

A GRADUAL SYSTEMATIC MODEL AIMED AT THE INTEGRATION OF WET AREAS AND PLUMBING SYSTEMS IN THE CONTEXT OF TRADITIONAL HOME MODERNIZATION

Z.SEVGEN PERKER* and NILUFER AKINCITURK

Department of Architecture, Faculty of Engineering and Architecture, University of Uludağ, Görükle,
16059 Bursa, Turkey,

*E-mail address for correspondence: sevper@gmail.com

Abstract: *Traditional homes should be protected as a part of the global cultural heritage. As a country considerably rich in terms of the stock of traditional homes, Turkey underwent a rapid social change driven by the rapid increase in industrialization efforts since 1950s. In the said social change process, dwellers of traditional homes, whose requirements and demands rapidly changed, started to consider some conditions of living in their homes as negative. In most cases, the situation compels the dwellers of traditional homes, who regard the conditions inside such homes as insufficient particularly in terms of wet areas, to abandon the homes or to make physical and functional changes inside such homes without consulting any experts. In the process, there are dwellers who make the changes and reconstructions in accordance with related legal procedures, consulting related specialists and receiving project support. It has been observed, however, that multiple very different solutions are produced to problems of similar nature in applications of this kind and that no systematic approach is followed in the conversion of traditional homes to modern comfort requirements. This study aims to produce a systematic model for the integration of comfortable, healthy wet areas and plumbing systems to traditional homes.*

Key Words: *Gradual Systematic Model, Wet Areas, Plumbing Systems, Traditional Home, Modernization, Conservation*

INTRODUCTION

Traditional homes can be considered as the most important elements of material culture shaped in accordance with moral cultural elements such as beliefs, traditions, norms, worldview and family structure as well as application techniques, principles and conditions of the past, local availability of materials and regional data. Traditional homes are valuable historical, socio-cultural and architectural assets for all societies and should therefore be protected as a part of global cultural heritage (Figure 1).

As a country considerably rich in terms of the stock of traditional homes, Turkey underwent a rapid social change driven by the rapid increase in industrialization efforts since 1950s. Changing relations of production, technological innovations and differentiations that occurred in interpersonal relations network have had a direct impact on physical surroundings. This has made the impact on traditional homes located inside cities or close to urban areas inevitable. Traditional homes dwellers, whose requirements and demands rapidly changed, have been observed to have been unable to satisfy their needs and requirements and to start abandoning their homes. In the process, dwellers, who due to a variety of reasons were unable

to abandon their homes, have been observed to start changing the traditional homes both physically and functionally.

A number of academic studies conducted so far to address the issue of preservation of traditional homes have emphasized that such homes fail to match the new needs and expectations emerging as a result of social change and that efforts to preserve such homes would be impossible without adaptation of such homes to modern requirements. The preservation of traditional homes and their conversion to match the needs and requirements of today's dwellers firstly requires the integration into such traditional homes of modern and healthy wet areas and plumbing systems.

However, the practice of preservation of traditional homes and their modernization in Turkey often involves unauthorized efforts undertaken by the dweller without consulting any specialists. It has also been observed that in cases of conversion of homes supported by specialist consulting and undertaken in compliance with related legal procedures, solution recommendations have been developed for problems of similar nature that greatly differentiated among each other. In this context, the lack of a systematic approach to the issue has been observed in Turkey. Because of the lack of a systematic approach, the said homes, which are forced to bear a wet area and plumbing load in excess of their capacity, are observed to suffer from physical and visual harm in terms of material, structure and spatial organization. In this regard, the purpose of this study would be to recommend a systematic model that would offer guidance for the relocation of wet areas into home buildings and integration of modern plumbing systems into traditional homes.

WET AREA AND PLUMBING SYSTEM REQUIREMENTS IN TRADITIONAL HOMES

It is known that wet areas serving as an integral part of modern homes were not in use at the time of the original construction of traditional homes, which were originally constructed with each room set almost as a separate dwelling, which involved a lot of activities such as sitting, dining, sleeping, worshipping and receiving guests performed in the same room with bathing taking place in a bathing cubicle section (*gusülhane*) located in that room. Originally, the bathing activity was performed with water heated on a stove or oven, which was then put on a shelf inside the bathing cubicle and the whole bathing activity required carrying water. It is known that sewage was directed to flow into the garden through a single pipe. In the original construction of traditional homes, toilet spaces were generally located in the garden, courtyard or under the staircase facing the courtyard and kitchens were constructed in a courtyard corner as a separate building. The kitchen, which due to climate conditions and other reasons could sometimes be located on the ground floor of the house, could be equipped with tandoor, oven or stove for cooking food and baking bread, shelves to store dishes and pots and a meat safe to preserve cooked foods [1]. Originally, traditional homes were heated using chimneys or ovens. Electric wiring was not originally available in traditional homes and gas lamps were in use for lighting purposes.

Traditional homes are assets of historical, socio-cultural and architectural importance for our society and should be preserved. However, failure to match the newly emerged needs of the dwellers and inability to fit into modern use makes it more difficult to protect such homes and preserve them for future generations. Under the effect of social change, needs of the dwellers change, diversify and become more complex. Traditional homes are harmed by efforts of the dwellers to implement changes without consulting specialists in the field. However, continued occupation of the homes by the dwellers is a prerequisite for the preservation of traditional homes. Change is inevitable. However, rectifications and adjustments that are to be implemented to match current and future new needs and requirements will need to be conducted under specialist supervision. Efforts undertaken without sufficient expertise in the field might make it more difficult to preserve the original materials of traditional homes. As a matter of fact, the preservation of original materials is one of the prerequisites for the protection of the homes.

In most cases, efforts undertaken by the dwellers to integrate units and systems that could satisfy their emerging needs into their homes without consulting any specialists harm the homes. Among issues caused by efforts undertaken by the dwellers to adapt their traditional homes to modern requirements, the most noteworthy are wet areas that are unhealthy, uncomfortable and physically and visually incompatible with the home, frequent discharge of sewage directly to the street using plastic pipes, harm caused to construction materials and elements by water leaks as a result of improper plumbing of potable

water and sewage pipes, fire hazards posed by improperly insulated and combustible electric cables and visual pollution created by modern elements of wiring and plumbing, which prevent the proper perception of original architectural details and features (Figures 2, 3, 4, 5, and 6). Furthermore, it has been observed that very different solutions have been produced for problems of similar nature in reconstruction efforts conducted under expert supervision and no systematic approach has been followed in addressing the matter [2].

SATISFACTION OF WET AREA NEEDS AND PLUMBING SYSTEM INTEGRATION IN TRADITIONAL HOMES

A systematic model offered for the matching of wet area needs and plumbing system integration in traditional homes consists of six stages: satisfaction of the wet area needs, plumbing integration, wiring integration, heating system integration, air conditioning system integration and integration of fire alarm and extinguishing systems. Each stage has been subdivided into sub-stages. The systematic model of satisfaction of the wet area needs of traditional homes and plumbing system integration operates in compliance with a variety of principles at all of its stages. The systematic model recommended in the scope of the study has been provided in Figure 7. Each stage of the systematic model recommended in this part of the study is discussed separately. Furthermore, principles governing the implementation of each stage of the systematic model recommended in this part have also been provided.

Stage 1: Satisfaction of the Wet Area Need

Picking the right location is important in the satisfaction of the need to integrate wet areas into the house in the process of traditional home modernization. A prerequisite in the selection of proper location for the kitchen, bathroom and toilet is a good analysis of the current state of the traditional home.

The following aspects should be considered in the scope of the wet area analysis of the current state of a traditional home: whether or not wet areas are present inside the building, whether or not the current wet areas date back to the original construction, whether or not the current wet areas have sufficient space for modern use, whether or not wet areas consisting of subsequently constructed annexes damage the original structure of the building, its original elements, components and materials.

In the satisfaction of kitchen requirements of a traditional home, if the current original kitchen of the building is usable and suitable for the installation of new fittings in terms of the size and architectural characteristics, it should be stabilized and reinforced for further use as a kitchen. If it is, however, not capable of meeting the said requirements, its original properties should be preserved but not used as a kitchen. If an annex has been constructed as an addition to the original kitchen of the building, the annex should be dismantled if the original kitchen is sufficient. If the kitchen is insufficient, the annex should be assessed for possible architectural and structural inconveniences and stabilized and reinforced if convenient. In case of absence of a kitchen in the original plan of the home and subsequent addition of a section currently used as a kitchen, such annex should be assessed possible architectural and structural inconveniences and stabilized and reinforced if convenient or dismantled if inconvenient. If it is finally decided that the building needs kitchen space after the assessment of all such factors, ground floor space should be considered for conversion into a kitchen as a priority or space on any of the floors should be given consideration as an alternative if the space on the ground floor is unsuitable. Architectural characteristics, modern equipment requirements, relation to the living space, proximity to the entrance and desirably minimum setbacks in terms of equipment installation of the space intended for use as a kitchen should be carefully considered. The application should be conducted in a reversible manner with minimum or no damage to the original construction materials. In traditional homes without space suitable to serve as a kitchen, it can be recommended to construct an additional kitchen in the courtyard. In the construction of such an annex, however, no damage should be inflicted on the original façade, materials and elements of the building, connection with the main building should be well planned for comfortable

use and the annex should be constructed in a manner that would allow it to be distinguished from the traditional building as a modern-day structure [3].

In the satisfaction of the bathroom need of a traditional home, if the current original bathroom of the building is usable and suitable for the installation of new fittings in terms of the size and architectural characteristics, it should be stabilized and reinforced for further use as a bathroom. If it is, however, not capable of meeting the said requirements, its original properties should be preserved but not used as a bathroom. If a non-original bathroom is already available in the traditional home, such bathroom should be assessed for possible architectural and structural inconveniences and stabilized and reinforced if convenient for continued use as a bathroom or dismantled if inconvenient. In traditional homes that do not have a bathroom suitable for improvement to fit current comfort requirements, it should firstly be considered whether or not the building has space available for use as a bathroom. Architectural characteristics, modern equipment requirements, relation to the bedroom, relation to other wet areas and desirably minimum setbacks in terms of plumbing and system installation of the space intended for use as bathroom should be carefully considered. If the traditional home does not have space suitable for conversion into a bathroom, it can be recommended to locate a bathroom in the cellar if the building has one or, in the absence of a cellar, to construct bathroom space in the courtyard as an annex. However, if bathroom is located in the cellar, it should be suitably connected to the bedroom so that principles of privacy are complied with. In addition to complying with the principles of privacy, if a bathroom annex is constructed in the courtyard, such additional structure should inflict no damage on the original façade, materials and elements of the building, spatial relations should be well planned for comfortable use and the annex should be constructed in a manner that would allow it to be distinguished from the traditional building [3].

In the satisfaction of the toilet need of a traditional home, it is considered that a toilet located in the garden or an edge of the courtyard would be capable of matching the need. However, if the existing toilet dates back to the original construction of the building or needs to be preserved considering the building's architectural and structural features, it could be maintained at its location as a second alternative toilet that could be used in good weather conditions. It should also be ensured that the newly added toilet space is located in the traditional home close to the bathroom planned for modern use or that a toilet bowl is installed in the bathroom if required where users' comfort conditions permit this [3]. In arrangements and adjustments to be performed in the scope of the integration of wet areas into the building in traditional homes, particular care should be taken to insulate wooden flooring, furnishing, walls and ceiling against possible effects of water / humidity and ensure that the wet area where the application is implemented is frequently ventilated.

Stage 2: Plumbing Integration

Potable water and sewage plumbing systems are installations of great importance in the modernization of traditional homes. Otherwise named sanitary installations, plumbing installations are the service systems that ensure the supply of clean water required for the protection and maintenance of human health and removal from buildings of sewage and waste water before they become a threat for the human health.

Another plumbing system that is important for the modernization of traditional homes is hot water plumbing. The system is used to supply the hot water required in buildings for bathing, laundering and dishwashing purposes. Hot water systems may employ local, central or solar heating systems. Heaters such as thermo-siphons, gas or electric water heaters are used in local systems. Central heating systems are preferred where hot water is to be used in a variety of places inside the building or distributed all around it [4]. Solar energy systems are also in use for water heating purposes nowadays. However, building capacity and user needs should be taken into consideration when selecting a water heating system based on solar energy.

During the integration of plumbing systems into traditional homes, special care should be taken to: insulate cold water pipes buried into walls to avoid biological and other decomposition caused by or related to humidity and moisture, lay horizontal pipes under proper slope angle to prevent plumbing-related leaks and ensure proper water flow, use a vent hole and air bleeding valve to ensure that air leaves horizontal pipes, locate the hot water pipe under other pipes within the group of horizontal plumbing pipes to prevent damage to the other pipes due to possible condensation drops, install a regulator

(pressure stabilizer) on the pressure tank outlet of the plumbing to prevent the water, which will occasionally flow under high pressure, from causing noise and damaging the plumbing, install each column and distribution line in the system independently in order to prevent the whole system from becoming out of order in case of a possible plumbing problem, net the manifolds of the plumbing laid for the wet areas directed downwards in order to prevent system congestion by materials such as dust, sand, etc., particularly insulate pipes laid inside external walls due to excessive condensation due to temperature differences inside and outside the building, well insulate the pipes that need to be laid on the external side of the building to prevent freezing and therefore congestion, seal the ends of lines that have been installed, but on which no valve or cock has been mounted, with blind plugs in order to prevent system congestions [5], lay the pipes so as to allow possible repair and maintenance interference and prevent construction materials from being damaged during such repair and maintenance interference, ensure that particularly connection pipes are not too long to prevent possible leaks, particularly avoid laying sewage pipes with too many connections, take measures required to properly seal pipe joints against any leaks, ensure the ventilation of potable water and sewage plumbing systems for the comfort of the users, insulate the plumbing to prevent noise, lay the pipes in a manner that would prevent visual pollution and prevent the plumbing from hindering the proper perception of the original values, original element details and construction materials of the traditional home, comply with any regulations and other rules that apply at the location of the home.

Stage 3: Wiring Integration

The wiring is divided into two parts: high-current wiring and low-current wiring. The high-current wiring is the electric wiring that assists in the generation, transformation, accumulation, transfer and distribution of electric energy that might be dangerous for users and the building and the conversion of such energy into other forms such as mechanical energy, light and chemical energy [6]. Lighting, air conditioning, power devices and UPS (uninterruptible power supply) devices are considered in the high-current scope. Low-current wiring is the electric wiring that poses no danger for users and the building under normal conditions [6]. Internet, telephone, antenna and cable TV broadcasting, communication systems inside the building, fire alarm systems, sound systems and video camera systems are considered in the low-current scope.

During the integration of wiring systems into traditional homes, special care should be taken to; avoid the selection of easily combustible cable guides, avoid frequently joining cables, avoid integrating excessive electric loads into the building, comply with any regulations and other rules that apply at the location of the home.

Stage 4: Heating System Integration

Heating systems are defined as systems required for a building to reach the desired level of comfort in terms of temperature control. Heating system alternatives that may be used in the modernization of a traditional home are central heating systems operating on natural gas or liquefied petroleum gas, individual heating systems and special heating systems such as under floor heating.

The first heating alternative available for use in a traditional home is the central heating (building-based) system. Three alternatives of a central heating system operating on hot water are systems where water is both distributed and collected from below, distributed from above and collected from below and both distributed and collected from above. The system where water is both distributed and collected from below involves a heating system completely located in the cellar whereas the system in which water is distributed from above and collected from below should be preferred if equal heating is desired for all of the floors. While the system where water is both distributed and collected from above is preferred for buildings without a cellar, it is an alternative that should be considered in case of necessity where the use of the other two systems is impossible [5].

Combination boilers, room heaters, heating stoves and fireplaces are among individual heating alternatives convenient for traditional homes. From these systems, combination boilers and room heaters operate preferably on natural gas or on liquid petroleum gas where no natural gas is available.

During the integration of hot water heating systems into traditional homes, special care should be taken to: leave no air inside the system elements to ensure proper water circulation and avoid the risk of system corrosion, operate a hot water circulation pump in order to prevent the freezing of water circulating in the system and damage to the system that may lead to leaks, etc. in case of the presence of sections in the house that are not heated, bleed the water out of the system if the house is not to be heated for a long time, place radiators used as heating elements at lower levels to avoid heat losses, select the type of radiators that minimize space loss, equip radiators with thermostatic valves that make it possible to adjust room temperature, prevent the heating system elements from hindering the proper perception of original details of the traditional home inside the building, comply with any regulations and other rules that apply at the location of the home [5].

Another heating system alternative suitable for use in traditional homes is the under floor heating system, also known as the special heating system, designed to operate with hot water heated using natural gas or liquid petroleum gas [5].

The choice to be made for a traditional home between radiator heating and under floor heating primarily depends on the structure of the floors inside the building. Under floor heating system will be suitable for houses with both ceiling and floor lining. However, other factors that need to be considered in the selection of a heating system for a traditional home include comfort, cost of installation, costs of operation and maintenance/repair, simplicity and frequency of maintenance and whether or not air conditioning would be required.

Stage 5: Air Conditioning System Integration

Air conditioning / climate control system is defined as the system required to maintain the temperature, humidity and cleanliness of air indoors at desired comfortable levels [7]. Elements such as architectural and structural characteristics and functions of the building, weather conditions at the location and user needs usually affect the installation of the air conditioning system. A number of air conditioning systems is available nowadays and although air conditioning systems that fit new functions and requirements are designed each day, the most suitable alternative for the modernization of a traditional home in terms of preservation, satisfaction of user needs, physical characteristics of the building and cost is an air conditioning system with a variable flow rate of the cooling fluid, which is a central system. The air conditioning system with a variable flow rate of the cooling fluid is a central system in which the cooling fluid is directly circulated in the air conditioning system. The system operates relying on the principle of directing the liquid cooling fluid obtained in an external unit to indoor unit devices located in each room. The cooling fluid inside indoor units evaporates to absorb the heat inside the room. Reversed operation of the fluid will make heating possible. The indoor units are generally mounted on the ceiling / upholstery. The said air conditioning system should be considered together with the heating system depending on the surrounding and physical conditions and functions of the house and user needs and no separate heating system should be planned if not required.

Stage 6: Fire Alarm and Extinguishing System Integration

Automatic control systems and fire extinguishing systems ensure early notification and alarm for the purpose of prevention of expansion and possible damage to the whole structure in case of a possible fire. The system is created by installing detectors sensitive to smoke and combustion gases at proper locations inside the building. While the extinguishing system envisages the use of a variety of extinguishers, gas extinguishers should be preferred considering the nature of the building being protected. Such use will prevent possible damage to details of historical importance. Care should be taken to make sure that fire extinguishing devices weigh approximately 6 kg for an area of 100 m, extinguishing tanks are fixed at

easily accessible locations and related maintenance and checks are actually conducted at proper intervals [8, 9].

CONCLUSION

The issue of integration of wet areas and utility systems into traditional homes is highly important in the raising of the standards of such homes to modern comfort requirements and requires a systematic approach. Considering the subject with a systematic approach will show that the integration into the traditional home of wet areas, plumbing, heating system and wiring to satisfy comfort requirements is unavoidable. The original design principles of a traditional home include the principle of conformity with surrounding and climate conditions. This makes possible to use natural ventilation and air conditioning of the home nowadays. In homes where natural ventilation / air conditioning is possible by both spatial settings and implemented details, the assembly of a mechanical ventilation / air conditioning system should not be preferred except where mandatory as it will impose additional utility system load on the building. The current potential of the building and its limitations in terms of materials should be well analyzed in the integration of each utility system into the traditional home. In particular, natural environment data and climate characteristics should be considered in the integration of the ventilation / air conditioning system. On the other hand, fuel options should be well considered in the heating system integration. Each system should be selected in good consideration of the costs of construction, operation and maintenance, the selected system should be applied and implemented in accordance with the principle of minimum interference in the building structure, no damage should be inflicted on the materials, elements and structure of the building and any interference should be reversible when required. Any related laws, regulations and other legal acts that apply at the location of the traditional home or to specifically to the traditional home should be complied with, not forgetting that the protection of the building is a necessary value to be respected in the integration of all systems. All of the interference operations to be conducted on the traditional home in the scope of the integration of modern utility systems should be considered from a two-way perspective covering the protection of the house as well as the satisfaction of the dwellers' needs and a balance should be correctly established between protection and renovation.

REFERENCES

- Fitoz, İ. 1999. Wet-Volumes Were Investigated In An Architectural Manner Thugh Historical Perspective. Master Thesis. Mimar Sinan University, İstanbul. pp. 157 – 223.
- Perker, Z.S. 2010. A Structural Model İn Adopting Traditional Anatolian Residence For Today. PhD Thesis. Uludağ University, Bursa.
- Erdem, E. 2007. Intervention Principles In Wet Spaces For Contemporary Residential Use, In Eski Foça Traditional Dwellings. Master Thesis. Middle East Technical University, Ankara. pp. 130 – 150.
- Sıdal, C. 2007. Plumbing. Birsen, İstanbul.
- Küçükalyı, R. 2008. Installation Manual of Architect's. Vol. 1,2. Isısan, 370-1, İstanbul.
- Anonim 2005. Wiring Regulation. Turkey.
- Baytop, F. 1998. West Based Building Terms in Turkish. YEM, İstanbul.

Çelebi, M. R., N. Akıncıtürk. 2003. Fire: Building Design Principles. T.C. İstanbul Kültür University, İstanbul. pp.169 – 173.

Akıncıtürk, N.,M. Kılıç. 2004. A Study On Fire Protection Of Historic Cumalıkızık Village. Journal Of Cultural Heritage. Vol. 5. pp 213 -219.

FIGURES



Figure 1. Traditional Home Examples of Turkey



Figure 2. Uncomfortable Wet Area



Figure 3. Unhealthy Wet Area



Figure 4. Uncomfortable Kitchen



Figure 5. Unhealthy Sewage Pipe



Figure 6. Dangerous Electric Wires

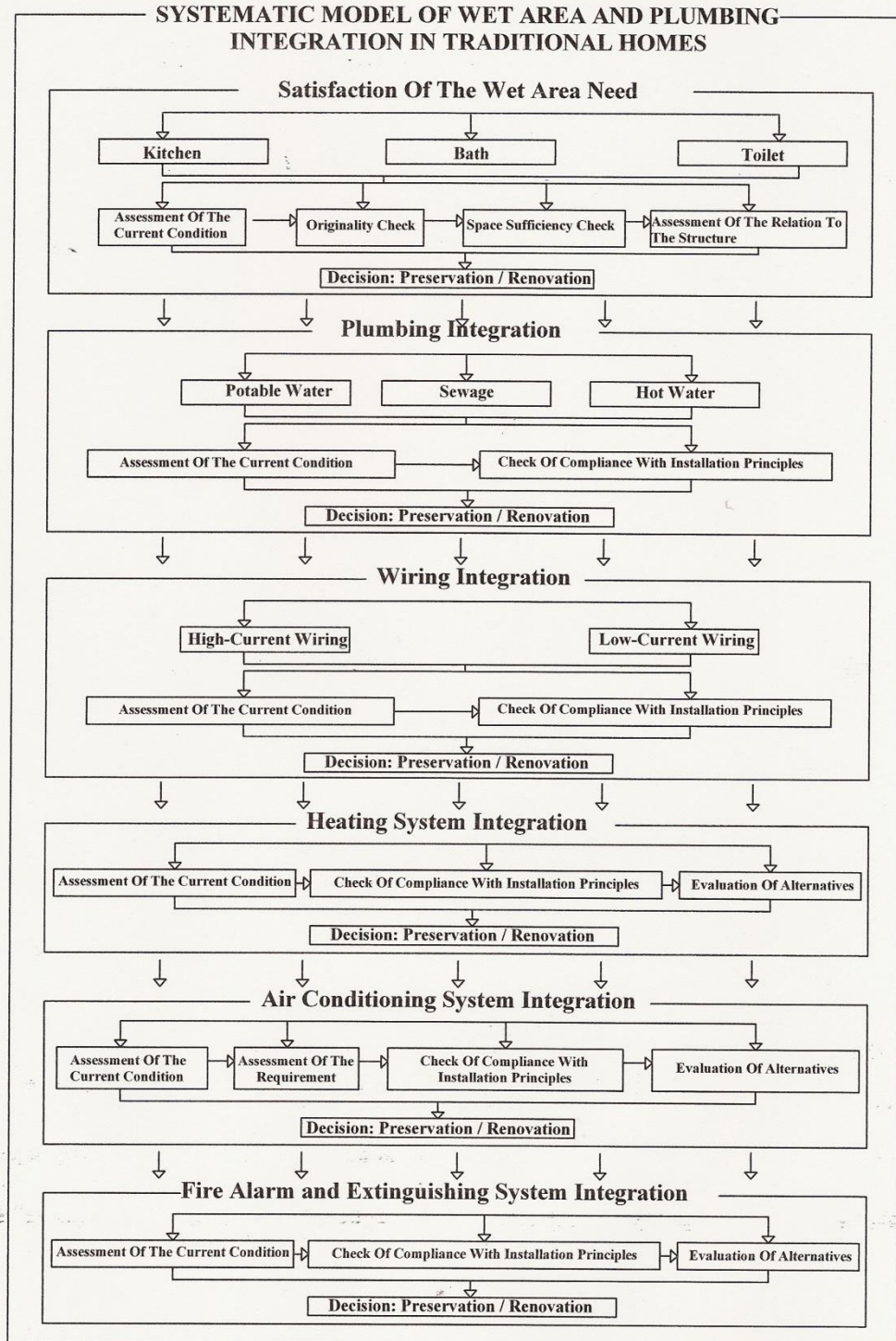


Figure 7. Systematic Model Of Wet Area And Plumbing Integration In Traditional Homes