Fig. 1. Jalahma house. Image by the author.

THE TECHNICAL REVOLUTION IN BAHRAIN

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The so-called industrial revolution which took place in the 19thce had a large impact on the production processes in Europe and North America affecting the lifestyles of these societies to a great extent. It is however argued by many historians and researchers that there was no "revolution" per se but rather a mere acceleration of a process which has always been in constant evolution. This evolving "cloud" is referred to as the "technical complex".

However, in non-western countries, the process of modernization happened in a much less organic way since industrialization resulted from a shock between a growing global technological complex and regional traditional complexes. A "technical revolution" did occur in countries like Bahrain, for example, where the contrast between new techniques and local techniques was enormous. Construction techniques offer physical evidence of this "point of impact", through the hundreds of buildings and the specific urban fabric that resulted from the sudden transformations. Their observation reveal the necessity of a mature technical thinking prior to any significant innovation in a given society.

Keywords:
Bahrain – modernization – heritage – construction – traditional

1. INTRODUCTION: DEFINITION OF THE TECHNICAL COMPLEX AND ITS EVOLUTION

Contemporary societies are, more than ever, governed by their technical environment. Conventionally we consider that "modernity" replaced "tradition", through the "industrial revolution". But since the 70's, many historians started to better define what the technical environment is about.

In "le cheval de César" (Caesar's horse), Maurice Daumas (1991), one of the pioneers in the History of Techniques, introduces the term "technical complex", where "complex" means: "a group or system of different things that are linked in a close or complicated way"[1]. According to Daumas, there was no revolution. The technical complex, which was initiated in Pre-history with the invention of the first tool, is an ever growing "cloud" with different evolutionary cycles.

He further loosely identifies these cycles as follows: the primitive complex, the traditional complex, the classical complex and the technological complex. The classical complex is identified by Daumas as the one born out of massive industrialisation and the use of mechanics (mid 18th to early 20th century), before the discovery of electricity and the invention of electronics, which lead to the technological complex. He also notes that, while pre-technological complexes are mostly characterized by an "additive effect", meaning that a technical object is improved, evolved and rarely replaced by a totally new one, the transition to the technological complex is mostly about "replacement": e.g. the car has completely replaced the chariot, concrete is overwhelmingly used over other building techniques, etc…

Arguably, the classical complex is a moment in the evolutionary process where the technical environment was still rooted in Nature, with the human scale, and could still be apprehended empirically though being quite advanced. While increasing our comfort and improving our lifestyle, the inventions of the 20th century took us further away from natural processes; chemically created materials, such as plastics, being a perfect example In her book "l'Allégorie du Patrimoine, Francoise Shoay[2] (1999) advances the idea that the modern city is affecting our ability to express our inner "builder" competence, which she compares to the competence of language. In her opinion,

[1] *As defined by the Oxford dictionaries, https://en.oxforddictionaries.com/definition/complex.*

[2] *Françoise Choay (born 29 March 1925, Paris) is a French architectural and urban historian and theorist. Since 1973 she has been a professor at the University of Paris. She has also been a visiting professor at numerous universities in the United States, Belgium and Italy. Choay was awarded the Grand Prix national du Livre d'architecture in 1981 and 2007.*

[3] *Anne-Françoise Garçon is a historian, researcher and a professor of History of Techniques at Universite Paris 1, la Sorbonne. She received her Doctorate from the EHESS.*

this is the reason for modern society's yearning for "heritage". Dr. Anne-Françoise Garçon[3] further on recognizes the existence of "technical culture" by stating: "Technical cultures and habitus, just like the techniques themselves, take form and evolve through time"[4].

Whereas in western countries societies have at least benefited from a slow and somehow continuous evolution of techniques, which allowed for a progressive inception of new technical cultures, this is not the case with most non-western countries. During the 18th and 19th centuries AD, worldwide colonization lead to the expansion of the classical "cloud", which eventually collided with regional complexes, these being either still primitive or traditional. By early 20th century, some extreme cases gradually occurred, as Technology, spreading at a global level, came closer to regional/traditional complexes which, for one reason or another, had not yet been influenced by the classical complex.

The case of the Kingdom of Bahrain in the Persian Gulf is quite relevant, as there is a bleak contrast between the country's long history of a stagnating technical complex and the speed at which it "developed" in early 20th century.

2. BAHRAIN: A BRIEF DESCRIPTION

A small archipelago of a less than 800 km2 area, is situated off the western coast of the Persian Gulf. Bahrain's main island, also known as Bahrain, is generally flat and arid, with mild winters and humid and hot summers (up to 50° Celsius). However it benefits from strong winds coming from the North and its winter nights may reach 5° Celsius, with an average low of 14° Celsius.

Bahrain's history stretches over nearly 5000 years, since it was identified as the capital of the Dilmun civilization, which was contemporary to the Sumerian. By the end of the 3rd millennium BC Bahrain/Dilmun was a major exporter of pearls and a trading entrepot, benefiting from its strategic position on trade routes along the Indian Ocean. The archipelago also had an abundance of sweet water sources and oyster beds, rich with high-quality pearls in its Northern waters. It had a relatively shallow sea front which made it hard to invade. Bahrain was therefore ideal for sedentary settlements and the development of economic activities such as trade, pearling, intensive agriculture, fishing and boat building.

However, the country's' small size and isolation prevented it from being politically stable, with several regional powers such as the Achaemenids and the Greeks successively annexing the islands. In the 16th century it became a Portuguese colony, before falling again to Persia, then to Hormuz/Oman and finally becoming a British Protectorate in 1820, when it was subjugated to the East India Company. Throughout this history, the economic and technical background remained more or less the same.

In 1931 oil was discovered in Bahrain and the first oil extraction well on the Arabian side of the Persian Gulf, was installed in the middle of the main island by the Standard Oil Company of California. This triggered a complete transformation of the local economic system which lead to a dazzling urban and infrastructural growth, especially around the two main cities, Manama and Muharraq. Bahrain obtained its independence from the United Kingdom in 1971, first becoming a sovereign emirate and later a kingdom. By then it had completely "modernized" and integrated the global technological complex. The four decades between the 1920's and 1960's can roughly be identified as the "point of impact" or "transition" between the local traditional complex and the global technological one.

2. THE TRADITIONAL TECHNICAL COMPLEX IN BAHRAIN

Although agriculture and transit trade had always been thriving activities in Bahrain, the backbone of its economy, historically, was pearling, an activity which employed most of the population and highly influenced the socio-cultural system. In early 20th century the pearling economy reached a peak of prosperity due to the intensification of trade relations with India and Europe, before witnessing a series of slumps and virtually disappearing in the early 60's.

Pearling was central to the traditional complex since many other professions and specialties were developed or adapted as a support. Boat building for example, was a locally developed craft using mostly teak wood imported from India and locally made elements like metal nails and cotton sails.

[4] *"Les cultures et habitus techniques, tout comme la pensée opératoire, se construisent et évoluent dans le temps." From: L'imaginaire et la pensée technique, by Anne-Françoise Garçon.*

"The tradition of boat building has been passed on from generation to generation as a well-honored and respected profession" (Rudolff, 2010: 119).

Of the many 'dhow[5] construction yards which used to exist along the coasts of Manama and Muharraq, only one remains nowadays, thanks to special orders by the ruling family.

Pearling also relied on the cultivation of dates: Dates form part of the staple diet in Bahrain and are much used for the provisioning of the pearling fleet." (Belgrave, 1937: 36).

It is interesting to note that many techniques were "passive", in the sense that they did not require an extensive human intervention, since physical effort is extenuating in the hot and humid weather of Bahrain. Two major examples are date syrup[6] making techniques and weir fishing techniques[7].

The pearl fishing techniques themselves barely changed over the centuries. Their description by Ibn Battuta in 1325 AD could still apply in the early days of the 20th century AD[8] (Mahfouz, 2011).

The decline of the pearling economy came about in the early years of the "transition", due to the worldwide financial crisis and the Japanese cultured pearls[9] flooding the markets, a direct effect of the expanding global technological complex. It is quite interesting that, when the influence of international trade diminished during World War II, most locally resourced activities re-flourished momentarily[10].

In the annual report for the year 1363 HA (1944 AD), Charles Belgrave (1944: 11), the British counselor to the Emir of Bahrain at the time, explains that "there was still a demand for pearls and people engaged in the trade did well in the last two or three seasons" implying that the economy could have survived in spite of the devaluation of the pearl market. It seems that what brought the pearling economy to an end is the availability of other jobs, however temporary they were. Belgrave further on in the 1926-1937 administrative report (1937: 55) mentions: "At present, about five thousand divers are working in the oil field; they are making a great deal more money than they would normally make from diving (…) but this employment is not permanent and, when present construction works at the oil field s will be finished, there will be a sudden increase in unemployment (…)".

This preference for the "easy way out" typically represents the transition period. While it was impossible to perpetuate traditional activities, the lack of technical culture in the "classical" sense prevented the proper inception of technical thinking and its development locally. However, the imported technical object became a necessity, imposing its own logic on everyday life.

The architecture of the transition period is a physical testimony to the modernization process, where one can trace the increased use of industrial products in the traditional construction system. But we first need to understand what traditional architecture was about in Bahrain.

3. THE TRADITIONAL CONSTRUCTION TECHNIQUE IN BAHRAIN

3.1. TRADITIONAL HOUSE LAYOUT

In the years preceding the transition period Bahrain witnessed an unprecedented urban development,

[5] *Dhow is a lateen-rigged ship with one or two masts, used chiefly in the Arabian region.*

[6] *Date syrup is produced by storing date bags over a special draining floor system called Madbasa.*

[7] *Fishing traps were made of nets and pikes installed in the shallow waters in the form of a giant arrow. The system relies on the extensive tide movements to trap the fish. It is still being used today along the Bahraini coastline, although new fishing traps are prohibited due to them causing over-fishing.*

[8] *"Before diving the diver puts on his face a sort of tortoise-shell mask and a tortoiseshell clip on his nose, then he ties a rope round his waist and dives. The divers differ in their endurance under water, some of them being able to stay under for an hour or two hours or less. When he reaches the bottom of the sea he finds the shells there stuck in the sand between small stones. He pulls them out by hand or cuts them loose with a knife then puts them in a leather bag attached around his neck. When he starts being short on breath he pulls the rope, and the man holding the rope on the shore feels the movement and pulls him up into the boat. The bag is taken from him and the shells are opened. Inside them are found pieces of flesh which are cut out with a knife, and when they come into contact with the air solidify and turn into pearls (…)" (Mahfouz quoting Ibn Battuta, 2011, translated by the author).*

[9] *Belgrave on the end of pearling: "the decrease in the number of the men diving was not because the Nakhudas could not offer employment for divers, (…) there was still a demand for pearls and people engaged in the trade did well during the last two or three seasons" (p. 11 administrative report for the year 1926-1937).*

[10] *Belgrave describes the state of the weaving and tin ware as prosperous during WW2 (p.63 administrative report for the year 1926-1937).*

Fig. 2. View of Muharraq from the 1950's (estimate). Most houses were built around a courtyard. Image by Tarek Wali, private skies.

due to the thriving economy and political stability under the British Protectorate as well as the intensified exchange with other coastal cities of the Persian Gulf, mainly Bushehr. Large courtyard houses were sprawling across Manama and Muharraq in an incremental development with no prior planning. The basic unit/cell was a fenced plot with one or two rooms built on one side; then, as the family grew, expansions ensued and new rooms were constructed around the periphery of the plot ending up with the formation of a courtyard. Expansions were sometimes vertical but to a lesser extent since rarely were rooms added in the first floor and mostly in the corners of the plot, giving the house a fort-like appearance. As privacy for the house was of utmost importance, little attention was given to the design of the ground level façade on the street, which had small windows; the focus of decorations and visible woodwork was mainly in the upper rooms and inner courtyard.

3.2. TRADITIONAL MATERIALS

The main construction material was coral stone. Known locally as sea stone or hadjar al bahr, coral stone is a crystallized carbonate of lime, highly porous

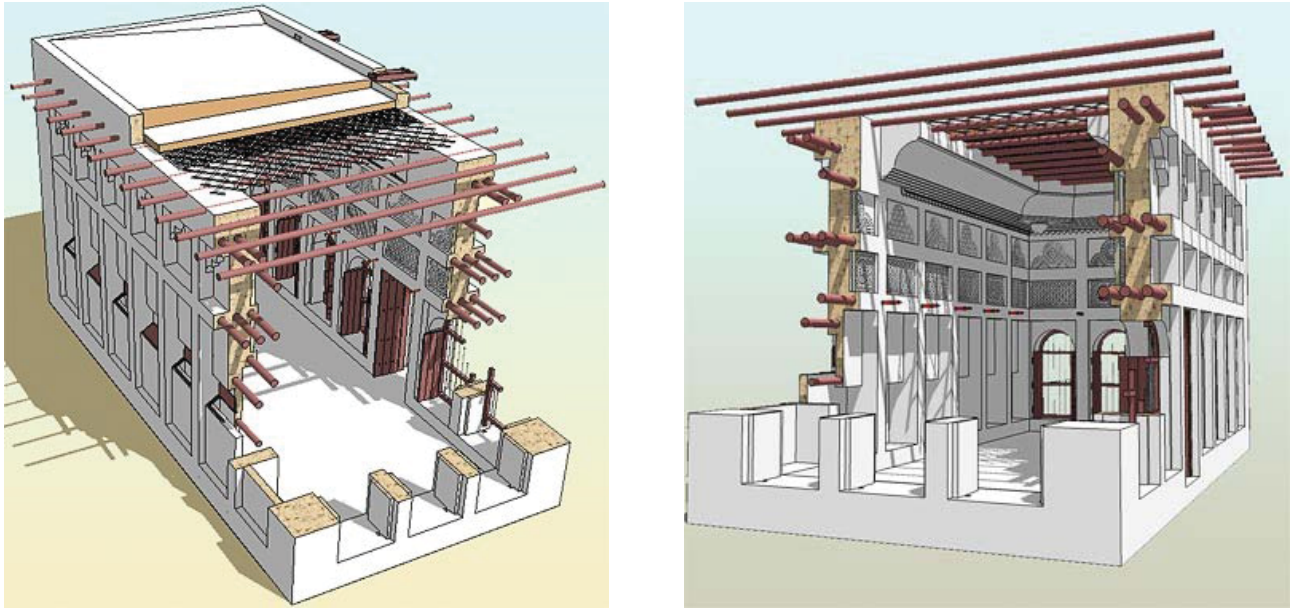

Fig. 3. Sketch of the traditional construction system showing a typical elaborately designed room. Image by http://catnaps.org/islamic/gulfarch3.html.

and salty. It was extracted from the shallow waters surrounding the islands and declined in several types of architectural elements: from the basic unit of an opus incertum wall to small gravel used for infill, to partition panels. Crushed coral stone may have also been used in mortar and plaster mixes which primarily contained gypsum. Coral stone in the form of thin 5 to 7 cm panels was called farsh or furoosh in plural, a regular bedrock stratum, quarried by driving wedges in strata and then levering with a claw bar. Besides coral stone, beams and tie beams were made out of either local palm tree trunks, cut in quarters, or mangrove poles (Danshal) imported from the Malabar Coast and East Africa. Other roof elements made of bamboo were also imported. Plaster and mortar were made out of lime, gypsum and other additives. Lime was produced locally by calcinating limestone from a quarry in the Aali area, gypsum was imported from Qatar and Arabia. Gypsum was also widely used for decorative panels, cornices etc…

Although most of these materials were not available on the small archipelago, the construction technique in Bahrain was nevertheless part of a regional complex, including India and Persia, which took shape centuries ago.

3.3. TRADITIONAL CONSTRUCTION SYSTEM

The traditional construction system was common to most cities of the Persian Gulf, and it developed as a response to the harsh local climate, optimizing the physical properties of the available materials. Ground floor rooms would have a double layer of opus incertum walls with a 15-20cm gap in between, filled with loose rubble and mortar, the total wall thickness reaching 50 to 70 cm. The porosity of coral stone was adequate for insulation from the cold winter nights and the hot summer days. For the same purpose, ground floor rooms would have very few, small windows. As coral stone has a low thermal capacity and the external gypsum plaster layer is of high reflectivity, the wall's heat absorption during the day was minimized.

Due, however, to the intense humidity, closed, hermetic rooms were inadequate for the hot summer nights. Thus the upper floor roofs and rooms were designed in a different way. Series of structural columns were built over the thick walls of the ground floor, with 70 to 90 cm gaps in between, which were treated in a variety of ways so as to maximize ventilation and lessen heat absorption. One way was to in-lay one layer of thin farsh panel in between the columns, since farsh lost its accumulated heat faster during the night. This created a series of niches on the external facade. A double layer of farsh panels ensured a better insulation thanks to the air gap in between. Another way was to create a wind catcher, locally known as badger, by laying two displaced farsh panels (rf. Illustration). Since wind speed increases when wind is funneled from a wider to a smaller aperture, badgeer creates a gentle breeze which is brought through to the sitting or sleeping levels. Badgeer were either installed in room walls or in roof parapets, as house occupants used to sleep on the roof during summer

Fig. 4. Sh. Salman House, a typical traditional house from the early stage. Image by Bahrain Authority for Culture and Antiquities.

nights. Badgeer were also made in the form of towers built on top of the most important rooms. They are very well described by Dr. John Yarwood[11], a British architect and author who thoroughly researched the remaining traditional architecture of Muharraq in the 1980's.

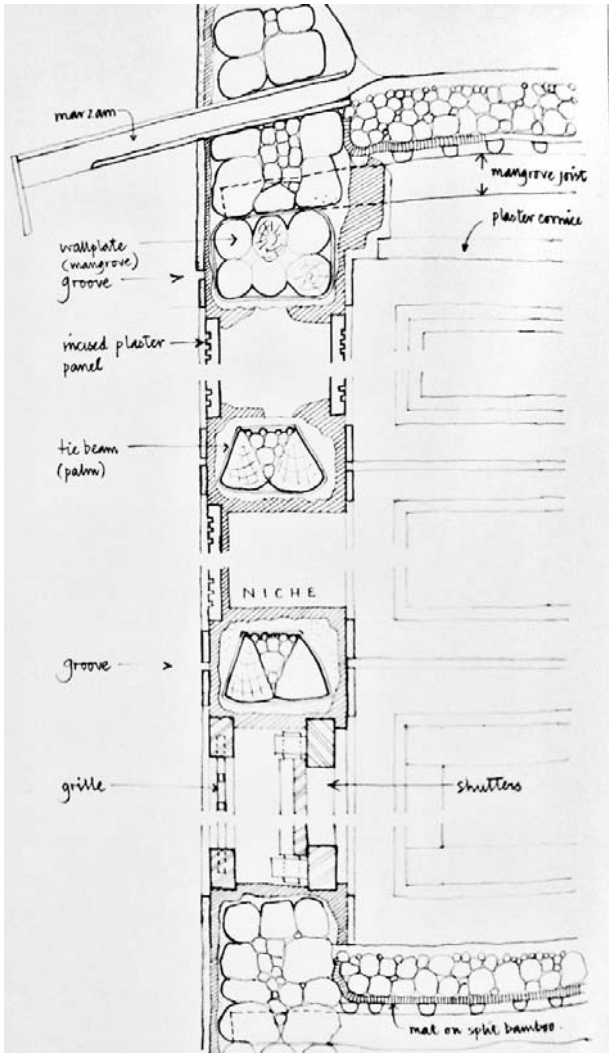

Fig. 5. Sketch of the traditional construction system. Image by John Yarwood (Yarwood, 2006).

[11] Wind towers are wind catchers in the form of a tower with wide openings on one or several of its sides. Wind towers in Bahrain were opened on all sides funnelling the air, wherever it came from, inside a specific room.

Fig. 6. Sh. Salman House, a typical traditional house from the early stage. Image by Bahrain Authority for Culture and Antiquities.

The space inbetween columns (70 to 90cm) would also be filled with wooden windows, equipped with shutters and stained glass to reduce glare and preserve privacy while allowing ventilation. As the ceilings were high, these windows would be narrow and tall. The shape and dimensions of the rooms themselves were adequate for cross ventilation, as the room's width never exceeded 3.5 to 4 meters. The typical first floor summer room of a large mansion would be equipped with a series of decorated windows on each of its four sides.

4. THE TRANSITION

In early 20th century, Bahrain became the focus of the British Agency in the Persian Gulf and consequently new construction elements and materials were being introduced in the country. In the administrative report of the years 1926-1937, Belgrave (1937: 54) describes the new constructions as being safer, with better foundations, and he remarks: "(…) cement and steel beams are universally used. A few years ago the use of steel beams was considered, locally, extremely dangerous."

The new construction methods were increasingly used to develop the country's infrastructure, building new facilities for the newly created public institutions and services such as schools, hospitals, post office etc… All this was taking place around the city centers which were quickly surrounded by large roads and reclaimed lands, thus losing their historical link with the sea. The core of those cities, was however changing at a much slower pace. The inception of modern techniques there was happening gradually and this is where the "transition" can be better observed.

4.1. INDUSTRIAL ELEMENTS AS STRUCTURAL SUPPORTS

It seems that at first industrial elements are used as a replacement for traditional elements in punctual alterations and/or additions to existing structures. The main concern is to resolve structural issues, provide wider spans, eliminate dividing walls etc… In Muharraq, many cases can be observed where steel I-beams were introduced instead of mangrove pole beams, especially in utilitarian buildings like commercial storage spaces and shops.

4.2. INDUSTRIAL ELEMENTS AS ALTERNATIVES

Longer lasting industrial products, cheaper in some cases and easier to install in others, were often used as alternatives to traditional ones when repairing parts of a house, consolidating a wall etc… As cement plaster appeared, many builders used it on external walls instead of lime plaster when renovating their facades, as an "upgrade". Portland cement was then used as mortar for coral stone in partial repairs or partial reconstructions and as screed to straighten floors and roofs. Cement was also used to build specific elements such as Madbasa[12] for example or as replacement for gypsum in some decorative elements, as is the case in the Siyadi Majlis building[13]. Decaying mangrove poles were often replaced by square beams. Thin, 10 cm block work was sometimes used to replace the furoush (thin coral stone panels) in parapets and wall

[12] *Madbasa is a date syrup production system where date bags are stored over channeled flooring allowing the syrup which sprawls from the dates under the effect of the heat to seep slowly through the channels and into a jar which is periodically collected.*

[13] *Siyadi majlis is one of the most prominent heritage houses in Muharraq today. It was inscribed on the World Heritage List in 2012 as a Property Component of the Pearling Testimony Site.*

Fig. 7. Steel beam system replacing the traditional danshal beams to enable wider openings. Image by Bahrain Authority for Culture and Antiquities.

niches, and at times the whole parapet was built with block work.

4.3. A NEW CONSTRUCTION SYSTEM

While the city's materiality was slowly changing, probably around the late 40's new constructions appeared, revolutionizing the existing construction system, taking fully into account the use of industrial elements and materials. By now the new elements were often dictating the proportions and dimensions of the building's layout. They are seen as a replacement of the traditional ones and no longer only as punctual "aids". There is more planning involved, more straight angles and more consistent dimensions, due to the abundant use of cement mortar and plaster. The walls and columns are finer, there are squarer shaped rooms since their dimensions are no longer dependent of the length of danshal beams.

The structural system is that of block masonry walls and beams/lintels made of reinforced concrete or square wooden beams. In most cases, block work simply replaces coral stone, meaning there is no vertical reinforcement and the whole wall is considered as

Fig. 8. Steel beam replacing a dividing wall in order to join two storage spaces together, in the Muharraq Suq. Image by Bahrain Authority for Culture and Antiquities.

Fig. 9. Shading element on a shop's façade clearly showing the traditional ceiling system. Image by Bahrain Authority for Culture and Antiquities.

load bearing. Furthermore, walls are sometimes built with a double layer of block work just like coral stone walls, with rotated blocks tying both sides together. In some cases though, coral stone is still used to build the wall but with Portland cement as mortar. Square wooden beams, being more reliable in their shape and dimensions than mangrove poles, are also easier to use for ceiling construction and plywood boards make a good replacement for the bamboo matt and stripes which had been used above the mangrove.

At this point it becomes clear that the tendency for replacement rather than improvement is taking over, just as Daumas had described it in the transition

Fig. 10. Basic traditional structural system used for warehouses. Image by Bahrain Authority for Culture and Antiquities.

Fig. 11. The new construction system using square wooden beams and ply-wood. Image by Bahrain Authority for Culture and Antiquities.

between the classical complex and the technological one.

4.4. APPEARANCE OF A DESIGN TYPOLOGY

With the construction technique liberated from the constraints of traditional materials, architectural style was affected accordingly, and since exchange with Persia and India was intensified under the British colonial banner, new designs were largely influenced by the colonial style, if not directly dictated by British representatives. One major example of this is the Bab al Bahrain building, designed by Charles Belgrave as a gateway to Manama in 1949 and practically crystallizing the Bahraini Capital as a "little Mumbai", since the monument was a clear reference to India Gate. A lot of new contractors were Indian or Persian; Belgrave mentions an "Indian contractor" as early as 1926 (Belgrave, 1937).

The distinctive change in the old urban centers concerns façade treatment. Privacy and climate seems to be less of a concern, faster and safer construction becoming the norm. In Muharraq and Manama a house typology occurs, where facades have large square windows on the ground floor and long shading cornices. The composition is now mostly horizontal rather than vertical, which is typical to the South Indian bungalow type. The windows themselves are made of steel, and have muntins, the most common window size being 120x120 cm. This greatly contrasts with the narrow/tall windows of the traditional architecture. Staircases appear as distinctive architectural features for the first time and their design has hints of the international style. This is when the influence of big contractors standardizing house construction becomes clear many houses actually bearing the "seal" of the contracting company.

However, despite these changes, the basic domestic unit was in most cases still centered around a courtyard, but the house was much more open on the public street. These new houses had conflicting characteristics of courtyard type and bungalow type constructions.

Fig. 12. Square beams extending to create a shading elements on the façade in a similar way to the traditional danshal beams. Image by Bahrain Authority for Culture and Antiquities.

4.5. REVERTING BACK TO TRADITIONAL FORMS AND SHAPES

Probably soon after the spread of these new typologies, there seems to have been attempts to reunite with tradition. Traditional architecture so far being one entity, was progressively seen as a "style", meaning an architectural language which is in its appearance similar to the traditional architecture but without its essence. Some façades were designed with rhythms of windows and niches, but since the construction system was completely different, the original capacity of these elements to adapt to the local climate was only partially achieved, if not at all.

Nevertheless, there seems to be a need to reconnect with a familiar "image"/"shape", one that forms the identity of the historic town. This is also clear in the design of some elements such as metal doors, which bear different kinds of decorative shapes and modular concrete blocks which make decorative patterns similar to those in traditional decorated gypsum panels. As time goes by reference to traditional architecture in modern architecture keeps becoming

Fig. 13. A typical house of the transitional period. Image by Bahrain Authority for Culture and Antiquities.

Fig. 14. A staircase volume. Image by Bahrain Authority for Culture and Antiquities.

Fig. 15. A typical steel window. Image by Bahrain Authority for Culture and Antiquities.

more and more related to mere shapes and less to function.

4.6. THE INCOMPATIBILITY OF NEW TECHNIQUES

While universal solutions are easy to apply and cheaper than what is custom made, modern materials usually proved to be highly incompatible with the local environment in Bahrain, where seawater is one of the most saline waters in the world (39000 to 42000ppm). In coastal areas of Bahrain, this seawater salinity is very high and since earlier foundations were not waterproofed, saline water is absorbed by the building walls. In the traditional construction system porous materials allowed the rising dampness to evaporate quickly, leading to little change in the humidity level inside t walls and foundations. When modern materials such as cement were used as plaster and mortar in buildings, or for street paving, evaporation was blocked and the variation in humidity levels inside the walls considerably weakened the structure and its foundations. In addition, salt accumulated behind the cement plaster, causing major flaking issues.
Furthermore, Portland cement is heavier than lime, adding much weight onto the coral stone masonry and ceilings, and its higher thermal capacity stores much heat which is diffused back during the night. Considering that August evening temperatures reach 30 degrees Celsius, this can create major discomfort. High temperatures and humidity also cause steel in reinforced concrete to expand and crack the concrete, not to mention the rusting I-beams.

With time, the techniques were certainly more or less adapted to these conditions in newly built structures, but not always conclusively. In a 2007 conference on concrete structures in the Gulf, a team of experts from Kuwait describes the cement concrete situation as follows: "Typically, one of the reasons speculated for such poor performance of concrete has been the use of international building codes of concrete practice such as ACI-3181, AS 36002, EuroCode3 and likewise. These codes catered more to their own countries of

Fig. 16. The contractor's signature. Image by Bahrain Authority for Culture and Antiquities.

Fig. 17. Series of niches and badgeer made of block work, the niches are only 5 cm deep. Image by Bahrain Authority for Culture and Antiquities.

origin. But when they are followed for the Gulf, their provisions fail to account for the harsh environmental conditions" (Al-Khaiat, 2007: 2).

5. CONCLUSION

While development was inevitable in Bahrain, the Gulf and elsewhere, the way it occurred is questionable. The global technological complex seems to have imposed its own sets of values which were completely incompatible with local realities, which were set aside and marginalized. Although the mix of techniques during the transition period was improper, it was still a period where the community was developing its own solutions, a short lived classical period. If changes were slower, if external factors had not created so much pressure for modernization, these new methods and materials might have possibly been integrated in the local technical culture.

Technical culture could be seen as the counterpoint to the purely scientific and programmatic aspect of technology. A sort of humanization of the endless possibilities offered by techniques. Today in the Persian Gulf, the intellectual and practical human capacity of defining and building places and cities is lost to an overwhelming dependency on technologies which provide comfort. Involving communities in deciding on the type of city they want to live in could be a first step in lessening this dependency. Conserving traditional urban patterns and spaces which were a direct produce of the human capacity of "building" can also help offer an alternative to living in

Fig. 18. A rare example of a wooden window with iron bars (traditional) mimicking the steel windows of the transitional style. Image by Bahrain Authority for Culture and Antiquities.

Fig. 19. Block work mimicking the traditional decorative screens in a staircase. Image by Bahrain Authority for Culture and Antiquities.

high-rises, which are majorly a produce of technology. Conservation in general could be seen as a part of this effort which sublimates its mere role of "memory keeper". But other complimentary disciplines might need to be developed in that same framework. On the long term, a certain dialectic, as opposed to the global technological rhetoric, needs to take place between society and technology, rational planning and human competence.

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