Compte rendu provisoire du Workshop International sur les Normes Parasismiques pour les Constructions Traditionnelles

International Workshop on Building codes for Traditional Materials.
Ecole Nationale d'Architecture, Rabat
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Outline:

1- Main conclusions

The debates which took place in the workshop reiterated and reinforced the main objectives, the organization, and the methodological approach of the research proposal. There was however a general consensus to introduce a few changes to the proposal. There was also general agreement about the usefulness and necessity to build an experimental public earthen building in Southern Morocco.

1-1-*Promoting Earthen Architecture through an Experimental Building in Errachidia.*

The pedagogical and symbolic effect of such a project would be of great importance in promoting and demonstrating the modernity and the performance of earth as a construction material. According to the Director of the DEP this building could be built in the short term by the Ministry of Infrastructures in Errachidia. The choice of this city is motivated by the fact that this city, unlike Ouarzazate, has very good and stable terrains. Because of the nature of the terrain of Ouarzazate many new buildings show cracks due to the settling of the foundations which, if the experimental building were built there, would be harmful to the promotion of earthen architecture. For if the buildings were

located there and cracks appeared they falsely would be attributed to the material, and not to the terrain, which would be misleading.

To anticipate on the requirements of the future Building Codes the design of that building will conform to the New Zealand Standards, for these standards are among the most restrictive existing codes in the world. However, in as much as the building will also make recourse to Adobe it may make use of the Peruvian Building Code, which resembles more closely what the future Moroccan code might probably look like. The Ministry will exceptionally give the contractor a waiver of the *Garantie Decenale,* (the legal ten year warranty of the construction).

The building should in part be accessible to the public, and should not be, as it happens too often, a mimicking of traditional architecture. On the contrary it should be designed in a clearly contemporary style, for it is crucial to demonstrate that earthen material is neither the material of the poor nor is it that of the past. Two or three good architects with consistent backgrounds and experience in earthen architecture should be invited to a competition for the design of that building, (eg., Bocara, and E. Mouyal)

1-2- Research phases, and International experience, learning from the Peruvian case.

The research proposal can benefit from the Peruvian and other international experiences. This can be done in two senses. Directly by making use of the results of the Peruvian and International scientific research in the Moroccan field. Indirectly, this will allow to shorten the duration of the research and of the implementation of its results.

In Peru, as in many other countries, after the two earthquakes of 1970 and 1974, there has been a strong reaction against earthen construction. Luckily, however, almost immediately the Academic community became invested in the debates about earthen construction. This is reminiscent to what is happening now in Morocco, which is witnessed by this workshop. Thanks to the insistence of the Academic community the Ministry of Housing became involved, and created the *Institute of Housing Research.* The research program of that Institute was not

devoted only to earthen construction, but it also dealt with concrete, wood, and steel. As Claudia Cancino showed to us the research of the Institute was conducted in four phases:

-Research on architectural typologies and traditional construction techniques, which consisted in the making of inventories, and the analysis of all available data on housing.

-Proposals for the stabilization of existing buildings typologies. The proposals were made mainly by engineers.

-Testing of the proposals in the Catolica University facilities.

-Writing of the first Code proposal, which was adopted as an addendum to the National Building Code. This document, which dealt with Adobe and Cob, (Torchis), consisted mainly in simple specifications for the soil, composition of materials, height to width ratio, simple calculations for load bearing... It is only in the beginning of 1990 that the addendum was promoted to a full code status, and adopted as a chapter of the National Building Codes.

The Peruvian experience took 20 years to write the code and to fully implement it. In the case of Morocco the process can be faster, and capitalizing on that experience the four steps research of Peru can be shortened. Indeed, given the fact that there is a wealth of information and inventories of Moroccan architectural typologies and construction techniques, and given the fact that there is, in the world, an important amount of technical data on how to improve the seismic performance of traditional constructions it is possible to merge the first two steps. **Thus the "Research on architectural typologies and traditional construction techniques," and "Making proposals for the stabilization of the buildings typologies" can be merged in one phase. This phase will be the subject of the next Workshop.**

1-3-Improving/imagining new building typologies in harmony with the current social and spatial changes

The analysis of the existing data about housing typologies indicates that, at least in some regions of Morocco such as the Southern Oases, architectural typologies are changing. People are moving out of the traditional settlements,

and dwellings are changing. This evolution and process of change are un-containable and irrepressible, and contribute to the creation of new architectural typologies. These new typologies ought to be clearly defined, and because the process of change is still very much ongoing it is crucial to research the ways of this change and the probable forms to which it is leading. Because making proposals for the seismic stabilisation of architectural typologies that are likely to be abandoned in the very near future, or are already abandoned would be a waste of time and money it is of the utmost importance to define the types still in use, and propose innovative improvements (formal, structural and esthetic), to the new typologies. To spare time and energy only these typologies should be taken into account in the proposals for the stabilisation of buildings.

1-4-Training of architects, engineers, masons, and the population

An effective implementation of Building Codes is necessarily based on the training of the building professionals. In Peru, after the four research phases, the phase of implementation begun with the addition to the Academic Curricula of Architectural Schools (and even some Engineering Schools) of required courses on earthen construction and the related building codes. Parallel to the training of architects and engineers the Institute of Housing Research developed manuals to teach masons and people how to build with seismic safety with Adobe.

These manuals written in a simple style make use of images and explain in very simple ways how to make good Adobe, how to connect buildings elements, how to build good foundations, good walls… The Getty will send to the ENA samples of these manuals, which should be used as a basis for the writing of similar ones in Morocco.

1-5-Valorising the potential of an International Impact

The Peruvian experience had an important international impact. The building codes of Peru first had an impact in Mexico, later in neighbouring countries. It also had an impact in the US and other countries, (India…), through the Getty Conservation Institute. In our Moroccan case, the writing and adoption of a building code for earthen construction will as well surely have an

International impact, prominently in the Maghreb and the Arab world. It is wise to prepare for that impact and to imagine ways of helping other countries facing the challenges we are facing now.

1-6-What kind of tests should we conduct?

The tests to be conducted in the project should not replicate tests already done elsewhere, and they should be conceived in the most economical way. The tests of the proposals of strengthening buildings should start first by a characterization of the materials. One of the best ways to do this consists in taking samples of materials from existing buildings, and from damaged buildings as well, for instance in the region of Al-Hoceima, and study them. This is a very effective way of studying construction, especially for codes. Because it gives simple means of knowing not the theoretical qualities of the materials, but the effective ones in real buildings, which is the basis of any attempt of improvement of the materials qualities, (Mosalam).

This position was balanced by other participants who argued that testing samples of materials of buildings (whether these have been damaged by an earthquake or not), should not the study of social aspects of building cultures, but a complement to that study, for any good policy of implementation of building codes must be built upon a good knowledge of all aspects of the activity of building, (Garnier, Guillaud) . Furthermore to write building codes one has to focus on two concepts: 1- the strength of the materials, 2-the stability of the building. The design of safer buildings depends not only on the qualities of the materials but also on the way the buildings are built, (Cancino) and this has to do with formal, cultural, social, political and aesthetic factors.

The issue of stability has to do with testing larger systems: connections of elements, that is to say how things are tied together. But if there is a large amount of research on the stability problems (Peru, GSAP), that can be used here tests on local materials should be done. Still structural tests should be conducted, and given the nature of earthen material the smaller elements to be tested should be something “like a room”, (Cherrabi). Indeed the study of the behaviour of earthen buildings is a system problem. Whereas for reinforced concrete or steel

construction one can study the column, the beam, and the joint for earthen building you must study the whole system, that is one need to study bigger units. Most importantly we should keep in mind that many tests have been conducted elsewhere, and that we should make use of them and conduct only the tests that are strictly necessary. We should think of making a great use of computational simulation instead, (Mosalam).

1-7- How to deal with the *Garantie Decenale,* (the legal ten year warranty issue)?

One of the utmost policy issues discussed in the workshop was the question of liability, commonly called in Morocco *La Garantie Decenale* (the ten year warranty of the buildings that a contractor has to legally provide his clients with). It was clearly argued that **whenever a building code is implemented there ought to be an experimental period during which the traditional requirements of liability are waived. In the case of Morocco this period may last up to four or five years from the implementation of the law during which the State will not require the contractors to provide the *Garantie Decenale,*** (Comerio).

As for the case of the experimental building to build in Errachidia the Ministry will exceptionally give the contractor a waiver of the *Garantie Decenale*. The case of *Le Domaine de la Terre* in l'Isle d'Abeau, France can set the model for us. In that case CRATerre wrote a special *"Document de Reference"* for the project which was used as a legal basis by the French State, the public institutions and the contractors. In the Moroccan case the document written by CRATerre in 1987 for the *ERAC of Tensift* may be used in a similar way, or at least as a starting point, (Guillaud).

1-8- Retrofits of existing buildings, Learning from California.

In as much as life safety from seismic hazard is a civic right it is necessary to upgrade the seismic performances of the stock of all existing buildings, (Bouhouche). This is issue has two aspects. The first concerns ordinary buildings, and the second historical buildings. In that respect the US case is interesting. In the 1980s to preserve historic buildings the American government used taxes

incentives. These incentives were rather substantial. In California which is a highly seismic zone this quickly came to how to address the seismic issue. There was a conflict between architects of preservation, who wanted to protect the qualities of historic buildings, and building officials who wanted to enforce traditional seismic building codes on all cases, including historic buildings too. Standard seismic codes were in fact causing much damage to historic buildings. Examples were given of historic buildings all over California which showed that, after standard retrofitting, the buildings were weaker than in the original state. In other cases the historical qualities of monuments was destroyed, for instance, by the addition of entire new walls. That conflict was the beginning of a process of negotiations between architects of preservation, engineers, and building officials. It is interesting to note that the group that brought them together to the negotiating table was the National Park Service, which had a lot of historic buildings and was at loss in the conflict. So it is only in the early 1990 that California had the first draft of a Historic Building Codes, and a few years later, (about 1995), that code moved to a full Codes Status. Here too it is important to note that the making of a code took a long time, about 15 years. **In the Moroccan case the writing a Historic Building Codes should involve all the professional groups, building officials, the Ministry of Cultural Affairs, and could be inspired by the California Historic Building Codes.**

The second facet of the issue of upgrading the seismic performance of existing buildings has to do with availability of the techniques, the expertise, the cost and the importance of ownership status. In the case of Morocco**, for the traditional housing sector, one solution could be the writing of Guidelines for safety and strengthening of existing buildings which can give guidance to the people on how to strengthen their buildings when doing ordinary maintenance.**

1-9- Phases for the research proposal.

Because of the locally widespread lack of knowledge of the Earthquake Engineering of Earthen Construction, and of all the policy issues brought to the discussion table by the representatives of the Ministry of Infrastructures all the

participants agreed on the organization and phasing of the research proposal as follows:

1-Scientific and technical feasibility of a seismic building code for earthen construction.

2-Research on architectural typologies, building cultures, and proposals for strengthening new buildings.

3-Tests of specific applications for local materials and for specific strengthening devices.

4-Writing of a draft of a code for earthen and traditional construction.

5- Guidelines for strengthening (retrofitting) existing buildings.

6-Implementation: Training, and Information

1-10- Suggestions concerning Presentations in the next meeting

Here are a few themes that need to be addressed during our next meeting. It goes without saying that this is not a limitative listing:

-What is the philosophy of the existing Moroccan building codes, (RPS2000)?

-Defining the traditional architectural typologies still in use, and propose innovative improvements to the new ones.

-What are the main features of local Building culture?

-What kind of cooperation can we develop with other research centres like those of Peru and Iran?

1-11-Next Meeting: Second International Workshop, Dec. 2005.

There was general agreement on the need to organize a second International Workshop. The second workshop will take place in Rabat around 20-25 December 2005. This meeting will be devoted mainly to the discussion of the architectural typologies, the related building culture, and to making proposals for the stabilization of the buildings typologies. The Moroccan team should be prepared to do most of the research on these subjects in the preparation for that workshop.

1-12-Composition of the International Scientific Board and the GCI contribution

To fully benefit from International expertise in the field the group decided to include in the International Scientific Board Prof. Julio Vargas from Peru. Dr Mel Green who generously contributed material to the workshop but could not actually attend the meeting is also a permanent member of the *I S Board,* and is expected to attend the December workshop. To make that possible, and to allow all the IS Board members to effectively attend the next meeting the Getty Conservation Institute offered to cover the expenses of participants coming from the Americas. The expenses of the colleagues from CRATerre will be paid as it was before, through the ENA-EAG program of cooperation.

2- Abstracts of communications

RECOVERY ISSUES IN THE HOUSING SECTOR

This paper includes excerpts from "Designing for Disasters" by Mary C. Comerio in *Cities for the New Millenium*, edited by Marcial Echenique and Andrew Saint, Spon Press, London, 2001; and from *Disaster Hits Home: New Policy for Urban Housing Recovery*, by Mary C. Comerio, University of California Press, Berkeley, 1998.

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Whenever an earthquake, hurricane, or major flood unleashes its fury, housing is typically hardest hit, representing ninety percent of the buildings damaged and fifty percent of the value of damage. The social upheaval in temporary sheltering and the financial burden of reconstruction are often beyond the capacity of most aid organizations and governments. Our understanding of housing loss and recovery in the months and years following a major urban disaster have changed substantially in the past decade. In the United States, disasters hit three major cites, San Francisco, Miami, and Los Angeles, overwhelming traditional government recovery programs, and pushing insurers to insolvency. Similarly, the government of Japan was unprepared for the losses in Kobe, as were the governments in Turkey and Taiwan in recent earthquakes.

These experiences have demonstrated three fundamental differences in the way we now evaluate losses and plan for post-disaster recovery. First, we now understand that we have systematically undercounted housing losses in past disasters and this affects our loss projections for future events. Second, future losses in earthquakes and hurricanes will continue to inflict major economic losses, and the burden of recovery has shifted away from insurance and onto the individual victims, charities, and governments. Third, the visibility of disasters through the media will assure that government response will be highly politicized. Societal expectations for public financial assistance will grow, even as governments and charitable aid organizations acknowledge the limits of their capacity to fund recovery.

Key Elements in a Comprehensive Theory of Disaster Recovery

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Research from sociology, anthropology, economics, and public policy over the past three decades points to “jobs” and “housing” as the key elements of disaster recovery for individuals or families. Individuals and communities struck by an earthquake, hurricane, or other calamity cannot “return to normal” unless people have means of supporting themselves and places to live. However, for the community, normalcy also requires that “community services” such as roads, bridges, and the utility infrastructure be functional, schools, health care and social services be available, and banks, businesses and governments are functioning. The way in which recovery is defined, and the metrics used to evaluate success or failure are critical to the kinds of assistance policies governments devise. In order to establish a comprehensive theory of disaster recovery, this paper will evaluate two definitions of recovery: first, the return to pre-event status-quo; and second, the replacement and renewal of facilities and services. In addition, this paper will discuss the influence that recovery metrics have on disaster assistance policies.

Recent Research on Masonry Structures at UC-Berkeley

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Research objectives

Develop a benchmark shake-table experiment for validation of new experimental techniques and computational models

- Develop a new experimental technique for testing hybrid structural systems
- Multiple physical sub-structures with different properties (bare versus URM infilled RC frames) tested simultaneously (could be at different locations)
- Mixed variable (force & displacement control) pseudo-dynamic formulation based on relative stiffness of sub-structures or change of stiffness in the same sub-structure
- Replacing physical modeling with a simulated model of one or more substructures,

e.g. the connecting floor slab

- Develop reliable computational models for unreinforced masonry infill walls
- Investigate and model the collapse mechanisms of infilled frames
- Develop retrofit techniques for masonry infill walls

NEES

NEES Goal

The George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) provides a national resource that will shift the emphasis of earthquake engineering research from current reliance on physical testing to integrated experimentation, computation, theory, databases, and model-based simulation.

NEES Overview

As a national resource, NEES includes 16 major earthquakeengineering experimental research equipment installationsnetworked through the high performance Internet.

Initially through 2004, NEES will include equipment sitesfunded through NSF program solicitations. NSF envisionsthat other globally significant earthquake engineering equipment sites will participate in NEES and bring in unique experimental capabilities.

NEES was completely developed by September 30, 2004 and will be operational through September 30, 2014 to perform many objectives.

Seismic Rehabilitation of Mission San Gabriel
San Gabriel, California

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Background

San Gabriel Mission was founded in 1771. The present church was begun around 1791 and not completed until about 1800. Over the years, the site has included numerous buildings. In addition to a series of churches and chapels, including quarters for the padres, quarters for the mission Indians, various agricultural buildings, a hospital, a school, a cemetery, and a kitchen building.

Many of these no longer exist. All of the building have sustained some changes over time.

The building was documented by Historic American Buildings Survey (HABS) in 1937. The drawings in this text are excerpted from the HABS drawings.

This paper describes the seismic rehabilitation and restoration of two structures: the church and the adjacent adobe rectory(museum).

The buildings are among the most important in the region. The church in particular is of national, perhaps even international, importance. It is one of the oldest extant buildings in California and was one of the most prominent buildings in the history of the state. According to early sources, Mission San Gabriel was one of the most important resources aiding the Spanish conquest of California. Thus, the buildings are associated with historical events which changed the history of the region. The church, including the campanario, is of primary historical and architectural significance on at least a national level.

The rectory is of primary architectural significance on at least a state level.

Mission San Gabriel is one of the few relatively unaltered missions remaining in California. The mission complex consists of two primary structures; the church and the adobe museum. Two areas included within the church are actually independent structures. One is a baptistery, located contiguous to the north side of the building; the other, a sacristy and campanario, is within the plan of the church but has a different roof construction. These are discussed later in this paper.

Preservation Approach

Our office's approach is that we are stewards of the past. No unnecessary changes are to be made in the process of repair and rehabilitation. In this role our goal is to repair the previous earthquake damage, strengthen the structure to resist future earthquakes and to do enough repainting and repairs so the building is clean and fresh, with paint and trim restored with the historic paint and materials touched up.

Summary

The restoration work for Mission San Gabriel illustrates that seismic safety can be achieved using state of the art techniques without damage or loss of historic materials and integrity.

Architectures rurales du Rif

M. BENELKHADIR et A. LAHBABI

I/ introduction :

L'étude de ces architectures date de 1985 ; elle était générale puisqu'elle traitait des dimensions aussi bien techniques que socio-économiques qui généraient ces architectures ; Cependant pour rester dans le périmètre d'étude assigné à la rencontre du 10/05/2005, l'accent est mis sur les aspects techniques (modèles élaborés, leurs enveloppes générales, leurs systèmes constructifs).

II/ Sommaire de ce qui a été exposé :

1) Sur le plan architectural, trois sous-régions peuvent être distinguées dans l'ensemble Rifain :

A- Le Pré-Rif (dans le triangle Fès-Taza-Ouezzane)

B- Le Rif central (Ouezzane-Chaouen-Aknoul)

C- Le Rif oriental (cote Méditerranéenne-AlHoceima-Nador).

2) Cependant dans ces 3 sous-régions, **des constantes** sont observées ; ce sont :

A- Présence de villes (secteur médina ancien – secteur époque coloniale relativement structuré – secteur Post-Colonial à urbanisation non contrôlée)

B- Présence de groupements d'habitat le long des axes routiers, selon un schéma-type.

C- .. de Douars et de Dchars (compacts, lâches, habitat dispersé).

D- L'habitat est considéré comme un simple abri contre le chaud, le froid, l'humide. Ce n'est pas un lieu d'investissement matériel ou moral.

E- D'une manière générale, les composantes de l'habitat sont :

a) Un corps principal (chambres, séjour),

b) Des dépendances,

c) 1 aire de service (pour activités domestiques), à l'air libre,

d) Un prolongement extérieur (grande terrasse),

F- Sur le plan conceptuel, l'organisation d'une habitation se fait autour d'un patio :

a) largement ouvert dans le Pré-Rif

b) couvert au Rif central

c) extrêmement réduit (lanternau) au Rif oriental.

G- Le système constructif est dicté par :

a) Des matériaux disponibles : terre (murs et couverture) – pierre (fondations) – bois (charpente) – le zinc, le roseau, des branchages d'arbres (couverture).

b) Les difficultés de leur utilisation : la raréfaction du bois, la vulnérabilité au feu des habitations, les problèmes de maintenance du pisé sous l'action de l'eau.

c) Les conditions sociales et culturelles de leur usage : connotations négatives face aux matériaux «modernes » tels le béton.

d) Un certain savoir faire.

3) Les catégories formelles rencontrées dans l'ensemble Rifain (voir Diapos)

A- Au Pré-Rif : à l'intérieur de cette sous-régions, trois catégories de formes sont relevées :

a) La maison **Hyayna** à dominante d'argile (aussi bien dans la structure que dans la couverture) très intégrée au site.

b) La maison **Tsoul** à dominante de pierre (mur et couverture).

c) La maison de **Louargha** à couverture en zinc.

B- A Rif Central : pays à écologie très dégradée et au climat montagnard, cette sous-région offre, elle aussi, des catégories très différenciées et toutes couvertes en zinc ; se sont

a) La maison **compacte**, ancêtre de la **chaumière paysanne** ancienne, ayant une enveloppe généralement carrée.

b) La maison à **galerie périphérique**, rectangulaire, assez élancée, faisant largement appel au bois ; elle est composée d'un rez-de-chaussée destinée aux

bêtes et d'un étage pour l'habitant, comportant plusieurs chambres de part et d'autre d'un couloir central.

c) La maison à **N'beh** caractérisée par la présence d'une loggia exposée à la bonne orientation, et par le coté massif de ses éléments de structure en argile.

Dans cette sous région du Rif Central, l'effet marquant des architectures rencontrées réside dans l'usage très répondu du zinc en couverture et en bardage sur les parois verticales des constructions ; pleinement maîtrisé, cet usage a débouché sur une véritable esthétique propre à la sous région.

C- Au Rif oriental

Pays de plaines et de bassins, de populations hétérogènes à sédentarité ancienne, le Rif oriental offre une image très spécifique de l'établissement humain habité, où domaine l'effet mitage (l'habitat très dispersé). Les types d'habitations rencontrées sont :

a) la maison **paysanne originelle** conçue en U autour d'un patio, construite en pierre (avec de grands liserés en plâtre autour des ouvertures) et couverte par une charpente en bois.

b) La maison **paysanne récente** qui selon le même schéma est couverte en zinc ou en béton ; elle présente aussi certaines particularités telles le remplacement du patio par un simple lanternau, l'aménagement d'une galerie extérieure sur sa façade d'entrée à usages multiples, et sur le plan constructif, l'utilisation de poutrelles (briques céramiques jointes par armatures en fer) et de dalettes préfabriquées en ciment dans le plancher de couverture.

c) L'économie régionale, qui ne satisfait pas les besoins des populations et les pousse à l'émigration, a conduit celles parmi ces populations qui retournent au pays, a élaborer une nouvelle catégorie formelle : **la maison de l'émigré**, qui empreinte aux modèles des centres ruraux et des villes limitrophes, aussi bien la conception d'ensemble de l'habitation (rez-de-chaussée et étage autour d'un patio couvert), que son système constructif (structure en béton, parois de remplissage en briques céramiques, couverture en dalle sur hourdis et poutrelles, mosaïque sur les sols, menuiseries et ferronneries selon les standards urbains, décors sur façades etc).

Séisme d'Al Hoceima : Description des désordres dans les structures en béton

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French version :

Le séisme qui a frappé la ville d'Al Hoceima, dans le Nord du Maroc, en date du 24 février 2004 à 2h27, a fait 628 morts et 929 blessés. Il a laissé dans la rue 15320 sans abris et détruit 2539 maisons de type traditionnel et réglementaire.
L'arrivée sur les lieux d'équipes d'experts, ingénieurs, architectes, médecins, etc… ont trouvé une population en plein désarroi, avec les services de proximité en panne (écoles, marchés, etc.) et une grande peur de l'espace construit.
Le séisme est de magnitude 6.2 sur l'échelle de Richter, l'épicentre situé dans la vallée de l'Oued Guiss, au niveau des agglomérations limitrophes d'Ajdir et d'Imzouren, elles-mêmes très touchées.
Il s'agit d'un séisme dû à l'une des nombreuses failles traversant la région, mises en évidence par les travaux du Pr Aït Brahim. La faille a joué sur une trentaine de km, partant de la mer méditerranée jusqu'au niveau du hameau d'Aït Kamra en direction de l'Ouest.
Les destructions des constructions armées, pour un terrain donné, sont d'autant plus prononcées qu'elles sont situées près de la vallée de l'Oued Guiss, qui matérialise la faille en question. Les constructions dans les villages d'Ajdir et d'Imzouren, situés de part et d'autre de la faille, sont d'autant plus touchées qu'elles sont plus élancées (phénomène de résonance entre la structure et le sol). Cependant, les observations semblent montrer que des erreurs de conception, de choix de matériaux, et des surélévations non réglementaires ont également été à l'origine de certains désordres et d'effondrement spectaculaires.

Al Hoceima earthquake : Concrete structures failure description

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The Al Hoceima earthquake, in the North Morocco, occurring on February 24, at 2 27 am, result in 628 dead and 929 injured. He also caused 15320 homeless and damaged 2539 housings both traditional and reinforced concrete.
Experts, engineers, physicians staff attending the area found disappointed families, with unavailable community services as schools, markets, etc. with huge fair in living inside built housing.
Richter earthquake magnitude was 6.2, epicenter localization found in the Guiss river valley, between Ajdir and Imzouren nearby and so damaged villages.
Earthquake is a consequence of one of the so numerous geological faults cutting the area, and already studied by Pr Aït Brahim. The concerning fault has moved over 30 km long, from the Mediterranean Sea to Aït Kamra village, to the West direction.

Reinforced concrete housing, for the same foundation soil, are more damaged when close to the Guiss fault valley. Ajdir and Imzouren reinforced concrete Constructions, situated opposite to each other across the seismic fault, are more failed when higher (soil-structure resonance phenomena). However, it seems that luck of adequate designing and construction material supply, so as unauthorized afterwards height raise are also factors explaining some important construction failures observed.

Traditional and Contemporary architectural typologies of the Moroccan South,

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Rabat

The aim of this paper is to describe the evolution of the architectural typology of housing in the Southern Valleys of Morocco, and to discuss the social factors that determine this evolution. It also tries to show that this evolution led to the creation of a diversity of types, ranging from and including the original Qasba, to the Ecochard housing unit (so called *habitat économique*).

Starting from my own observation in the field, and from a limited but interesting literature, I attempt to show that this evolution started very early, perhaps with the building of home in the midst of the cultivated gardens in the nineteenth century. As D. Jacques-Meunié has shown in her *Architectures and Habitats du Dadès*, (Librairie Klincksieck, Paris, 1962), very early powerful families started leaving the Ksars, the collective settlements, and settled outside, either just next to these Ksars, or in the gardens (on agricultural land). Designed as improved and fortified garden-houses, the first Qasbas, or *small castles*, were single family homes with or without patio depending on the altitude of the site. In the first half of the twentieth century, around 1920-30, the typology of Qasbas with patio was abandoned in favour of an urban typology, that of Marrakesh Riyads, or houses with a large internal garden.

Because of the safety and more freedom of nowadays, the move outside the collective settlements was accelerated after independence, in particular in the 1980s. Much of the Ksars of the region are now being abandoned and people are dwelling outside, on a completely different urban design basis. Seeking more spacious housing, most families are leaving the overcrowded old settlements. An outspoken longing for "freedom" is driving everyone out of the traditional housing forms. More strikingly traditional housing and even traditional materials are identified with the old way of life, the overcrowded homes, and lack of freedom that resulted from living with the extended family in constricted spaces. Whereas the traditional agricultural way of life in the region was organized around a time partition, with day time in the gardens, and night time at home, the shift from an agricultural economy to a migration economy put an end to the importance of gardening. In the new context old housing forms are no more perceived as shelters for night time and hard times, but as oppressive "family prisons."

Going out of the Ksars, near the road and public services, whatever little these services may appear to us, has become the driving force of the settlements and townscape of the region. With the new urban and village fabric the housing typologies changed too for the better and for the worst.

3- Planning of the workshop

Although there were some slight changes in the organization of the workshop all the goals of the workshop were met. Thus the official opening session was delayed to the afternoon of Tuesday May 10, 2005. During that session Mr Karim GHELLAB, Minister of Infrastructures and Transportations gave a speech in which he stressed his support and that of the Moroccan Government of the research and the aims of the workshop.
The workshop was organized as follows:

May 10th,
9: 30 - 12:00 am
Opening:
- Mohammed Hamdouni Alami introduces the participants and the project
- Khalid Mosalam: 1-The NEES Initiative
2-Recent Experiments on Reinforced Frames with Concrete Masonry Infill.
-Discussion.

12:30
Lunch break all together

14:45
Presentation on the architectural typologies of the Region of Al-Hoceima by Mohammed Benelkhadir (architect, former president of the Moroccan Association of Architects) and Lahbabi Abderrafih (co-authors of a recent study of architectural typologies in this region).

15:45
Allocution of Mr GHELLAB, Minister of Infrastructures and Transportation

16:00- Mary Comerio: Recovery Issues in the Housing Sector.

16:30
Pause cafe

16:45 -18:30
- Disaster report on al-Hoceima: Urban Housing by Prof. Sahli Mohamed,(earthquake engineering, Ecole Hassania)
- General discussion

May 11th

9:30-12:30
- Disaster report on al-Hoceima: Rural Housing by Prof. Salahane Ahmed,(earthquake engineering, Ecole Hassania)
-Presentation of the Research Proposal by Abdelkader Cherrabi.

- General discussion: Imagining a draft of building codes for the Al-Hoceima typology, (Brainstorming).

14:30-16:00
- Philippe Garnier: CRATerre experience in Bam, Iran
- Discussion.

16 :00
Pause café.

16 :30-1830
- Mohammed Hamdouni Alami, " Traditional and Contemporary architectural typologies of the Moroccan South"
- Stefania Pandolfo, "The cultural and historical logic of earthen architecture in the Moroccan South"
- General Discussion

May 12th

9:00 -12:30
- Mary Hardy: The Getty Conservation Institute, and the Getty Adobe Project.
-Claudia Cancino: The Peruvian Adobe Building Codes Experience and Regional Impacts.
-Philippe Garnier: Norms and standards of Earthen Materials
-Discussion of existing documentary materials.

14:30-17:00
Brainstorming:
Mohammed Hamdouni Alami, Moderator: Imagining a draft of building codes for earthen constructions in Morocco)

4- Listing of visited sites

May 13th

After breakfast, bus to Casablanca airport
Flight to Ouarzazate at *11:00*
Arrival *12:00*
15:00
Vist of Ksar Ait Ben Haddou
18:00
Visit of Kasbat Taourirt, Ouarzazate
19:00
Visit of the LPEE Labs in Ouarzazate.

Night in Berbere Palace, nice hotel in Ourzazate,

May 14th

9:00
Departure for Zagora.
12:00
Visit of Ksar Ouled Slimane
13:30
Visit of Tissergate of Zagora.
14:45
Arrival at theHotel in Zagora and check in.

16:00-20:00
-Visit of Beni Zouli, and Tarallal,
- Tour in the Gardens of Beni Zouli and Tinguedad
Night in Zagora (Hotel Tinzouline, or La Fibule).

May 15th

8:00-10:00
Visit of the Informal Housing Neighbourhoods of Zagora.
10:00-11:00
Visit of an earthen construction site in the outskirts of Zagora.
11:00
Departure for Ouarzazate
12:00
Stop at Tissergate of Agdez, and visit of the so called Self Built Tower (the unique stone monument of the Draa Valley).
13:30-15:00
Lunch in Ait Sawen, the departure for Skoura.
17:00-18:30
Visit of the Kasba of Ben Mouro (a renovated kasba, Hotel), and of the Kasba of Amridil.

19:015-20:30
Visit of Down Town Ouarzazate.
Night in Ouarzazate

May 16th

9:30
Departure for Telwet
12:00-14:00
Visit of the Kasba of Glaoui in Telwet.
14:00-15:30
Lunch and some shopping.
15:30
Departure for Ourzazate.
18:00-19:00
Visit of the School of Cinema of Ouarzazate.

5- Listing of participants

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