic data and habitation condition of the building and the appropriate wall thickness for that location and building can be calculated.

5. Compared to other wall building materials. There is no scale limitation in buildings made with earth. Due to the high resistance to pressure of ALKER, the width of external walls can be decreased as much as 30 cm. The increase in width required for thermal reasons can be made in-situ by changing the molds, with a negligible increase in costs.

(b) Evaluation of the thermal properties of ALKER test building

The relationship between the structure of the building and its inhabitants.

In the test building constructed with earth, the internal temperature and relative humidity were kept constantly at a level appropriate for human health. No additional system was required for providing these conditions. This type of building can provide the desired conditions particularly in hot and dry regions where sharp daily and seasonal changes of temperature occur. People can live in invariable atmosphere where climatic changes are limited and very slow because the temperature and humidity changes seen in the diagram in annex IV are not reflected in the interior of the building.

The temperature of the internal wall surface hardly follows the external conditions. The overall temperature change during one day on the north wall was recorded as

1^0 C, similar values were found on the other walls. The difference between the internal wall surface and the internal atmosphere temperatures is limited to 2^0 C. These conditions decrease the radial heat loss of people to the minimum, and they are able to live in lower internal temperatures.

As the wall surface temperature decreases, the temperature of the internal atmosphere should be increased, further increasing this difference and thus affecting negatively the comfort condition of the building. Obviously, the opposite situation occurs during hot periods. Both conditions result from the fact that the heat conservation value of the wall building material is low. This problem can be solved by using earth constructions, which will also avoid the negative affects of air currents caused by the difference in temperature between internal atmosphere and wall surface.

Structural health of the building

In buildings constructed with earth, comfortable living conditions are attained naturally, whereas today, materials constituted by multiple layers of different materials are produced in order to achieve the same conditions. As some of these materials are new and not well-known, builders art likely to face faults and problems, causing early deterioration of the buildings. Walls formed by a single homogenous layer of the earth have a healthy structure in themselves and, thus, the problems often seen in other kinds of construction are avoided.

Saving of energy

The building industry consumes a large amount of energy. Energy saved in the construction and usage of buildings can be utilized for development in developing countries.

The first step in the identification of the opportunities for energy saving in the building industry is to determine the energy consuming areas of a building. Walls account for the largest proportion of energy consumed due to their weight and mass. They also have an important role in the relationship between nature and the building. Thus, energy saved by improving the properties of walls can be very effective.

(i) Energy spent on the production of wall building materials

Table 2 gives an idea of the amount of energy consumed in the production of different wall building materials.

Assuming that there are 30 m^3 of wall material in a house with an area of 80 m^2, the number of bricks needed for the walls can be estimated to be around 15,000. In a country where 50,000 houses are built every year, the amount of energy which could be saved by building with earth would be considerable. Saving would be even greater if the energy expenditure of factories producing bricks and the capital and time necessary for the construction and organization of those factories was included in the calculation.

(ii) Energy spent for the transportation of wall building materials

The use of bricks, concrete blocks or similar materials implies transportation from the factory to the construction site. Assuming an average transportation distance of 50 km and that the amount of material needed for one house is 45 to 50 tones, Then, approximately 2,500 tone-km of transportation work is required. Construction with earth, where possible, will result in a considerable amount saving in transportation.

Assuming that there are 30 m3 of wall material in a house with an area of 80 m2, the number of bricks needed for the walls can be estimated to be around 15,000. In country where 50,0000 houses are built every year, the amount of energy which could be saved by building whit earth would be considerable. Saving would be even

greater if the energy expenditure of factories producing bricks, and the capital and time necessary for the construction and organization
of those factories was included in the calculations.

Table 2. Energy expenditure in the production of wall building materials

	Nature of fuel	Calorific value per tonne a/	Weight of fuel equivalent to burn 1000 bricks b/	Heat needed to burn 1000 bricks c/	Capital cost of firing installation c/
Modern oil-fire tunnel kiln factory	oil	44 000	0.11	4 800	2 000
Traditional wood fired clamp brickworks (East Africa)	firewood	16 000	1.00	16 000	3
Traditional coal fired Bull's Trench continuos kiln (India, Pakistan)	Coal	27 000	0/20	5 400	20
Coal fired clamp (India, Turkey, United Kingdom)	Coal	27 000	0/32	8 600	1

Source: J.P.M. Parry, Brick-making in Developing Countries, BRE department of the
Environment, p.4, A/ Mega joules, B/ Tonnes, C/ Thousand British pounds at 1987 cost prices

(iii) Energy spent for heating and cooling the building

Expenditure on production and transportation of materials occurs only once, when the building is constructed, whereas expenditure on heating and cooling as necessary as long as the building as used/ Therefore, using a wall building material which cab minimize this expenditure is highly relevant. Producing this type of material may result in an increase of the initial cost but long-term saving will

compensate this. Heating and cooling values of walls built with different materials are compared in figure 9. Parallel to the increase of the overall heat transfer coefficient of the wall, the amount of energy needed for heating and cooling also increases. As was mentioned before, excellent bioclimatic condition and energy savings can be achieved if walls are constructed with the appropriate material. When the temperature difference between the internal atmosphere and the wall surface is decreased by 2 to 30C, the energy needed to attain a comfortable condition is significantly reduced. A decrease from 22 to 200C in the interior in a region where the external temperature is between -3 and 00C will save 8 to 10 per cent in heating energy.

6. Conclusion

The history of earth construction in Turkey goes back to prehistoric times and is still being used. Nevertheless, earthen materials in their natural state have disadvantages as building materials, however, the transfer of technology and materials from developed countries to developing ones and people's belief that the new materials and technologies are better then their old ones, have made earth an "out of date" building material. Developing countries should make use of technologies and materials suited to their specific conditions. Unfortunately, they have often made the mistake of blindly importing technologies as solutions for their rapidly growing housing problems, disregarding the fact that, in most cases, the best solution lies in the country's own resources.

This paper has shown that the use of ALKER, which is a developed version of an earthen material, offers the opportunity to construct buildings with physical and mechanical properties adapted to the needs of contemporary civilization. These buildings would also help to solve the energy problem, an important point for most developing countries. Except for densely populated urban areas, this building method can be used in rural areas, houses, workshops and agricultural buildings. Earth is the most appropriate material for the social and economic condition of our day.

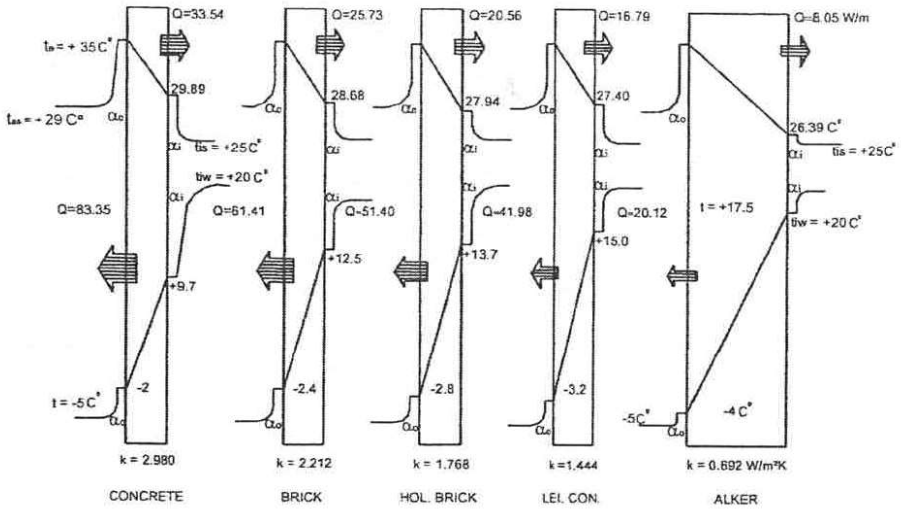


Figure 9. Comparison of the internal and external wall surface temperatures, heating and cooling values of different building materials

Table 3. Electricity consumption (averages)

Date of heating	Days	Energy spent /a/	Daily average /a/	Hourly average /a/	Graph in annex IV
18/02-28/02 1986	10	461.5	41.650	1.735	2
01/03-31/03 1986	31	1119.1	38.722	1.61	
01/04-30/04 1986	30	1234.5	41.150	1.715	3
01/05-26/05 1986	26	329.7	12.680	0.528	4
End of heating period					
06/10-31/10 1986	26	308.0	11.788	0.491	
01/11-30/11 1986	30	629.9	20.199	0.841	6
01/12-31/12 1986	31	1055.1	34.035	1.418	
01/01-28/02 1987	59	2722.9	46.151	1.923	6
01/03-31/03 1987	31	1407.1	45.390	1.891	
01/04-28/04 1987	28	1157.6	41.343	1.723	7
29/04-05/05 1987	7	281.3	40.185	1.647	
End of heating period					

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8.5 Pilot yapı inşaatı

Pilot yapı olarak KKTC-2006 konut kurultayında sunulan iki katlı dışı kerpiç, iç duvar ve döşemeleri hafifçelik olan yapının inşaatı öngörülmüştür. (EK xxx) ArGe amaçlı pilot yapılar firmaların kendi ürünlerini işçilik dahil, uygulama prensibi içinde yürür.

Projesi Şekil.xx de görülen için Türkiye'deki alçı ve kontrplak olan yapı akşan firması ile anlaşma yapılmış,

Proje kapsamında pilot yapı inşa edilmesi bulunmakla beraber, inşaat için şartlar sağlanamamıştır.

Alçılı Kerpiç ile sürdürülebilirliğe katkı

Mukavemet, durabilite, çevre: Karışımda bulunan alçı 20 dakika gibi kısa zamanda priz yaptıktan sonra malzeme kullanılmaya başlar. Kerpiç malzeme harç suyunun kuruması ile gözenekli hale gelir. Ortalama olarak 2.2 t/m^3 olan toprağın birim ağırlığı, alçı ile karıştıktan sonra 1.7 t/m^3 şeklinde hafiflemiş olur. Gözeneklilik alkerin geleneksel kerpice göre özelliklerini iyileştirir. Alker yapı yanal yüklerde daha sünek davranır Yapının depremde ivme alacak kendi yükü azalır. Malzemenin ısı direnci geleneksel kerpiçten yüksektir. Dünya alçı ile stabilizasyonu tanımamakta, çimento ile stabilizasyon yapmaktadır . Çimento ısı geçirgenliğini arttırır ve kırılganlık verir. Bu durumda çimentolu kerpiç çevreci değeri kaybetmiş olur.

8.6 Ulusal ve uluslar arası kerpic eğitimi: kurumsallaşma

8.6.1 Park orman eğitimi

8.6.2 CRATerre eğitimi (Ekli Belge)

8.6.3 USAID eğitimi

The virtual reconstruction of cultural heritage reducing the effects of natural or man-provoked disaster on cultural heritage has received little attention. The ec system of Cyprus as an island is more fragile than on continents. Brand building in earthen architectural heritage creates trustworthy property. "Earthen architecture revival" is a place branding practice; will navigate the way **to learn the real value from heritage,** concerning the climatic also seismic preventions. Restoration of the existing structures and producing new buildings in advanced technologies with the support of the historical **"real value"** earthen architectural revival will help Cyprus to stay competitive in the global ecological rivalry.

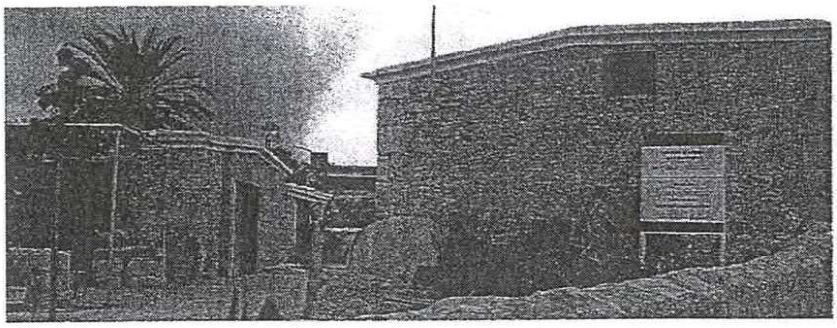


Fig.20 - Restoration of an arch-house

Target groups of the brand building project which will benefit from the results or providing their contribution to the phases of action are:

- **Researchers and research organizations** studying on earthen architecture and adobe across Mediterranean region: One of the particular aims of the proposed action is to transfer knowledge through organizing seminars, workshops and offering courses on the architectural heritage particularly on adobe, researchers will be able to exchange know-how.

- **Educational organizations:** Both students and teachers at universities and schools are beneficiaries of the action. The benefit may be provided by means of offering professional knowledge for the students from related fields of architecture, art history, construction etc. and by transferring knowledge about cultural heritage in field trips.

- **Housing consumers**: It is common in Cyprus to have individual houses but not flats, thus the citizens are always in need of new residential buildings. Regarding the consumer potential, the proposed action will offer assistance for environment friendly and higher quality residential buildings with affordable prices.

- **Local Authorities:** Municipalities and other small scale authorities (rural settlements which are not under the authority of Municipalities have an elected government representative) will use the information and experience they obtain from the action in the implementation of their local projects. With the sustainability of action, such implementations will contribute to the improvement of overall characteristics of the settlements.

- **Population living in the proposed area of action**: Together with the transformation of traditional buildings to the present conditions, the proposed action aims at the regeneration of social life in the area.

- **Chamber of Architects, Chamber of Civil Engineers, Constructors Association:** Members of nongovernmental organizations from related

professions may also be able to participate in the training activities and help prevalence of adobe usage in the region.

A national brand does not create a completely new image but also to reproduce the real life. Earthen architecture revival as identity and brand building tool of the country will reduce the loss of architectural heritage and difficulty in access to knowledge of related technologies

The research board accompanies the achievement and gives advice for future development.

BÖLÜM.3

Yeni kerpiç teknolojisini KKTC inşaat sektörüne kazandırmak

3.1. Yapı malzemesi olarak toprak (5sayfa)

Toprak insanlık tarihi boyunca yapı malzemesi olarak kullanılmıştır. Bölgenin iklimsel ve jeolojik yapısına bağlı olarak gelişen yapı kültürü ustalar tarafından nesilden nesil'e gelişerek aktarılmıştır. Kerpiç yapı uygun toprağa blok olarak şekil verilip, yapı malzemesi olarak kullanılması halidir. Toprak jeolojik yapıda ana kayaçların değişik boyutta ufalanması ile meydana gelir. En küçük boyutlusu kil adını alır. Kilden sonra büyüklüklerine göre taneler silt, kum, çakıl isimlerini alır. Kil toprağın iri taneleri olan silt, kum ve çakılı birbirine bağlar. Islak olması durumunda kil parçacıkları birbirlerinin üstünden kayarak malzemeye yoğrulma özelliği kazandırır. Karışımdaki suyun artması ile toprak akışkan hale gelir. Malzeme kuruduğu zaman kil taneleri birbirlerine ve diğer tanelere yapışarak taşıyıcılığı sağlarlar. Yapı malzemesi olarak toprağın olumsuz özelliği:

- Aşınması
- Deprem riski

3.1.1 Kerpicin olumsuz özelliği

- **Kerpiç yapının aşınması**

Kil bağlayıcılı toprak yapı malzemesi, su ile karşılaştığında, önce plastik kıvama gelir böylelikle taşıyıcılığını kaybeder. Suyun daha çok etkimesi halinde ise yıkanarak yok olur. Su yapıyı: doğal zeminden yükselerek, zeminden sıçrayarak, çatıdan duvar yüzüne akarak, yapı mekânlarında veya kesitinde tesisat ve kullanma faaliyetleri sonucunda etkileyebilir. Proje ve detaylara özen gösterilmesi halinde suyun yapıyı etkilemesi önlenir.

Aşınma, sudan başka çevre olaylarında da görülür. Şiddetli rüzgarlar ve taşıdıkları bitki kum gibi malzemeler çarparak kerpiç duvarı aşındırırlar. Önemli etkenlerden biri de ısıl genleşmedir. Homojen olmayan yüzeylerde veya farklı malzeme birleşmelerinde ortaya çıkan farklı boyut değiştirme, çatlak ve dökülmelere sebep olur.

İnsan faaliyetleri, kasıtlı müdahaleler, diğer canlıların hareket darbe veya yuva delikleri kerpiç yapıya zarar verir.

- **Kerpiç yapıda deprem riski**

Kerpiç malzeme genellikle yığma yapıda veya ahşap iskelet içi dolgu olarak kullanılır. Kerpiç ile dolgu iskelet yapıya "hımış yapı " denilir. Deprem bölgesindeki hımış (ahşap iskelet) yapıyı etkileyen yatay kuvvetler çok sayıda esnek birleşme noktasında söndürüldüğü için yapı yıkılmadan depremi atlatır.

Yığma kerpiç yapılar için deprem yönetmeliklerinde proje esasları belirtilmiştir. Kuralsız yapılan her tür yapı depremde hasar görürü. Deprem güvenliği sağlayan bazı özellikler kısaca: duvarların düşey yükleri taşıyacak kadar kalın olmamalı, devrilme riskine karşı duvarın kalınlık/ yükseklik oranını korumalı, projenin x ve y yönlerinde devrilmeyi önleyecek duvar bulunmalı, pencere-kapı boşlukları köşelere çok yanaşmamalıdır.

3.1.2 Toprak malzemenin olumlu özellikleri

Kerpiç ekolojik, ekonomik ve insan sağlığına uygun yapı malzemesidir.

- **Ekolojik yapı malzemesi kerpiç**

İnsanlar dünya gezegeninin yarattığı şartlarda gelişmiş bir canlı türüdür. Dünyanın etkileşim içindeki doğal şartlarına kısaca ekolojik denge denilmektedir. Ekolojik dengelerdeki değişiklik insanları da etkileyecektir. İnsan faaliyetleri özellikle enerji kullanımı ekolojik dengeyi en çok etkileyen faktördür.

Topraktan elde edilen yapı malzemesi 1-ısı yapıtım, 2-ısı depolama, 3-nefes lama özellikleri ile insan sağlığına en uygun yapı malzemesidir.

- Isı yalıtım değerinin yüksel olması
- Enerji depolaması
- Mekân içindeki nem'i dengeler.

Endüstriyel yapı malzemeleri kullanıldığında değişik malzemeler ile katmanlar oluşturarak elde edilecek performans, toprak esaslı yapı malzemesi kullanıldığında, bir seferde elde edilir.

Yalın kullanıldığı gibi, tarihteki dönemlere ve bölgelere bağlı olarak bazı malzeme ve teknikleri ile

güçlendirilmiştir.

BÖLÜM.4

4.1 yığma kerpic yapı teknolojisi 5

1.köşegenler yönünde kesme kuvveti çatlakları

2.hatıl hizasında yatay çatlak

3.burulma çatlağı: köşe birleşmelerde

4.burulma çatlağı: duvar üstünde

5.burulma çatlağı: duvar ortasında

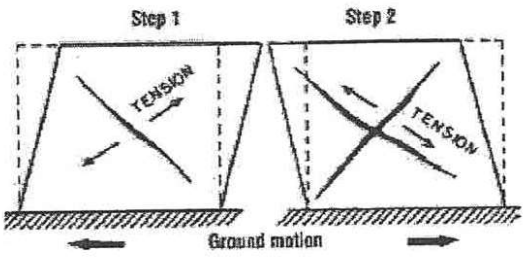
6.burulma çatlağı: duvar döşeme birleşmesi

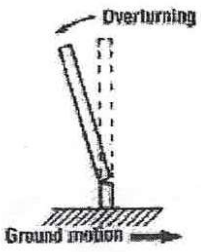
7.sıvanın ayrılması

8.yatay zemin hareketinde duvarın x-çatlağı

9. yatay zemin hareketinde: çatı kalkan duvarını yıkılması

10. yatay zemin hareketinde: çatının şekil değiştirmesi





4.1.1. blok üretimi, ekipman + toprak seçimi 10

4.1.2. tokmaklama tekniği, ekipman + toprak seçimi 15

4.1.3. püskürtme tekniği, ekipman + toprak seçimi 15

4.2 kerpiç dolgu ahşap iskelet yapı: Hımış yapı

BÖLÜM.5

İnşaat sektöründe kerpicin yeniden kullanımı için gerekli **"standart", "yönetmelik" ve "şartname"** hazırlıklarını yapmak

4.1 standart 15

4.2 yönetmelik 15

4.3. şartname 15

BÖLÜM.5

5.1. Kıbrıs'ta örnek yapı inşa 15

(Projeci", "uygulayıcı", "denetleyici", "**kullanıcı"ya** örnek teşkil etmek üzere)

BÖLÜM.6 "uluslararası kerpiç okulu" projelendirmek

[2] Numan I, Pulhan H, Dincyurek O. Culture as a determinant of identity of the two walled cities of Cyprus. In: Post proceedings of the world conference on cultural design, November 2001. Seoul: Yonsei University Press; 2001. p. 489–502.
[3] Pulhan H, Numan I. The transitional space in the traditional urban settlement of Cyprus. Journal of Architectural and Planning Research 2005;22(2):160–78.
[4] Pulhan H, Numan I. The traditional urban house in Cyprus as material expression of cultural transformation. Journal of Design History 2006;19(2):105–19.
[iv] Chapman EF. Cyprus eucalypts: A report on the eucalyptus species found growing in Cyprus, 1953. Nicosia: Goverment Printer; 1954.

BÖLÜM.7

Özgeçmiş

Bilge IŞIK

Özge ÖZBEKOĞLU

Serkan ABBASOĞLU

Mete Mutlu BALKIS

Assoc. Prof. PhD. BİLGE IŞIK (TANIG)

(2008-02-21)

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Phone	+90 (212) 293 - 1300 / 2206; +90 (212) 288 78 79
Fax	+90 (212) 251 48 95
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web	http://www.kerpic.org www.itu.edu.tr
Languages	English, German, Turkish (mother tongue)
Address	İTU, Taskisla 118 Taksim, Istanbul-Turkey, **Post:** Buyukdere c. 93/2, 80300 M.koy, Istanbul-TURKEY

1970	graduated from D.G.S.A, (Fine Arts Academy and **Architectural** Department)
1972	married, two children
1970-75	Project manager at Cuhadaroglu Aluminum Frame Company
1978	ITU Architectural Faculty, Construction Technology Department
1981-82	experiences: Hannover University, Architectural Faculty, Industrialisierung des Bauens, Prof. Dr. Helmut Weber, and Prof. Neumann Venevere
1991	12. December, Ph.D., 'Tolerances of the Prefabricated Large Panel Elements"
1993	18. October, Associated Professor

LANGUAGES: Turkish (native language), English, German,

LECTURING: Building Element and Construction Technology (Terms 2, 3), Building Substructure and Ground, Projecting in Steel, Detailing Indoor Partitions, Conceptual Designing of Building Elements (26 or 16 hours week/term)

UNDERGRADUATE: 6000 Students

GRADUATE THESIS SUPERVISION: 40 finished, 1 ongoing

RESEARCH AREA IN BUILDING SCIENCE: 1.Constitutional activities concerning the University and Industry; 2.Prefabricated concrete large panels; 3.Gypsum Stabilized Earthen Wall Material; 4.Construction Technology; 5.Durability and sustainability; 6.Market Researches,7.Healthy in- and outdoors

PUBLICATIONS: 98

RESEARCH PROJECTS:18

1.Production tolerances of reinforced concrete prefabricated walls (1984); **2.**Heat transfer measurements on 1st Alker pilot building (1987); **3.**Durability of outdoor plaster on Alker wall (October 1991-1996); **4.**TÜBITAK TIDEB ÜSAMP R&D Project (1996-2001); **5.**TUBITAK - INTAG-TOKI 622, 2nd Alker Pilot Building (April 1994-December 1995); **6.**ALTINOLUK 3rd Alker Pilot Building (1997-1998); **7.**ITU-GAP 4th Alker Pilot Building (July 1999-June 2000)); **8.**Preserving the earthen architecture heritage in Mediterranean region; **9.**Technology or Alker construction: **10.**Alker shooting technology **11.**Alker construction durability; **12.**Physical properties of Alker-shot; **13.** Mechanical properties of Alker-shot; **14.**Alker as ecological construction: **15.**Seismic reliability of Alker wall; **16.**Biaxial load application on unreinforced Alker wall**; 17.** Biaxial load application on reinforced Alker wall **18.**Seismic energy dissipation research on earthen wall (2002)

MEMBERSHIP:

1- Architects Association of Turkey (1970 Nr.3666), 2- IGIP International Gesaeschaft Fur Ingenieurpedagogik 1988, 3- ITU Kindergarten Association (1980-1990), 4- EU Association of Turkey (Nr. 176), 5- ITU-Architectural Faculty Association, 6- Steel Construction Association of Turkey (1996-Nr.34)

ESTABLISHED

1- Kindergarten Macka-Campus of ITU, (construction and school statute) (1980), 2- Kindergarten Ayazaga-Campus of ITU, (project, construction) (1985, 2- Students Club of ITU Architectural Faculty (1988)

3- "R&D network" with partnership of ITU-TUBITAK- Gypsum and Lime Producers Association;

Araştırma alanları

EARTH CONSTRUCTION
Alker Technology

Curriculum vitae of Dr. Bilge I§IK,
Istanbul Technical University, Architectural Faculty, TR, April 01

Italic/bold publication titles are originally in international language, others in mother tongue
(1) TÜBITAK Turkish Scientific and Research Council, TIDEB Chair of Technology Observation and Evaluation
(2) TÜBITAK INTAG -, Chair of Construction Technology Researches
(3) GAP BKI South East Anatolia Project, Prime Ministry, Regional Development Department
(South East Anatolian Project: Irrigation and Power Plants on 1/10th Area of Turkey)
(4) TOKI Prime Ministry, Social Housing Department

Classification 1
Durability of Earthen Construction
Project 1

Title: "Plaster on Alker Wall"
Timetable: October 1991-96
Project Leader: Dr. Bilge ISIK
Support from industry: 1. ABS, 2.Serpo, 3.Entegre, 4.Kaleterasit, 5 Kenitex, 6.ISIK AS

Master Thesis in Building Science (MS):
1. Alev AKIN 1998 (in Turkish)"Plaster Applications on Earth Construction"
2. Gul Nur GUNDUZ 1999 (in Turkish)"Plaster Durability on Alker Wall"

Research Publication (durability 1)
1. ISIK B., (in Turkish) "Using ready mixed plaster on gypsum stabilized wall" National Gypsum Congress I, YEM Istanbul 04.11.91(12)
2. ISIK B, ***"Outdoor Plaster Applications on Gypsum-Adobe Wall"*** Poster Presentation, CIB Congress, Vanquver 20.06.93 (13)
3. ISIK B., AKIN A., "Alci Dıs Yüzey Bitirme İslemleri ve Gozlemler" (English: Case Study on using Gypsum for Outdoor Plasters) 2nd National Gypsum Congress, Y0M, Istanbul 02.06.97(23)

Classification 2:
Construction Technology of Alker
Project 2:

Title Original: "Alcı Katkılı Kerpic Yapi Malzemesine Uygun Mekanize Insaat Teknolojisinin ve Standartlarının belirlenmesi"
(English: Determining the Construction Technology and Standards for Gypsum Stabilized Earthen Wall Material)

Time Table: April 1994-December 1995

Project Leader: Dr. Bilge I§IK
Adviser: Prof Ruhi KAFESCIOGLU
Researchers: Alev AKIN, Caner GOCER, Hulya KUS, Ikbal CETINER, Nihal ARIOGLU
Project Holder: TUBITAK (1), INTAG (2), TOKI (3)
Project Number: TUBITAK INTAG TOKI 622
Support from Industry: Gypsum Producer Association, Lime Producer Association, Borusan Granit, Cam Pazarlama, Ondulin, ISIK AS,

Research Publications (construction 2)

1. ISIK B., ***"Adobe Research for Mass Housing in Turkey"*** Workshop, International Association for Housing Science 22nd Symposium, Salzburg, 3-7. 10.1994
2. ISIK B., ***"Mechanization of Adobe Construction",*** 23rd IAHS World Housing Congress, Singapore, 25.09.1995 (17)
3. ISIK B., INTAG T 622: "Alci Katkili Yapı Malzemesine Uygun Insaat Teknolojisi ve Standartlarının Belirletimesi" Toplu Konut Sorununun Muhendislik Boyutu",
4. ISIK B., ***"Mechanization of Gypsum Adobe Construction II" (Conclusion Remark of the Research'96)"*** 24th IAHS, How to House a Nation, the Challenge for the XXI Century, METU, Ankara 27.05.1996(18)
5. ISIK B., ***"Building Intelligent Houses: the Mechanization of Adobe Construction"*** Invited speaker, SCI Arc, Los Angeles, 14.02.1997 (20)
6. ISIK B., GOCER C, "Konut Sektorunde Dıs Duvar Cevre Iliskisi" (English: Outdoor Wall and Environment Relation of Housing Sector) Yalrtim'97 Symposium, Firat University, 15.05.1997
7. ISIK B., ***"Earth as a Wall Material and it's Impact on Pollution"*** CIB World Building Congress'98, Gaevle, 07-12.06.1998
8. ISIK B., OZDEMJROGLU, P., BODUROGLU, H., ***"Earthquakes Aspects of Proposing Gypsum Stabilized Earth (Alker) Construction for Housing in the South east (GAP) Area of Turkey",*** Workshop on Recent Earthquakes and Disaster Prevention Management, Earthquake Disaster Prevention Research Center Project (JICA), General Directorate of Disaster Affairs (GDDA), Disaster Management Implementation and Research Center (METU) Middle East Technical University, ANKARA 10-12 March 1999
9.

Classification 3
Constitutional Activities
Project 3

Original title: "Insaat Malzeme Teknolojisi ve Cevre ArGe Merkezi Projesi"
(English: "Construction Material Technology and Environment R&D Center Project)

Timetable: October 1996- ongoing
Project Leader: Dr. Bilge ISIK
Project Holder: TUBITAK TIDEB
Support from Industry: Gypsum Producers Association, Lime Producers Association

Feasibility Report
ISIK B., "Alcı, Toprak, Kirece Baglı Ileri Malzemeler ve Kompozitler ile Uretim ve Insaat Teknolojileri" (English: Construction Material and hi-Tech Composite Production with Gypsum, Lime and Soil), TOPRAK ArGe Feasibility Report Presentation, TUBITAK TIDEB, Istanbul, 16.09.1997

Fair, exhibition conference activities

25 March 1998, Gaziantep, Yapi'98 Construction Fair, YEM
Stand presentation:
Creating Stand: Doc, Dr. Bilge ISIK
Co-worker: Gamze HELVACI (graduate student.)
Posters for exhibition and Power Point presentation,

29 April 1998, Istanbul, Yapi'98 Construction Fair, YEM
Stands presentation: Project Leader Creating Stand: Project Leader

5-11 October 1998, URFA, 1st International GAP Fair
TOPRAK ARGE Stand presentation: •
1. Creating Stand: Project Leader
2. Power-point presentation: Project Leader
3 Posters for exhibition Under ITU Rector's patronage

TUBITAK R&D Fair, participation

4-7 June 1997, TUBITAK MAM (Marmara Research Center) ArGe'97
Science and Technology Fair, Istanbul, Tepebası,
Posters for exhibition: Under ITU Rector's patronage
1. Creating Stand: Project Leader
2. Conference hall, cocktail responsibility: Project Leader
3. Power-Point presentation: Project Leader

TUBITAK Research & Development Market, Participation

4-5 December 1997, TUBITAK R&D Market, Classis, Istanbul
1. Power point presentation
"TOPRAK R&D Center Feasibility Report", Doc. Dr. Bilge I§IK
2. Workshop participation

Constitutional Assembly of the Research Center, Coordinated by Project Leader

I. Meeting, 12 March 1997, Location ANKARA
Gypsum Producer Association, Lime Producer Association, Project Leader

II. Meeting, 18 March 1998,Location ITU Rectors office
Gypsum Producer Association, Lime Producer Association, Prof. Dr. Temel Belek, TUBITAK TIDEB representative Mahmut Kiper, Project Leader

III. Meeting, 6 May 1998, Location ITU Rectors office
Gypsum Producer Association, Lime Producer Association, Ytong and Brick Producer and Project Leader

IV. Meeting, 24 March 2000, Location: Gypsum Producers Association, Istanbul
Participants. Gypsum Producer Association, Lime Producer Association and Project Leader

V. Meeting, 12 January 2001, Location ITU Rectors office
Participants: Vice Rector Prof. Dr. Ekrem Ekinci, Gypsum Producer Association, Lime Producer Association and Project Leader

VI. Meeting, 22 January 2001 Location: Faculty of Chemical Engineering
Participants: Dean of the Chemical Engineering Faculty Prof Dr Hasancan OKUTAN, Gypsum Producer Association, Lime Producer Association and Project Leader

VT. Meeting, 26 January 2001 Location: Gypsum Producers Association, Istanbul
Participants: Dean of the Chemical Engineering Faculty Prof Dr Hasancan Okutan
Gypsum Producers Association: Alp Akman, Ruhi Kafescioglu, Ümit Gürbüz; Lime Producer Association: Cetin Demirman, Coskun Gonültas and Project Leader

VII. Meeting: 9 February 2001 Location: Faculty of Chemical Engineering
Participants: Dean of the Chemical Engineering Faculty Prof Dr Hasancan Okutan

Lime Producer Association and Project Leader VIII Meeting: 23 February 2001
Location: Chemical Engineering Faculty
Participants: Dean of the Chemical Engineering Prof Dr Hasancan Okutan
Lime Producer Association and Project Leader Faculty
IX. Meeting: 21 March 2001 Location: Chemical Engineering Faculty
Participants: Dean of the Chemical Engineering Faculty Prof Dr Hasancan Okutan Lime Producer Association and Project Leader

Publication (constitutional)
1. ISIK B., "Alci, Toprak, Kirece Bagli Ileri Malzemeler ve Kompozitler ile Uretim ve insaat Teknolojileri" (English: Construction Material and hi-Tech Composite Production with Gypsum, Lime and Soil) TOPRAK ArGe Feasibility Report on Establishing a R&D Center presentation at TUBITAK (Turkish Scientific and Research Council" TIDEB (1), Istanbul. 16.09.1997
2. ISIK B., "Universite Sanayi Isbirligi TOPRAK ArGe Merkezi Degerlendirme Bildirisi"ARGE'97 Science and Teknoloji Fair, TUBITAK MAM, TUYAP Tepebasi, Istanbul, 4/7.06.1997 (25)

Classification 4
Market Activities on Alker Technology
Project 4

Project Title: "ALTINOLUK, III. Alker Pilot Building (summer residence) Construction"

Timetable: 1997 in use since 1998
Project Leader: Dr. Bilge ISIK
Project Holder: House Owner, Okan/Meral TUTNAR, 220 600 USD (136 000 TL May97)
Supporting Industry: Gypsum Producer Association, Entegre and Serpo.

Master Thesis in Building Science
Imran AGAN, "Kerpic Yapinin Yazlik Piyasinda Uygulanmasinui Fizibilitesi"(English: Feasibility
of Using Alker Technology for Summerhouses"

Research Publication (market 4)
ISIKB, GOCER C., "Alcinin Kerpic Stabilizasyonunda Kullanılmasi Halinde Turkiye'de Alci Talebinin Belirlenmesi" (English: Determining the Demand for Gypsum Market after Using Alker in
Housing Sector) 2nd National Gypsum Congress, Istanbul 2-3 May 1997 (22)
ISIK, B., "A.B.D.'de Konut Yapilan, Kerpic Yapilar" (English. Residential Buildings in the US, Adobe Homes) Conference, Yapi Endustri Merkezi, 10.01.1991 (10)

Classification 5
Healthy indoor & outdoor
Project 5

Project Title: "ITU-GAP Alker Pilot House Project"

Timetable: Julyl999-since June2000 in use
Title: "ITU-GAP Alker Pilot Yapi Projesi"
(English: ITU GAP Alker Building Pilot Project) "Birecik Barajından Etkilenen Nufusun Yeniden Yerlesimi, Istihdami ve Ekonomik Yatinmi icin Planlama ve

Uygulama Projesi" Uyannca Yapi Teknolojisi Calismasi Cercevesinde (English: According to the Program: Planing and Action Program for Investment, Employment and Housing Problems of the Population in the Birecik Power Dam Area)

Project Leader: Dr. Bilge ISIK
Project Holder: Prime Ministry GAP Regional Development Department, ITU
Support from Industry: Gypsum Producer Association, ABS, Dogan Alci, Barit, Entegre, Serpo, Ege Yildiz, Eczacibasi-Intema, Berkosan, Betek, Forbo, ISIK AS.

Activities

1. **Workshop Organizing 22.03.1999 I**

UNI-YEM Meeting
Location: Yapi Endustri Merkezi, Istanbul Organizer:
ITU represented: Doc. Dr. Bilge ISIK-YEM represented: Birgül YAVUZ
Adviser: Prof. Ruhi KAFESCIOGLU
Participant: Construction Material Producer: Betek and Ege Plastic,

2. Congress, 22.04.1999

Location: TUYAP Fair Center, Yapi'99
Organization by
From ITU: Doc. Dr. Bilge ISIK-
From YEM: Birgül YAVUZ
Adviser: Prof. Ruhi KAFESCIOGLU
Topics of the Congress: (English: Construction Technology
According to the Program: Planing and Action Program for Investment, Employment and Housing Problems of the Population in the Birecik Power Dam Area)
Keynote Paper: ISIK B., "GAP'a Yapi Sektoründen ArGe Destegi", (English: R&D support to the Construction Sector of the GAP Area)
UNI-YEM Meeting TUYAP, 22.04.1999

4. Workshop Participation 07.05.1999

Location: Urfa, Birecik in the GAP Area
Workshop Organizer: T.C. Prime Ministry GAP Regional Development Department
Workshop title: (English: According to the Program: Planing and Action Program for Investment, Employment and Housing Problems of the Population in the Birecik Power Dam Area)
Participation and Presentation:

1. Lecture: "Healthy Houses for the new settlements in the Birecik Power Dam Area"
2. Poster Exhibition: Construction of Healthy Alker House
3. Demonstration: Producing alker wall material.

5. Architectural Project Development:

a. Gozeli village civic center project (Architects: B. I§IK, M. KAFESCIOGLU)

b. GAP BKI, Urfa Social Apartment House (Architect. B. ISIK)

6. Constructing the Social House

Project and work of the Urfa Pilot Building (Apartment House, 4 units each 100 $m^{2)}$

7. Material tests are carried by

a. ITU Civil Engineering Faculty **b.** Harran University, Agricultural Faculty **c.** DSI Urfa Region, Material Laboratory **d.** Birecik Power Dam Concrete Laboratory

Publication (healthy indoor/outdoor 5)

1. ISIK B., HELVACI G., ***"Role of Culture and Tradition in the Development of Housing in the GAP Area of Turkey"*** IAHS World Congress on Housing "Housing Issues and Challenges for the New Millennium" San Fransisco, USA, June 1-7 1999 (31)
2. ISIK B., "Ecological Aspects of Proposing Gypsum Stabilized Earth (Alker) Construction for Housing in the south east (GAP) Area of Turkey" International Conference Eco-materials for Sustainable Habitat, Havana, CUBA, Nov. 23727th 1998 (29)
3. ISIK B., "Earth as a Wall Material and its Impact on Pollution" Poster Paper, CIB World Building Congress'98, Gaevle, Sweden, 7-12 June 1998(28)
4. ISIK B., GOCER C.,: "Konut Sektoründe Dis Duvar Cevre Kirliligi Iliskisi", (English: Relation between Outdoor Wall and Air Pollution) Yahtim'97, Sempozyumu, Firat Universitesi, Elazig, 15-16 May 1997(24)
5. ISIK, B.: "***Energieverlust derLehmbau Haeuser***" Presentation, Energie, Umwelt und Bauen - Symposium, IB Institut fur Bauforschung, Hannover-Germany, 17 October 19 (9) 90

ÖZGEÇMİŞ

1. **Adı Soyadı: Serkan ABBASOĞLU**
2. **Doğum Tarihi: 09 / 09 / 1976**
3. **Unvanı: Yrd. Doç. Dr.**
4. **Öğrenim Durumu:**

Derece	Alan	Üniversite	Yıl
Lisans	Makina Mühendisliği	Yıldız Teknik Üniversitesi	1997
Y. Lisans	Makina Mühendisliği	Yıldız Teknik Üniversitesi	1999
Doktora	Makina Mühendisliği	Doğu Akdeniz Üniversitesi	2006

5. **Akademik Unvanlar:**

Yardımcı Doçentlik Tarihi : 04.07.2006
Doçentlik Tarihi : -------
Profesörlük Tarihi : -------

6. **Yönetilen Yüksek Lisans ve Doktora Tezleri**

6.1. Yüksek Lisans Tezleri

6.2. Doktora Tezleri

7. **Yayınlar**

7.1. Uluslararası hakemli dergilerde yayınlanan makaleler (SCI & SSCI & Arts and Humanities)

1. Abbasoglu S., Sezai I., "3-D modeling of melt flow and segregation during Czochraski growth of Ge_xSi_{1-x} single crystals", *J. Thermal Sciences,* Vol. 46, pp. 561-572, 2007.
2. Abbasoglu S., Sezai I., "Three-dimensional analysis of Marangoni flow and radial segregation in Ge x Si1- x melt with Czochralski configuration", *Engineering with Computers*, Vol. 23, No.2, 123-135, 2007.

7.2. Uluslararası diğer hakemli dergilerde yayınlanan makaleler

7.3. Uluslararası bilimsel toplantılarda sunulan ve bildiri kitabında (*Proceedings*) basılan bildiriler

1. Abbasoglu S., Sezai I., "3-D Modeling of radial segregation during Czochralski Growth of GeSi Single Crystals", *4th International Conference on Computational Heat and Mass Transfer*, Conference Proceedings, Vol. II, 1171-1175, 17-20 May 2005, Paris, France.
2. Abbasoglu S., "Water resource problems and a case study for Cyprus", 10th Year Symposium of the Faculty of Architecture and Engineering, Conference Proceedings, 245-247, 18th November 2000, European University of Lefke, Cyprus.
3. Abbasoglu S., Atikol U., "The role of solar collector efficiency in reducing the electricity costs of water heating in Cyprus", 34th FAE International Symposium, Conference Proceedings, 483-486, 25-26 November, 2004, Lefke, Cyprus.

7.4. Yazılan uluslararası kitaplar veya kitaplarda bölümler

7.5. Ulusal hakemli dergilerde yayınlanan makaleler

1. Atikol U., Abbasoglu S., "Güneş Kollektörleri Kullanarak Depolama Tanksız Yerden Istma Sistemi Uygulaması", II. Konut Kongresi, Konferans Kitabı, 412-419, 8-10 Mart 2006, Lefkoşa, Kıbrıs.

7.6. Ulusal bilimsel toplantılarda sunulan ve bildiri kitabında basılan bildiriler

7.7. Diğer yayınlar

1. Abbasoglu S., "Türkiyedeki Havalandırma ve Soğutma Sektörü", *TERMOKLIMA Dergisi*, İstanbul/Türkiye, Kasım, 1998.
2. Abbasoglu S., "Santrifüj Pompalarda Emiş Problemi", *TERMOKLIMA* Dergisi, İstanbul/Türkiye, Mayıs, 1999.
3. Abbasoglu S., "Rüzgar Enerjisi", *Makina Mühendisleri Odası Bülteni*, No.12, Kıbrıs, 2002.

7.8 Verilen Seminerler

1. Abbasoglu S., "Computational modeling of single crystal growth process", Freiberg Technical Uni., 19th February 2003, Germany.
2. Abbasoglu S., "Numerical study of Rayleigh-Benard convection in a cylinder", Freiberg Technical Uni., 21st July 2003, Germany.
3. Abbasoglu S., "Off-Peak Cold Storage Systems", *State-of-the-Art Energy Systems* organized by Eastern Mediterranean University Energy Research Centre & Resource Efficiency Achievement Project funded by United States Agency for International Development, 12th January 2007, Cyprus.

8. Projeler

- Resource Efficiency Expert for the Resource Efficiency Achievement Project (REAP) organized by United States Agency for International Development (USAID) between March 2006 and September 2007.

9. İdari Görevler

- Editor of the report named as "Energy Audit of the Department of Mechanical Engineering-building", published by Energy Research Center of Eastern Mediterranean University in 2005.
- Chair of ASME Student Section in EMU. (2003 - 2005)
- Coordinator Support at Framework Programme 7 Coordination Office of EMU (2006-2007)
- Editorial Assistant of *Research Newsletter* Magazine. (2005 - 2006)

10. Bilimsel ve Mesleki Kuruluşlara Üyelikler

- Member of the Chamber of Mechanical Engineers (CME).
- Member of ASME (American Society of Mechanical Engineers).
- Member of AEE (Association of Energy Engineers).
- Member of EPA (Association of Energy Professionals)
- Member of editing commission for "Air-conditioning handbook 1998", published by Istanbul section of Chamber of Mechanical Engineers of Turkey in 1998.
- In the board of governors of the CME of Cyprus. (1999 – 2002)
- Member of EMU Senate as "Graduate Student Representative". (2004 - 2005)
- Member of Research Advisory Board in EMU. (2004 - 2005)
- In the board of governors of the Association of Energy Professionals. (2007 – .....)

11. Ödüller

- Research Scholarship at FREIBERG Technical University in Germany, DAAD (German Academic Exchange Service), October 2002 (10 months).
- Research Scholarship at FREIBERG Technical University in Germany, DAAD (German Academic Exchange Service), October 2003 (10 months).