

**INFLUENCE OF CULTURE, FAITH, ENVIRONMENT, AND BUILDING
TECHNOLOGY ON THE BUILT FORM: THE CASE OF NINETEENTH
CENTURY CATHOLIC CHURCHES IN GALVESTON, TEXAS**

A Dissertation

by

DAVID MARK DUBBELDE

Submitted to the Office of Graduate Studies
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2006

Major Subject: Architecture

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ABSTRACT

Influence of Culture, Faith, Environment, and Building Technology on the Built Form:
The Case of Nineteenth Century Catholic Churches in Galveston, Texas. (August 2006)

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Why do churches of the same faith built in the same location and era of time differ in their built form? The focus of this dissertation led to the identification of four variables that influence the built form. These are culture, faith, environment and building technology.

The physical location (Galveston, Texas), Catholicism, and era of time (last half of the nineteenth century (19C)) are significant to the framework of this study. A single location held constant the physical environment—climate and topography. Catholicism held constant faith. The era of time exposed the study churches to the same, but evolving, built environment and building technology. Galveston, in particular, during the era of study, presented a dynamic confluence of these variables. The city emerged as the commercial entrepôt and financial center for Texas. It was Texas's cultural capital and its most dynamic urban center boasting the most advanced architecture. It had the best newspapers and theater in the state and was the first city in Texas to provide electricity and telephones. During this era Galveston was a gateway for thousands of European Catholic immigrants, who brought to Texas a diversity of culture, traditions and skills.

The Catholic Church chose Galveston as the place to reassert itself in America against a Protestant wave swept westward on a tide of settlement.

A conceptual model illustrating the interaction of these variables among each other and on the built form was created. From this model two subordinate models were developed and three hypotheses were derived which test the assumption that *variety in church form and construction is a function of culture*. The research is a qualitative approach implementing a comparative analysis methodology of multiple cases—five Catholic churches (the study units).

The data for the individual study units were analyzed against a set of criteria for each of the variables identified. A *comparative analysis matrix* was used to contrast these data between the variables and the study units from which conclusions were drawn.

The results of this analysis demonstrated that of these variables culture was the most influential on the built form, thus supporting the research hypotheses. Therefore, it is concluded that the variety in the churches' built form was a function of culture.

DEDICATION

To

The Holy Spirit:

Fountain of inspiration, discipline, perseverance, and patience.

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Gratitude beyond measure goes to the chair of my committee, Dr. Anat Geva. Your example is one to be emulated and embraced by all. The guidance, encouragement, and dedication to my success that you provided render a debt that I will never be able to repay. You are a window to the universe through which the sunshine enters, I have learned much.

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INTRODUCTION

History is the portal of tomorrow, for at one time the past was the future...Dubbelde (March, 2006).

This study endeavors to answer the question: Why are churches of the same faith, built in the same geographical location, and during the same approximate era different in their built form? One would think that the single most powerful cultural influence in man's life, religion, would dominate the form and style of religious edifices, particularly those of the same faith and thus, they would look the same. Yet five Roman Catholic churches built in Galveston, Texas, during the second half of the 19C suggest otherwise.

The objective of this inquiry is to identify the cause(s) for these differences. The impetus for this investigation is grounded in theoretical assumptions regarding the role culture plays in shaping built form. On the surface it would seem that faith should be the most influential. Culture, however, may play a more significant role. It is also acknowledged that other causal factors may influence architectural choices. Therefore, within this context the variables of *culture*, *faith*, *environment*, and *building technology* are identified, and their influence on church form and construction is examined. For the purpose of this research the variables are defined further. *Culture* encompasses the ethnicity of the church, its people and architecture. *Faith* constitutes church (Canon) law as applied to church construction. The *environment* subdivides between the physical climate and the built environment. *Building technology* addresses the methods and materials used to construct the churches.

This dissertation follows the style of *Journal of the American Planning Association*.

A general conceptual model and two sub-models are used to illustrate the relationships between these variables and to church form and construction. From these models are drawn the study's hypotheses, which test the theoretical assumption that *the variety in church form and construction is a function of culture*.

(a) Churches of the same religion built in the same environment and approximately during the same era vary in their built form and construction.

(b) If religion, physical environment, and building technology are held constant then the variety in church form and construction is a function of culture.

(c) If form and construction of the churches do not reflect the variety of the built environment and evolving building technology then the variety in church form and construction is a function of culture.

The methodology implemented for this examination is a qualitative comparative case analysis using multiple cases. Each of the study churches is analyzed against an established set of criteria for each of the variables identified. The results of this analysis are placed into a *comparative analysis matrix* (see figure, p. 154). Through the use of this matrix comparisons and contrasts among and between the variables and the study churches can be made. From these comparisons conclusions are drawn regarding the influence these variables had on the churches' built form.

The significance of this inquiry resides in its potential to provide insight and discovery into the phenomenon of architectural variety. In addition, it may open avenues of thinking which may lead to a more profound understanding of the built environment, particularly the underlying influences on its manifestations.

LITERATURE REVIEW

Numerous publications have studied the relationship between culture and the built form. A significant portion of this study has focused on the impact of culture on architecture engendered by the physical world and societal dynamics. In man's effort to know more about this relationship he has attempted to establish a link between culture and the built environment and has explicated his understanding of it philosophically and through empirical examples which endeavor to tether the abstract to reality. The review of literature that follows presents both abstract and concrete examples that demonstrate and support the effect of culture on the built form.

John Whiteman's (1987) essay on Hegel's definition of architecture illustrates this linkage from the philosophical perspective. Here it is declared that art and architecture are the products of nature's incomplete state, and it is only through man's transformation of nature that man can really come to know who he is. The motivational force that drives this transformation is passion, an energy exhorting man to achieve and thus produce culture. Due to the way the human mind works, what something is, is determined by the way it is defined—a construct of human thought. Man is a thinker; his objects, specifically architectural objects, are not natural objects but cultural ones. Man's ability to cope with nature (the physical world) is primarily defensive and reactionary and success depends on his ability to understand its erratic and unpredictable behavior. His influence, if any, on the physical forces of the universe is limited, therefore he channels what persuasion he has into adapting for survival. The cultural realm, however, unlike the physical world, is a construct of the mind and is produced from the limitless

possibility of human thought. Architecture, the built form, is man's creation; it is a vehicle by which constructs of his mind (thoughts) are captured in physical form.

According to Whiteman's interpretation of Hegel, the creation of art and architecture is a dialectical process in which the mind (thought) is taken over or returns to itself by a reality (form) and thus produces culture. Architecture manipulates external, material/physical nature (lumber, concrete, brick, etc.) such that the mind recognizes an artistic form. But because it is of material form architecture has limits. Its lower bound is its symbolism; it can not be reduced to something without meaning. If its thought and purpose are excluded from the composition it ceases to be architecture. The upper limit is the threshold of transcendence. Architecture can not be so powerful that it becomes over-real. It can communicate function and purpose and provoke thought regarding the designer's intention. But its appearance should not be to the extent that the structure is thought to have a soul. Assigning such a quality, architecture, because of its very material nature, becomes non-real.

An architectural cultural link is further illustrated in the rise and fall of architectural modernism. Passanti (1997) contends that Le Corbusier's modern style, rooted in his interest in people and their artifacts, looked to precedent for many of his design solutions. Influenced by Rousseau's idea that the more basic a solution the closer it was to original, Le Corbusier frequently sought answers in the vernacular. This notion was reinforced by writer critic William Ritter and architect Peter Behrens. Ritter emphasized one's roots; identity was not willed or manufactured but rather, it is received, the product of the history and place of your birth. Behrens classicism

buttressed the idea of *received*; the classic style is a received architectural language to be learned not invented.

Passanti (1997) posits that Le Corbusier's modern style emerged from a synthesis of these philosophies, whereby he integrated "found" elements being issued by the new modern culture of the industrial west, not invented ones, into his designs. The vernacular served as a model for a natural relationship between people and their artifacts, between society and architecture. Le Corbusier's modern style connected architecture to society; his vernacular model paved the way for architecture to keep pace with a changing world accelerated by technology.

Pierre Bourdieu's theory of cultural change (elaborated in a series of studies and theoretical works, 1984, 1993, 1996), examined by David Gartman (2002) regarding the decline of architectural modernism continues to illustrate an architectural cultural linkage. Bourdieu's theory focuses on the internal dynamics of a culture and uses as its model the "market", where symbols, beliefs, and ideas function as its commodities. In the cultural market people compete for scarce rewards and mobilize resources to best the competition; i.e. the realm of culture is a distinct arena in which people compete for status and honor. These cultural forces are both internal and external, and impact the supply and demand side as well (Gartman, 2002).

Bourdieu contends that society is a social *playing field* created by the intersection of economic and cultural playing fields. The positions on the field are the social classes, determined by both the balance of economic and cultural goods and the sum total of both. On the cultural field, cultural goods are produced (supply) and consumed (demand)

by the different classes as they strive for distinction—status, position, prestige. There are a variety of goods for consumption because the suppliers know what the consumers want (distinction), and they themselves are driven by their own need to be distinct (engendered by the demand for distinction) among other suppliers—competition.

The cultural field is divided into two subfields—large scale and small scale (Gartman, 2002). The producers for the small field are the high arts, their rewards being symbolic—praise and recognition by other artists—rather than economic, which is the motivation for the large subfield. These small scale producers have more cultural capital—education, knowledge, tastes, etc.—than money and hence their products appeal to consumers of like circumstance. This small field is further divided into those who have received cultural prestige and those yet to do so; individuals striving for a seat at the table of recognition.

Into this model the idea of “imitation” is introduced (Gartman, 2002). As each class attempts to gain distinction from the class below they borrow cultural goods from class above. As the upper classes become imitated they seek new and distinct cultural goods that have not been tainted by imitation. This imitation creates a constant tension in the symbolic goods market, forcing those who have distinctive goods, which are threatened by popularization, to engage in an endless pursuit of different and distinctive goods through which they can reassert their sense of superiority. In essence the classes play chase; get away vs. catch up.

For Bourdieu, however, it is not demand by the consumer for distinctive goods that primarily generates their production, but the competition between the producers for

recognition in the subfield. The new entrants to the field struggle for distinction against those already recognized. The newcomers bring new ideas which lead to new cultural forms. And often the aesthetic upstarts receive external support from those struggling in the larger social field—both groups are outsiders endeavoring to dispose established power. Thus, he asserts that cultural change is a two sided dynamic brought about by both consumers and producers influenced by external forces.

Gartman (2002) uses the dynamics of Bourdieu's cultural market to illustrate how cultural forces impacted architectural modernism's decline. In the 1960s society began to question the unbridled consumerism of mass production. These external forces impacted architecture directly, since the modern style symbolized the mass production, technocracy, and the establishment, now in question. Internally young architects began to criticize the modernist establishment as being complicit with this corporate and governmental technocracy. The internal force that created the schism was the competition between the cultural producers. With increased education opportunities fueled by the GI Bill and increased corporate and government interest in the arts, an increasing number of artists could now compete in the high art subfield of architecture. This architectural abundance could not be absorbed by an urban market controlled by the modernist architectural elite and their corporate and institutional clients. Hostility broke out between the two factions with Bourdieu's predictable charge of "sell-out" coming from the "young turks." Allied in this rebellion were the middle and working classes who felt the modernist elite were pushing their snobbish attitudes and values down their throat. Young architects, encouraged by the middle and working classes, acted partly

from iconoclastic motives against the establishment and partly from the need to be distinct in their own right and to feed the need for individuality demanded by consumers, began to make revolutionary innovations in building design which undermined the modernist establishment and its style. The convergence of these external and internal forces signaled the end of modern architecture.

Edward Abernethy (2000) further ratifies the argument in favor of a link between culture and architecture. In the book “Built in Texas,” Abernethy explains that man builds because he must. He is naturally and genetically a builder. He continually endeavors to plumb and square life into an order he can cope with. From his culture he forges art, religion and philosophy into shelters that protect him from the vicissitudes of life. He builds his structures for the same reasons, but they are more than just a place in which to flee. Order is found in them; his structures reflect and satisfy his culture’s traditional forms and fashions, they provide symmetry and balance. He builds with what he has and the fruits of his labor are the product of his energy and imagination, and a source of personal pride. They are part of his life and the traditions passed from his ancestors. Man’s building is a tangible result of his self. The urge to preserve one’s lifestyle is a powerful force. When people move to a new place they seek one like the one they left. These emigrants perpetuate familiar forms in the homes, farms, and towns they build (Rapoport 1969, Geva 1995).

According to Upton (1983), culture is the learned behavior that embodies the enduring values and deepest cognitive structures of a social group. These concepts are human constructs generated by the mind that speak of ideas and of behavior. In “House,

Form and Culture” (1969), Amos Rapoport claims that the objects that man creates serve as concrete symbols of a culture’s ideas and feelings. Man’s architecture, his dwellings and settlements are the physical expression of the *genre de vie*—the sum total of the cultural, spiritual, material, and social aspects of man’s life. According to Rapoport this is logical; if one accepts the symbolic nature of man’s environment and that these symbols have meaning, then, because they have meaning, they have value and according to Upton, values are culture.

Symbolism in architecture draws much interest as we search for the meaning of buildings. Geva (1995) argues the case for understanding culture through the study of Architecture. Her seminal research cites the use of descriptive studies, studies of origin, and studies of function as ways of analyzing and understanding the influence of culture on the built form. Upton (1983) in his attempt to understand structures, for example, credits the linguistic models developed by Chomsky and used by Henry Glassie, “Folk Housing of Middle Virginia” (1975). The thesis proposes that buildings and their formal elements are systems of signs that communicate identification with, or a rejection of, a given social group, specific social values, and status or at the least assert their existence. Other approaches to this understanding have employed semiotics. Upton (1983) contends that the study of structures as signs and symbols may provide the underlying connections and they may be the key to unraveling the artifacts of a landscape in ways that promote our understanding of the choices people made in adopting and adapting building forms.

According to Rapoport (1969), the perpetuation of this architecture persists even when the new environment is not suitable for the tradition. And while the forces at play are complex and varied, rendering attempts to explicate the different forms a difficult endeavor, he acknowledges a common thread: people with very different attitudes and ideals do respond to varied physical environments. He hypothesizes that form is not the result of physical forces or any single causal factor but is the consequence of a whole range of socio-cultural elements. Abernethy (2000), contends that the forms man shapes satisfy not only his immediate needs but also satisfy what his eye has been conditioned by his culture to see as pleasing.

Rapoport (1969) argues that if a scale for physical forces—for example, climate (from harsh to benign); economic (from subsistence to affluent); technology (barest skill to artisan); material availability (from dearth to abundant)—was created and the severest conditions for these forces were experienced and a variety of forms still existed then one must conclude that cultural forces are behind this variety. As the physical conditions moderate, he continues, the cultural forces assert themselves even more. Rapoport concludes that what finally decides the form and fashions the space is the vision of the people in their pursuit of the ideal life—the physical expression of the *genre de vie*. Geva (1995, 2002) adds building type as a factor linking architecture to culture, arguing that the expression of culture in the selection of building type is less influenced by physical forces.

Ameri (1997) lends support to Rapoport's and Geva's conclusions. Ameri contrasts the different architectural styles used in house and church construction found in

the New England and Chesapeake Bay Colonies. In New England with its Puritan settlers these structures predominantly consisted of clapboard siding applied to a wood frame with central chimneys; as opposed to the Anglican's of Chesapeake Colony use of masonry construction with peripheral chimneys, most notably located in the gable end walls.

Conventional academic thought explained the use of these different architectural styles as climatic differences between the two regions and to the settlers' origins. Ameri discounts these explanations, pointing out that a diversity of settlers immigrated to both colonies whose English origins were equally as diverse. And with this diversity came knowledge to each colony of both masonry and wood frame construction. Additionally, there was no climatic precedent in the regions of England from which the settlers emigrated, for the climates of either New England (harsh cold winters) or the Chesapeake Bay region (hot humid summers).

Ameri's interpretation, like Rapoport's, is that the differences are owed to a people pursuing life ideals. The selection of material and built form by the settlers in these colonies bifurcated along religious ideologies. The Chesapeake's Anglican settlers' belief system was framed by the concept of gentility. Considered virtuous, this way of life, espoused and encouraged by the Church of England, held to a superior social status or prestige evidenced by propriety, manners and possessions. New England's Puritans took exception to inappropriate displays of wealth. They thought it objectionable that virtue and good were attached more to image than worthy deeds. Even though they had knowledge of masonry construction and were well acquainted with its attached social

status, particularly that of chimney placement, this material and form represented the very institutions which drove the Puritans to seek a better life in the New World. Their choice to not build their homes, churches and meeting houses of brick was a liturgical counterstatement to the Anglican structures of the Chesapeake colony.

Ameri's essay provides a duality of significance. First, he presents another pier that supports the bridge between culture and the built form. Furthermore, his conclusion introduces into the discourse the impact of culture on religious architecture which represents the central theme of my research. Ameri's conclusions, however, are based on differences in form arising from different religious approaches—Puritan versus Anglican. This study takes the impact of religious ideology on architecture further by examining differences in built form and construction occurring within the same religion.

Charles Heatwole (1989) examines this approach as he surveys differences in form of Mennonite churches. Heatwole's research revealed a diversity of architecture (plain to modern and embellished) among contemporary Mennonite churches. His discussion classifies the Mennonites into three distinct sects—traditional, moderate, and liberal—based on religious ideology. This classification is tied to the principle of nonconformity, which as interpreted by Heatwole, defines the Mennonite groups in terms of their relationship to the broader society. For example, the traditional (conservative) Mennonites interpret nonconformity (reject society) strictly and therefore build austere plain churches; liberal Mennonite sects have a lenient (accept society) interpretation and thus build their churches with more modern styles and embellishments (steeple, belfry, and stained glass).

While acknowledging that church style was influenced somewhat by other factors such as congregation size, he concludes, similar to Ameri that the most determinant factor for the architectural differences is owed to differing religious ideology among the Mennonites. But unlike Ameri, who contrasts two religious groups, Heatwole's focus is within the same religion, Mennonite.

By examining architectural differences among Catholic churches this inquiry attempts to further narrow the focus of culture's impact on built form and construction. Unlike Protestantism which has many different ideological approaches—Baptist, Methodist, Lutheran, etc.—and sects within these approaches for example, Baptist (Southern, Evangelical), or Lutheran (Missouri Synod, Wisconsin Synod)—Catholicism is non-sectarian. Its formal liturgy, teachings, and Order of the Mass are specific and are universal, as the name catholic implies, changing little over the centuries. Furthermore, unlike Heatwole's characterization of the Mennonite churches as meeting houses, Catholicism regards its churches as the House of God, sacred places on earth.

According to Reverend C. C. Tiffany writing in 1875, architecture subjoins thought to a structure and as such attempts to demonstrate in the edifice its purpose. This expression however, extends beyond ornamentation; it goes to the character of the structure and encompasses the uses that it must serve. It therefore falls to the province of architecture to create structures that appropriately express their meanings.

A church building is more than just a skin for the liturgical service taking place within. Its architecture enters into the action of the liturgy; it is part of the worship, and not just a place in which the worship takes place (Mannion, 1997). The church is an

embodiment of physical and spiritual elements endeavoring to connect man with his deity. The physical building is a material symbol that declares God's presence. It serves the necessities of the living Church and provides for the exercise of worship and its attendant functions. Christianity's focus however, is on the unseen, the faith and hope to be at a future time united with Him, while simultaneously being presently connected to Him through the Holy Spirit. Its physical impression therefore, must harmonize the mind and eye to the spirit of worship. The physical church should awaken in the living Church the numinous elements of aspiration and communion. The church should be so built and ordered that while they are in this world they are not of this world. It is a symbolic and almost transcendental structure embracing the extremes of Hegel's architectural limits.

Sacred architecture began primitively as simple gathering places where man made offerings and sacrifice to his God(s) (Bowler, 1856). As these agoras became the customary place of worship they were enclosed forming a primitive tabernacle. These simple houses of worship evolved into splendid temples, their edifices becoming enduring examples of architecture that a culture produced. Quite similarly the Christian church evolved over time from a simple cella to grand cathedrals. Like most architecture the church was not suddenly invented but emerged from antecedents and prototypes. As Stroik (1997) writes, sacred architecture just like the faith it seeks to represent, should reflect its own tradition. Each church needs to be a work of art that references previous greatness. Just as the Catholic liturgy is a remembrance of Christ's Last Supper, the church is a reminiscence of the Upper Room where the Body and Blood were shared.

It is in the context of this liturgical expression that a final argument for the impact of culture on the built form is made. As Seasoltz (2005) explains, the Church does not exist in isolation from the world. It is part of the saga of human history and is subject to the cultural phenomena of a wider world. The liturgy of the Catholic Church intrinsically identifies with the Eucharistic celebration of the Body and Blood of Jesus. Over the centuries, the Church has wrestled with an effective and meaningful way to relate this identification, this sacred ritual in a way that can be appropriated by contemporary people (Seasoltz, 2005). The result has been a variety of sacred spaces and form.

Rome emerging as the center of Christianity in its infancy provided the earliest models for the Christian church. Most notable was the basilica with its *double cube* (Sholl, 1869) form (twice as long as its width) ending in a circular apse. The longitudinal axis of the church was divided into three parts by a row of columns that extended along each side of the nave. The principal arches supported a gallery and an upper wall of windows (clerestory). A significant modification to this form was the addition of a dome to the roof and the adoption of the Latin cross shape to the ground plan through the addition of transepts. The chancel arch which separated the nave from the apse symbolized the gates to heaven. The crypts derived from the ancient custom of building churches over the catacombs of the martyrs. From this archetype, ecclesiastical design embraced the Romanesque, Gothic, Renaissance, and Baroque styles (Bowler, 1856; Sholl, 1869; Stroik 1997). The Church of the Middle Ages, in its desire to accentuate the divinity of this most Holy Eucharistic expression, witnessed the transformation of its

churches into these massive, transcendent, and ornate cathedrals from the simple gathering place of the Upper Room. Through the emphasis placed on the hierarchical structure and the clergy's significance the faithful were detached from this liturgical celebration; they became observers and listeners, not participants. Vatican II in 1962 was an acknowledgement by the Church of its need to be more reflective of the contemporary culture. Emanating from this rethinking was, among other things, a need to return its churches to forms that would engender a sense of community, a sense of participation by the worshipping faithful. What resulted were churches that attempted to create the sense of a gathering place by integrating into their designs space that encircled the altar.

Catholic Church authority for the design and construction of its churches resides in Canon Law. It is the body of law, either made or adopted by ecclesiastical authority governing the Sacred Liturgy, and the Church and its members regarding the Catholic faith. Its canons are binding on all Catholics of the Latin rite (CJC 1). Canon, a regulation or dogma decreed by church council, is derived from the Greek word *kanon*, meaning rule or practical direction. In time the term adopted an ecumenical significance and by the 4C it was applied to the ordinances of religious councils. The 12C saw the term "canon law" (*jus canoncium*) appear, followed shortly by *Corpus Juris Canonici* (CJC), and established itself as the formal expression for the body of law—ecclesiastical, sacred and divine—concerned with Holy objects and the well being of the souls of Christ's divinely established church on earth (Boudinhon, 1910).

The source for canon law is material and formal. Materially, the supreme source is God. Through natural Divine Law (the nature of things) and positive Divine law (what He reveals to us), both found in scripture and tradition, God manifests His will. The church accepts these as sovereign binding laws which it can interpret but cannot modify. Formally, empowered by God, Mathew 16.19 (Good News Bible, 1992), the Church can make laws that conform to His law. This responsibility falls to the episcopate (governing hierarchy) with the pope as its head. Through their ecumenical councils, this body of prelates produces laws binding upon the entire church. The pope, through his direct lineage to St Peter's empowerment by Christ over His church on earth, Mathew 16.18 (Good News Bible, 1992), and through God's guidance (papal infallibility), has final authority regarding these laws.

Canon law is found in form both written (those rules promulgated by competent church authority) and unwritten (laws emerging from custom and tradition). Furthermore, it is divided into public and private; public referring to the laws governing the Church (a perfect society established by Christ), while private alludes to the regulations made by ecclesiastical authority governing internal organization, the functions of its ministers, and the duties of its members.

Liturgical law regarding church architecture and construction has two overriding objectives. The first is to prevent the design and construction of churches that would not be effective houses of worship. The second is to free talent so that churches will be more effective places of worship. The intent is to provide flexibility to architects, builders, and clergy so that they can adapt their local conditions to the dictates of the church.

The Church grants to the architect freedom of expression and gives wide latitude regarding design, style, and use of materials. The designer is given the opportunity to apply his talent to incorporate utility, symbolism and beauty in the creation of effective houses of worship in accord with liturgical law and the laws of sacred art. The Committee on Liturgy (2000) proclaims that the Church is not wedded to a single architectural or artistic form, but rather it seeks to engage the genius of every time and place and craft the finest praise of God from what is available.

The Church, nevertheless, does not leave church design up to the designer's ideas of what is attractive or reverent. It has handed down principles that direct designers to create forms that distinguish a church from secular buildings, provide a certain internal plan with a relation and proportion to its parts, and fashion a structure worthy of being *Domus Dei*. In this endeavor, the Church addresses five areas or criterion regarding church planning and design, which are also part of the focus of this study, (a) the church site, (b) the church plan as it relates to the sacred path, (c) natural lighting, (d) verticality in the church, and (e) construction materials (Committee on Liturgy, 2000; O'Connell, 1955; Woywod, 1918;).

- The Church Site
 - The location of the church must be approved by the Bishop.
 - The location should be such that the church is removed from traffic and noise emanating from streets of commerce.
 - There should be sufficient space around the church perimeter to allow the Bishop to pass freely—consecration ceremony.

- Due to its profound symbolism the church's longitudinal axis should have an East-West orientation with the altar located at the eastern end of this axis.
- The construction to be such that the church interior is not visible from the outside.
- There must be no door or window that opens into the house of a lay person (non-clergy).
- No space above or below a church can be used for profane purposes—storage room, bedroom, theater or cinema (school rooms or libraries are considered acceptable uses).
- The Church Plan
 - The church should encourage the active participation of the faithful, creating a spirit of community.
 - The congregation should not be separated from the sanctuary by the distance between them or physical barriers that mask or otherwise separate the faithful from the altar.
 - The Space Arrangement within the church should be suitable to accommodate the worshippers as they participate in the sacraments and other liturgical ceremonies and contain the following:
 - Narthex (entrance vestibule)
 - Nave (seating for the worshipping faithful)
 - Sanctuary (chancel)—place of the altar
 - Smaller side chapel

- Baptistry

- The church's sacred path is axial.
 - Internally it extends from the baptismal font, usually located by the church entrance, to the high altar at the end opposite the entrance.
 - Externally the sacred path circumvents the church's exterior. Mentioned previously, the church siting must provide ample space at the building's perimeter to accommodate its consecration.

- Verticality

Canon Law, while relatively silent regarding church height and heights within churches, does speak to the following:

- Altars elevated and in positions of visible prominence but not so much so that there is separation from the faithful.
 - The altar location should be indicated on the church's exterior, characteristically by a tower or dome that surmounts it.
 - The baptismal font should be circular in design while maintaining its vertical axis.
 - In a subtle way the entire design of the church should be such that it lifts man's heart and mind toward heaven.
- Natural Lighting
 - There must be sufficient light for worshippers to read their books in any part of the church set aside for them.

- The altar must be well lighted—preferably by windows placed in the side walls.
- Windows in the east should be discouraged. If they are incorporated.
 - They should be of stained glass.
 - Or of sufficient height to diminish the effects of solar glare.
- Construction Materials

Natural stone is the preferred material in church construction due to its durability and the symbolism that attaches to its permanence. Yet church law does not limit the materials used to construct churches. In fact it embraces new materials and their integration into church design provided their use is not tawdry, profane, or pretentious. The Church, however, has strict rules it applies to churches as a result of the materials used.

- Cathedrals must be consecrated (made sacred) parish and other churches are desired to be consecrated, but not required to be.
- Churches built of wood or metal cannot be consecrated only solemnly blessed.
- Consecration must take place on natural stone.
- Consecration of masonry or concrete churches is permitted, but the 12 places that require anointing must be natural stone—clearly visible and marked with a cross.
- The foundation stone (corner stone)—must be natural stone regardless of the material used in church construction.

- It should be about one cubic foot.
- Its shape should be that of a cube.
- All six sides should be incised with a cross.
- Church law does not affix its exact location, in theory it is laid first, practically it is laid in a visible location.

Church planning and building go beyond the principles of sound construction; they are in and of themselves acts of worship guided by the principles that make it distinct from other buildings. The church is a sacred building dedicated to divine worship. It sanctifies those who worship in it, it enlightens and attracts those not of the faith. Symbolically it is one of the many doors about which C.S. Lewis (1996) spoke. The church is also a building type, in which society will sacrifice comfort in order to retain their cultural identity and the symbols of their heritage (Geva, 1995, 2002). Moreover, the church building expresses the link, through faith, between architecture and culture. This link can also serve as a symbol for a national (group) identity.

The 19C was a time America identified with icons that best expressed the political-cultural ideals of a nation (Wilson, 1983). American architecture manifested itself in the belief it would be a window to a nation's morality, democracy, and historical significance. It was so for Texas, as it attempted to define itself as a new republic and then as a state. Galveston stood at the threshold of this discovery. As a major port, this "Queen City" of the new and emerging land was at the confluence of the physical and cultural forces that characterized the city and Texas. Galveston was a physical and cultural gateway for the thousands of immigrants, from myriad ethnic origins, who

arrived directly from other lands in search of new opportunity and religious freedom; shouldering their hopes, dreams, and ideas.

Many of these immigrants—German, Irish, Italian and Eastern European—disembarking in Galveston were Catholic; their faith preceding their arrival by more than a century. It could be said that Catholicism’s pilgrimage to the new world began in earnest when Luther innocuously posted his 95 theses on the door of All Saints’ Church in 1517, thus sparking the Protestant Reformation’s firestorm. For centuries man’s history has been forged in the fires of religious wars and political machinations as Jew, Christian, and Muslim have struggled to advance or defend their faith. In the Christian world itself culture continues to be shaped as Protestants and Catholics clash over doctrine.

A major pillar of the Catholic Reformation (mid 1500s), the Vatican’s effort to stem Protestantism’s proliferation, was the establishment of the Jesuit Order (Spielvogel, 2005). These missionaries, eliciting support among other religious orders, spread beyond Europe’s borders bringing Catholic Christianity to people of the new world (Barzun, 2000). Bolstered by papal decree, granting the Catholic monarchs of France and Spain significant authority regarding church affairs in the New World, Catholicism’s journey took two paths. As part of Spain’s efforts to settle New Spain, it entered Texas through what is now Mexico. Its second path accompanied French explorers through Canada, eventually descending the Mississippi River valley to New Orleans; whereby La Salle laid claim to these vast lands, naming them “Louisiana” in honor of Louis XIV (Brands, 2005).

Texas was a Spanish colonial province from 1690 until 1823. “Los Texas” the land now known as East Texas provided New Spain its northeastern frontier and its original settlement was ostensibly to affect a bulwark against French incursions and to Christianize native inhabitants. The charge of founding missions for their conversion was given to the Spanish Franciscan friars. In 1790 Texas was placed under the jurisdiction of the Bishop of Guadalajara and in 1793 it passed to the Bishop of Monterrey. Priests were stationed at various locations in Texas where these missions/colonies had been established (Connally, 1955; Brands 2005).

The bifurcation of Catholicism’s pilgrimage to the New World along northern and southern routes was primarily the result of colonization from New England to Florida by the predominantly Protestant English settlers. The promise of land and tax relief was often used to encourage settlement in Colonial America. But many of the colonies had laws to discourage certain immigrants—specifically Roman Catholics (Levin, 2005). Ship’s captains were levied with head taxes for any Catholic given passage. Certain colonies only granted land and tax incentives to Protestants. With the French defeat by the British in the mid 18C coupled with President Jefferson’s Louisiana Purchase, and Mexico’s defeat at the hands of the Americans by the early 19C, Catholicism in North America was ebbing. The Church in an attempt to reverse its fortunes in the New World selected Galveston, Texas as its new frontier.

The selection of Galveston, Texas for this study is grounded religiously and architecturally. As part of the Catholic Church’s strategy to reassert itself against a tide of American settlement that was sweeping Protestantism westward, the Catholic Church

courted and received encouragement of the newly formed Texas republic eager to bring civility to its untamed lands (Knight, 2003). The Texas legislature returned several churches to their original use, schools were open, and the Ursuline nuns, the first religious order to the new republic, initiated their running. In 1842 Father Jean Marie Odin was named Bishop to Texas and in 1847 Galveston became the new state's first Catholic diocese. Texas' settlement during the last half of the 19C is directly tied to the great migration of European immigrant Catholics.

Galveston's economic potential, promised by its natural harbor and Galveston Bay, beckoned this settlement. As the immigrants arrived they brought with them their design ideas and construction skills (Upton, 1986; Geva, 1995). The period between 1870 and 1900 defined Galveston architecturally (Beasley & Fox, 1996) as the city attempted to keep pace with its commercial growth and economic prosperity. David McComb (1986) credits the Island City as the most advanced in Texas at the end of the 19C. Galveston at this time was the most important port; it was the first city in Texas to have electricity and telephones; it had the best newspapers and theater in Texas. It had the most individual wealth and most advanced architecture. So significant was Galveston to Texas's growth and prosperity during the last half of the 19C than an entire chapter in McComb's book is entitled "The New York of Texas". The city attracted architects and professionals to build its monuments and neighborhoods.

Echols (2000) brings to light Texas' architectural heritage against the back drop of the national stage. The American architectural style of the last half of the 19C was based on reviving Medieval, Renaissance Classical and Victorian styles (McAlester &

McAlester, 1991) while using new building technology. The Ancient Classical emerging in the 1820's as Greek Revival persisted to the 1860's. By the 1840's and lasting to the end of the century Medieval Architecture manifested itself as Gothic Revival and to a lesser degree Romanesque. Also during this time Renaissance Classical found representation in the Italianate style (1840-1885), Second Empire (1855-1885), and the Beaux Arts (1885-1930). By the end of the century the Queen Anne Victorian style (1880-1910) was giving ground to the dernier cri manifested in the austere Modern mode (1900-1940) (McAlester & McAlester, 1991).

Beasley and Fox (1996) and Barnstone (2001) succinctly document Galveston's streetscapes and stylistic changes that emerged during the last half of the 19C as influenced by the nation's revival styles. For example, the Menard and Williams homes, 1838, and the Powhatan house, 1847, typified "Greek-Revival"; Ashton Villa, 1859, the "Italianate"; and the Gresham residence, 1885-93, panoply of vague Renaissance to Romanesque.

While paying homage to national architectural trends, Galveston's architecture had a twist that expressed the conditions of a hot and humid climate and landscape situated by the Gulf of Mexico. Its architecture simplified the fashionable styles of the era; for example, the Sawyer-Flood House, 1879, and the Voelcker House, 1887 (Barnstone, 2001). Galveston, characterized as the "vernacular city", represented many "folk" versions of the national revival styles. Scardino and Turner (2000) point out Galveston's architectural flavor mimicked the aesthetic standards of the "American Vernacular"—an abundance of ornamentation with little concern for its proportion, and

in sharp contrast to the fabric of the building. In addition to homes, other Galveston buildings also illustrate the parallel between this island city and national architectural patterns. The 1858 Custom house brought to Galveston the Renaissance Style, in 1878 High Victorian was exemplified in the First National Bank Building, and the 1896 Ball, Hutchings & Company Building saw a return to the classical order that America was experiencing by the late 1890s (Beasley & Fox, 1996).

Paralleling this ensemble of architecture was the advance of building technology spawned by America's industrialization during the same era. This development of building technology in America is well chronicled by Donald Friedman (1995) in his book "Historical Building Construction" where he states the information presented, "represents the state of common knowledge at various times in the past." Heavy timber framing and load bearing masonry were the primary building technologies in America from the 1600s to the first third of the 19C. By the 1840s heavy timber framing was being replaced by the "stick frame" and cast iron, made possible by saw mills and iron foundries of the emerging industrial age. The 1870s witnessed diminished use of monolithic load bearing masonry in buildings as cast iron assumed more of the structural loading. As the century ended both masonry and cast iron as structural components in building construction were being replaced by concrete and the steel skeleton frame.

Historical accounts document Galveston's architectural enrichment and use of building technology paralleled the nation's (Scardino & Turner, 2000; Beasley & Fox, 1996; Robinson, 1981). Galveston's development began with the establishment of Menard's Galveston City Company in 1836. The economic engine fueled by the port

brought to antebellum Galveston a variety of buildings in both scale and quality (Scardino & Turner, 2000). This variety of structures was predominantly wood frame and clapboard construction. In fact, some of nascent Galveston's more prominent structures were constructed of precut lumber and manufactured components—e.g. the Menard House, 1838 (Barnstone, 2001). A newspaper article “(Local Intelligence: Dwelling Houses”(HABS 1967-8) informs of a local firm's plans to erect in Galveston 100 homes that are currently being manufactured and framed in Bangor, Maine. By the 1850's Galveston's economic prosperity and a concern for fire ushered in a fusion of masonry, tile, and cast iron construction. Emerging technologies, architectural designs, and the culture of New York and the East Coast was funneled to Galveston through its port activity (Robinson, 1981). Cast iron store fronts began to appear along the Strand and continued in use through the 1870s. By the mid 1880s iron and steel were incorporated into many building designs and with the construction of the Galveston County Court House and the Ball, Hutchings & Co. Building, 1890s Galveston witnessed the steel skeleton frame (Scardino & Turner, 2000; Beasley & Fox, 1996).

Interestingly, religious edifices did not follow this architectural or technological sequence. Driskill and Grisham (1980) document the Medieval style, with Gothic being the predominant architectural fashion employed throughout Texas during this era. Furthermore, this style was well represented across all Christian faiths and Galveston was no exception. Four of the study churches as well as other prominent churches on the island, for example Trinity Episcopal Church, embraced architecture rooted in Medieval cathedrals. This is not surprising, considering the era's contemporary thought regarding

ecclesiastical building. As explained by Seasoltz (2005) the romantic period, in reaction to the neo-classicism of the 17C and 18C and its use and abuse of mythology, extolled the culture of the Middle Ages. The primary object of this cultural adoration was the Medieval Church. It symbolized the view that the medieval period was the most human, most religious, and most Christian. Augustus Pugin (1812-1852) a distinguished and influential ecclesiastical architect of this era maintained that Christian architecture should reflect Christian beliefs and the style best suited to accomplish this was Gothic (Seasoltz, 2005). In 1856 Reverend George Bowler's commentary on chapel and church architecture acknowledges the firm presence of the Gothic style in America. Architect Charles Sholl writing in 1869 characterized the Gothic style as the true architecture of Catholicism, not the revived paganism of classic renaissance architecture. And 1875 finds Reverend C. C. Tiffany extolling the virtues of Gothic architecture as the style that "best impresses the Christian ideal."

Building technology regarding church construction lagged behind that employed in contemporary secular buildings. The masonry bearing wall construction, prominent in the first third of the 19C, and used in the construction of Galveston's St. Mary's Cathedral in 1848 was the same technology adopted for the construction of Sacred Heart II (post-1900 Storm) reconstructed in a different style (see analysis section, Sacred Heart-II, p. 136) half a century later.

In summary, the review of this literature demonstrates the intrinsic connection between architecture and culture. Hegel's definition of architecture (Whiteman, 1987) describes this connection philosophically. Others (Gartman, 2002; Passanti, 1997; Geva,

1995; for example.) explain this connection through a variety of concrete examples. Furthermore, the literature reveals that a variety of sources in an ever changing world can impact the built form and makes the case for Galveston, Texas as a location where such sources were existent and dynamically converging. It therefore, can be reasoned that architecture (built form) can be influenced by factors other than culture, such as *faith*, *environment*, and *building technology*. Although *faith* can be considered as part of *culture*, in religious structures *faith* becomes a separate variable catering to the specific religious dictates. The conceptual model that follows in the next section defines and illustrates the interrelationship among these factors and between them and the built form.

CONCEPTUAL MODEL AND HYPOTHESES

Conceptual Model

The literature review chronicles substantial evidence that supports theoretical assumptions regarding the significant effect of culture on the built form. It is acknowledged however, that culture may not stand alone in its influence on the form and construction of a religious structure. Three other influences—faith, environment, and building technology—have been identified and are included as part of this inquiry. Thus, these four influences may be identified as the variables influencing church form and construction. Figure 1 (page 32) illustrates a conceptual model which depicts the five major variables subject to analysis. It is a two dimensional attempt to portray a complex interactive and dynamic multi-dimensional reality. The association between the independent variables is represented by a dashed line; although it is also acknowledged that some if not all of the circles can overlap. The impact of the four independent variables on *church form and construction* (the dependent variable) is expressed by a solid line that represents not only the sole influence of a variable but also the interrelation of the overlapping impacts. This model therefore depicts the relationship between the dependent variable of *church form and construction* and the independent variables of *culture, religion, environment, and building technology*.

As described in the literature review, each variable is characterized by operational definitions. *Culture* consists of three operational definitions, the architect, architectural style, and parish. Regarding the architect, the study documents the designer's cultural background as influencing church design. Architectural style

identifies any thematic design or patterns of the era. Parish focuses on the ethnic/ancestral roots of the church parishioners and their cultural symbols integrated into church construction.

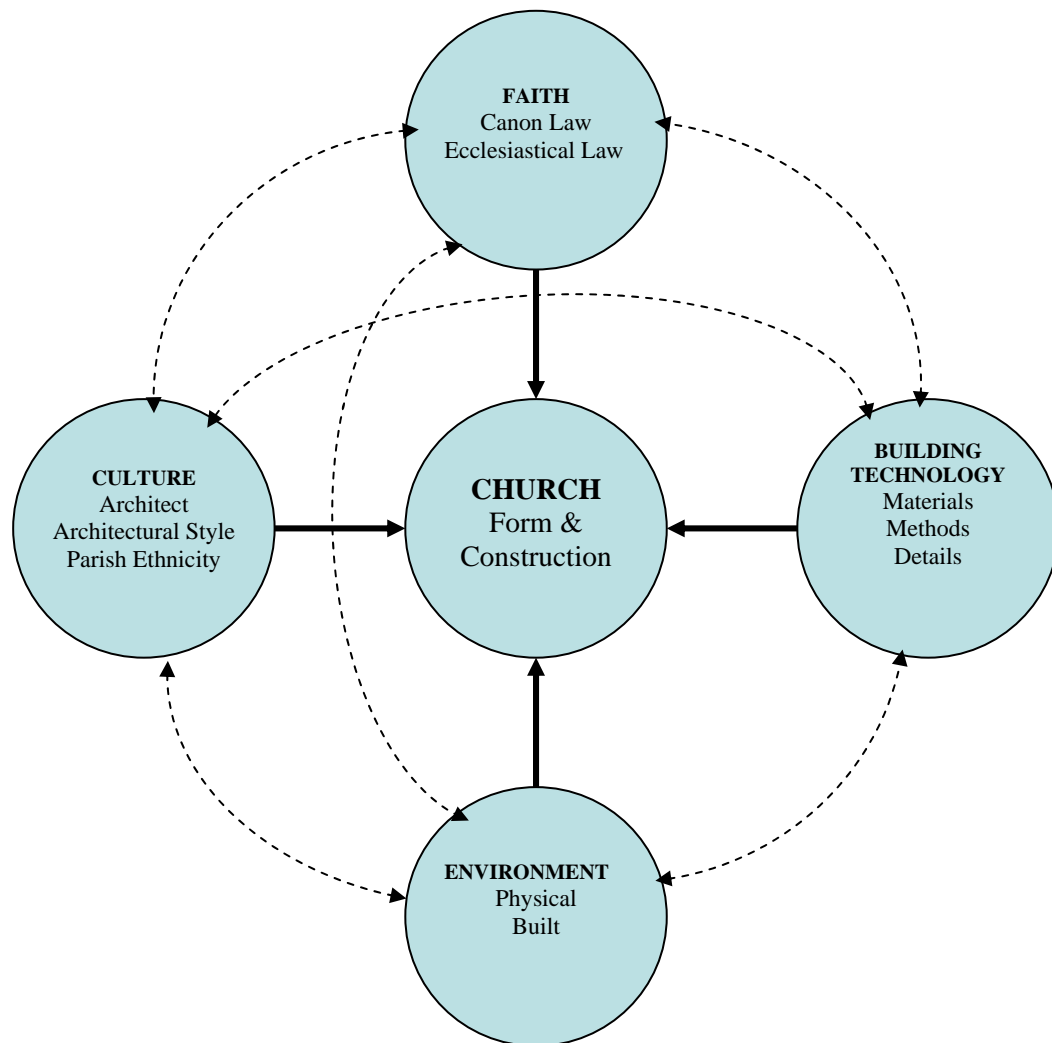


Figure 1: Conceptual Model.
Source: Created by Author.

Faith, acknowledging that it is a cultural force, narrows its focus for the purpose of this inquiry to the Church's governing principles that affect church planning and construction. O'Connell (1955) summarized the authority abiding in liturgical law that is part of the Church requirements since the beginning of Christianity. Canons (CJC) 1164§1 and 1296§3 require that ecclesiastical tradition and the laws of sacred art are to be followed in the design, construction and furnishing of churches. Woywod (1918) described the specific Canon Law requirements concerning church planning and construction addressed in Book III: Sacred Things, Part II: Sacred Places and Seasons, Section I: Sacred Places, Title IX: Churches, of the Code of Canon Law (see details in literature review, p. 18). O'Connell (1955) and the Committee on Liturgy (2000) identify five operational definitions determined out of Canon Law that dictate church design: Church site, plan (sacred path), verticality (height), Holy light, and construction materials. Moreover, houses of worship across all faiths are deliberately constructed with regard to most if not all of these criteria (Barrie, 1996).

Environmental impact on the built form positions itself from the standpoint of both the physical geography and the built environment. Because Galveston's topography is uniformly flat the impact from the physical environment limits itself only to Galveston's physical climate. Therefore, the study employs operational definitions of building design strategies that promote thermal comfort appropriate for Galveston's climatic conditions. The built environment focuses on architectural styles prevalent to the location and the era of the church construction. In the instance of this study, the built

environment includes the architectural styles in America and Galveston during the last half of the 19C, the time in which these churches were built.

Building technology includes two operational definitions. The prevailing building knowledge and skills present in America and Galveston during the last half of the 19C with the supposition that this influenced the construction and scale of the churches. And the actual church construction, defined as “architectural details”, comprised of building dimensions, structural systems, construction and finish materials.

Since this study examines churches of the same faith (Catholicism) that were built in the same location (Galveston) and during the same era (second half of the 19C), and because the literature review demonstrates the strong link between culture and built form, this study’s specific focus is on the unique impact of culture on the church form and construction. Figure 2 (p. 35), demonstrates this impact by holding constant the variables of *faith*, *physical environment*, and *building technology* employed in the church construction. Furthermore, Figure 3, (p. 35) addresses certain variations in the built environment and building technology that affected America and Galveston in the second half of the 19C, which in turn influenced the local built environment. It shows that these variations did not affect the study churches. Thus, culture is the main factor influencing the church form and construction.

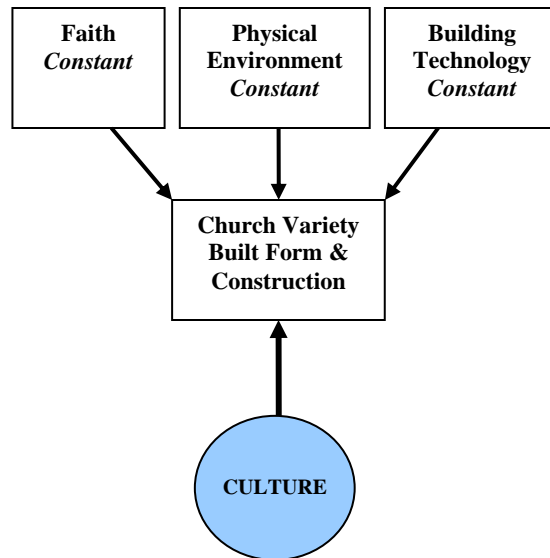


Figure 2: Constant variables.
Source: Created by Author.

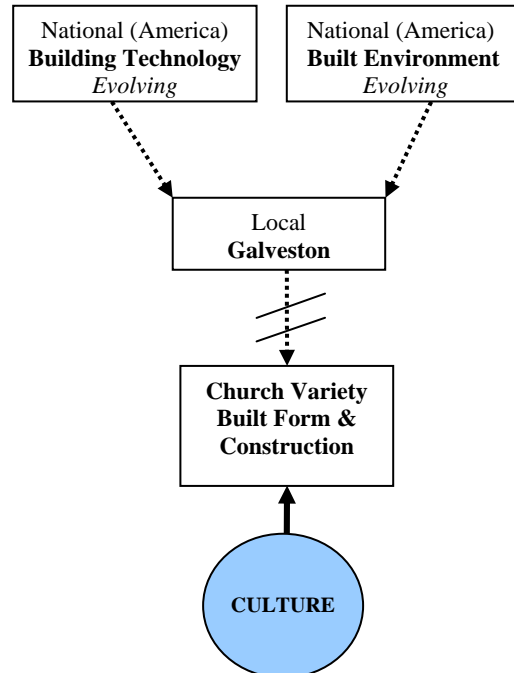


Figure 3: Evolving variables.
Source: Created by Author.

Hypotheses

Three major hypotheses are derived from the conceptual model that illustrates the variables, *culture, faith, environment, building technology, and church form and construction*, involved in this study and from Figure 2 and Figure 3 that identify in detail the relationship between these variables and illustrate the impact of culture on the churches' form and construction.

(a) Churches of the same religion built in the same environment and approximately during the same era vary in their built form and construction. During a personal field trip to Galveston the phenomenon described in this hypothesis was observed, which formed the foundation for this inquiry. Historical documents, photographs, church records and other archival data corroborated this observation giving basis from which the hypothesis was derived.

(b) If religion, physical environment, and building technology are held constant then the variety in church form and construction is a function of culture. This hypothesis finds grounding in the argument that if faith is held constant (Catholicism) then variety in built form and construction can not be explained because of differing religious doctrine. Likewise, if the physical environment in which the churches were built is the same (Galveston) for all of them, then their variety of form and construction is not owed to differing environmental conditions. Furthermore, if the building systems and materials employed to construct the churches remains constant across all of the churches, then it can be reasoned that the diversity of form is not the result of evolving building technology.

(c) If form and construction of the churches do not reflect the variety of the built environment and evolving building technology then the variety in church form and construction is a function of culture. To test the argument that the built environment and building technology had evolved in America and Galveston during this era, the study introduces this hypothesis. As chronicled by McAlester and McAlester (1991), Scardino and Turner (2000), and Barnstone (2001), America and Galveston were subjected to an evolving built environment manifested by changing architectural styles. Furthermore, America and Galveston during this era (last half of the 19C) experienced evolving building technology as construction methods and materials advanced from load bearing masonry and timber construction to the use of cast iron and the steel skeleton frame (Friedman, 1995). Thus it is syllogized that if the churches' built form did not reflect the evolving architectural styles in vogue in America and Galveston nor implement the changing building technologies during this era then their influence on the built form is concluded to be minimal.

METHODOLOGY AND PROCEDURE

Method

The research design methodology for this study is an “explanatory case study”, which uses multiple units of analysis (Yin, 1993), further described as comparative case analysis. This approach presents data which bears on a cause-effect relationship—attempting to explain what causes produced what results. As described previously in the Conceptual Model section, the dependent (outcome) variable for this study is *church form and construction*. The independent (explanatory) variables—those factors influencing the church form—are identified as *culture*, *religion*, the *environment* (built and physical), and *building technology*. In relation to this study’s research question (see page 1), the religion variable is held constant as the study churches serve the same faith (Catholicism). The physical environment variable is held constant as the churches were built in the same geographic location, Galveston, Texas, and during the same approximate era (the last half of the 19C). This in turn exposed the churches to the same evolution in the built environment and building technology of the era. To test the study’s hypotheses a comparative analysis matrix is used to compare each church along the predetermined variable criteria and against the other churches.

The *comparative analysis matrix* (see figure, p. 154) is designed with the units of analysis (churches) positioned across the top of the matrix and the independent variables listed down the left margin. Each independent variable is assigned a set of criteria that further defines them and establishes their operational parameters (see the matrix and the conceptual model section).

Culture

As mentioned, this variable draws on three criteria.

- The background of the church builder/designer—ancestral origin, formal training and practical experience.
- The architectural style criterion includes—the roots of the style; the anthropomorphic design of the Latin-cross configuration (Stroik, 1997); side aisles; and scale, which is defined as the overall size/volume of the church (large, medium, or small). This criterion also attempts to answer the following questions: Did the church architecture represent a known design style or pattern? Did the church reflect stylish contemporary thought of the era, such as the Gothic Revival style rooted in medieval traditions (Willis, 1850; Sholl, 1869; Withers, 1873; Tiffany, 1875; Robinson, 1981; Scardino & Turner, 2000; Seasoltz, 2005).
- Parish ethnicity. The major question being; did the majority of parishioners represent ethnic groups who brought with them their cultural symbols to Galveston? What cultural symbols are manifested in the church construction?

Faith

The faith variable centers on five criteria of church design and construction that the Catholic Church expressly informs through Canon Law: Book III: Sacred Things, Part II: Sacred Places and Seasons, Section I: Sacred Places, Title IX: Churches (Woywod, 1918); and from its long history of ecclesiastical policy writings summarized by Rev O’Connell (1955) and the Committee on Liturgy (2000) of the National Council

of Catholic Bishops. The following criteria and operational parameters were drawn out of the literature review (page 18) and selected pertinent to the study churches.

- The physical site upon which the church is constructed. The operational parameters which further define this criterion are:
 - Site location. The emphasis being a neighborhood site that is removed from major thoroughfares. The intent, to provide visibility and convenience for parishioners and to diminish disruption to the sanctity of *Domus Dei* caused by traffic and associated street noise.
 - Perimeter space. It is desirable to leave space at the church perimeter to permit the clergy to freely pass as they conduct various liturgical rituals (blessings, consecrations, etc.).
 - Church orientation. The stated desire is to orient the church's long axis east-west with the altar in the east and the entrance doors facing west, owing to the powerful symbolism inherent. Thus, the risen Christ, the altar's focal point, is connoted by the rising sun, while the western facing doors look upon death/departure expressed by the setting sun.
- The church plan (space arrangement within).
 - Spatial hierarchy. The church is to encourage the active participation of the faithful creating a spirit of community. The Church defines its buildings—chapels, parish churches, cathedrals—according to the spaces that they contain (O'Connell, 1955). At a minimum the parish church (the classification of four of the study churches) should in addition to the entrance

have a narthex (a vestibule inside the entrance), a nave, a baptistery and a sanctuary (seat of the altar). A cathedral (St. Mary's, the fifth study church) is to have all of the above, plus it usually is larger in size than a parish church.

- Baptismal font and altar location. The arrangement of the baptismal font to the altar, like the church's longitudinal axis, is also symbolic. The relationship between them is linear, signifying man's rebirth and his journey to salvation as he moves from baptism towards the altar, the risen Christ, and heaven. Thus the baptismal font should be near the church entrance with the altar at the opposite end.
- Prominence of Altar. This parameter concerns the altar's placement. Because it is the focal point of the church its position should be prominent, the interior lines of the church should draw the eye to it. It should be elevated to promote visibility but should not be so positioned that it is not separated from the faithful.
- Verticality (physical height). While Canon Law is relatively silent regarding the height of churches and the physical height within churches, it does speak to identifying the location of the altar and baptismal font within, through the placement of domes and/or spires externally. In a subtle way the church design should lift man's heart and mind heavenward, more over, the vertical elements can serve as the link between earth and heaven.
 - The finish floor elevation of the nave. Published data regarding specific topographic elevations for the study churches prior to the early 1900's was

not available. Therefore, their finish floor elevations were based on an article entitled “Raising Galveston” (Walden, 1990) and published grade-raising figures (figure A-1, p. 193). Walden explains that the island elevation was to be raised to a height of eight feet above mean low tide (MLT) starting at avenue “A” (proximate to Galveston Bay) and slope upward at the rate of one foot per every 1500 ft of horizontal distance until reaching the sea wall (facing the Gulf of Mexico) which was constructed to an approximate height of 17’ above MLT. The published grade raising figures table was organized as an intersecting grid of Galveston city streets—lettered streets across the top and numbered streets down the left margin. At the street intersections a value indicating how much fill was required to bring the grade up to the new elevation was indicated. Using these values the original ground elevation could be determined. For example, Avenue J (Broadway) was to be raised to a uniform elevation of 10 ft. At the intersection of Avenue J and 13th Street, the location of Sacred Heart-I, the amount of fill required, according to the table, to bring the elevation up to 10’ was 2.8 ft, thus the original ground height for the church was determined to be 10’ – 2.8’ or 7.2 ft above MLT. The next step in the calculation was to determine the height of the finish floor above the existing grade. From pictures of the study churches’ exterior available before the “grade raising” stair risers from the finish grade to the church entrance were counted. Assuming a uniform architectural standard dimension of 7½” per tread riser, the finish floor height is calculated.

- The presence of steeples, spires, and/or domes. Steeples, spires, and domes are used to draw attention to the church and contribute to the sense of man's connection to heaven. Furthermore, they often are external acknowledgements to the internal presence of the altar and baptismal font, and to the intersection of the cross.
- Nave ceiling height to width proportion. While physical vertical height is a quantifiable measurement, the sense of height is not created just by the vertical measurement. Rather it is achieved through the relationship between height and width that influences the sense of height (loftiness) and can be measured by the ratio of the nave/sanctuary ceiling height to its width ¹.
- Holy Light. In evaluating this criterion three operational parameters were derived from ecclesiastical thought, literature addressing lighting in places of worship (Aitken, 1998; Rea, 2000; Lechner, 2000), and contemporary thought of the era (last half of the 19C) regarding church design and lighting (Bowler, 1856).
 - Accent lighting evaluates how the church building provides direct light to religious focal points. Did day lighting directly illuminate those locations within the church where ceremony takes place—the altar, the baptismal font? Were the religious symbols—statues, tabernacle, and crucifix—specifically illuminated by Holy Light? In response the study churches were appraised for the presence of windows or other wall openings that flanked these locations and for windows in domes, lanterns, or other roof constructions that provided direct light to these locations and symbols.

- The presence of general (ambient) lighting to the churches' interior was observed. In contrast to accent light, the question raised is: was there sufficient general light for reading and the illumination of walls and ceilings such that religious and architectural features are revealed?
- Avoiding glare within a church represents the third parameter. Harsh light that penetrates the church can distract the worshipping faithful, obscure liturgical ceremony, and conceal religious symbols and focal points. In an effort to reduce glare, factors such as window/opening location should be considered. Preferably there are no windows in the east or west, and if present should be situated high in the wall or shaded. Accounting for Galveston's geographic latitude, windows/openings should occur in north and south building façades, with the majority facing north. Another factor is the use of stained glass in window glazing that can diffuse light. Additionally, church design should incorporate external shading devices, overhangs, and parapet walls to directly block harsh sunlight from entering the church.
- Construction materials. The evaluation of this criterion considered the materials incorporated into the construction of the church. The specific focus following from implications set by Canon Law was the use of permanent materials such as stone, brick (see literature review, p. 21).

Environment (Physical & Built)

Physical Environment: Climate and Terrain

Galveston of the last half of the 19C can be described geologically as a low, flat sand barrier island, typical of those along Texas coast that buffer the mainland from the Gulf of Mexico. Eric Larson (1999) notes Galveston's lack of physical presence regarding its terrain, "Its highest point, on Broadway, was 8.7 feet above sea level; its average altitude was half that." Therefore, physical environment in this study examines only the impact of climate and not the flat topography on the church form and construction. Moreover, since all of the churches were built in the same location, Galveston, Texas, the physical environment can be held constant. Thus, differences in church form were not due to the impact of different climatic conditions or topography. It might be argued the varied church form can be attributed to whether or not the designers/builders complied with design expedients intended to maximize thermal comfort within their structures. To appraise this possibility the study churches were contrasted against four accepted thermal comfort design strategies tailored to the Texas Gulf Coast (Lechner, 2000).

- *Keep the summer heat out of the building.*
 - Compact design (minimal surface area to volume).
 - The presence of exterior shade and vegetation to reduce sunlight entering the building.
 - Small windows and few in number.
 - Light colored roofs and walls.

- *Use of natural ventilation to cool and remove humidity.*
 - Orient the structure such that it captures prevailing winds.
 - Provide space between buildings to allow for air circulation.
 - Incorporate high ceilings into the design.
 - Provide cross-ventilation through operable windows on the leeward and windward side of the structure.
- *Protect from the summer sun.*
 - Shading devices including forms of the building itself.
 - Use plants for shading.
 - Highly reflective building surfaces—roofs and walls.
- *Avoid the creation of additional humidity.*
 - Avoid the use of pools or fountains.
 - Eliminate or reduce standing water by providing proper drainage.

Built Environment

The built environment addresses the prevailing architectural styles of the era (last half of the 19C) in America and specifically Galveston. To illustrate and track this phenomenon a time line is used to contrast the architectural styles in vogue in America during the last half of the 19C versus the style(s) manifest in Galveston and represented in the study churches during this same era (see figure, p. 154). In the Figure on page 154 the time line has an architectural style classification on the left followed to the right by the specific style that typified this classification. The brackets serve to illustrate the range in years this style was in vogue. For example, by the 1840s and to the 1860s

American architecture was rooted in Ancient Classical which manifested itself in the style of Greek Revival (McAlester & McAlester, 1991). In Galveston this same style showed itself between the mid 1830s and late 1850's, in what Barnstone (2001) calls "Galveston Greek". The Catholic churches, built before the Civil War, ignore this fashionable style turning to the Gothic Revival design instead.

Building Technology

Building technology centers on the methods, systems and materials that were known and available in America and specifically in Galveston, Texas during the last half of the 19C. The study focuses on the actual application of this available building technology to the study churches. In other words, (a) did church construction use the era's available building technology and (b) was this advancement consistent with the evolving building technologies available in America at this time?

To demonstrate this impact, the variable of *building technology* is incorporated into the *comparative analysis matrix* (see figure, p. 154) using a time line that contrasts its progression of use in America and in Galveston. Similar to the architectural style time line explained previously, specific building technologies are identified and the range of years representing their predominant use in America and in Galveston is defined by brackets. For example, in the time period from mid 1840s through the 1860s the use of milled lumber was a predominant building technology employed by builders and designers.

Against the backdrop of this time line the criterion of *architectural detail* is used to examine the construction of the study churches. Given that building technology can

impact the scale of a structure this parameter utilized general building dimensions (height, width, and length) to depict its impact on the study churches. The building materials as well as the structural systems adopted for the foundation, floors, walls, and roof are considered. Exterior and interior finishes used in the church construction are identified.

Procedure

The unit of analysis for this study is the church form and construction. The study analyzes five Catholic churches constructed in Galveston, Texas, during the last half of the 19C². The study churches selected were: (a) St. Mary's Cathedral, built in 1848, (b) St. Joseph's, built in 1859, (c) St. Patrick's, constructed in 1872-1877, (d) Sacred Heart, built in 1892, before the 1900 Storm which is designated Sacred Heart-I, and (e) Sacred Heart erected in 1904, after the 1900 Storm which is designated Sacred Heart-II. The criteria for selecting these churches is based on the research question (see page 1) and the conceptual model (figure 1, p. 32). They are as follows

- They all represent the same religion—Catholicism (Faith).
- They were built in the same location—Galveston, Texas (physical environment).
- They have all been constructed during the same era—the last half of the 19C, which exposed them to the era's built environment and building technology.
- They represent different ethnic groups of immigrants and designers/builders (Culture).
- They all express a variety of form and construction.

Data Collection

Data for this study was obtained from three major sources: literature review, archival studies, and field trips.

- Literature review. Through the review of the pertinent literature the following background data was obtained: Galveston's history and physical and built environment; the history of the study churches, their construction, architecture, designer/builder, and building technology (see for example, McComb, 1986; Moore, 1992; Scardino & Turner, 2000; and Brands, 2005). Additional data was gathered from short papers or brief publications that expounded contemporary architectural thought of the era such as *Expressions in Church Architecture: A Paper* (Tiffany, 1875), or Frank Wills' 1850 essay in which the principles of ecclesiastical architecture as applied to the present day desires of the church are expressed.
- Archival studies were conducted through a content analysis of archived data. The following archives were used: The Catholic Archives of Texas, Austin Texas; the Alexander Architectural Library, and the Center for American History both located on the campus of the University of Texas, Austin, Texas; the Rosenberg Library, Galveston, Texas; the Archives of the New Orleans Province of the Society of Jesus , Loyola University Library, New Orleans, Louisiana; Sterling C. Evans Library, Texas A&M University, College Station, Texas; the Galveston-Houston Diocesan Archives, Houston, Texas, and the Galveston Historical Foundation (GHF), Galveston, Texas.

The collected data was extracted from a variety of sources. Among these were newspaper accounts regarding the history and construction of the study churches published in the Galveston Daily News, The Galveston Tri-weekly News, and The Galveston Evening Tribune, for instance. Also included were first hand accounts found in personal diaries and letters, such as the correspondence between Bishop Odin and his primary benefactor, the Propagation of the Faith, Lyon, France. Further information was found in books, pamphlets or printed church histories. Additional data was sifted from manuscripts, typified by the National Park Service HABS survey, the William Maury Darst papers, and the Jane Chapman papers.

Architectural drawings, exemplified by Nicholas Clayton's plans for the reconstruction of St. Patrick's church post-1900 Storm, provided more data.

Photographs, particularly those taken proximate to the time of the church's original construction, were a rich source of detail as were the Sanborn insurance and Galveston city maps.

- Field trips constituted personal observations of the churches by the author, review of documents, pictures, and other records maintained by the individual parish offices, and interviews with church and Galveston Historical Foundation staff.

Additional information was secured from two practicing preservation/restoration architects: Joseph K. Oppermann, FAIA, presently engaged in St. Mary's Cathedral's current restoration project, and Killis P. Almond, FAIA, who was retained by the Galveston-Houston Diocese for its restoration efforts regarding St. Patrick's church in the late 1980's.

Data Collection Limitations

While the archives provided much information used in this study, their limitations should be acknowledged. Some of these limits are in the nature of the collection's condition and its storage; others are described by texts devoted to case study research theory and application (Stake, 1995; Yin, 1993). For example, deterioration of documents caused by age and handling—fading, shrinkage, torn or missing page parts—obscures the data. Furthermore, document condition may classify them unavailable for public viewing, for copying, or to be examined closely. Records may be incomplete, missing issues of newspapers or journals for example, the result of past fires, storms, or civil unrest. Often materials, particularly photographs, are undated thus obscuring time frames. Since the organization and classification of the archive's contents are the prerogative of the particular archivist, the indexing/cataloging of collections is not standardized from archive to archive. Also, the constraint of time can limit this approach to data collection because access is often restricted by an archive's circumscribed hours of operation.

Language can also pose a barrier. Documents may require translation into English with the translation subject to the interpretation of the translator. Additionally, documents in English may be of an era that used a handwritten script difficult to decipher.

Personal observations were hindered by the elapsed time between these churches' inaugural construction and the present. Just as Galveston has evolved over the last 150 years so have these churches and their context. Four of the church structures

have undergone alternations to their initial fabrication so what is represented currently is not its original composition. The fifth church, Sacred Heart-I, destroyed by the 1900 Storm was not rebuilt to its original form, so personal observation was not possible. In addition, the church context has transformed. Sanborn maps clearly illustrate that many buildings currently proximate to these churches did not exist when the churches were originally built. Moreover, the proximity of adjacent buildings/structures obfuscated observations from a particular view. In the aftermath of the 1900 Storm portions of Galveston underwent a “grade raising” which impacted the building site and its surroundings. Another limitation was access. The physical size of the edifices prevented in many instances close observations without the use of sophisticated hoists or scaffolding unavailable to the author. In addition, church officials’ preferred to deny such access, citing safety/liability concerns.

Finally, the data, whether gleaned from observation, documents, pictures, or accounts are subject to the judgments, inferences of meaning, and interpretations of the researcher. And while photographs by their nature can be revealing they only capture a moment in time. In addition, data retrieved from second hand sources is subject to the interpretations of that author (Marshall & Rossman, 1999).

Data Organization

The data collected from the sources mentioned previously was assembled into separate folders for each church. This assembled data was then organized into two parts and is structured according to the conceptual variables and their criteria for analyses. The first is the *analysis description* for each church. The second is the *comparative*

analysis matrix (see figure, p. 154); which summarizes the analysis, shows the variable criteria for each church, and illustrates the comparison among the churches.

Each data source—photograph, news article, letter, manuscript, etc—was scrutinized for information applicable to the particular criterion/parameter for each variable. The identified data in the source document was highlighted and then manually copied and grouped by the criterion for each variable (see matrix for arrangement) along with its citation into an electronic version. To provide an audit trail, the highlighted data in the source document was referenced to its location in the criterion grouping (figure A-2, p. 194). For example, any highlighted information in the source document that referred to a church’s architectural origin was coded “IB-1” next to the highlighted text (IB-1 of the matrix is the criterion under the variable of culture pertaining to the origin of the church’s architecture). If highlighted data referenced the church’s architectural plan it was coded “IB-2” (IB-2 of the matrix is the criterion corresponding to the architectural plan of the church). This process of highlighting, coding and copying continued until all source document data had been thoroughly examined and the data placed into its proper location within each church folder.

The analysis description for each church was created by analyzing the assembled data against the variables, their criterion, and parameters and in accordance with the established guidelines as described in the introduction of the analysis section (page 54). The summary of this analysis was placed into the matrix (see figure, p. 154) while the analysis description (narrative) provided the written justification for its placement (see next section: Analysis and Results).

ANALYSES AND RESULTS

Introduction

This section consists of three parts. The first is the introduction which contains the guidelines that govern the analysis of each variable and its criteria/parameters. Described below, they are arranged in the same format (variable/criteria/parameter) as in the methodology section discussed previously. The second part is a descriptive analysis (narrative) of each church regarding the variables, their operational definitions (criteria) and parameters. The third part is the *comparative analysis matrix* (see figure, p. 154) that summarizes and illustrates the result of the analyses. Based on the study's independent variables and their operational definitions (criteria/parameters), each church was assigned a particular datum entry for that criterion/parameter which the matrix reflects. For example this data entry could be a name or an alphabetic designation, such as a Y (yes), N (no) or M (for medium), BM (for bearing masonry); a number; or a symbol indicating whether the study church fully {●}, partially {◐}, or had not met {○} the specific parameter.

Culture

Architect/Builder

Under this criterion the church architect/designer/builder (name); his ancestral/ethnic background; and his formal training and experience is documented.

Architectural Style

If the church's architecture was of a known origin, i.e. represented an acknowledged architectural theme or pattern, that theme is indicated by name in the

matrix, If the ethnicity of the designer/and builder matched the subset of the church's architecture {Y} was placed in the matrix, if not then {N}. The presence of a Latin-cross configuration equaled a {Y} entry; its absence received {N}. The presence or absence of side aisles received the same designation. Scale of the church is a subjective opinion by the author using volume ($\text{ft}^2 \text{ area} \times \text{height}$) to designate the size of the church as small (S), volume less than $100,000 \text{ ft}^3$; medium (M), volume between $100,000 \text{ ft}^3$ and $250,000 \text{ ft}^3$; or large (L), volume greater than $250,000 \text{ ft}^3$. If the church substantially represented the contemporary thought of the era regarding the look of a church {Y} was placed in the matrix for yes, and {N} if not.

Parish

If the parish membership was predominantly a particular ethnic group their ethnicity was entered by name into the matrix along with {Y}, if not, {N} was designated. The presence of ethnic/cultural symbols as part of church form and construction were indicated with a designation of {Y} or {N}.

Faith

Church Site

If the church site location was in a residential neighborhood and also removed from major traffic thoroughfares (based on historical data as close to the time of church construction) {●} was placed in the matrix, if the church was in a residential neighborhood but not removed from major streets {◐} was placed in the matrix, if site location was not a residential neighborhood, regardless of the proximity to a major street(s), {○} was designated.

If physical space that would accommodate ambulatory movement completely encircled the church perimeter the designation was {●}, if any portion of the perimeter did not provide for unobstructed passage {☐} was assigned. Perimeter space that was either less than half of the perimeter length or absent was given {○}.

If the church's longitudinal axis was oriented east-west with the altar in the east and the church entrance in the west {●} was placed in the matrix, if the long axis was east-west but the altar was not facing east then {☐} was assigned. For any axis that was not an east-west orientation {○} was designated.

Plan

If the church building contained all of a parish church's designated spaces—entrance, narthex, baptistery, nave, and sanctuary—it was given {●}, if it had at least three of these components {☐} was assigned. A church having only two or less of these spatial designations was assigned {○}.

The baptismal font and altar relationship was administered in the following manner. If the font and altar were present and positioned at the opposite ends of the church from one another {●} was given. If they were present but not situated at opposite ends of the church, i.e. were in a proximate position to each other, {☐} was designated. If either component was not present {○} was placed in the matrix.

Prominence of the altar was designated according to the following. A {●} was designated if the altar was (a) placed in an elevated position from the nave; (b) was clearly visible from the back of the nave, and (c) there were no large obstructions

(barrier screens) that separated it from the nave. If any of these conditions were not met {☐} was designated, if all three conditions were not met {○} was given.

Verticality

Using the grade raising figures (figure A-1, p 193) and the assumed uniform tread height of 7½” as described in the methodology section, the finish floor elevation for each church was calculated. If the church’s finish floor height was less than 2’ above existing grade it was considered to be insignificant and was given {○}. If the floor height was between 2’ and 4’ it received {☐}. Any height above 4’ was indicated by {●}.

The presence of steeples, spires, and/or domes was rated in the following manner. If no steeples, spires, or domes were present {○} was assigned. If at least one steeple, spire or dome adorned the church it received {☐}. A {●} was warranted where both a steeple or spire and a dome were present and the dome or steeple surmounted the altar or baptismal font location.

The height to width ratio was assigned the following values. If the height of the nave ceiling equals its width (the distance between clerestory walls if present) the ratio is 1.0 and the loftiness parameter is not met. Therefore if the ratio was 1.0 or less a {○} was assigned. If the ratio is between 1.0 and 2.0 the parameter is partially met {☐}, a ratio exceeding 2.0 fully meets the parameter {●}. Because side aisles, typically used to structurally buttress the nave and clerestory walls, generally have lower ceilings than the nave, their width is not an included dimension.

Holy Light

Accent lighting was assigned the corresponding matrix values. If the altar, baptismal font, other ceremonial locations and religious symbols as described in the methodology section were subject to direct day lighting as the result of windows or other openings placed next to or above these symbols for that specific purpose, {●} was accorded, if some of these religious focal points but not all received direct lighting, {☐} was allotted. A {○} was apportioned for any instance in which all of the previously mentioned entities received no direct day lighting.

The rationale used to gauge the effect of ambient lighting was the existence of clerestory and nave windows in conjunction with their approximate estimated wall area percentage. If both nave and clerestory windows were present and they comprised more than 50% of the wall area the criterion was met {●}. If, (a) both clerestory and nave window/opening(s) were present but their area was less than 50% of the wall area, or (b) either clerestory or nave window/openings were absent but the glass/opening area exceeded 50% of the wall area, the criterion was partially met {☐}. The criterion was not met{○}, if, (a) both nave and clerestory window/openings were absent, or (b) only nave or only clerestory window/openings were present and their glass area was less than 50% of the wall area.

Avoiding glare within the church was evaluated as follows. If no east or west window/openings into the nave or sanctuary are present or if present they are glazed with stained glass, {●} was assigned. The parameter is partially met {☐} if (a) east or west window/openings with clear glazing are placed high in the wall or (b) the church

design integrated external shading devices. The parameter is not met {○} if all of the above conditions are not met.

Construction Materials

As explained in the literature review, Canon Law regards stone as the material of choice for the construction of Catholic churches, and mandates its presence for the consecration of the edifice. Therefore, this criterion was assigned the following values. If the church was constructed of stone the criterion was fully met {●}. The criterion was partially met {■} if brick masonry was used to construct the church. The criterion was not met {○} if a material different than stone or brick masonry, for example wood, was used.

Environment

Physical Environment

The first thermal comfort design strategy is, *keep summer heat out of the building*. To fully meet {●} this parameter all four conditions must be met (a) compact design, (b) the presence of exterior shade and/or vegetation, (c) small window size and few in number, and (d) light colored roofs and walls. If some but not all of these conditions are present the parameter is partially satisfied {■}. If none of the conditions are met, the parameter is not met {○}.

The second thermal comfort design strategy is, *use natural ventilation to cool and remove humidity*. To meet this standard fully {●} (a) orient the structure so that it captures the prevailing wind, (b) space between buildings to provide for air circulation, (c) high ceilings, and (d) cross-ventilation through operable windows on the structure's

windward and leeward elevations. If some but not all of these conditions are met the parameter is partially met {☐}. If none of these are met the parameter is not met {○}.

The third thermal comfort design strategy is, *protect from the summer sun*. Full compliance {●} with this parameter equates to (a) the presence of shading devices including the building itself, (b) plants for shading, and (c) reflective building surfaces—roofs, walls. Again, if some but not all of these conditions are met the parameter is partially met {☐}. If none of the conditions are met the parameter is not met {○}.

The fourth thermal comfort design strategy is, *avoid the creation of additional humidity*. A fully met parameter {●} would (a) avoid the use of pools or fountains, and (b) provide proper drainage to eliminate or reduce standing water. A partial compliance is achieved {☐} if either (a) or (b) is met, and if neither (a) or (b) is met then the parameter is not met {○}.

Built Environment

The built environment uses a time line of documented architectural styles present in America and Galveston during the last half of the 19C. Against these time lines the architectural style of the study churches is compared, the intent of which is the identification of parallel(s) that may help explain the impact the built environment had on church form and construction.

Building Technology

Similarly, building technology also uses a time line to illustrate the presence of building knowledge/systems and materials used in both America and Galveston during the last half of the 19C. This time line commences in the 1600s rather than at the start of

the study era to demonstrate that building technology during America's first 250 years of growth and development remained virtually unchanged. Against this time line the criterion of architectural detail and its associated parameters, previously defined (see methodology section), for the study churches are contrasted. The data presented in the matrix are alphabetic designations representing material(s) and/or building system(s) used in the study churches' construction (see figure, p. 154). The purpose, again, is to identify the presence of parallel(s), which may help explain the impact that building technology of the era had on church form and construction.

Analysis: St Mary's Cathedral



Figure 4: St. Mary's Cathedral, circa 1847-1860.

Source: Courtesy Galveston-Houston Diocese Archives, Houston.

Culture

Historical Background

As part of a grander plan by the Catholic Church to reestablish Catholic affections in the new Republic of Texas, St. Mary's parish was established in 1841, with Reverend John M. Odin, a native of Ambierle, France as its pastor. In 1847 Pope Pius IX elevated Texas to a bishopric, establishing Galveston as its episcopal see (the bishop's official residence), and naming Father Odin as Bishop. The new Galveston/Texas diocese was organized administratively under the Archdiocese of New Orleans, Louisiana, and its archbishop the Rt. Reverend Blanc (Wright, 2001).

The original church was a simple wooden structure and served this new parish until a permanent church could be erected. In a letter to the Propagation of the Faith, Lyon, France, dated 14 May 1845 Bishop Odin declares his desire to build a solid church for all the Catholic population in Galveston. With the creation of the Texas bishopric in 1847 construction of St. Mary's Cathedral began. It was completed as a solid masonry structure and consecrated in November 1848. Nicholas Clayton designed and supervised in the construction of the bell tower adjacent to the church apse in 1876 and the heightening of the front twin spires in 1884.

St. Mary's was named a Texas historic landmark and placed on the National Register of Historic Places in 1968. Pope John Paul II recognizing St. Mary's antiquity and historical importance as a place of worship, elevated St. Mary's to a minor basilica in August of 1979 (Christensen, 2001).

Architect

The architect of record for St. Mary's is Theodore E. Giraud, the younger brother of Francois P. Giraud, a noted San Antonio architect and onetime mayor of the city. Theodore was born in Charleston, South Carolina to François and Adele Giraud who had immigrated to America from Bordeaux, France. In 1847 the family moved from Charleston, to San Antonio, Texas (Scardino & Turner, 2000).

Following in his brother's footsteps, Theodore's formal instruction in architecture was received in Paris, France. But unlike François, Theodore lived a nomadic life. After meeting and marrying Margaret Sturrock in Galveston, Texas the couple moved to New Orleans where Theodore established an architectural practice. He is listed in the 1850 New Orleans city directory as an architect residing at #12 Rue Conti. During his tenure in the Crescent City he designed and constructed several churches. One in particular, Immaculate Conception, ca. 1857, is believed to have served as the prototype for Galveston's Sacred Heart-II constructed at the turn of the century. It is conceivable that the architectural style Giraud adopted and Bishop Odin approved for St. Mary's in addition to their collaboration on the project was influenced by the French heritage of both men, and particularly Giraud's formal architectural training received while studying in France. With the fall of New Orleans to Union forces in the early 1860s Theodore and his family moved to Monterey, Mexico, where he was the city engineer at the time of his death in 1863 (Beasley & Fox, 1996).

Architectural Style (see figure 4, p. 61)

St. Mary's architectural origin to French Medieval is revealed by its Gothic elements. Completed in 1848, it is considered the first monumental work of civil architecture in Texas (Beasley & Fox, 1996). Evidence of the French influence owed to Giraud's heritage and training is strengthened by the parallels in form between St. Mary's in Galveston and New Orleans' St. Louis Cathedral and St. Theresa's Catholic Church. Thus, {Y} is designated.

The Historical American Building Survey (HABS, 1966) documented the church plan as that of a Latin-cross (a central nave with transepts) which is further confirmed by the 1885 Sanborn map (figure 5, p. 65). Therefore, {Y} is given in the matrix. The HABS (1966) drawings and personal observations establish the presence of side aisles between the exterior walls of the nave and the clerestory wall supports, thus {Y} is placed in the matrix. In consideration of Beasley and Fox's characterization of St. Mary's as a monumental work in its volume, and based on the following dimensions of 126'-0" L x 64'-0" W x 43'-6" H = 350,800 ft³ as described in the Odin letter date December 6, 1847, and HABS (1966) the scale of the church is considered to be "large", therefore, an 'L' is designated in the matrix. St. Mary's Gothic style, cited previously, was consistent with the contemporary thought of the day regarding church architecture as explained in the literature review, therefore, {Y} is placed in the matrix.

Parish

The collected data failed to establish a predominant ethnicity for the parishioners of St. Mary's. In letters to the Propagation of the Faith, Lyon, France(1845, May14;

1847, April 9; 1850, March 10), Bishop Odin refers to the ever increasing emigration of European Catholics to Texas, with many remaining in Galveston, thereby justifying the need for a larger permanent church. There is no reference however, to any specific cultural group. Therefore, {N} is placed in the matrix. Similarly, because there were no specific ethnic cultural symbols that graced the church, {N} was placed in the matrix.

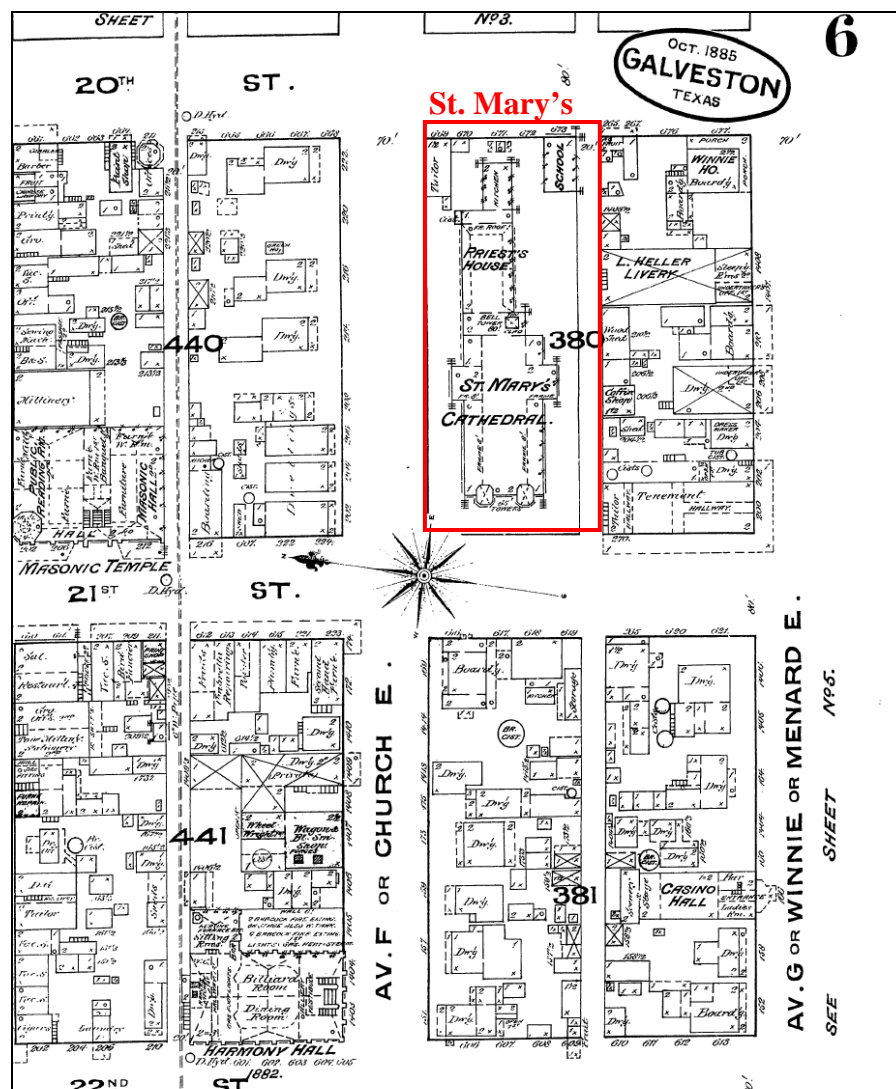


Figure 5: 1885 Sanborn map, # 6, St. Mary's Cathedral, Galveston Texas.

Source: available at <http://sanborn.umi.com.ezproxy.tamu.edu:2048/tx/8539/dateid-000001-sheets-1a.htm>

Summary of Results

A specific cultural/ethnic background of the parish cannot be determined as an influential factor in the design of St Mary's. Its built form appears to have resulted from a French influence, cited previously, and contemporary architectural thought of the era. The architect Giraud, an American by birth was the son of French immigrants. In addition, he received formal architectural training in France. This influence was likely strengthened by Bishop Odin's French heritage and the ties he maintained with his homeland. Furthermore, since Canon Law mandates that the Bishop approve church construction, it could be argued that Odin's French ties guided his decision to grant Giraud the commission. The scale of the church was determined to be large and this is consistent with the Catholic Church's desire regarding cathedrals. In addition, the Gothic elements, Latin-Cross plan, and side aisles speak to the Medieval model of church design and are consistent with the prevailing architectural thought of the era regarding church architectural style.

Faith

Church Site

St. Mary's Cathedral is located at the southeast corner of the intersection of Twenty-First Street and Post Office Street (Avenue F) (figure 5, p. 65), in the commercial district of downtown. The rationale for this selection appears based on its position of prominence. According to Joseph Oppermann's 2003 Conditions Report, the present church site is the original site and was adjacent to property set aside for county government. Bishop Odin's letter of December 6, 1847 declares the church to be situated

in the very center of the city and is the city's most beautiful ornament, "it can be said that it is the only monument in Galveston." The church's prominent location while drawing attention does not provide a location visible and convenient to the parishioners. Also its location is not sufficiently removed from the commercial streets serving port activity. Based on this evidence, compliance with the operational parameter of *desiring a neighborhood location removed from major traffic thoroughfares* is not met {○}.

The next operational parameter mandates church perimeter space to accommodate religious ritual(s). Photographic evidence (Oppermann, 2003) and the 1885 Sanborn map (figure 5, p. 65), reveal space at the church perimeter sufficient to accommodate this requirement. Furthermore, since the transept tower and rectory building shown on the 1885 Sanborn map were not part of the original construction, it is likely there was additional perimeter space at the time of the church's dedication in 1848. Therefore, it is determined the condition is fully met {●}.

The third parameter, church orientation, desires its long axis to have an east-west bearing that accommodates the altar in the east and the entrance in the west. While Galveston's street grid does not follow an exact north-south alignment, it is very close and is assumed to be the case for this study. The 1885 Sanborn map and photographic evidence referenced previously indicate the church fully meets this parameter {●}.

Plan (sacred path)

Hierarchy of space is the first operational parameter of this criterion. Oppermann (2003) cites that early images and the building fabric itself confirm the Latin-cross plan of today is essentially the plan of the original church. The hierarchy of space consisting

of an entrance, narthex, baptistery, nave and sanctuary is present (Oppermann, 2003; HABS, 1966). This is further confirmed in the National Register of Historic Places nomination form (Galveston-Houston Dioceses Archives, 1973). Thus it is concluded that the church fully meets this parameter {●}.

The location of the baptismal font vis-à-vis the altar is the next operational parameter. The desired arrangement is for the baptismal font to be situated near the entrance and the altar at the opposite end. The HABS floor plan drawings (Oppermann, 2003) clearly show the baptistery located on the ground level of the front right tower with the altar at the opposite end. Therefore, it is determined that this parameter is fully met {●}.

The prominence of the altar represents the third parameter. Photographs and the HABS drawings (Oppermann, 2003) show the altar located in the sanctuary at the front of the church. The sanctuary floor is elevated above the nave floor three step risers; additionally the altar rests on a low pedestal base elevated above the sanctuary floor. From photographs and personal observations the altar is clearly visible from the back of the nave. Before the chancel is a low communion rail, which separates it from the nave. This is a common structure in Catholic churches, designed to contribute to the sanctity of the space and was likely a configuration in the original church. It is not, however, a barrier that would render separation of the worshipping faithful from the altar. Thus, this parameter is fully met {●}.

Verticality (height)

Height in church design comprises the religious variable's third criterion. The first operational parameter of the criterion is the nave's finish floor elevation. According to the grade raising figures (figure A-1, p. 193) the corner of Twenty-First Street and Avenue F (Church Street) was to be raised 1.2 feet to a finish elevation of 9.1 feet. The original ground elevation at this location was calculated to be $(9.1' - 1.2' = 7.9')$. From pre-grade raising photographs (Oppermann, 2003) it appears that the front entrance (most proximate to the intersection of 21st Street and Avenue F) is two stair risers above the finish grade. Based on a standard 7½" stair riser height the nave's finish floor elevation height is calculated to be 1' - 3". Consistent with the stated guidelines this measurement is not significant {○} and is so indicated in the matrix.

The next operational parameter is the presence of steeples, spires, and/or domes. Figure 4 (p. 61) shows the presence of twin spires that flank the front entrance. In addition (noted previously), the baptistery is located at ground level of the right front tower. Being that the church has at least one steeple/spire and the baptismal font is surmounted by the same, it is concluded this operational parameter is fully met {●}.

Verticality's third operational parameter examines the church building's width to height ratio. According to the floor plan (sheet 2), HABS drawings (Oppermann, 2003) the nave width is 30' - 2". The transverse cross section (sheet 6) shows a nave height of 43' - 6". The mathematical calculation of this proportion is $(43.5' \div 30.17 = 1.44)$. Since this ratio is between 1.0' and 2.0' the parameter is partially met {◐}.

Holy Light

Direct lighting of the focal points of the faith is partially met { ☐ }. Photographs labeled “1860-1876” and “1876-1883” (Oppermann, 2003) show the presence of ground level and clerestory windows in the end-wall and of the north transept. An interior picture dated 1899 shows the presence of clerestory windows flanking the altar. However, the “1876-1883” picture does not reflect the clerestory windows in the west façade of the north transept that appear in a picture labeled “1884.” Therefore, the presence of the clerestory windows that flanked the altar as part of the original construction can not be certain, nor can the presence of window/openings in the south transept. In the superstructure of the bell tower, circa 1876 there is evidence that there were clerestory window/openings in the brick wall behind the altar before the tower was constructed. It can be argued these openings were integral to the original church and were filled with masonry as part of the 1876 bell tower construction. It is concluded that the main altar was illuminated by the clerestory windows located in the east wall. The illumination of the side altars is uncertain. The baptistery is illuminated by two ground level windows (one facing southwest one facing northwest) of the right front spire. Thus, it is concluded that only some { ☐ } of the church’s focal points were directly illuminated.

The second operational parameter regards ambient lighting of the church interior. The north elevation HABS drawing (sheet 4) and the floor plan (sheet 2) (Oppermann, 2003) and personal observation show the presence of both nave and clerestory windows. Using the north elevation drawing, the nave and clerestory window areas were estimated

to be 15% of the wall area and therefore this operational parameter is partially met {☹} (nave and clerestory windows present but their area is less than 50% of the wall area).

The third operational parameter concerns the absence of glare. Glare was likely if as suggested (Oppermann, 2003) the original window glazing was not stained glass. Given the general state of the diocese's finances, evidenced by Bishop Odin's repeated requests for donations (1845, May 14; 1846, February 28, March 17; 1847 January 11, February 24), stained glass was likely a subsequent addition. Furthermore, in evaluating the edifice's exterior there is no significant evidence of shading devices, overhangs, or parapet walls that could obfuscate glare. However, the church's orientation and window positioning do work to minimize it. As the parishioners look to the east and the altar the windows in the east wall of the chancel, believed there originally, were positioned high in the wall. The one large window above the west entrance is blocked by the choir loft, and the two ground level windows to the left of the west entrance are sufficiently obscured by the interior roof line of the side aisles. It is determined that glare, while possible, was not problematic. Thus, this parameter is partially met {☹}.

Construction Materials

The primary material used to construct St. Mary's Cathedral was brick masonry. Therefore, it qualified for consecration, which is mandated by Canon Law regarding cathedrals. However, since the church was not built of stone it partially met {☹} this criterion.

Summary of Results

St. Mary's adherence to the faith's guidelines regarding church design achieved only partial compliance. Out of 13 possible operational parameters, the church fully complied with six, partially complied with five, and failed to meet two. Concerning church site, St. Mary's provided the necessary perimeter space and the desired orientation. However, its location was neither the desired neighborhood setting nor removed from major thoroughfares and street noise. The church did comply fully with the accords of the faith regarding the sacred path. The building addressed verticality partially. Its physical elevation was considered insignificant; the sense of height within the church was partially achieved. Externally, verticality was acquired through the presence of the twin spires flanking the main church entrance, one of which surmounted the baptismal font. Regarding natural light all three of the criteria were only partially achieved. Direct lighting of all the focal points within the church could not be established. The area of the window openings was not sufficiently large to fully meet the guideline, and while they were glazed with clear glass, their orientation and positioning were such that glare was reduced. Because the church was constructed of brick masonry it qualified for consecration, which is mandated by Canon Law for cathedrals, but because it was constructed of brick and not stone it did not achieve full compliance with this criterion.

Environment (Physical & Built)

Physical Environment

As previously described, the study identified four thermal comfort design strategies. Each of them includes several operational conditions. All of these conditions must be met to receive {●}, which indicates a design compatible with the specific strategy.

Thermal comfort design strategy 1: *Keep the summer heat out of the building.*

- The condition of compact design is not met. In the HABS drawings—elevations, floor plans—(Oppermann 2003), the 1885 Sanborn insurance map (figure 5, p. 65), and photographs dated 1860-1876 and 1876-1883 (Oppermann 2003) reveal a church edifice with numerous façades and wall line offsets which increase perimeter distance and thus, wall area.
- Exterior shade and/or vegetation. Early historical accounts describe the island as a sparsely vegetated sand bar. Church photographs circa 1860 (Oppermann, 2003) show the presence of trees to a height just above the exterior aisle walls. There is no evidence of trees sufficiently tall to provide shade for the clerestory windows or the roof. Nor is there any exterior shade provided by the building other than the front towers which would offer some shading over a portion of the roof during the late afternoon. Thus, it is determined this operational condition is partially met.
- Small window size and few in number. Review of photographs and HABS drawings previously cited, and personal observation, it is determined that while the

window/openings are small in size they are not few in number and that this operational condition is not met.

- Light colored roof and walls. Pictures (cited previously) show light colored exterior walls. Personal examination of the exterior walls from the superstructure of the bell tower addition reveal a light colored lime wash applied to the exterior surface of the masonry walls. These photographs show a dark colored roof in contrast to the walls.

Some of the operational conditions for this parameter have been satisfied.

Therefore, this first operational design strategy is partially met, indicated by { ◐ } in the matrix.

Thermal comfort design strategy 2: Use *natural ventilation to cool and remove humidity*.

- Prevailing winds are captured by the church's orientation. St. Mary's long axis is oriented east-west (cited previously) exposing the south façade window/openings to prevailing south and south-easterly winds (Lechner, 2000; Galveston City map, 1891). Thus, this condition is met.
- Space between buildings to provide for air circulation. The 1885 Sanborn map (figure 5, p. 65) shows perimeter space. Also, as cited earlier, many of the structures shown on the 1885 map did not exist at the time the church was built. Thus this condition is met.
- High ceilings. The nave ceiling height is determined to be 43' - 6", HABS drawings (sheet 6), (Oppermann, 2003) and is considered to satisfy this condition.
- Cross-ventilation through operable windows on the structure's windward and leeward elevations. The presence of what appears to be window sashes from the

previously cited photographs suggests operable windows, but this is not confirmed by the collected data. Therefore, this condition can not be established.

Three of the operational conditions have been met, therefore this thermal comfort design strategy is partially met and is indicated by {☐} in the matrix.

Thermal comfort design strategy 3: *Protect from the summer sun.*

- Shading devices. As explained previously in the analysis comfort design strategy 1, there were no exterior building devices or components that offered any substantial shading of exterior surfaces. Thus, this condition is not met.
- Plants for shading. As explained in design strategy 1, photographs show the presence of trees with a moderate size canopy that provided shade to the ground level nave walls and, to a lesser extent, the roof above the side aisles (figure 4, p. 61). The trees were not sufficiently tall to furnish shade for the high roof area. Hence, this condition is not met.
- Reflective building surfaces. Referencing the discussion in design strategy 1, the relevant data determines that this operational condition is partially met.

Since not all of the operational conditions are fully satisfied, this third thermal comfort design strategy is only partially satisfied {☐}.

Thermal comfort design strategy 4: *Avoid the creation of additional humidity.*

- Avoiding the use of pools or fountains. There was no evidence in the collected data that referenced the existence of a fountain(s) or pool(s) on the church site. The baptismal font is not a considerable source of humidity since it is located indoor

(minimal evaporation), its size is small and usually it remains covered until such time that ritual calls for its use. Thus, this condition is met.

- Proper drainage conditions to eliminate or minimize standing water. Photographs (Oppermann, 2003)) reveal what appears to be a facsimile of a gutter and curb at the street edge of the church site. This suggests an attempt to drain water away from the site. Therefore, this condition is considered met.

Whereas both of these operational conditions are met, this fourth operational design strategy is fully met, which is indicated by { ● } in the matrix.

Summary of Results

Indications are that architect Giraud did not consider thermal comfort in his design. The only comfort strategy fully complied with concerned the *avoidance of additional humidity in the summer*. The other three were partially satisfied. Therefore, it appears the effects of climate were not an important factor in St. Mary's built form and construction.

Built Environment

Historical records credit St. Mary's architectural style as Victorian Gothic Revival (Oppermann, 2003). The architecture may, as suggested earlier, have been influenced more by Giraud's and Odin's French background. But considering that this style was consistent with contemporary thought one might speculate about the influence by English ecclesiastical architect Pugin.

Summary of Results

A comparison of the church's architectural style against the architectural style time lines for America and Galveston during this era reveals St. Mary's Gothic Revival mode as corresponding to the style occurring in America at this time and as mentioned earlier was in step with the architectural thought of the era concerning church architecture. It also appears, since Greek Revival was the predominant style in Galveston at this time (see literature review), that St. Mary's, circa 1848, was one of the first Gothic styled structures introduced into Galveston's built environment. As such, it was quite innovative at the time.

Building Technology

The building materials and methods, detailed below, employed to construct St. Mary's appear to express those methods and materials in vogue in America at this time. Yet, the use of solid masonry to construct the church is a distinct contrast to the frame construction techniques widely used on structures in Galveston during this time (Scardino & Turner, 2000).

Scale

The general dimensions of the church are 126' - 0" L x 64' - 0" W x 43'6" H, documented previously.

Building Materials

The data indicates the primary building materials used in the church construction was brick masonry and wood timbers (HABS, 1966; Catholic Youth Organization, 1957; Odin, 1847, May 30).

Structural Systems

Foundation

HABS (1966) documents the foundation material to be of brick. Oppermann (2003) acknowledges that the actual foundation design is unknown, but suggests a usual practice of this era was to build on shallow and narrow masonry spread footings resting on a thin layer of some inert material, such as ceramic ginger beer bottles, to provide a more stable base. The internal foundation members that supported the floor structures were likely rectangular masonry piers.

Floors

The flooring of the sanctuary is tongue and grooved pine boards (Oppermann, 2003) likely supported by a system of wood joists and girders that are in turn supported by the masonry foundation walls and piers.

Walls

The exterior walls, approximately 1' 10" thick are constructed of soft low-fired load bearing brick masonry and lime mortar. The clerestory walls use brick masonry arch construction supported on wood columns 14" square (HABS, 1966); Oppermann, 2003).

Roof

Photographs and commentary (HABS, 1966; Oppermann, 2003) document the roof as an elaborate heavy timber truss system comprised of heavy rafters; brace and beam; wood purlins, braces, and struts. These trusses are supported on the 14" square columns that line the nave. The side aisle roof consist of wood planking supported on

trusses running from the 14" nave columns to shorter and smaller diameter columns positioned in the exterior wall.

Finishes

The HABS (1966) references the ceilings as painted. The inside walls were plastered (Odin, 1847, November 11.). The ceiling panels of the nave formed by the truss spacing received decorative paintings (Oppermann, 2003). Oppermann suggests that the interior surfaces were subdued. Odin's correspondence (1847, November 11; 1852, March 28) discusses the need to postpone interior embellishments until more prosperous times and declares that the completed St. Mary's is a simple building but appropriate and spacious. The exterior walls were exposed and painted with a tinted lime wash light in color (Oppermann, 2003). This is confirmed by personal observation of the original exterior walls from within the superstructure of the bell tower added in 1876 (noted previously).

Summary of Results

St. Mary's large scale (documented previously) is consistent with Catholic Church preferences regarding its cathedrals. The use of load bearing masonry in the foundation and walls, complimented by heavy timbers in the walls and roof structure was consistent with current building technology employed in America during this time. A crawl space beneath the first floor is typical of many structures built in Galveston. The use of this system no doubt is in reaction to the islands propensity for flooding due to its low elevation and proximity to the Gulf of Mexico. However, the bearing masonry and heavy timber construction was in contrast to the milled lumber framing in wide use in

Galveston during this period. The interior walls were treated with a light stucco/plaster finish, while the exterior wall surfaces were painted with a light colored lime wash. It seems these treatments were added to provide a uniformity of appearance and finish until such time more ornamentation and embellishments could be added.

Analysis: St. Joseph's Church



Figure 6: St. Joseph's Church, circa 1904-1905; Catholic Guide Book.
Source: Courtesy; Rosenberg Library, Galveston, Texas.

Culture

Historical Background

An article about the “Cat Spring Germans” (Darst W. M., manuscript #93-0023, box 8, ff 39) describes the emigration of Germans to Texas beginning in 1831. With the hope of obtaining land promised by the Frieberg’s Grant, Austin Colony, these immigrants came directly from Germany to Texas, arriving by ship at Matagorda and Galveston, through New Orleans. By the 1850s Galveston was a major port of entry for European immigrants, the majority being Germans, which numbered 5,000 annually. According to the “Galveston Era” by Earl Wesley Fornell (Darst, manuscript #93-0023, box 17, ff 26) one-third to one half of Galveston’s population was German and needed their own church.

In light of this, Bishop Odin thought it desirable and necessary to establish a separate parish for these immigrants in which services could be celebrated in their native language (Galveston County Genealogical Society, 1984). With Odin’s blessing, construction on this unassuming wooden church began in 1859 and was dedicated in April, 1860 (Dedication, 1860, April 26) in honor of St. Joseph, the patron saint of laborers. A news paper article states what its title suggests and further declares the church is likely the oldest remaining example of Galveston’s simple wooden ecclesiastical style (St. Joseph’s Church one of..., 1978).

St. Joseph’s served the people of the parish for 109 years. In 1968 the Galveston-Houston Diocese, citing redundancy, vacated the church and auctioned off most of its contents. Through the efforts of concerned citizens the Diocese agreed to lease the

building to the Galveston Historical Foundation (GHF) under whose auspices it currently remains. Through Historical Foundation efforts to restore the church to its original state most of the auctioned contents were donated back to the church building. Today the church is leased from the diocese by the GHF, who maintains it and makes it available for historic tours, weddings, and other social events.

Architect

History records Joseph Bleicke as the architect-contractor for the church. Little is known of him and his formal training. He was born in Germany and emigrated from his homeland to Galveston with his family November 20, 1850 (Darst, manuscript #93-0023, box 17, ff 26). The Galveston Directory of 1859-60 lists him as a carpenter living between Avenue K and Broadway (Avenue J). Ironically, Joseph Bleicke was the first funeral in the church, having died in June 1860, shortly after its dedication in April of that year (Galveston County Genealogy Society, 1984).

Architectural Style (see figure 6, p. 80)

The origins of St. Joseph's architectural design have roots in Medieval rural German churches. Robinson (1981) refers to its design as transitional, which characteristically employed Gothic pointed arches. The lancet arched front entrance, nave windows and the large trefoil window adorning the front of the bell tower confirm the Gothic influence that Robinson suggests. The Gothic motif continues inside with quatrefoil shaped ceiling panels and the carved altar rail. A {Y} is placed in the matrix because of the German ethnicity shared by the church architecture and its builder.

St. Joseph's plan is a basic rectangular shape without transepts and therefore lacks the Latin-cross design. This configuration is confirmed by the 1889 Sanborn map (figure 7, p. 86) and is reflected by {N} in the matrix. Within this rectangle there are three aisles, one central and two side aisles, one each at the nave side walls. The side aisles do not form structural bays that buttress a clerestory wall but likely provided parishioners with access to the pews, their presence is indicated by {Y} in the matrix for this operational parameter. The following field measurements, taken by the author, were used to calculate the scale of the church. The width across the front is 35' - 10"; its length (depth of the original church) 70' - 6", the front entrance projection of five feet was not included in this length since it did not extend across the entire width of the church. The height of 36' - 8" was determined by counting the number of reveals (80) in the clapboard siding from the first floor to the apex of the roof gable. The reveal distance of each lap varied between 5" and 6", an average of 5½" was used in the calculation. The building volume was calculated at (70' - 6" L x 35' - 10" W x 36' - 8" H = 92,629 ft³) which is less than 100,000 ft³. In addition, the undated newspaper article cited previously, remarks, "The Gothic Revival structure provides a contrast to the larger brick churches with their exterior elaborations and stained glass." Therefore, an S was placed in the matrix.

Although Beasley and Fox's (1996) architectural guide book of Galveston does not give St. Joseph's a gothic designation, she does describe it as a Gothic Revival structure on the National Register nomination form (Darst. W. M., manuscript #93-0023, box 17, ff 26, paragraph 6, rough draft structures checklist). It is also referred to as

Gothic Revival by Darst (noted previously) as well as in church records (Galveston County Genealogy Society, 1984). Furthermore (mentioned earlier), several church elements reflect a Gothic influence. Therefore it is considered to be consistent with the contemporary church architectural thought (Gothic) of the era, and {Y} is placed in the matrix.

Parish

The news paper article (St. Joseph's Church one of..., 1978) and the historical background informs that St. Josephs was the result of specific religious needs of Galveston's German population and its (parish) creation bears evidence of the influence exerted on the community by the German immigrants. In the draft submission to the Texas Historical Commission for an historical marker (Darst, manuscript #93-0023, box 17, ff 26) it is declared that the parishioners were primarily German working class, with occupations as carpenter, printer, clerk, etc., and lived in modest housing south of Broadway (Avenue J). Therefore, it is determined that there was a predominant ethnic group (German) and is so indicated in the matrix.

Beasley and Fox (1996) characterize the church exterior as unpretentious and the inside as surprisingly ornate. The interior is adorned with intricate wood carvings which is not uncommon for German craftsmen. Also of note are the plaster stations of the cross which are considered original and bear German inscriptions. Thus {Y} is placed in the matrix signifying the presence of distinct cultural symbols.

Summary of Results

The data clearly supports a strong ethnic influence on St. Joseph's built form and construction. The church and the creation of the parish was a direct result of Bishop Odin catering to the specific needs of the German immigrants. The church was constructed (and assumed designed) by a German carpenter presumably assisted by parishioners who likely were German tradesmen. Its plan did not mimic the Latin-cross nor did it have clerestory walls or buttresses typical of grander Gothic models. St. Joseph's architecture was simple and its scale small, typical of rural folk churches. The Gothic elements reflected in its revival style however, were consistent with contemporary thought regarding church architecture. The specific German cultural symbols the church manifested are testimony to its heritage.

Faith

Church Site

The Galveston City Directory of 1859-1860 points out that the German Catholic church has been built on the southeast corner of city block 142, formed by 22nd Street and Avenue K (Isle church to become..., 1970) This location, confirmed by the 1889 Sanborn map (figure 7, p. 86) is south of Broadway (Avenue J), which as described in the parish section was then and continues today a residential neighborhood. This site, however, is only one-half block removed from Broadway, designated as the principle east-west thoroughfare in the original town plan of 1828 and its John Groesbeck revision of 1838 (Scardino & Turner, 2000). As a result the parameter of *desiring a neighborhood location removed from major traffic thoroughfares* is partially met { ◐ }.

The operational parameter regarding the presence of space at the church perimeter to accommodate religious ceremony is confirmed by the 1889 Sanborn map (figure 7). Thus {●} is placed in the matrix. Ironically, the ritual of consecration cannot be performed because Canon Law prohibits the consecration of wooden churches.

Church orientation regarding its longitudinal axis does not subscribe to the preferred east-west alignment. It runs in a north-south direction with the altar in the north and the entrance doors facing south. This operational parameter is not met {○}.

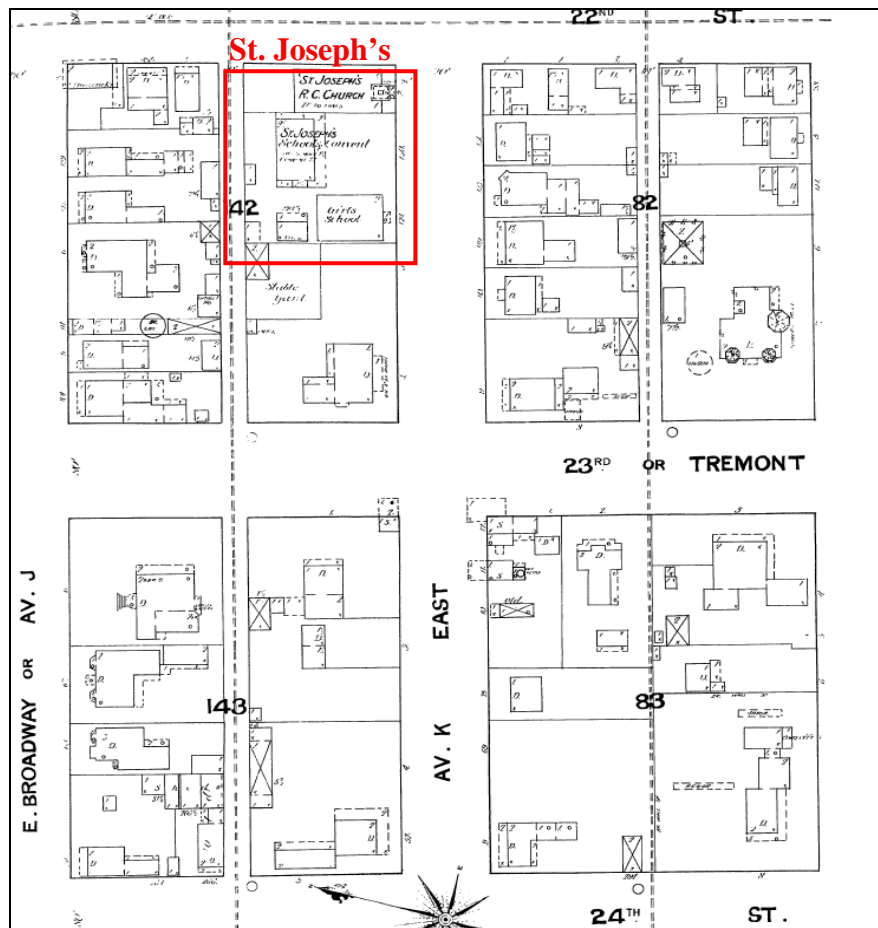


Figure 7: 1889 Sanborn map, # 28, St. Joseph's, Galveston, Texas.
Source: available at <http://sanborn.umi.com.ezproxy.tamu.edu:2048/tx/8539/dateid-000002.htm>

Plan (sacred path)

As noted earlier (Darst W. M., manuscript #93-0023, box 17, ff 26) the church has changed little from its original architecture. Personal observation and photographs taken by the author confirms that St. Joseph's contains all of the elements desired in a parish church regarding hierarchy of space—entrance, narthex, baptistery, nave and sanctuary. Hence, this operational parameter is fully met {●}.

In the same context regarding space arrangement it is also noted that the baptismal font is positioned near the entrance at the back of the nave with the altar at the opposite end of the church. This is consistent with the preferred alignment, ergo {●}.

The altar is slightly elevated, resting on a pedestal above the sanctuary floor, which is one stair riser up from the nave floor. It is also highly visible from the narthex and the back of the nave. Currently the altar is recessed at the back of the sanctuary; however its original placement was much closer to the congregation and likely more prominent as the sanctuary extension was part of church repairs made post-1900 Storm. This operational parameter, *altar in a position of prominence*, is fully met {●}.

Verticality (height)

The first operational parameter of this criterion is finish floor elevation. Again referring to the published grade-raising figures (figure A-1, p. 193) the elevation at the intersection of Twenty-second street and Avenue K was to be raised 4.1 feet, to a finish grade of 10.3'. The original elevation of the land was $(10.3' - 4.1') = 6.2'$. Figure 6 (p. 80), shows seven stair risers from ground level to the first floor. Based on a standard stair riser height of $7\frac{1}{2}"$ the church's finish floor elevation is calculated to be $4' - 2\frac{1}{2}"$.

Consistent with the stated guidelines this height is considered significant and therefore {●} is placed in the matrix.

The next operational parameter is the presence of steeples, spires and/or domes. In accordance with the established guidelines, St. Joseph's singular bell tower with steeple is a partial fulfillment {◐} of this parameter and so indicated in the matrix.

The third operational parameter is the nave/sanctuary ceiling height proportion to its width. Because the nave ceiling is coffered, the height used in this calculation is less than that used in the volume calculation. From personal photographs taken of the church interior and exterior, and using the clapboard siding reveal of 5½", cited previously, the interior ceiling height of the nave is calculated to be $(51 \times 5.5'' = 280.5'' = 23' - 5'')$. The mathematical calculation of the proportion is $(23' - 5'' \text{ H} \div 35' - 10'' \text{ W} = 0.65)$. Since this value is not greater than one (1.0), the parameter is not met {○}.

Holy Light

The focal points of the faith did not receive direct lighting from windows or openings that were specifically placed in the roof or exterior walls for said purpose. However, the nave windows were positioned far enough forward and rearward in the nave side walls that light from them did illuminate the altar and baptismal font. Therefore, it is considered that this parameter was partially met {◐}.

Ambient (general) day lighting to the nave was received through 10 windows (five each side) that flanked the nave; there were no clerestory windows present. By using the clapboard reveal measurement of 5½" described earlier the exterior window and wall height (to the rafter plate) was determined: wall $(51 \times 5\frac{1}{2}'' \div 12 = 23' - 5'')$,

windows ($35 \times 5\frac{1}{2}'' \div 12 = 16' - 0''$). Therefore, the wall area equals $(70' - 6'' L^{[used\ previously]} \times 23' - 5'' H = 1651 \text{ ft}^2)$; the window area equals $46'' W^{[field\ measure]} \times 16' - 0'' \times 5 = 307 \text{ ft}^2$. In accordance with the guidelines previously established, since there were only nave windows and their area was less than 50% of the wall area this parameter is not met {○}.

The third operational parameter addresses the absence of glare within the church. Twelve of the church's 16 widow/openings are located in an east/west wall. Three windows and the entrance door are located in the south wall; there are no windows or openings in the north elevation. All windows, while glazed with clear glass, are fitted with operable exterior shutters (shading devices) that close over them. Therefore, consistent with the guidelines, this parameter is partially met {◐}.

Construction Materials

Because St. Joseph's was constructed almost exclusively of wood, it was not eligible for consecration. Therefore, it did not meet {○} this criterion.

Summary of Results

The evidence shows that St. Joseph's built form complied only partially with the faith's church design guidelines. Of 13 possible operational parameters five were fully complied with, four were partially satisfied, and four were not met. Thus, St. Joseph's was less compliant than St. Mary's (see figure, p. 154). Regarding site, the church only satisfied one parameter, while partially satisfying another, and failing to meet the third parameter. Its location did satisfy a neighborhood location but it was not removed from major streets. While its position on the building site did provide the desired building

perimeter space, its longitudinal axis did not follow the prescribed E-W orientation. St. Joseph' did comply fully with the tenets of faith concerning the sacred path, but only partially regarding verticality. The finish floor elevation was satisfied fully. However, the parameter regarding steeples, domes, etc was only partially fulfilled and the nave ceiling height to width ratio was not met. In the matter of Holy Light the church partially complied with only two of the parameters (accent lighting and absence of glare) while failing to meet the guideline regarding ambient lighting. Since it was built of wood (a lower rated material in the eyes of the Church) it did not meet the criterion regarding the preferred use of construction materials.

Environment (Physical & Built)


Physical Environment

Thermal comfort design strategy 1: Keep summer heat out of the building.

- The condition of a compact design is met. The plan of the church is a simple rectangle (70' - 6" L x 35' - 10" W) with no perimeter wall offsets other than a five foot projection at the church entrance. In addition, the top plate height of the exterior side walls is 23' - 5". The church is therefore considered to be a compact design.
- Exterior shade and or vegetation. As documented previously in the *avoiding glare* discussion, all of the windows are fitted with operable shutters, therefore exterior shading is present.
- Small window size and few in number. The window/openings as recorded earlier comprise significantly less than 50% of the wall surface area but their individual size

is (16' - 0" H x 3' - 10" W) approximately 57.5 ft², and is considered large. The condition is considered partially met.

- Light colored roofs and walls. Pictures of the 1900 Storm damaged church (available at the Galveston and Texas History Center, Rosenberg Library, Galveston, Texas) show light colored exterior walls. The picture does not display the roof, so its color is not discernable. It is assumed that it was a darker color, likely wood shingle. Figure 6 (p. 80), shows a dark roofing material on the steeple and it is assumed the main roof was covered with a like material. Pictures of Galveston structures taken before the 1900 Storm (street files, available at <http://www.gthcenter.org/collections/photos/index.html>) reflect many dark colored roofs. Thus, this final condition is partly met.

Therefore, since not all of the design strategy conditions have been fully met this design strategy is considered to be only partially met {  } and so indicated in the matrix.

Thermal comfort design strategy 2: *Use natural ventilation to cool and remove humidity*

- Prevailing winds are captured by the church's orientation. The climatic data (documented previously in St. Mary's analysis) establishes the prevailing winds for Galveston as south-east to south for most of the year. The church orientation (figure 7, p. 86) places all of the windows facing east, west and south. As such they are in position to capture the prevailing winds. Thus this condition is fully met.
- Space between buildings to provide for air circulation. The 1889 Sanborn map (figure 7) shows the presence of such space, thus, this condition is fulfilled.

- High ceilings. The ceiling height of 23' - 5" calculated previously is considered to meet the definition of high. Therefore, this condition is fully met.
- Cross-ventilation through operable windows located on the windward and leeward side of the structure. Twelve of the 16 window/openings are oriented east-west and have operable sashes. Thus, this condition is also fully met.

All four conditions of this thermal comfort design strategy have been fully met.

Therefore, this design strategy is fully met {●}.

Thermal comfort design strategy 3: *Protect from the summer sun.*

- Shading devices. Pictures cited previously document the presence of shutters on the exterior windows. In addition, the bell tower located in the building's south elevation provides limited shading to the roof as the sun's arc is in the southern hemisphere for most days except those few on either side of the summer solstice in June. It is therefore considered this condition is complied with.
- Plants for shading. This condition is not met. Pictures (figure 6, p. 80; additional photos available at the Galveston and Texas History Center, Rosenberg Library, Galveston) show no trees present at the church perimeter. Characteristic of a barrier sand island's climate and geology the presence of large trees would be an anomaly. It is likely that such shading was not present on the site at the time St. Joseph's was constructed. Forty years after the church was built, sufficient time for trees to establish themselves, a 1900 Storm damage photograph, available at (<http://www.gthcenter.org/exhibits/storms/index.html>) reveals no trees proximate to the building.

- Reflective building surfaces. This condition is partially met—the presence of light colored walls but an assumed darker roofing material, discussed previously.

In accordance with the guidelines since not all of these conditions are fully met, this design strategy is only partially fulfilled { ☹ }.

Thermal comfort design strategy 4: Avoid the creation of additional humidity.

- Avoiding the use of pools or fountain(s). Photographs taken of the church interior by the author, the 1889 Sanborn map (figure 7, p. 86), and photographs cited previously contain no evidence suggesting the presence of a fountain or pool on site or in the church. The baptismal font is small in size and is not a consideration. Thus this condition is met.
- Proper drainage conditions to eliminate or minimize standing water. Since Galveston's initial elevation was approximately nine feet above MSL at its highest point, drainage was a likely concern. Numerous buildings were built on elevated foundations to avoid potential and periodic flooding that occurred. Figure 6 (p 80), shows the presence of a street curb and gutter at the corner of Avenue K and Twenty-Second Street. This is evidence of an attempt to promote positive drainage away from the site. Consequently, this measure is considered met.

Both components of this thermal comfort design strategy have been fully met. Therefore, the thermal comfort design strategy is fully met { ● }.

Summary of Results

St. Joseph's design reflects moderate consideration regarding the thermal comfort criteria. Two of the comfort strategies, the provision for natural ventilation and the avoidance additional summer humidity, were fully complied with. The remaining two, keeping heat out and protecting from the summer sun were only partially satisfied. Therefore, it is reasonable to assume that Galveston's climatic conditions were considered in the church's design and construction.

Built Environment

Beasley and Fox (1996) describe the church as adhering faithfully to the mid 19C Texas vernacular church type, but as mentioned previously she pays tribute to its Gothic Revival style on the National Register nomination form. It can be argued that the style reflects a folk Gothic Revival influenced by German rural churches. It is a simple rectangle wood frame with clapboard construction, three bays wide with a front facing gable roof. The front entrance is surmounted by a rectangular bell tower. Darst's draft submission for a marker to the Texas Historical Commission (manuscript #93-0023, box 17, ff 26), discussed earlier, refers to the church as a Gothic Revival that has changed little architecturally from its original construction. In the aftermath of the 1900 Storm the church, under the direction of Nicholas Clayton, was repaired and enlarged with a back wall addition of a new sanctuary and flanking sacristies (Scardino & Turner, 2000).

Summary of Results

As discussed in the literature review and illustrated in the matrix time line, the Gothic Revival style was in vogue in America by the 1840s and in Galveston by the

1850s. By contrasting the church's architectural style against these time lines it can be seen that St. Joseph's, ca. 1859, is consistent with the style of the built environment in America and Galveston during this time.

Building Technology

There is minimal published data documenting methods and material used in the construction of the original church. Darst's claim that the church differs very little from the original structure (manuscript #93-0023, box 17, ff 26) is taken at face value.

Therefore, the data regarding the use of materials and structural systems is taken from personal observations/measurements and the information contained on the draft nomination forms for the National Register and the Texas Historical Foundation contained in Darst's papers cited previously. A comparison of the building technology detailed below against that presented in the literature review and the matrix time line exhibits a parallel between St. Joseph's building technology and the building technology prevalent (milled lumber stick framing) in America and Galveston during this same era.

Scale

Documented earlier under the cultural variable criterion of architecture, the church's general building dimensions are: 70' - 6" L x 35' - 10" W x 36' - 8" H.

Building Materials

The majority building material is milled wood lumber. It is used for the frame and the interior and exterior cladding.

Structural Systems

Foundation

The foundation is a crawl space configuration created by masonry piers positioned at the perimeter and internally that support the floor superstructure.

Floors

The floor structure is a system of wood floor joists supported by wood girders that are in turn supported by the masonry foundation piers. The flooring surface is comprised of wood planking that spans the floor joists.

Walls

The walls are wood frame that incorporates spaced studs with milled wood planking affixed to the interior surface and clapboard lap siding attached to the exterior.

Roof

The roof is a pitched gable design using cut wood rafters and lath for support of what appears to be wood shingles, though the available data cannot confirm this roof covering material.

Finishes

The draft of the historical marker application submission to the Texas Historical Commission (Darst, W. M., manuscript #93-0023, box 17, ff 26) describes St. Joseph's interior as unusual with its coffered, decorated wood ceilings, elaborate altar and Stations of the Cross and painted wood walls. The church's baptismal record (Galveston County Genealogical Society, 1984) refers to the ceiling and other Gothic Revival symbols as painted in soft muted colors. The interior wall surface is a wainscot

configuration of horizontal wood planking with vertical wood bead board that extends to the ceiling from a horizontal wood sill capping the wainscot.

Summary of Results

The small scale of St. Joseph's is consistent with size expectations regarding rural wood churches. Its length and width dimensions are approximately one-half of St. Mary's. The use of milled lumber framing, which may have contributed to the churches small scale, is consistent with building technologies in both America and Galveston during that era. In fact, wood framing was the predominant pre-Civil War building technology used in Galveston (Scardino & Turner, 2000). Acknowledged earlier, the elevation of the first floor above a crawl space was typical. Also typical was the use of a wood girder and joist system to support a wood plank floor. Plain and unadorned clapboard siding painted white constituted the church's exterior, while the interior surfaces received considerably more attention. The use of paints and carved moldings provided visual accents, particularly to the coffered ceiling and the choir loft railing.

Analysis: St. Patrick's Church



Figure 8: St Patrick's Church, before the 1900 Storm.
Source: Courtesy of the Catholic Archives of Texas, Austin.

Culture

Historical Background

St. Patrick's parish was created in response to Galveston's increasing population. In 1870 Odin's successor Bishop Dubuis approved the construction of a wood frame church in Galveston's west end to meet this need. This original frame church was destroyed however, as the Galveston Tribune remembers (St. Patrick's Church dedicated..., 1927): A strong southerly gale in advance of an approaching "nor'ther"—an abrupt weather changing cold front—that blew for several days pushed the frame structure out of plumb to the north. Braces were applied to the north wall to support the church until the wind stopped and repairs could be made. As the front passed the wind reversed direction—now blowing from the north—and pushed the structure away from the braces causing them to shift and the church to collapse.

A small wooden building serving as a temporary church was erected from the wreckage and on St. Patrick's Day in 1872, the cornerstone of present masonry church was set. By 1877 construction was sufficiently complete to allow celebration of the Mass. The mid 1880s saw the interior finish work complete and in 1898 the Menard tower (in honor of city founder and parishioner Michael B Menard) was erected. In the aftermath of the 1900 Storm the church under the supervision of Nicholas Clayton was reconstructed. In 1988 St Patrick's experienced a restoration effort, supervised by preservation architect Killis P. Almond, which the current church reflects.

Architect

History credits Nicholas J. Clayton (1840-1916) as architect for St. Patrick's parish churches, though the time line of his travels opens to speculation his involvement with the original wooden church. Records do show however, his association with the permanent church and its many phases of construction (Almond, 1988). The church directory (St. Patrick's, 1985) is dedicated to "the loving memory and enduring genius of *Nicholas Joseph Clayton*, architect and builder of our sacred place of worship."

Scardino and Turner (2000), document Clayton's birth in Cork County, Ireland on November 1, 1840. At the age of eight, escaping with his mother the Irish famine of the 1840s, he immigrated to Cincinnati, Ohio, where his mother's sister Mary (O'Mahoney) Crowley lived. His uncle Daniel Crowley was involved in the building trades and Scardino and Turner postulate this may have influenced the young Clayton to a career in architecture. He attended parochial Catholic schools, graduating in 1858. Little is known about his life between graduation and his enlistment in the Union Navy in 1862. Though Scardino and Turner speculate he spent time in Memphis and St. Louis and was likely involved in some aspect of building. During the Civil War he served aboard U.S. Gunboats assigned to the Mississippi River and its southern tributaries. His military records reflect his duties as a plasterer and an architectural draftsman. It appears that Clayton received no or very little formal academic/classroom instruction in architecture but learned his skill through understudy and apprenticeship (Scardino & Turner, 2000).

The immediate years following the Civil War witnessed Clayton's return to Cincinnati. There, it is believed his architectural aspirations were influenced by architect James K. Wilson, who had trained in the New York offices of Martin Thompson and James Renwick, Jr., before establishing his (Wilson) own practice in Cincinnati. What is significant according to Scardino is Clayton's timing. He, along with an entire generation of American architects, adopted A. W. N. Pugin's dictate that Gothic was the only style suitable for Christian buildings. In 1871 Clayton moved to Memphis and by November of that year he had settled in Houston, Texas. April 1872 saw his official arrival in Galveston to supervise the construction of the Tremont Hotel and the First Presbyterian Church for Baldwin and Jones, a Memphis, Tennessee architectural and engineering company. Impressed with the Island City, he remained, establishing his own architectural practice, and establishing himself as Texas' first architect (Almond, 1988). During his career Clayton showed an awareness of advances in construction technology (Scardino & Turner, 2000) which manifested itself in his secular projects but sparingly, if at all, in his churches. Clayton died in November of 1916 of pneumonia arising from burns he received while cleaning his chimney.

Architectural Style (see figure 8, p. 98)

The Gothic architecture of St. Patrick's can be traced to the medieval. "In the Hollow of His Hand" (Lauve, 2000) references a Galveston Daily News article, November 20, 1877, which describes the church as Gothic, the particular phase of which can be found in the earlier part of the 13C. The church directory (St. Patrick's, 1985) references the architecture of the church as 13C gothic. Almond (1988) buttresses this

characterization as he describes the church as a “massive Gothic Revival-style structure”, adding that it was modeled after a European basilica with side aisles, a central nave, a semicircular apse, and a tower centered over the narthex. Thus, the term medieval with the Irish subset is placed into the matrix. {Y} also appears because of the ethnic link between the church architecture and its designer/builder.

The November 20, 1877 article further describes the plan of the church as cruciform in shape. The head of the cross being formed by the tower projection at the church entrance and the cross arm by the transept entrances to the aisles. This shape is further confirmed by the 1889 Sanborn map (figure 9, p. 105). Therefore, {Y} is placed into the matrix.

The above referenced article, an 1898 Clayton drawn church floor plan (Almond, 1988), and storm damage photos (<http://www.gthcenter.org/exhibits/storms/index.html>) all indicate the presence of side aisles flanking the nave. Accordingly, {Y} is placed into the matrix.

The scale of the church (volume) was calculated using the following dimensions taken from the November 20, 1877 article cited previously. The width (including the side aisles) is 50' - 0"; the church's length (including the tower and chancel) is 140' - 0". The height of the structure from the finish floor to apex of the nave roof was estimated to be 58' - 0". This was determined by scaling sheets No. 2 and No. 3 of the “Design for Reconstruction of St. Patrick's Church, Galveston, Texas” prepared by Clayton dated 3-25-01 (Almond, 1988). The author assumes the height of the reconstructed roof is proximate to that of the pre-1900 Storm church. Thus, the volume is calculated to be

(140' - 0" L x 50' - 0" W x 58' - 0" H) = 406,000 ft³. In accordance with the stated guidelines the structure is classified as large and an "L" is placed in the matrix.

The church is consistent with the architectural thought of the era—Gothic. The newspaper article of November 20, 1877 notes several Gothic elements encompassed in the church design. For example, lofty lancet shaped arches that spring from the top of the low nave columns, which are also visible in photographs of the storm-damaged church. This, according to the article is characteristic of the Celtic treatment of the Gothic style, an instance of which exists in the ruin of Kilerea, in the south of Ireland. Additional evidence is provided by remarks concerning the Gothic foliage that adorns these columns, the church's lancet and rose windows, and the Gothic vaulted nave ceilings. The Gothic style is furthermore conferred by Almond (1988), Beasley and Fox (1996), and Scardino and Turner (2000). It is therefore considered that St. Patrick's is consistent with the architectural thought of the era concerning churches (Gothic) and {Y} is placed in the matrix.

Parish

The parish history (Lauve, 2000) makes reference to Bishop Dubuis' decision to establish a new parish in Galveston's west end to serve the increasing number of Irish immigrants arriving in Galveston. As a fitting tribute, the new parish was named in honor of St. Patrick, the patron saint of Ireland. Further evidence supporting this intent was the installation of an Irish priest, Father Glynn, as the church's first pastor. Of note are the Irish surnames of the inaugural parishioners—Clayton, Franklin, Hennessey, Gaffney, and Montgomery.

The shamrock, a traditional Irish symbol, was used throughout the church. The most notable examples were the shamrock shaped clerestory windows, the use of the shamrock in the ornate carvings of the column capitals, nave arches, and front entrance. Furthermore, the column capital carvings tell the story of Ireland's conversion to Christianity by St. Patrick as he used the shamrock to explain the Holy Trinity to the Druids and Irish princes at the palace of Tara (Lauve, 2000). In addition, the church cornerstone was set and blessed on St. Patrick's Day (March 17th), 1872. Thus, it is considered that St. Patrick's was (a) established for a specific ethnic group (Irish), which is indicated in the matrix, and (b) that there were specific ethnic symbols bearing witness to the church and parish heritage, thus { Y } is indicated in the matrix.

Summary of Results

The Medieval period is clearly resurrected through St. Patrick's Gothic Revival architecture. The model of its cruciform plan, central nave, clerestory, side aisles, rose windows, and circular apse can be traced to churches of the 12C and 13C. The scale of the church is considered large, rivaling Galveston's St. Mary's and its style was in vogue with contemporary architectural thought of the era regarding church design. Interestingly, St. Patrick's transepts extend laterally from the side of the narthex rather than at the nave/chancel transition, creating a cruciform plan reversed from what is typically seen. St. Patrick's cultural ethnicity and Irish heritage is acutely displayed in its name, charter, architect, and the shamrock.

Faith

Church Site

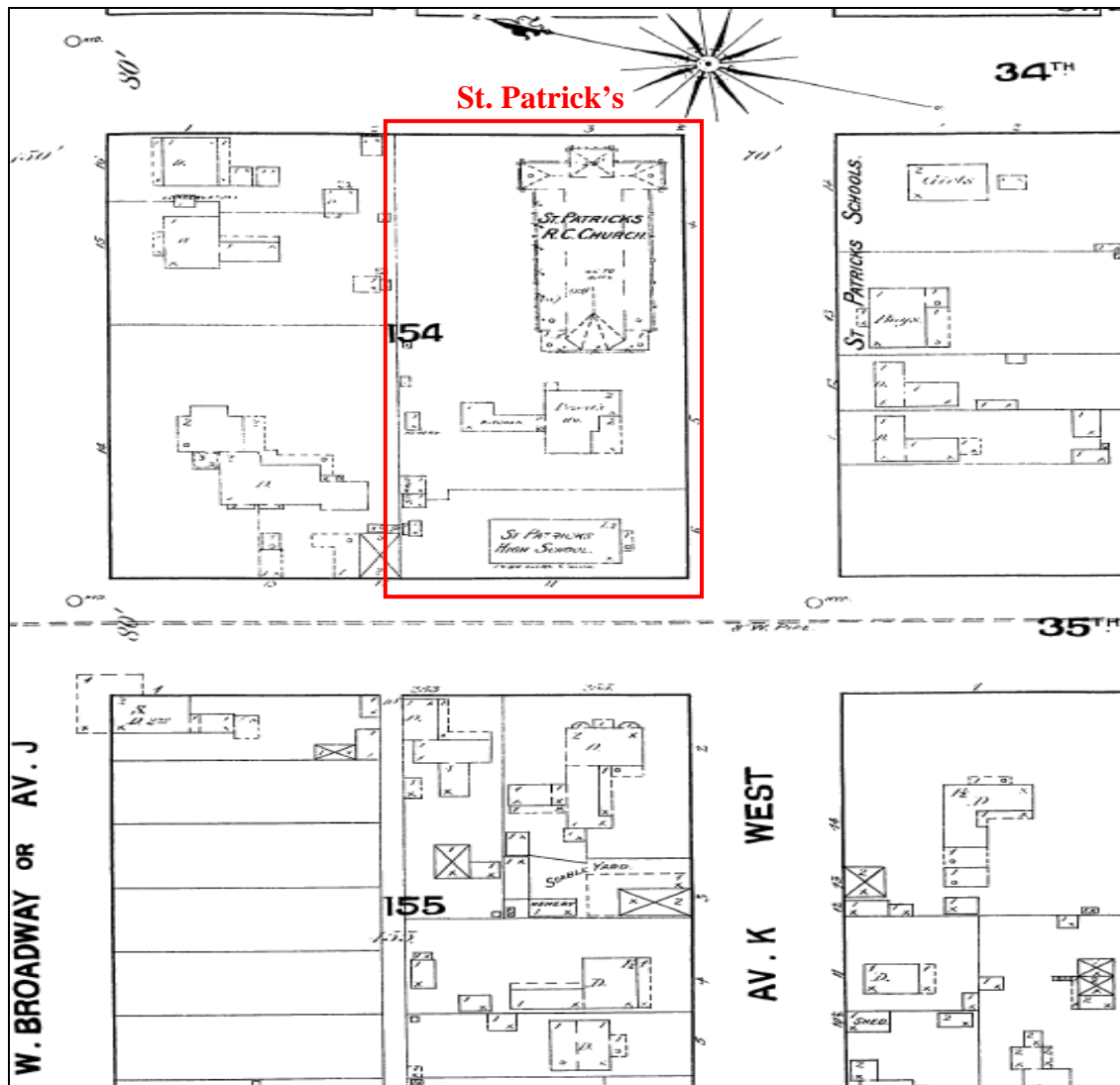


Figure 9: 1889 Sanborn map, # 18, St. Patrick's, Galveston, Texas.

Source: available at <http://sanborn.umi.com.ezproxy.tamu.edu:2048/tx/8539/dateid-000002.htm>

The church is situated on the northwest corner of Thirty-Fourth Street and Avenue K (figure 9). As was the case for St. Joseph's church this location likely was a

residential neighborhood, which is reflected in the current streetscapes. The site however, is bounded to the north by Broadway (Avenue J), which was designated as the principle east-west thoroughfare for Galveston in the original 1828 town plan and its 1838 revision (Scardino & Turner, 2000). Hence, the parameter of *desiring a neighborhood location removed from major traffic thoroughfares* is only partly met {☐}.

Figure 9 (p. 105) confirms the space at the church perimeter required for the conduct of religious ceremony. Therefore, {●} is placed in the matrix.

The church's orientation regarding its longitudinal axis on an east-west alignment is only partially met {☐}. Figure 9 shows the church's long axis configured on an east-west line. However, in the instance of St. Patrick's the desired position of the altar and the entrance, east and west respectively, are reversed; i.e. the altar is in the west end and the entrance the east.

Plan (sacred path)

Hierarchy of Space: Galveston Daily News articles of November 20, 1877 and March 17, 1898 (Lauve, 2000) describe the church as containing a nave, side aisles, and chancel (sanctuary). A photograph (#G-8426, Rosenberg Library, Galveston) taken on St. Patrick's day 1887, and one appearing as Figure 8 (p. 98) indicate the presence of the front entrance and a narthex located at the base of the bell tower. This is confirmed by a church floor plan drawn by Clayton, dated 2-14-98 (Almond, 1988)—the 98 being 1898—that shows a circular baptismal font located in the front corner of the right transept. All of the desired space elements were present in the church—entrance,

narthex, baptismal font, nave, and chancel—and arranged in accordance with the desired hierarchy and is indicated by {●} in the matrix.

The baptismal font and altar were present in the original permanent church. Their placement satisfied the faith's desire to locate the altar in the chancel and the baptismal font at the rear of the nave. Ergo, a {●} was placed into the matrix.

The 1898 church floor plan (previously cited) indicates the chancel floor is three stair risers above the nave floor; the altar is situated two stair risers above the chancel floor. The altar is highly visible upon entering the nave through the narthex. According to personal remarks by Killis P. Almond and reiterated by Beasley and Fox (1996), the post-1900 Storm reconstructed church did not differ significantly from the original structure. It is therefore assumed that the current altar's position is proximate to that of the original and satisfies the operational parameter, *altar in a position of prominence*. Accordingly, {●} is placed in the matrix.

Verticality (height)

This criterion's first operational parameter is the finish floor elevation. The grade raising figures (figure A-1, p. 193) indicates the corner of Thirty-Fourth Street and Avenue K is to be raised 4.5' to a finish grade of 10.3'. The original elevation of the site is calculated to be $(10.3' - 4.5' = 5.8')$ above MLT. A church photograph taken after completion of the Menard Tower (circa 1899) but pre-1900 storm, and one appearing in the 1904-1905 (pre-Galveston's grade raising) Catholic Guide Book for Galveston indicates what appears to be seven stair risers from the ground finish grade to first floor. Using the standard riser height of 7½" as discussed in the guidelines, the finish floor

elevation of the church is calculated to be 4' - 2½" and is considered to fully satisfy the parameter {●}.

The second operational parameter is presence of steeples, spires and/or domes. A photograph of the church prior to the storm (Galveston-Houston Diocese Archives) shows the presence of the very tall spire that surmounts the Menard tower. The November 20, 1877 news article (Lauve, 2000) in its discussion of building dimensions makes reference to a tower. There is no reference in the data from the time of the church's original construction to the construction of the Menard tower indicating the presence of additional spires or domes adorning the church. Therefore, this operational parameter is partially met {◐}.

The third operational parameter is the proportion of the nave/sanctuary ceiling height to its width. Using the figures cited in the news article of November 20, 1877 referenced in St. Patrick's church history (Fauve, 2000) this ratio is calculated to be ($45'H \div 27'W = 1.67$). In accordance with the published guidelines, this ratio is between 1.5 and 2.0, therefore, {◐} is placed in the matrix.

Holy Light

Direct lighting: The Galveston County Daily New articles of November 20, 1877 and March 17, 1898 make reference to the windows of the chancel providing ample light to the church interior. Storm damage photos, courtesy of the Rosenberg Library, Galveston, Texas; available at (<http://www.gthcenter.org/exhibits/storms/index.html>) show the presence of windows next to the side altars. The baptismal font, located at the back of the nave was likewise illuminated by windows in close proximity to it. All three

of these are confirmed by the Clayton floor plan drawing dated 2-14-98 (Almond, 1988).

Therefore, it is considered that this parameter is fully met {●}.

Ambient lighting to the church interior was received through 24 nave (12 each side) and 12 (six each side) clerestory windows that flank the nave. In addition, four clerestory windows are positioned at the apse perimeter, plus the gothic and rose windows that adorn the front entrance and transepts contributed to this lighting. By use of the scaled drawings (Almond, 1988) it is determined that the windows/openings do not exceed 50% of the wall area. Thus in accordance with the guidelines, *nave and clerestory windows present but their area does not exceed 50% of the wall area*, the operational condition for ambient lighting is partially met {☐}.

Absence of glare: The November 20, 1877 newspaper article makes the following reference to window glazing, “the building is amply lighted by the stained glass windows of the aisles, clerestory, and chancel.” The presence of stained glass glazing is confirmed by 1900 storm damage photos of St. Patrick’s (Almond, 1988; Lauve 2000). According to the stated guidelines therefore, the presence of stained glass fully meets this operational condition {●}.

Construction Materials

St. Patrick’s was constructed of brick masonry, thus establishing its eligibility for consecration. Since stone was not used however, it is determined that this criterion was only partially met {☐}.

Summary of Results

St. Patrick's design attempted to comply with the tenets of the faith regarding church design and construction. The church fully met seven out of a possible 13 operational parameters and partially satisfied the remaining six. No parameters were deemed as "not met". Its site satisfied the requirement for perimeter space, and partially met orientation and location guidelines. It fully satisfied all of the operational parameters regarding the sacred path. In the matter of verticality St. Patrick's fully met the parameter of finish floor height, while partially fulfilling the parameters concerning steeples, spires and/or domes and the nave/sanctuary width to height ratio. Illumination of the focal points of faith through accent lighting and the absence of glare were partially met. Because the church was constructed of brick masonry rather than stone it was in partial compliance with this criterion.

Environment (Physical & Built)

Physical Environment

Thermal Comfort Design Strategy 1: Keep summer heat out of the building.

- The first condition of compact design is not met. St. Patrick's volume calculated previously classifies the building as "large" (L). In addition, Figure 9 (p. 105), and church photographs reveal numerous building offsets at the foundation and roof lines which increase the surface area exposed to the environment.
- Exterior shade and/or vegetation. A pre-1900 Storm photograph (figure 8, p. 98) and photographs on file at the Rosenberg library (link provided previously) reveal the absence of either external shading devices affixed to the structure or the close

proximity of vegetation that would provide shading. While the Menard tower steeple is tall and would have provided some shade in the early morning hours, the tower was not completed until 1899 and was destroyed by the 1900 Storm. Its replacement was considerably shorter. Thus, it is determined that this condition is not met.

- Small window size and few in number. Pre-1900 Storm (cited above) and 1900 Storm damage photographs (Almond, 1988; Rosenberg Library, linked previously), and Clayton drawings (Almond, 1988) reveal the following. There are 24 moderate sized nave windows. Their current measurements are 27 ft² and compare similarly in size and configuration to those appearing in the cited photographs. Above the nave are 12 small trefoil (shamrock) shaped clerestory windows. The chancel is surrounded by four lower and four clerestory windows positioned to the side of the main altar. Behind the altar is a tall window that extends two thirds of the wall height. The front tower and entrance are adorned with lancet shaped and rose windows of various sizes and clustering. It is determined that the windows are neither sufficiently small in size nor few in number; therefore this condition is not met.
- Light colored roof and walls. The photographs cited earlier show the exterior church walls to be a dark colored masonry. The roofing material (a rectangular shingle shaped material) is likewise dark in color. Thus, this condition is not met.

Since none of the conditions for this design strategy are met it is determined that the design strategy is not met {○}.

Thermal Comfort Design Strategy 2: Use natural ventilation to cool and remove humidity.

- Prevailing winds captured by the church's orientation. The church orientation (figure 9, p. 105) places a significant window area facing south and east and in position to capture the prevailing south and south-east winds (cited previously, St. Mary's analysis). Thus, this condition is met.
- Space between buildings to provide for air circulation is met. The presence of this space is confirmed by church photographs (cited previously) and the 1889 Sanborn map (figure 9).
- High ceilings. As established earlier (verticality discussion) the ceiling height from the floor to the apex of the nave vault is 45' and is considered to meet the definition of a high ceiling.
- Cross-ventilation through operable windows on the windward and leeward building elevations. The church orientation places 12 windows on the south (windward) and 12 on the north (leeward) building façades. In addition, Figure 8 (p. 98) shows these windows to be open (window sash tilting out at bottom). Therefore, this design condition is met.

All of the design conditions for this thermal comfort design strategy are met.

Therefore, {●} is placed in the matrix.

Thermal Comfort Design Strategy 3: Protect from the summer sun.

- Shading devices. The church does not have external devices to provide shading to windows or walls, such as shutters, parapet walls, or overhangs. The church spire

faces east but the shading it provides is limited (cited previously). This condition is not met.

- Plants for shading. As described previously, design strategy 1, photographs do not show trees, plants, or other vegetation sufficiently near to the church to provide effective shading of the building. This condition is not met.
- Reflective building surfaces. Again as described previously, design strategy 1, the church's exterior wall and roof surfaces are dark in color and not reflective. Thus, this condition is not met.

All three design conditions are not met. Therefore, it is determined that thermal design strategy 3 is not met {○}.

Thermal Comfort Design Strategy 4: Avoid the creation of additional humidity.

- Avoiding the use of pools or fountains. Photographs (cited previously) and the 1898 church floor plan (Almond, 1988) do not indicate pools or fountains within the church or on the church site. Citing the same reasoning (see discussion St. Mary's—avoiding pools/fountains, p. 75), the baptismal font is discounted. This condition is met.
- Proper drainage conditions to eliminate or maximize standing water. Figure 8 (p. 98), indicates what appears to be slopping ground away from the church foundation. In addition, it is assumed the builder/designer was acquainted with flooding on the island and the elevated foundation provided height necessary to provide positive drainage off the site. The available photographs (photo archives, Rosenberg Library, Galveston) of the church pre-1900 Storm, however, do not confirm the absence or

presence of street curb or guttering. Therefore it cannot be established if this design condition is met.

Since the presence of this second design condition cannot be confirmed it is determined that thermal comfort design strategy 4 is only partially met and is indicated by { ◐ } in the matrix.

Summary of Results

It appears that Clayton's design did not consider thermal comfort. Of the four possible thermal comfort design strategies used in this analysis, St. Patrick's fully complied with only one, partially fulfilled one, and failed to meet the remaining two. The church did provide for natural ventilation to cool and remove humidity. It however, only partially satisfied the need to avoid the creation of additional humidity and failed to address the requirements to protect the building from summer sun and keep summer heat out.

Built Environment

Scardino and Turner (2000) classify St. Patrick's architecture as Victorian Gothic. It can be argued that Clayton's use of this style resulted from his Roman Catholic and Irish heritage and the contemporary thought concerning ecclesiastical architecture which influenced his training. Often described as Celtic-Gothic, Scardino and Turner (2000) speculate that a more representative model of St. Patrick's design lays in the 13C English church of St. Wulfram's. The literature review and matrix time line reveal the timing of St. Patrick's architectural style was congruous with the Gothic Revival style prevalent in America and Galveston at the time of its construction. St.

Patrick's post-1900 Storm reconstruction remained true to its original motif, even though by the turn of the century the Gothic style was no longer fashionable in America or Galveston.

Summary of Results

St. Patrick's built form was consistent to its Gothic heritage both ecclesiastically and regarding the architectural fashion of its day in America and Galveston.

Interestingly, the design of the rebuilt St. Patrick's (ca. 1902) remained steadfast to its ecclesiastical heritage even though Gothic as a secular fashion had ceased to be popular by century's end.

Building Technology

A Galveston County Daily News (GDN) article (St. Patrick's Church, 1872) commemorating the setting of the church cornerstone characterizes St. Patrick's as being constructed of plain walls and buttressed. In post-Civil War era America and Galveston, wood frame and wood timber/masonry construction was being replaced by the masonry-cast iron building technology. Galveston's Strand (business district) was rife with buildings designed and constructed implementing this technology. As Friedman (1995) points out, the concern for fire was behind the transition to ferrous metals. In addition, as Galveston continued to prosper in the post-Civil War boom, real estate values increased. In response to this economic trend the demand for building space encouraged developers to build taller buildings. Load bearing masonry was not a building technology either practically or economically suited to address this need.

The general building technology employed in St. Patrick's construction was load bearing masonry and wood frame (1900 Storm damage photos, Rosenberg Library, linked previously). Of note is the use of the "Benton Coignet process"³ in the forming of the columns that supported the clerestory walls (Galveston County Daily News, 1877 November 20, cited previously in Lauve, 2000).

Scale (General building dimensions)

As documented earlier the scale of the church was determined to be large. Its general building dimensions are; 140'- 0" L x 50'- 0" W x 58'- 0" H.

Building Materials

The primary building material is brick masonry with milled lumber used in the roof framing. Also, as noted above, concrete was used in the nave columns. There are no references to concrete used elsewhere.

Structural Systems

Foundation

A crawl space beneath the first floor is created by an elevated brick masonry wall at the church perimeter and interior spaced brick masonry piers. It is likely the wall rests on a shallow footing, which as Oppermann (2003) suggests was a common practice. Clayton section drawings (Almond, 1988) show a spread footing beneath the interior columns and the exterior buttresses.

Floors

The floor structure is a system of wood floor joists supported by wood girders that rest on the masonry foundation piers and a perimeter wall. The flooring surface consists of wood planks that span the floor joists.

Walls

The walls are load bearing brick masonry. Arches integrated into the wall design carry the load around window/door openings and the clerestory wall. This creates open spaces between the nave and side aisles. The ends of the nave arches are supported by round columns cast in concrete. The exterior walls at the side aisles have integral buttresses designed to resist the lateral forces created by the roof thrust against the clerestory wall.

Roof

The roof is a pitched gable design using milled lumber for rafters, purlins, and associated bracing. The lateral thrust of the main roof is absorbed by the side aisle roof supports and carried to the buttresses of the exterior wall. Indications are these roof supports are fabricated from milled lumber. Almond (1988) references the use of scissor trusses in his preservation plan. This reference however, does not specify if these trusses were part of the original design or part of the post-1900 Storm reconstruction. The GDN article, November 20, 1877, acknowledges a Mr. N. White as having accomplished the “slating.” The author assumes this reference is in regards to the roof.

Finishes

As noted in the historical background, St. Patrick's was completed over a period of approximately 25 years. While the superstructure of the church was sufficiently completed to accommodate worship services, it is not likely that a significant amount of applied finish work was accomplished originally. Almond (1988) makes reference to Clayton drawings (dated 1884 and 1898) that detail the finish work was to be completed. The GDN article of November 20, 1877, points out the use of molded brick to create elaborate moldings adorning the nave arches, a technique rarely used for interior decorative construction and the use of stone work around the front door. It continues to describe Claytons' use of brick masonry via splayed jambs, string courses, hood moldings and corbels to appropriately decorate the church. The article mentions the finish of the nave and aisle ceilings to be (a reference to future work) the usual "vaulted Gothic graining" exemplified by Galveston's Ursuline Convent. The GDN news article, March 17, 1898 confirms this in remarks about the grained and vaulted nave and sanctuary ceilings being executed in wood and the beautiful carved arch that separates the nave from the chancel.

Photographs (pre-1900 Storm & storm damage, photo archives Rosenberg Library, Galveston) of St. Patrick's do not reveal any interior/exterior treatment of the exposed masonry walls such as lime wash, stucco, or paint as was the case for St. Mary's and St. Joseph's. Photographs (Almond, 1988) however, reveal the presence of ornate tile work on the interior walls of the chancel.

Summary of Results

St. Patrick's Gothic Revival style remained true to its medieval roots and to the contemporary thought of the era (last half of the 19C) regarding church architecture. It did not however, maintain that style through the implementation of emerging building technology prevalent in America and available in Galveston. Other than the concrete nave columns the structural systems employed for the foundation, walls, and roof assembly was strikingly similar to the building technology used in the construction of St. Mary's 30 years earlier.

Analysis: Sacred Heart-I

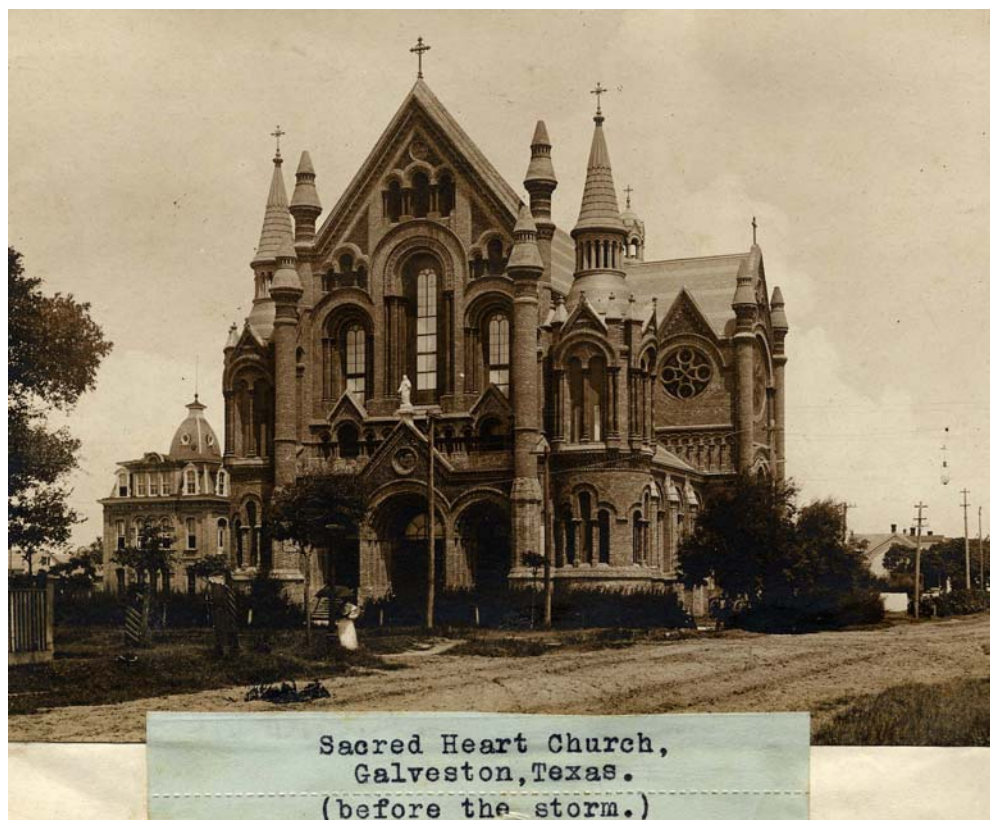


Figure 10: Sacred Heart-I, before the 1900 Storm.

Source: Archives of the New Orleans Province of the Society of Jesus, Loyola University Library.

Culture

Historical Background

The history of Sacred Heart-I begins with the creation of the University of St. Mary's, Galveston, Texas in 1847. The newly ordained Bishop Odin desired to establish religious schools to combat the secularism prevalent in the city. To accomplish this he brought the Ursuline Nuns to Galveston to establish a convent for young women. Concurrent with this, Galveston's city planners designated land for parks, church sites, public squares and a college. Odin requested and was granted the site designated for the college (block 193), with the stipulation that it be used to create an educational facility for boys. Construction started in 1851 and completed in 1854. In 1856 it received its state charter, St. Mary's University, making it the first chartered college in Texas.

In 1884, Bishop Gallagher, Odin's and Dubuis' successor respectively, turned the operational and administrative duties of the church over to the Society of Jesus (the Jesuits) and simultaneously established a new parish in Galveston's east end which would fall under their jurisdiction. Interestingly, this parish was established for white Catholics except the German immigrants living east of 15th & 16th streets and north of Broadway (New parish, 1928).

To meet the immediate needs of this newly formed parish, a temporary church was located in a ground floor play-hall of the college. By 1889 this school chapel was unable to accommodate the ever-increasing congregation, so construction began on a larger permanent church. On January 17, 1892 Sacred Heart church was dedicated amid much pomp and circumstance. It was hailed as a testimony to the religious zeal of the

City (Sacred Heart church..., 1892). The church's existence was brief as it was completely destroyed in the notorious 1900 Storm that ravished Galveston. In the aftermath of this disaster the church was rebuilt, but curiously the Catholic diocese chose not to rebuild the church to its former style or form.

Architect

History records Nicholas J. Clayton as the architect of Sacred Heart-I. The reader is referred to the analysis (architect) of St. Patrick's church for information regarding Clayton's background. Assisting Clayton in the supervision of construction was Cornelius Otten, a Dutch born Jesuit Brother (Clancy, 1978) with training as a carpenter and builder. His first major project was the construction of the church at Grand Coteau, Louisiana. He was transferred to Galveston in 1884.

Architectural Style (see figure 10, p. 119)

The architecture of Sacred Heart-I returns to the Middle Ages but unlike the previous churches discussed, its homecoming is Romanesque rather than Gothic. Interestingly, Clayton's first official Galveston assignment in the employ of Baldwin and Jones was the construction of the Romanesque styled First Presbyterian church (Robinson, 1981). A newspaper article describes the style as French Romanesque, examples of which are found in Provence and Normandy of the 10C, 11C, and 12C (Sacred Heart church..., 1892). This is confirmed by Scardino and Turner's (2000) Romanesque characterization of the church. Thus "Medieval" with the subset French is placed in the matrix. Since Clayton's ethnicity and the church's architectural subset do not match, {N} is also placed in the matrix.

The article continues to describe the plan of the church as that of the Latin-cross, which is confirmed by the 1899 Sanborn map (figure 11). The article also narrates the presence side aisles, which is confirmed by a photograph (Scardino & Turner, 2000). Therefore, {Y} is placed in the matrix for both operational parameters.

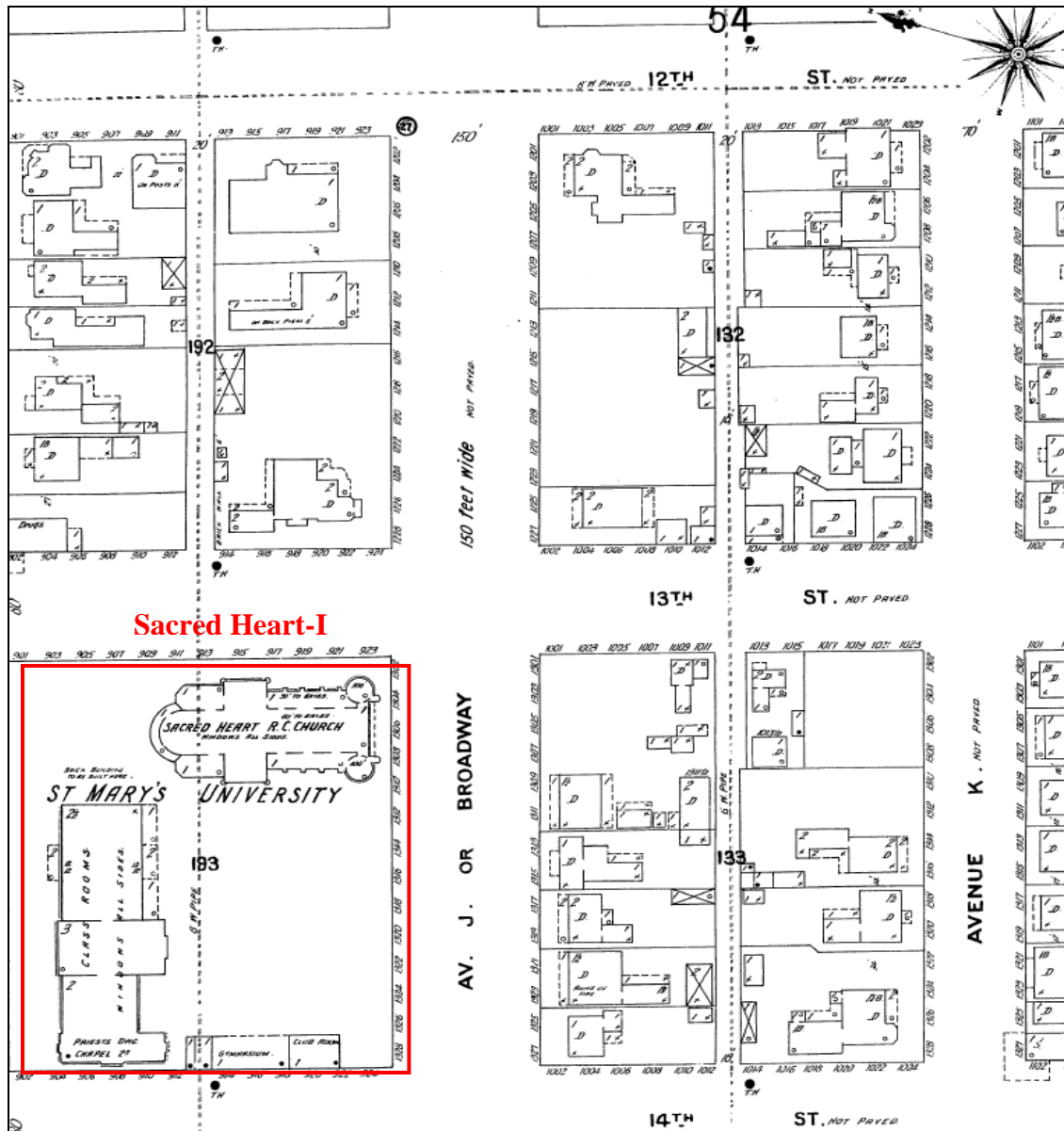


Figure 11: 1899 Sanborn map, # 56, Sacred Heart-I, Galveston, Texas.

Source: available at <http://sanborn.umi.com.ezproxy.tamu.edu:2048/tx/8539/dateid-000003.htm>

Furthermore, this article makes reference to Sacred Heart-I as being the largest in the state and with two exceptions the largest in the South. It gives the dimensions at 150' 0" L x 65' 0" W ^(at the nave) x 71' 0" H at the ceiling. It further references a height to the top of the cross at the front gable to be 120'. Pictures of the church both pre-1900 Storm and storm damage (photo archives, Rosenberg Library, Galveston, previously linked; Society of Jesus archives, Loyola University, New Orleans, Louisiana) depict a gabled wood frame roof above a vaulted nave ceiling. While there are no existing dimensions it is assumed the height of the main roof rests somewhere between 71' and 120'. For the purpose of this study a subjective determination is made that the gable roof rises approximately 25' above the nave ceiling to a total height of 96' 0". Therefore, the volume of the church is calculated as 150' 0" L x 65' 0" W ^(at the nave) x 96' 0" H = 936,000 ft³. Thus, it is considered large and an "L" is placed in the matrix.

Sacred Heart-I's physical presence leaves no doubt as to its powerful expression of Christianity. The mass and size of the church, the inclusion of several large rose windows and its expression of verticality demonstrated by its physical height are found in its Medieval antecedents from which the Gothic descended. Regardless of these qualities, Sacred Heart-I, in its Romanesque predication is determined to be outside of contemporary thought of the era regarding church construction in its preference for the Gothic, and thus {N} is indicated.

Parish

The data revealed no evidence pointing to the establishment of Sacred Heart-I for a particular ethnic group; even though some data sources made undocumented hints that

the parish was to include Italians. The GDN article of January 18, 1892, suggestive of a multiple ethnicity, describes the United States, Texas, Irish, and German, French, and Italian flags as part of the church dedication decorations. Remarks recounted earlier about blacks and Germans seems to be a statement of who the church was not for rather than who it was for. Sacred Heart-I was likely established in response to Galveston's increasing population (cited previously). Interestingly, a Celtic cross adorns the apex of the front gable. One can speculate as to the source and reasoning for it. Therefore {N} is placed in the matrix for parish ethnicity and {Y} for cultural symbols.

Summary of Results

The impact of a particular ethnic group on the design and construction of Sacred Heart-I cannot be determined. The building was likely constructed in response to a general need by the Church due to Galveston's increasing population. The scale of the church was large, bordering on massive. In volume it was more than twice the size of St. Mary's Cathedral. In fact one is left to speculate on the clergy's rationale for constructing such a large church. It also appears that Clayton's Irish heritage found its way into his design through the Celtic cross at the apex of the front gable. Its Romanesque style, cruciform plan, circular apse, and clerestory leave little doubt as to the church's Medieval origin. Ironically this grand church (biggest in the state), was the only study church not salvaged to its previous form post-1900 Storm.

Faith

Church Site

Sacred Heart-I was built on the south east corner of block 193, at the intersection of 13th Street and Broadway (Avenue J), (figure 11, p. 122). At that time this was a residential neighborhood and remains predominantly so today. However, it fronted directly on Broadway, the major east-west thoroughfare on the island (documented previously). Thus, this location partially satisfies the operational parameter of *desiring a neighborhood location removed from major traffic thoroughfares* {☐}.

The presence of perimeter space that encircles the church is met {●}. This is confirmed by photographs (Jesuit Archives, previously noted), and Figure 11 (p. 122).

The desired east-west orientation is not met {○}. Figure 11 shows the longitudinal axis of the church runs on a north south line.

Plan (sacred path)

The desired spaces (entrance, narthex, nave, sanctuary) in the desired hierarchical order are present {●} (Sacred Heart church..., 1892; Scardino & Turner, 2000). The presence of the baptistery cannot be confirmed, it is argued that a church of this magnitude would certainly have had one. Photographs (Jesuit archives, Loyola University cited previously) show the presence of two elevated structures at the front of the chancel. One is likely the pulpit and the other is possibly the baptismal font.

In this same context, however, since the presence of a baptismal font and therefore its location cannot be confirmed the relationship of it to the altar is not

definable. Thus it is assumed that the operational parameter of *the baptismal font at entrance, altar at opposite end* is not met {○}.

The operational parameter of *altar in a position of prominence* is met {●}. This is confirmed by interior photographs (Jesuit archives, Loyola University) of the church

Verticality

Finish floor height: According to the grade raising figures (figure A-1, p. 193) the corner of 13th Street and Broadway was to be raised 2.8' to an elevation of 10.0'. The original ground elevation at this location was ($10.0' - 2.8' = 7.2'$). An exterior photograph (#G-8424, photo archives, Rosenberg Library, Galveston, Texas) shows 10 stair risers from the finish grade to the first floor. Therefore, at the estimated riser height of 7.5" per tread riser the finish elevation of the first floor is calculated to be 75" or 6'-3". In accordance with the stated guidelines this measurement is considered significant {●}.

The operational parameter for the presence of steeples, spires, and/or domes is fully met {●}. An exterior photograph (figure 10, p. 119) shows the presence of several spires/towers adorning the church. In addition, there is a cupola positioned directly above the altar.

The next operational parameter, ratio of ceiling height to nave width is partially met {◐}. The available data does not reference a dimension across the nave only. From the photographs (Jesuit Archives, Loyola University; Scardino & Turner, 2000) it is estimated that the width of the side aisles is 10'-0", therefore it is assumed that the width of the nave is $65'-0" - 20'-0" = 45'-0"$. Using this dimension and the ceiling

height dimension cited previously, the ceiling height to nave width ratio is calculated to be $71' 0'' \div 45' 0'' = 1.58$.

Holy Light

Direct Lighting: The GDN article of January 18, 1892 describes a cupola being positioned directly above the altar. The provision for light is established by the cupola's arched openings visible in exterior church photographs (Jesuit archives, Loyola University; file photo G-8424 Rosenberg Library, Galveston). From additional photographs (Jesuit archives, Loyola University) of the interior, the side altars and what is assumed as the baptismal font (described earlier) do not appear illuminated by direct lighting sources. Therefore, the operational parameter for direct lighting is partially met {☹}.

The second operational parameter, ambient lighting for the church interior is fully met {●}. The photographs (cited previously) reveal the presence of both nave and clerestory windows. In addition, the photographs show six large rose windows, three in each transept and seven substantially sized windows wrapping the apse. From these photographs a subjective calculation is made that the window/opening area is at least 50% of the wall area. Worth noting is that some pre-1900 Storm photographs show several windows boarded up—clerestory, nave, and front towers. Other photographs, particularly storm damage photos, (Jesuit archives and Rosenberg library, cited previously) show no boarding. In addition, these storm damage photos reveal the nave window openings to have a slightly different shape from earlier photographs. Possibly,

due to funding not all of the windows were glazed initially and had to wait until money was available.

In reviewing the several photographs cited previously, many of the windows appear to be glazed with stained glass—nave, apse, and rose. However, as mentioned, pictures show the nave windows were boarded up at some time before the storm and some of the glazing appears to be something other than stained glass. In addition, a GDN article (New Jesuit Church, 1903) makes reference to the original church, running north-south, being troubled by the morning sun, which was a primary consideration for reorienting the new church. Therefore this operational parameter, avoidance of glare, is considered not met {○}.

Construction Materials

Sacred Heart-I was constructed predominantly of brick masonry. As such it was eligible for consecration but because stone was not used it is determined that it partially meets {☐} this criterion.

Summary of Results

Sacred Heart-I partially complied regarding dictates of the faith. Of 13 possible operational parameters, the church fully complied with six, partially complied with five, and did not meet two parameters. Regarding site, it provided a neighborhood location but it was not removed from major thoroughfares. It did have the desired perimeter space but not the desired east-west orientation. The church fully met the accords for the desired space hierarchy and for the prominence of the altar. The baptismal font's presence or location could not be confirmed. The criterion of verticality was fully met for its

physical elevation and the presence of steeples, spires and/or domes, the nave ceiling height to its width ratio was only partially met. Sufficient ambient lighting was considered present while direct lighting on the focal points of the faith was partially satisfied. The avoidance of glare was not met. Lastly, since the church was constructed predominantly of brick masonry, it was considered to have partially met { ● } the criterion regarding construction materials.

Environment (Physical & Built)

Physical Environment

Thermal comfort design strategy 1: *Keep the summer heat out of the building.*

- The condition of compact design is not met. As cited previously Sacred Heart-I was declared the largest church in the state. Furthermore, the volume calculation revealed a scale twice that of St. Mary's Cathedral.
- Exterior shade and/or vegetation. Church photographs pre-1900 Storm (figure 10, p. 119; Jesuit Archives, Loyola University) show low hedges and a few diminutive trees (their canopy barely rising above the first floor) scattered at the church perimeter. Hence this condition is not met.
- Small window size and few in number. This condition is not met. These same photographs show an edifice with many windows, several of which are quite large, particularly the transept rose windows.
- Light colored roof and wall. Figure 10 (p. 119) clearly shows the church exterior clad in a dark colored masonry. In addition, the roof has a variegated cladding the majority of which is also dark in color. Therefore, this condition is not met.

None of the operational conditions for this comfort design strategy have been met. Therefore, this design strategy is not met {○}.

Thermal comfort design strategy 2: Use natural ventilation to cool and remove humidity.

- Prevailing winds are not captured by the church's orientation. Its long axis running north-south (figure 11, p. 122) places most of the church windows in a position that is not exposed to the south south-easterly winds documented previously. Thus, this condition is not met.
- Space between buildings to provide for air circulation. The photographs cited previously and Figure 11 show perimeter space. This condition is met.
- High ceilings. The GDN article of Jan 18, 1892 declares the height of the ceiling to be 71' 0"; this is considered to fully satisfy the condition.
- Cross-ventilation through operable windows on the structure's windward and leeward elevations. An undated photograph (Jesuit archives, Loyola University) reveals the presence of operable (tilt out) window sashes in the nave and sacristy windows. However, storm damaged church photographs reveal a window configuration that reflects fixed glazing of stained glass. It is likely that the earlier windows were installed and then replaced by the stained glass when either funding was available or when their fabrication was complete. Therefore, this condition is considered partially met.

All four operational conditions have not been fully met. Two have been fully met, one not satisfied, and one partially satisfied. Thus, this thermal comfort design strategy is partially met {◐}.

Thermal comfort design strategy 3: *Protect from the summer sun.*

- Shading devices. Some photographs among those cited show some windows boarded up. However, this condition, it is argued, was not permanent as storm damage photos indicate. Furthermore, there were no exterior shutters, parapet walls or other design techniques that afforded any significant shading to the building. The front doors and front windows were recessed into the wall which was indicative of the Romanesque style, but these were the only openings that were provided shading from such a technique. Therefore, this condition is not met.
- Plants for shading. As explained in design strategy 1 there was minimal shade provided by trees or shrubs at the church perimeter. Ergo, this condition is not met.
- Reflective building surfaces. Referencing the narrative for design strategy 1, the exterior walls were dark, and the roof, while variegated, was predominantly a dark surface. Therefore, this condition is not met.

None of the operational conditions for this design strategy are met. Thus the design condition is not met {○}.

Thermal comfort design strategy 4: *Avoid the creation of additional humidity.*

- Avoiding the use of pools or fountains. The collected data provides no evidence to support the existence of a pool or fountain on the church site or within the structure. This condition is met.
- Proper drainage conditions to eliminate or minimize standing water. The church is situated on the north-west corner of 13th Street and Broadway. Photographs (photo archives, Rosenberg Library, Galveston; Jesuit archives, Loyola University) show

the absence of a curb at the edge of these streets. However, the general impression from these pictures reflects a gradual sloping of the finish grade away from the church. In addition, at the corner formed by these two streets the photographs show a declination of the sidewalk and a small bridge over what is assumed to be a shallow drainage swale. Therefore, it is argued this condition is met.

Since both of these operational conditions are met, it is considered that this thermal comfort design strategy is met {●}.

Summary of Results

Clayton's design gives little consideration to the climatic conditions of Galveston. Only one operational parameter was satisfied completely. Two were partially fulfilled and one was not met. Apparently, this is consistent with Clayton's other church designs such as St. Patrick's.

Built Environment

As recounted earlier by Robinson (1981) and others, Sacred Heart-I was an excellent example of Richardsonian Romanesque design. Why Clayton chose this style is open to speculation. As Robinson noted earlier, Clayton's first Galveston project in the employ of Baldwin & Jones was the Romanesque styled First Presbyterian Church, ca. 1872. Furthermore, while Clayton was working on Sacred Heart-I, he was simultaneously involved with the design and construction of the Romanesque styled University of Texas Medical School, "Old Red", ca. 1890. To observe church photographs and acknowledge the commentary of the January 18, 1892 GDN article, praising the church as an ornament to the city, the impression is that the church was

more than an ornament, it was monumental. This characterization is supported by it being at the time the largest church in the state (cited previously). Even though Sacred Heart-I diverged from the Gothic style, it maintained Medieval ecclesiastical elements—cruciform plan, rose windows, clerestory with central nave, and circular apse.

Summary of Results

Clayton's choice of Romanesque for the style of this church can be debated. Although it can be seen from the time line that this style for both America and Galveston was in vogue during the 1890s; it can be speculated as to why the church was monumental in its proportion. The GDN article of January 18, 1892 (cited previously) notes the attendance at the church's dedication ceremony was 2500, stating further that this seating capacity far exceeded the parish needs.

Building Technology

Sacred Hearts-I's load bearing and arched masonry construction lagged behind the technology available to builders and designers in America and Galveston during this time. The technology time line in the *comparative analysis matrix* (see figure, p. 154) shows that while masonry was still utilized, it was done so in concert with cast iron. In addition, structural steel was making its debut. Clayton's knowledge of this technology is evident through his incorporation of it in his designs for the Galveston Daily News Building (1883-84) and St. Edwards College (1888-89), Austin, Texas (Scardino & Turner, 2000; Robinson, 1981). Clayton did employ the use of concrete however, in the nave columns supporting the clerestory wall, a design he had implemented in Galveston's St. Patrick's more than 10 years earlier.

Scale

The general church dimensions are 150' - 0" L x 65' - 0" W x 96' - 0" H, cited previously.

Building Materials

The photographs cited previously clearly reveal the church's masonry construction. The January, 18, 1892 GDN article declares the church to be built of brick with artificial stone features. It continues by describing the clerestory walls supported by artificial stone columns. Jesuit Archive 1900 Storm damage photos reveal wood rafter framing used to support the roof of the side aisles.

Structural Systems

Foundation

There is no data reference regarding the specific design of the foundation. By studying the photographs, cited previously, it appears church loading is carried by a load bearing masonry wall at the church perimeter, and it is assumed by interior masonry piers thus creating a crawl space beneath the main floor. It is further assumed that this perimeter wall and these piers rest on a shallow spread footing similar to that described previously for St. Mary's Cathedral.

Floors

The church photographs cited previously indicate the flooring to be wood planking. It is assumed that this is supported by a system of wood joists, beams and/or girders which in turn are supported by the masonry piers and perimeter wall.

Walls

These same photographs, clearly show the load bearing arch and masonry construction used in the walls. Also they distinctly reveal the system of columns and buttresses designed to carry the roof and clerestory loads.

Roof

As mentioned previously the roofing system appears to be wood frame, using rafters, horizontal laths and associated braces. The roof covering is slate tiles (Robinson, 1981).

Finishes

The grand scale of Sacred Heart-I is punctuated by the significant architectural appointments that embrace its interior and exterior surfaces. Images of the church exterior display detailed masonry craftsmanship. Numerous corbels, banding configurations, archivolt, and projections highlight its surface. Contrast is further added by the use of different colored brick for the crawl space walls and the rest of the church. In addition, the January 18, 1892 GDN article makes reference to exterior features of artificial stone and its roof is a striated pattern of alternating colored slate tiles. Also adding to the overall effect are the differently configured towers and turrets.

The interior walls and aisle ceilings are light in color, appearing in photographs to have been plastered or smoothly parged over the masonry substrate. The nave ceiling is vaulted and looks darker than the converging walls (Scardino & Turner, 2000); its surface treatment however is not discernable from the collected data. The aisle ceilings

sport ribbed vaulting, and the interior walls midway up in the apse and below the clerestory windows show a band of small narrow arches adding accent and interest.

Summary of Results

Clayton remained consistent in his application of building technology to church design and construction, even though he applied emerging technologies of iron and steel in his secular building projects. The use of load bearing masonry above a crawl space fits a pattern revealed in other churches during this era, as does wood plank flooring supported by a wood framing system and the wood framed roof covered with slate or terra cotta tiles. The versatility of brick masonry construction is fully portrayed by the variety and depth of detailing that Clayton accomplishes.

Analysis: Sacred Heart-II



Figure 12: Sacred Heart-II, after the 1900 Storm.

Source: Archives of the New Orleans Province of the Society of Jesus, Loyola University Library.

Culture

Historical Background

The history of Sacred Heart parish commences with its establishment in 1884 but the history of Sacred Heart-II, the church, begins on September 8, 1900. On that day the Great Galveston Storm destroyed Sacred Heart-I giving birth to the present day House of God.

A souvenir booklet (University of St. Mary's, 1909) documents the laying of the church cornerstone on the 21st of June, 1903 with its completion and dedication on January 17, 1904. The church remains substantially the same today as it was originally constructed. In the years 1910-1912 (Beasley & Fox, 1996) the original dome above the altar was replaced with an onion shaped dome designed by Clayton. The original dome and the Clayton replacement were adorned with a marble stature of the Sacred Heart of Jesus, one of the few surviving artifacts of the original church. Struck by lightning in 1948 this statue was replaced by an eight foot replica of the statue "Christ of the Andes", which remains today (Darst, E., manuscript # 87-0026, box 2, ff 12). In 1923 due to policy changes regarding educational institutions the Jesuits left St Mary's, the parish, and Galveston. In the wake of their absences St. Mary's University closed and the administration of the parish was assumed by the diocese (Chapman, J., manuscript #97-0019, box 1, ff 10).

Architect

Many including Clayton assumed he would be charged with Sacred Heart's reconstruction. Though he was the architect of Sacred Heart-I and had drawn the

replacement plans he was not given the commission. The project went to Peter Jimenez, a Jesuit brother with a background in carpentry and building. History can speculate why Clayton was not selected. One theory suggests Clayton's financial difficulties at the time, another reasons the Church was endeavoring to save money in the wake of Galveston's disaster. Perhaps, quite simply, the parish did not want remembrances of the destroyed church.

A GDN article (To build..., 1903) recounts the arrival of Brother Otten (who had been reassigned by the order, after the completion of Sacred Heart-I) and Brother Wagner from Tampa, Florida, and Brother Jimenez from Macon, Georgia to oversee the church construction. Brother Jimenez assumed overall responsibility for the project when an accident disabled Brother Otten with a broken ankle. Little is documented regarding Brother Jimenez's formal architectural education and construction training. Beasley and Fox (1996) credit Jimenez's ancestry as Spanish, which his sir name implies. It is likely that his construction knowledge was forged through practical hands-on experience much like that documented for Brother Otten. Barnstone (2001) speculates Jimenez was involved in the construction of a New Orleans church (Immaculate Conception) similar in stature and style to the Galveston church.

Architectural Style (see figure 12, p. 136)

Several sources (Beasley& Fox, 1996; Scardino & Turner, 2000; Barnstone, 2001) characterize Sacred Heart-II's architecture as having a Moorish-Byzantine flavor. Beasley and Fox (1996) trace the church's built form back to the medieval 13C, as it pays tribute to "Puerta Santa Maria", Toledo, Spain's Grand Synagogue. It is further

suggested as cited previously that the church design may have been modeled after T. E. Giraud's New Orleans Immaculate Conception church, ca. 1857, which it is believed Brother Jimenez had a hand in constructing. Whereas, there is consistency between the architectural subset of the church and its designer/builder {Y} is placed into the matrix.

The church's Latin-cross plan is confirmed by the 1912 Sanborn map (figure 13, p 140). Thus {Y} is placed into the matrix. Furthermore, this same map illustrates the presence of side aisles flanking the nave as drawn in the church footprint and is confirmed by the author's personal observation. The length of the church is 158' - 0" and its width at the nave is 53' - 0" (University of St. Mary's 1909). Figure 13 (p. 140) denotes the height of the nave ceiling at 41' - 0". The church volume is calculated to be 158'-0" L x 53'-0" W x 41'-0" H = 343,334 ft³ and in accordance with the published guidelines it is considered large. Therefore an "L" is designated in the matrix.

Sacred Heart-II's architecture is very unique to Galveston. Barnstone (2001) considers the church's style to be anachronistic and out of place in architectural history. He states that in the early 1900s when Gothic was in vogue for tasteful churches, Brother Jimenez designed a building that was reminiscent of the style used for the Congregation B'nai Israel Synagogue 35 years earlier. Furthermore, as discussed in the literature review, contemporary architectural thought regarding construction never considered the Moorish-Byzantine style appropriate for church design. Therefore, {N} is placed in the matrix.

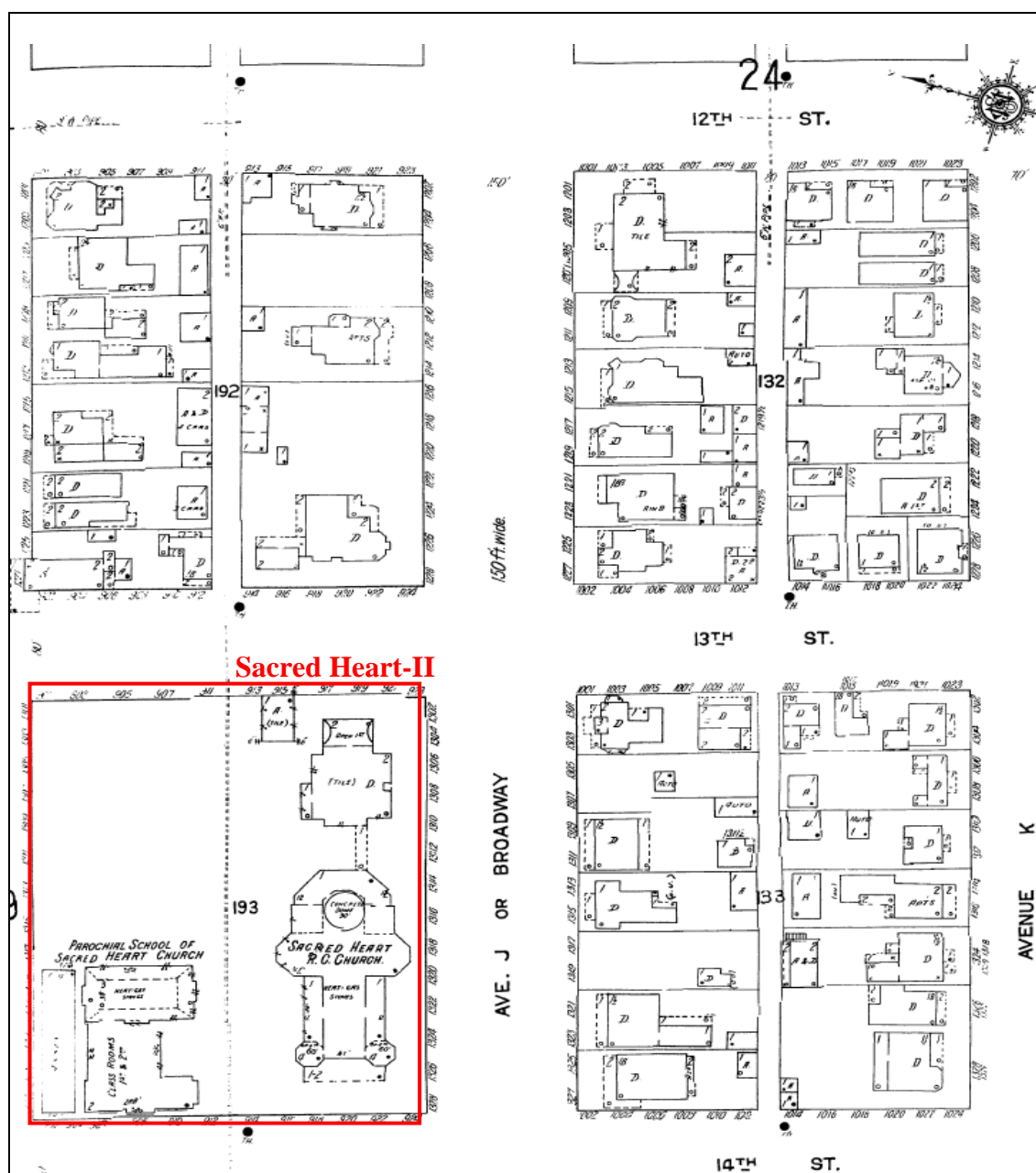


Figure 13: 1912-Feb 1950 Sanborn map, # 30, Sacred Heart-II, Galveston, Texas.
 Source: available at <http://sanborn.umi.com.ezproxy.tamu.edu:2048/tx/8539/dateid-000006.htm>

Parish

The collected data provided no evidence to support the idea that the parish was established for a particular ethnic group. As documented previously, the establishment of

the parish originally was not to satisfy the needs of a particular ethnicity and since Sacred Heart II was not for the purpose creating a new parish but to replace the destroyed church it is logical to assume that the parish make up remained primarily as it was before the 1900 Storm. Furthermore, there are no specific ethnic/cultural symbols or embellishments either integrated into or adorning the church building. Therefore, {N} is placed into the matrix for both operational parameters.

Summary of Results

The church's construction was in direct response to the 1900 Storm, as its purpose was to replace the original church. The fact that Clayton was not retained to construct it remains a speculation. It is also curious as to why the architectural style of Sacred Heart II deviated from the style that was in vogue during this era. While its architectural style was characterized as flamboyant (Barnstone, 2001), its Latin-cross plan, with nave, side aisles and transepts stayed faithful to its Medieval heritage. Furthermore, there was no evidence to indicate that the parish was established for, or its membership consisted of, a predominant ethnic group.

Faith

Church Site

Figure 13 (p. 140) shows that Sacred Heart-II is situated on the north east corner of Fourteenth Street and Broadway (Avenue J). It is located in the same block (193) as was Sacred Heart-I but on the opposite corner. And like Sacred Heart-I it is located in a residential neighborhood but since Broadway was and is the major east-west traffic

artery on the island it only partially meets {☐} the operational parameter of *desiring a neighborhood location removed from major traffic thoroughfares*.

Perimeter space that circumvents the church exterior sufficient for religious ceremony is present and is verified also by the Figure 13 (p. 140). Therefore, {●} is indicated. Referencing Figure 13, it is documented that the church's longitudinal axis is oriented east-west, with the altar in the east and the entrance facing west. Thus, this operational parameter is met {●}

Plan (sacred path)

The church foot print (figure 13) shows the presence of the desired hierarchal arrangement of the required spaces—entrance, narthex, baptistery, nave and sanctuary. This is confirmed by church photographs (Jesuit archives, Loyola University) and personal observation. Thus, this operational parameter is fully met {●}.

The condition for the presence of a baptismal font and its location at the church entrance and thus at the opposite end of the church from the altar is met {●}. This is documented by personal observation and in the souvenir booklet (University of St. Mary's, 1909) which describes the font located to the right as you enter the church.

The photographs (Jesuit Archives, Loyola University), personal observation, and the souvenir booklet (cited previously) clearly show the prominence of the altar; its presence is particularly noticeable as viewed at the rear of the nave from the church entrance. Thus, this operational parameter is fully met {●}.

Verticality (height)

Finish floor elevation. The published grade raising figures (appendix figure A-1, p. 193) indicate that the intersection of Fourteenth Street and Broadway is to be raised 2.3' to a finish elevation of 10.0'. The original ground elevation at this location was calculated to be $(10.0' - 2.3' = 7.7')$. From pre-grade raising photographs (Jesuit Archives, Loyola University, New Orleans) it is determined that the finish floor was seven stair risers above grade. Based on a standard of 7½" stair riser height, the nave's finish floor elevation height is determined to be 4' - 4½". According to the stated guidelines this elevation ($> 4' - 0''$) is considered significant and is indicated by {●}.

The operational parameter; regarding the presence of steeples, spires, and/or domes is fully met {●}. Church photographs (cited previously) and personal observation clearly document the presence of twin towers flanking the front entrance of the church and a dome situated above the altar. The presence of the dome above the altar is further confirmed by the narrative contained in the souvenir booklet (St. Mary's University, 1909).

The third operational parameter, nave ceiling height to width ratio, is partially met {◐}. The width of the church at the nave is documented to be 53' - 0", from personal observation it is determined that the side aisle width is approximately 10' - 0", therefore the actual nave width is estimated to be 33' - 0". The height of the nave ceiling (documented previously) is 41' - 0". Thus the nave height to width ratio is calculated to be $(41' - 0'' \div 33' - 0'' = 1.24)$ which partially meets the parameter.

Holy Light

Direct lighting of the faith's focal points is partially met { ◐ }. Photographs cited previously clearly show the presence of windows in the dome and lantern that surmount the altar. This is confirmed by narrative descriptions regarding the natural light being shed down upon the altar (Elizabeth Darst, E., manuscript #87-0026, box 2, ff 12; University of St. Mary's, 1909). In addition the side altars are sufficiently illuminated by their proximity to the transept windows. The baptismal font however, receives no direct lighting, being illuminated rather from the general ambient lighting provided by the nave windows.

The provision for general ambient lighting is partially met { ◐ }. The church design does have numerous windows at both the nave and clerestory windows, in addition to a large rose window above the main entrance and several windows in the transept and sanctuary. Their collective area, however, was estimated to be less than 50% of the church's wall area.

The third operational parameter avoidance of glare is partially met { ◐ }. There are east-west windows in the church but they are placed high in the wall. Presently the church windows are glazed with stained glass. However, data refers to the windows being glazed with frosted glass, and the hope that at some future date their will be sufficient funds to replace it with stained glass (St. Mary's University, 1909). Photographs cited previously seem to confirm this as they show the presence of an opaque material in the window opening frames.

Construction Materials

Sacred Heart-II was constructed almost exclusively of brick masonry, which renders it suitable for consecration. Since, however, it was not constructed of stone this criterion is only partially met {☹}.

Summary of Results

The results show that while Sacred Heart-II partially fulfilled the dictates of the faith, it did so in a fairly substantial way and was more compliant than the other four churches. Of the 13 possible operational conditions it fully complied with seven and partially met the remaining six. None of the operational conditions were determined as “not met”. Regarding site, the church was fully compliant regarding perimeter space and orientation, and was partially compliant with location due to its proximity to a major street. The sacred path was fully complied with. With respect to verticality the church fully satisfied the parameters for height of the finish floor and the presence of steeples, spires, and/or domes, and partially satisfied the nave/sanctuary height to width ratio. Partial compliance regarding construction materials was owed to the church’s masonry construction. The least compliant operational criterion was Holy Light. The church only partially satisfied all three of the operational parameters.

Environment (Physical & Built)

Physical Environment

Thermal comfort design strategy 1: Keep the summer heat out of the building.

- The condition of compact design is not met. Church photographs, previously cited, and its footprint (figure 13, p. 140) clearly show an extended building perimeter as a

result of its cruciform plan. In addition, the apse, transepts, and front towers have an octagonal configuration which contributes to the perimeter dimension and wall area.

- Exterior shade and or vegetation. Photographs of the church taken during and after construction (Jesuit archives, Loyola University) show no trees or other vegetation providing shade to the structure. Being that the building's longitudinal axis is east-west the northern façade of the church will be cast in the shade throughout the year. In addition, due to the size (width) and placement of the towers, they will shade the roof from the western setting sun beginning late in the afternoon. Thus, this condition is partially met.
- Small window size and few in number. From church photographs and personal observations it is determined that the church windows are not small in size. In addition, windows are present for the nave, transepts, clerestory, chancel, towers, and dome and thus it is determined that the windows are not few in number. Therefore, this operational condition is not met.
- Light colored roof and walls. While the present day church is painted white, photographs of the finished church (Jesuit archives, Loyola University) and one taken after Clayton's 1910-12 dome modification (Catholic archives of Texas, Austin) show a light gray church exterior—the shade of an uncolored cement stucco/parge coat. The main roof is not visible in any of the data photographs so a determination as to its color is not possible. The photographs however show the dome roof in a dark colored cladding. Thus this operational condition is partially met.

Some of the operational conditions for this comfort design strategy are partially met; therefore, it is determined that this comfort design strategy is partially met {☹}.

Thermal comfort design strategy 2: Use *natural ventilation to cool and remove humidity*.

- Prevailing winds are captured by the church's east-west orientation of its longitudinal axis. This positioning exposes the church's southern elevation with its nave and clerestory windows to Galveston's prevailing south and south-easterly winds (Lechner, 2000; Galveston city map, 1891). Thus this condition is met.
- Space between buildings to provide for air circulation. The 1912 Sanborn map (figure 13, p. 140) indicates the presence of significant perimeter space between the church and proximate structures. The condition is met.
- High ceilings. The nave ceiling height was determined from Figure 13 and a newspaper article (New Jesuit Church, 1903) to be 41' - 0". This height is considered to fully satisfy this condition.
- Cross-ventilation through operable windows on the structure's windward and leeward elevations. The church's orientation places the majority of its windows on the windward and leeward elevations. Furthermore, the crawl space vents located in the perimeter foundation walls contribute to air movement beneath the first floor. The window frames contain horizontal members dividing the windows into an upper and lower half. As can be determined from the photographs cited previously, these cross pieces constitute a muntin used to strengthen the glazing in the frames of the clerestory windows in the nave, transepts, and chancel. However, the lower windows of these locations are a casement design and appear to be open (figure 12, p. 136).

While not conclusive due to the possibility of changes made over time, the presence of latching devices on the current church windows is consistent with the assumption that these windows are operable. Therefore, it is determined that this condition is met.

Since all four of the operational conditions are met it is determined that this thermal comfort design strategy is fully met {●} and is indicated in the matrix.

Thermal comfort design strategy 3: *Protect from the summer sun.*

- Shading devices. As described previously in comfort design strategy 1, there are no external shading devices incorporated into the church design or attached to it. There is some shade provided by the front towers and the church's orientation. Therefore, this condition is partially met.
- Plants for shading. As explained earlier, there are no trees or significant vegetation that provides shading to the church surfaces. Thus, this condition is not met.
- Reflective building surfaces. Referencing the discussion in comfort design strategy 1, the light gray colored cement parge coat applied to the church's exterior, it is determined, would provide only minimal reflective qualities, thus, this condition is considered only partially met.

Since some of the operational conditions are only partially met, this operational comfort design strategy is only partially satisfied {◐}.

Thermal comfort design strategy 4: *Avoid the creation of additional humidity.*

- Avoid the use of pools or fountains. The collected data (photographs cited previously, figure 13, p. 140) provided no evidence for the presence of a fountain or

pool either within the church or in an exterior location proximate to it, notwithstanding the baptismal font as described previously. The condition is met.

- Provide drainage conditions to eliminate or minimize standing water. Church construction photographs (Jesuit Archives, Loyola University) show the presence of drainage swales and ditches at the building site perimeter and the adjacent streets (viewed from the corner of Broadway and Fourteenth Street). Thus, this operational condition is met.

Both of the operational parameters are fully met, thus, this thermal comfort design strategy is fully met {●}.

Summary of Results

Brother Jimenez's design appears to some degree accommodating of the Galveston's climatic conditions. Two of the thermal comfort design strategies, *providing for natural ventilation* and the *avoidance of additional humidity*, were fully met, while the remaining two parameters, *keeping the summer heat out* and *protecting from the summer sun*, were partially met. There were no comfort design strategies that were completely "not met."

Built Environment

Sacred Heart-II's architectural style as documented earlier has definite Moorish characteristics, most notably are the horseshoe shaped arches that punctuate the windows and portals. Also, a crescent, the symbol of Islam, surmounted by a cross, is positioned horizontally above the front portico. Quite telling of the church design is Barnstone's (2001) remark regarding the anachronistic quality of its style.

Summary of Results

A comparison of this Moorish style against the style time lines for America and Galveston during this era provides further credibility to Barnstone's characterization. It was not a case of this style being out of phase with those in vogue, but rather this style was never part of any significant architectural trend or pattern occurring in either America or Galveston during the last half of the 19C. Furthermore, the Moorish style, with lineage to the Medieval period, was not consistent with contemporary architectural thought regarding church design and construction, which was predisposed to Gothic. It can be argued that this style was not influenced by the built environment of either America generally or Galveston specifically, nor was it influenced by contemporary architectural thought of that era.

Building Technology

Not only did Sacred Heart-II's architectural style run counter to both the built environment and contemporary thought regarding church design of the era, but so did its building technology. The *matrix's* (see figure, p. 154) building technology time line illustrates the atavistic use of load bearing masonry and cast iron as inconsistent with building technologies of that time and contradicts contemporary and historical accounts describing the use of steel reinforced concrete in its construction. A GDN article (To build..., 1903) contains Father Murphy's (church pastor) declaration that the masonry of the old church will be broken up and used in the concrete of the new church and that it is likely that the clerestory will be of concrete block or artificial stone. A subsequent GDN article (New Jesuit Church, 1903) modifies Father Murphy's claim as it describes the

foundation being constructed of concrete, batched from cement and crushed brick collected from the ruins of Sacred Heart-I. Beasley and Fox (1996) describe the church as being constructed of cast in place reinforced concrete. Several pictures (Jesuit Archives, Loyola University) taken during different phases of church construction, clearly show the use of load bearing masonry in its fabrication.

Scale

The scale of the church as defined by its general building dimensions is 158'- 0" L x 53'- 0" W x 41'- 0" H, cited previously.

Building Materials

The primary building material is brick masonry; reference is made to the use of a hard burned Cedar Bayou brick to be covered in cement (New Jesuit Church, 1903). In addition, the data indicates the use of cast iron pillars (Chapman, J., manuscript #97-0019, box 1, ff 10), which personal observation establishes present in the interior columns that support the clerestory walls. This contradicts Father Murphy's contention that the interior columns will be fabricated of Georgian marble (New Jesuit Church, 1903).

Structural Systems

Foundation

From the photographs and GDN articles cited previously, plus personal observation; indications are that the foundation is a load bearing concrete design consisting of cement and crushed brick masonry. The configuration is a perimeter wall and internal piers supporting the first floor, thus creating a crawl space.

Floors

These same pictures show the flooring material to be wood planking (random length and assumed to be tongue and groove) and are supported by a system of wood joists and girders, which in turn are supported by the foundation wall and piers.

Walls

The walls are load bearing brick masonry (Cedar Bayou brick, cited previously). The loading imposed by the dome, clerestory walls, and roof is carried by the external walls, flying buttresses, and internal masonry arches, some of which are supported by cast iron columns.

Roof

The data does not provide any insight as to the material used in the roof or the specifics of its design. Father Murphy makes reference to the roof being flat with sufficient inclination to provide water runoff (New Jesuit Church, 1903). Photographs show the original dome being constructed of masonry and clad in a dark material, which the author assumes to be metal (possibly lead or galvanized iron).

Finishes

The primary finish materials are stucco and paint. Construction photographs reveal a stucco/cement parge coat being applied to the brick masonry (Jesuit archives, Loyola University). The original color was light gray and remained at least until Clayton's dome modification in 1910-12, which photographs (Jesuit archives, Loyola University) document. The present day (2006) church's brilliant white exterior is dramatically captured by the reflection of the setting sun. The church interior was

finished in a white stucco/plaster and remains so today. Minor interior wall damage near the front left tower reveal a metal wire mesh fastened to the interior surface of the brick masonry over which the cement plaster was applied. The lower radius of the nave and chancel arches is adorned with numerous small scalloped carvings which add to the arches' interest. The wood floor is stained, and reference is made to the oak pews, antique in color, and the carved Georgian marble communion rail (University of St. Mary's, 1909)

Summary of Results

The building technology used to construct Sacred Heart-II did not keep pace with the emerging technologies present at the beginning of the 20C. Load bearing brick masonry, arches, and buttresses were characteristic of the building techniques used in Medieval times. Notwithstanding the use of cement and crushed brick in the foundation, these same technologies interwoven with a crawl space, wooden substructure for the floor, and stucco/plaster finishes was consistent with the other study churches built on the Island during the last half of the 19C. It is likely that this technology persisted because that is what Bother Jimenez knew, what his experience was. If Clayton had received the commission it might have been otherwise, though his reconstruction of St. Patrick's did not venture beyond the building technologies use to construct it originally.

Summary

The *comparative analysis matrix* (figure 14, p. 154) which follows illustrates the comparative analysis and results of this section.

Comparative analysis matrix					
Criteria	Study Churches				
I. Variable: Culture (historical background)	St Mary's	St. Joseph's	St. Patrick's	Sacred Heart I	Sacred Heart II
A Architect/Builder	////////////////////////////////////				
1. Name	Giraud	Bleicke	Clayton	Clayton	Jimenez
2. Origin/Ancestry	American/ French	German	Irish	Irish	Spanish
3. Training: Title OJT = On the Job Training Education	Architect French	Carpenter OJT	Architect American	Architect American	Carpenter OJT
B. Architectural Style	////////////////////////////////////				
1. Origin If the ethnicity of the designer/builder matched the subset of the architecture, then Y if not N.	Medieval French Y	Medieval German Y	Medieval Irish Y	Medieval French N	Medieval Spanish Y
2. Latin-cross (presence of transepts) (Yes-Y; No-N)	Y	N	Y	Y	Y
3. Side Aisles Present (Yes-Y; No-N)	Y	Y	Y	Y	Y
4. Scale: (Small-S) (Medium-M) (Large-L)	L	S	L	L	L
5. Contemporary Thoughts: (Yes-Y; No-N)	Y	Y	Y	N	N
C. Parish (a predominant group)	////////////////////////////////////				
1. Ethnicity (a predominant group)	N	Y German	Y Irish	N	N
2. Cultural Symbols: (Yes-Y; No-N)	N	Y	Y	Y	N
II. Variable: Faith					
A. Church Site	////////////////////////////////////				
1. Neighborhood site (removed from major streets)	○	●	●	●	●
2. Space—Church Perimeter	●	●	●	●	●
3. Church Orientation: E-W axis	●	○	●	○	●
B. Plan (sacred path)	////////////////////////////////////				
1. Space Hierarchy (entrance, narthex, nave, sanctuary)	●	●	●	●	●
2. Baptismal Font at Entrance, Altar at Opposite End	●	●	●	○	●
3. Altar in Prominent Position	●	●	●	●	●
C. Verticality (height)	////////////////////////////////////				
1. Church Finish Floor Height	○	●	●	●	●
2. Steeples, Spires, and/or Domes,	●	●	●	●	●
3. Nave/Sanctuary (proportion: ceiling height to width)	●	○	●	●	●
D Holy Light	////////////////////////////////////				
1. Focal Points of Faith Illuminated (accent lighting)	●	●	●	●	●
2. Interior Surfaces Illuminated (ambient lighting)	●	○	●	●	●
3. Absence of Glare—interior spaces	●	●	●	○	●
E. Construction Materials	////////////////////////////////////				
Canon Law—the use of natural stone	●	○	●	●	●
III. Variable: Environment (physical & built)					
A. Physical Environment: Thermal Comfort (Design Strategies)	////////////////////////////////////				
1. Keep heat out in Summer	●	●	○	○	●
2. Natural Ventilation to Cool & Remove Humidity.	●	●	●	●	●
3. Protect From Summer Sun	●	●	○	○	●
4. Avoid creation of additional humidity in summer	●	●	●	●	●

Figure 14: Comparative analysis matrix.

Source: Created by author.

Matrix Continued		Criteria	Study Churches										
III. Variable: Environment (continued)			St. Mary's 1847-48	St. Joseph's 1859-60	St. Patrick's 1872-77	Sacred Heart I 1889-92	Sacred Heart II 1901-04						
B. Built Environment: Style	Time line	1840	↓	1850	↓	1860	1870	↓	1880	↓	1890	1900	↓
	American Architectural Style ¹	[-----Greek Revival-----]											
	Ancient Classical	[-----Gothic Revival-----][--Romanesque, Victorian--]											
	Medieval	[-----Italianate-----][----Beaux Arts---]											
	Renaissance Classical	[-----2 nd Empire-----]											
Galveston Architectural Style ²		[-----Greek Revival-----]											
		[-----Gothic Revival-----][-----Victorian-----]											
		[--Romanesque--]											
		[-----Italianate-----][Beaux Arts-----]											
		[--2 nd Empire--]											
Study Churches (style)			St. Mary's Gothic Revival	St. Joseph's Gothic Revival	St. Patrick's Victorian Gothic	SH-I Romanesque		SH II Moorish					
IV. Variable: Building Technology													
Time line	1600-----1840	1850	1860	1870	1880	1890	1900						
	American Building Technology ³	[timber & masonry][---milled lumber---][masonry & cast iron][steel skeleton]											
Galveston Building Technology ^{2,4}	[milled lumber, masonry][masonry & cast iron][steel skeleton]												
City founded 1836													
Architectural Details			St. Mary's	St. Joseph's	St. Patrick's	Sacred Heart I		Sacred Heart II					
A. Scale: General Building Dimensions:	Length	126'- 0"	70'- 6"	140'- 0"	150'- 0"	158'- 0"							
	Width	64'- 0"	35'- 10"	50'- 0"	65'- 0"	53'- 0"							
	Height	43'- 6"	36'- 8"	58'- 0"	96'- 0"	41'- 0"							
B. Building Materials			Masonry Timber	Wood Frame	Masonry Lumber Concrete	Masonry Lumber Concrete		Masonry Cast Iron Concrete					
C. Structural Systems			////////////////////////////////////										
1. Foundations			CS, MP	CS, MP	CS, MP	CS, MP		CS, C, MP					
2. Floors			GDR, FJ, WP	GDR, FJ, WP	GDR, FJ WP	GDR, FJ WP		GDR, FJ WP					
3. Walls			BM, MA	WF	BM, MA	BM, MA		BM, MA					
4. Roof			WTp	RFp	RFp	RFp		F					
D. Finishes: material, color, texture			P, S/P, LW	P, WSd	EM, S/P	EM, S/P		S/P					

¹ McAlester & McAlester, 1991, Echols, 2000; ² Beasley & Fox, 1996, Barnstone, 2001; ³ Friedman, 1995;

⁴ Scardino & Turner, 2000, Robinson, 1981

Met the parameter: fully = ●; partially = ◐; did not meet = ○

BM = Bearing Masonry

C = Concrete

CS = Crawl Space

EM = Exposed Masonry

F = Flat

FJ = Floor Joists

GDR = Girder

LW = Lime Wash

MA = Masonry Arches

MP = Masonry Piers

MTL = Metal

MF = Masonry Footing

P = Paint

RFp = Rafter Frame pitched

S/P = Stucco/Plaster

WSd = Wood Siding

WF = Wood Frame

WP = Wood Plank

WTp = Wood Truss pitched

Figure 14: Continued.

DISCUSSION AND SUMMARY

Discussion

Thus far this inquiry has examined the specific data for the study churches and has presented the results of this analysis for each church in both a narrative discussion and a *comparative analysis matrix* (figure 14, p. 154). In this section a comparative analysis, by variable, between the study churches is made, the findings of which are discussed and summarized. To foster insight and abet this discourse, the *comparative analysis matrix* has been edited into segments corresponding to each of the study variables and is presented as a separate figure with an accompanying discussion.

To augment the qualitative comparisons a quantitative approach, described next, is implemented where feasible. The quantification is based on an ordinal ranking system, which seems appropriate for the qualitative nature of this analysis. The scoring convention used is $\{\bigcirc\} \& \{N\} = 0$, $\{\text{—}\} = 1$, $\{\bullet\} \& \{Y\} = 2$. The numerical values assigned to the scoring are arbitrary, representing no predefined standard of performance. They hold no significance other than to provide an alternative perspective which can illuminate comparisons among the study churches and between the study churches, the criterion, and the variables. The quantitative element is calculated (as a percent) by dividing the total number of points each study church received for a variable by the total points possible for that variable. For example, the variable of faith represents thirteen criterion evaluated, equating to a maximum total 26 possible points if all of the criterion were fully met (13 x 2). St. Mary's Cathedral received 17 of the 26 possible points. This equated to a numerical value of 0.65, which can viewed as the church

having a 65% compliance rating regarding the dictates of the faith. The other churches were scored in like manner. In addition to quantification by church the same scoring convention calculations were made by variable criterion and collectively by each variable as a whole. For example, within the culture variable parish received 10 of 20 possible points for a score of 0.50. The entire culture variable received 42 of 60 possible points for a score 0.70.

Culture

Comparative Analysis Matrix					
Culture					
Criteria	Study Churches				
I. Variable: Culture (historical background)	St Mary's	St. Joseph's	St. Patrick's	Sacred Heart I	Sacred Heart II
A Architect/Builder	////////////////////////////////////				
1. Name	Giraud	Bleicke	Clayton	Clayton	Jimenez
2. Origin/Ancestry	American /French	German	Irish	Irish	Spanish
3. Training: Title OJT = On the Job Training Education	Architect French	Carpenter OJT	Architect American	Architect American	Carpenter OJT
B. Architecture	////////////////////////////////////				
1. Origin: If the ethnicity of the designer/builder matched the subset of the architecture, then Y if not N	Medieval French Y	Medieval German Y	Medieval Irish Y	Medieval French N	Medieval Spanish Y
2. Latin-cross (presence of transepts) (Yes-Y; No-N)	Y	N	Y	Y	Y
3. Side Aisles Present (Yes-Y; No-N)	Y	Y	Y	Y	Y
4. Scale: (Small-S) (Medium-M) (Large-L)	L	S	L	L	L
5. Contemporary Thoughts: (Yes-Y; No-N)	Y	Y	Y	N	N
C. Parish (a predominant group)	////////////////////////////////////				
1. Ethnicity (a predominant group)	N	Y German	Y Irish	N	N
2. Cultural Symbols: (Yes-Y; No-N)	N	Y	Y	Y	N
INDIVIDUAL CHURCH SCORE	0.67	0.83	1.00	0.50	0.50

Figure 15: Comparative analysis matrix segment—culture variable.
Source: Created by Author.

A basic focus of this dissertation is the variety in the built form and construction of Catholic churches built in Galveston, Texas during the last half of the 19C. This variation in built form is clearly visible in the photographs and analyses presented in the

analysis section for each church. In addition to this variety of form, Figure 15 (p. 157) shows a variety among the designers/builders of these churches. Four of the five churches were constructed by four separate individuals, presenting different ethnic origins/ancestry. Furthermore, they had diverse pedigrees regarding construction skills and there was differentiation within them. Two of the builders, Giraud and Clayton, were architects by profession while the other two, Bleicke and Jimenez were considered carpenters. Giraud benefited from formal education while studying architecture in France. In contrast, Nicholas Clayton received no formal scholastic training; acquiring his proficiency through apprenticeship in America. Two of the churches were designed by the same architect, yet their built form adopted two different architectural styles, Gothic Revival and Romanesque respectively.

Also noteworthy is the common European heritage nested in the interstices of the designer/builders' diverse ancestral ethnicity. This may help explain the consistency of certain architectural elements among the churches and draws on Abernethy's (2000), Geva's (1995, 2002), and Rapoport's (1969) arguments that people—emigrants—seeking what they left behind perpetuate familiar forms in their new towns, homes and farms. The architecture of all the churches has origin in the Medieval period with a particular ethnic subset. Four of the church plans are a Latin-cross configuration and all five churches contain side aisles. Moreover, the scale of four churches was determined to be large, the precedent for which is found in Middle Age cathedrals in Europe. In addition, the Gothic theme present in four of the churches harmonizes with the architectural thought of the era regarding church form and style (see literature review, p.

28). Yet, this backdrop of architectural constancy was permeated with variety. It can be argued that the *mélange* of built form manifested by the study churches is influenced by the varied backgrounds of the designer/builders; further reinforcing the link between culture and architecture. In addition, St. Joseph's, built for the largest immigrant population (German) living in Galveston at the time, was basic in its plan and the smallest in scale. St. Patrick's Latin-cross configuration, with the transepts near the entrance, was the reverse of the other three cruciform churches. Lastly, Sacred Heart-II, with its Moorish trappings, ran counter to the preference for the Gothic Revival motif—the prevalent theme of ecclesiastical architecture thinking at that time. For an explanation of this phenomenon the reader is directed to the discussion of the built environment (p. 167).

Figure 15 (p. 157) also demonstrates that the variegated cultural theme extends beyond the architect and architecture; embracing the ethnicity and culture of the parishioners as well. St. Joseph's and St. Patrick's were constructed for the express purpose of meeting the needs of a particular ethnic group—German and Irish respectively. Furthermore, the designer/builders of these churches, Bleicke and Clayton, were conjoined, by their personal ethnic heritage, respectively, to the ethnicity of the parishes for which they built. In addition, three of the churches displayed specific cultural symbols relating directly to ethnicity. St. Joseph's intricately carved wood altar and communion rail were in the finest tradition of German craftsmanship, as were the German inscribed Stations of the Cross. Clayton's use of the shamrock shape for St. Patrick's clerestory windows and incorporation of it into interior arch and column capital

carvings speaks sonorously to the church's cultural roots as does its name—St. Patrick's. These, plus the Celtic cross Clayton used to adorn Sacred Heart-I—a church without allegiance to a specific ethnic group—is evidentiary of culture's influence on the built form.

The quantifying value was derived using the {Y} and {N} scoring convention in the following manner: The {Y} or {N} appearing in the “origin” row gave value to the ethnic/cultural relationship between the architect/builder's ancestry and the specific medieval architecture subset (see architectural style, p. 54).

Among the individual church scores, St. Patrick's full compliance (1.00) demonstrated the strongest link to culture, followed by St. Joseph's 0.83 (see calculation format, p. 156) These results are yoked by the uniform adherence to traditional church building and to the ethnicity and cultural symbols of the parish. St. Mary's scored 0.67. Sacred Heart-I and II's scores of 0.50 are attributed to their architectural style not being consistent with contemporary ecclesiastical thought of the era and an insufficient association with specific parish ethnicity or their cultural symbols.

In evaluating each criterion of the culture variable, it demonstrates the following. Architecture's score of 0.80 demonstrates a strong correlation between the architecture of the study churches and traditional church building, as well as the cultural influence emanating from the ethnicity of the designer/builder. The parish score of 0.50 indicates that the churches' built form had a moderate affiliation to the specific ethnicity and cultural symbols of the worshipping faithful (parish). Taken together, however, the

parishioner's European roots are evident and the built form was likely influenced by their composite memory of building type.

The collective quantification value, 0.70, for the entire culture variable demonstrates culture's considerable influence. The strength of this number can be found in the cultural relationship between the study churches, the designer/builder, and the architecture. The churches present a variety of form the marrow for which can be traced to the ethnical background of the designers/builders and the heritage of traditional church building rooted in and brought forth from the European Middle Ages.

Faith

Comparative Analysis Matrix					
Faith					
Criteria	Study Churches				
II. Variable: Faith	St Mary's	St. Joseph's	St. Patrick's	Sacred Heart I	Sacred Heart II
A. Church Site	////////////////////////////////////				
1. Neighborhood site (removed from major streets)	○	●	●	●	●
2. Space—Church Perimeter	●	●	●	●	●
3. Church Orientation: E-W axis	●	○	●	○	●
B. Plan (sacred path)	////////////////////////////////////				
1. Space Hierarchy (entrance, narthex, nave, sanctuary)	●	●	●	●	●
2. Baptismal Font at Entrance, Altar at Opposite End	●	●	●	○	●
3. Altar in Prominent Position	●	●	●	●	●
C. Verticality (height)	////////////////////////////////////				
1. Church Finish Floor Height	○	●	●	●	●
2. Steeples, Spires, and/or Domes,	●	●	●	●	●
3. Nave/Sanctuary (proportion: ceiling height to width)	●	○	●	●	●
D Holy Light	////////////////////////////////////				
1. Focal Points of Faith Illuminated (accent lighting)	●	●	●	●	●
2. Interior Surfaces Illuminated (ambient lighting)	●	○	●	●	●
3. Absence of Glare—interior spaces	●	●	●	○	●
E. Construction Materials	////////////////////////////////////				
Canon Law—the use of natural stone	●	○	●	●	●
INDIVIDUAL CHURCH SCORE	0.65	0.54	0.77	0.58	0.77

Figure 16: Comparative analysis matrix segment— faith variable.
Source: Created by Author.

This segment of the *comparative analysis matrix* (figure 16, p. 161) contrasts the study churches' conformance to the dictates of the faith concerning church design and construction (see literature review). In comparing church site note that the degree of compliance varied by church and no church fully met this criterion. St. Mary's site did not meet Church guidelines for location, while the other four church sites only partially satisfied them. An explanation for this may be that individual church location was impacted by the availability of a suitable building site or its cost or both. While a possibility, whether causal or not, the argument against faith having an instrumental influence is strengthened. Church positioning on their respective sites to achieve the desired perimeter space was fully met by all of the churches, but this positioning provided the desired east-west orientation for just two churches—St. Mary's and Sacred Heart-II. St. Patrick's orientation was partially met, while St. Joseph's and Sacred Heart-I failed to meet. It could be postulated that church orientation was influenced by the context of the building site, but Figures 7 (p. 86) and 11 (p. 122) show sufficient space for the desired orientation of St. Joseph's and Sacred Heart-I. In other words, even though the desired positioning was possible, a conscious decision was made not to conform to dictates of the faith.

Examination by church plan reveals that all but one church fully complied with this criterion. The lone exception, Sacred Heart-I, did not comply because the presence and location of the baptismal font could not be conclusively established. An explanation for high compliance across all churches within this criterion may be in the consistency of the architecture relating to the Medieval period and the cultural tradition for the Latin-

cross configuration discussed previously (see culture, p. 157). Essentially, the cruciform plan was familiar, customary, and compatible with the ecclesiastical desire for space arrangement (sacred path).

Verticality, reverts to the variety witnessed in church site. Four churches were fully compliant regarding finish floor height. An outcome that may be explained by practical considerations regarding street flooding resulting from Galveston's flat topography and an annual rainfall approaching 50" (Galveston city map, 1891), rather than a desire to have the church elevated to a position of prominence. Three churches fully satisfied the requirement regarding the presence of steeples, spires, and/or domes, while St. Joseph's and St. Patrick's did not. In these cases, the absence of steeples, spires or domes adorning focal points of faith precluded their achieving full compliance. No church fully achieved the desired effect with respect to the proportion of nave/sanctuary ceiling height to nave width, and one failed to meet entirely this operational parameter. It can therefore be argued that verticality in and of itself was given inconsistent and token consideration with regards to the built form.

Similarly, the variety and degree of compliance extends to the integration of Holy Light (daylight) into church design. Only one church fully satisfied the operational parameter regarding accent lighting, while one fully satisfied the desire for ambient lighting and one the avoidance of glare. The remaining operational parameters are either partially or not met. Again it can be argued that the presence of natural light within a structure was not the result of a particular effort to accommodate the functional or spiritual requirements of the Church.

The choice of construction materials also varied among the churches and by degree. Although, the first preference of Canon Law is that churches be built of stone, none of the churches complied with this faith recommendation. St. Joseph's, built of wood, the lowest preference for materials, demonstrates further the dearth of influence faith wielded on the built form, while the other churches were fabricated of brick.

A quantitative assessment of each church, applying the scoring convention, reflects the following. Sacred Heart-II and St. Patrick's each scored 0.77; fully complying with seven of the 13 operational parameters and partially complying with the other six. Next was St. Mary's score of 0.65, followed by Sacred Heart-I at 0.58, which failed to have any level of compliance with two and three of the operational parameters respectively. St. Joseph's, failing to meet four operational parameters, scored the lowest, with 0.54,

If each criterion is collectively rated, the scoring is: plan = 0.93; verticality = 0.67; church site = 0.63; Holy light = 0.53; construction materials = 0.40. The collective perspective is revealing. The prescribed church plan, achieved the highest compliance score, but the other criterion ratings were far less and varied. Furthermore, the collective compliance rating for the entire variable was 0.67, which is less than the 0.70 scored for culture. From this it can be reasoned that while faith's influence on the study churches' built form and construction was relatively high, culture wields more influence.

Physical Environment

Comparative Analysis Matrix Physical Environment					
Criteria	Study Churches				
III. Variable: Environment (physical & built)	St Mary's	St. Joseph's	St. Patrick's	Sacred Heart I	Sacred Heart II
A. Physical Environment: Thermal Comfort (Design Strategies)	////////////////////////////////////				
1. Keep heat out in Summer	☹	☹	○	○	☹
2. Natural Ventilation to Cool & Remove Humidity.	☹	●	●	☹	●
3. Protect From Summer Sun	☹	☹	○	○	☹
4. Avoid creation of additional humidity in summer.	●	●	☹	●	●
INDIVIDUAL CHURCH SCORE	0.63	0.75	0.38	0.38	0.75

Figure 17: Comparative analysis matrix segment—physical environment variable.
Source: Created by author.

It was advanced previously that since all of the churches were constructed in the same location (Galveston) differences in built form is not attributed to different climatic conditions, but could be explained by the degree to which climate/thermal comfort was integrated into the church design. As Figure 17 illustrates, the leitmotiv of variety witnessed in the variables of culture and faith continues in the adaptation of the study churches to the physical environment (climate) of Galveston. The level of compliance with the thermal comfort design strategies varies for each church and between them. Converting the results into quantifiable terms using the aforementioned scoring convention, shows that individually, St. Joseph's and Sacred Heart-II were most compliant with ratings of 0.75, St. Mary's scored 0.63, while St. Patrick's and Sacred Heart-I were least at 0.38. It may be said that the high score for the more recently built Sacred Heart-II is expected, since, supposedly designers over time become adept at adapting built forms to climatic conditions. The fact that St. Joseph's was constructed 40

years prior to Sacred Heart-II and Sacred Heart-I (the least compliant) only 10 years before, appears to dampen that contention. In other words, if the designers/builders had knowledge of thermal comfort design strategies and it is reasonable to assume they had, given Galveston's hot and humid climate and the lack of mechanical heating or cooling systems; they chose not to implement them in the case of these churches.

In gauging the churches by design strategy, *avoiding the creation of additional humidity* received the highest compliance score, 0.90; followed by *natural ventilation to cool and remove humidity*, 0.80. *Keeping heat out in summer* and *protecting from summer sun* were the least compliant, 0.30. The high score for avoiding humidity increases is explained by the removal of surface water through the presence of site drainage and the absence of fountains or pools. The removal of humidity through natural ventilation was accomplished by the presence of operable windows and crawl space louvers/vents that were exposed to Galveston's prevailing winds. The paucity of protection against summer heat/sun is owed to dark building surfaces, the absence of external shading devices, and non-compact designs. This collective perspective shows a dearth of consistency among the churches in complying with these strategies.

In examining the physical environment variable as a whole, the churches as a group scored 0.58. In other words, thermal comfort considerations manifested themselves in the churches slightly more than half of the time. This is particularly interesting given the fact that the climatic conditions in the homelands of these European immigrants was in stark contrast to that of the Texas Gulf Coast. The designers/builders in their constructions were not overly influenced by Galveston's hot humid climate. It

can therefore be argued that climate was not dictating the built form and construction of the study churches. This finding corroborates Geva's (1995, 2002) conclusion that churches serve as cultural symbols and society is therefore willing to sacrifice climatic comfort to maintain their cultural identity.

Built Environment

Comparative Analysis Matrix Built Environment					
Criteria	Study Churches				
III. Variable: Environment (continued)	St Mary's 1847-48	St. Joseph's 1859-60	St. Patrick's 1872-77	Sacred Heart I 1889-92	Sacred Heart II 1901-04
B. Built Environment: Style	<div>Time line</div> <div>1840 ↓ 1850 ↓ 1860 1870 ↓ 1880 1890 ↓ 1900 ↓</div> <div>American Architectural Style</div> <div>Ancient Classical [-----Greek Revival-----]</div> <div>Medieval [-----Gothic Revival-----][--Romanesque, Victorian--]</div> <div>Renaissance Classical [-----Italianate-----][-----Beaux Arts-----]</div> <div> [-----2nd Empire-----]</div> <div>Galveston Architectural Style</div> <div>[-----Greek Revival-----]</div> <div>[-----Gothic Revival-----][-----Victorian-----]</div> <div> [--Romanesque--]</div> <div> [-----Italianate-----][--- Beaux Arts---]</div> <div> [---2nd Empire---]</div>				
Study Churches (style)	St. Mary's Gothic Revival	St. Joseph's Gothic Revival	St. Patrick's Victorian Gothic	SH-I Romanesque	SH II Moorish

Figure 18: Comparative analysis matrix segment—built environment variable.
Source: Created by the Author.

The influence of the built environment on the form and construction of the study churches focuses on the prevalent architectural styles in vogue in America and Galveston during the last half of the 19C. A time line reflecting the architectural fashions of this era is the primary element against which comparisons and contrasts are made.

In this segment of the *comparative analysis matrix* (figure 18) the names of the study churches and the dates of their construction appear across the top. The time line of

19C American and Galveston architectural styles appear below the names, intersected by arrows which correspond approximately to the churches' construction dates. The American subset is organized by the major architectural thematic styles (Ancient Classical, Medieval, and Renaissance Classical) occurring in America during this period. Each of these themes includes the particular styles represented to the right. The brackets that envelope these styles reflect the approximate time the style was popular. For example, the Greek Revival style, was prevalent in America from the mid 1830s to the start of the Civil War in the early 1860s. The styles regnant in Galveston are represented in a like manner using the same convention. At the bottom of Figure 18 (p. 167) the study churches and their architectural styles are indicated.

An overview of Figure 18 reveals a parallel in architectural styles between America generally and Galveston specifically. A likely explanation for this is the fact that Galveston, as Texas' significant seaport, was directly connected to major East Coast and European cultural centers and economic entrepôts through maritime commerce (Robinson, 1981). In similar fashion there is a parallel between the study churches and the built environment of the era. In three churches—St. Mary's, St. Joseph's and St. Patrick's—the Gothic style is retained, while Sacred Heart-I adapts the Romanesque. In the case of the Gothic Revival fashioned churches, it can be argued, that the selection of style was influenced by the built environment of the era and by contemporary thought for church design and construction both of which emphasized Gothic during the time these churches were built. Sacred Heart-I, it appears, was influenced more by the built environment than contemporary thought. At the time of its construction, Richardsonian

Romanesque was a popular style in America (McAlester & McAlester, 1991) and its popularity extended to Galveston. As Sacred Heart-I, designed by Clayton, was being constructed, his Romanesque design for the University of Texas Medical School was also executed and exemplified “Romanesque par excellence” (Scardino & Turner, 2000).

Perhaps more revealing and insightful regarding the influence of this variable are the post-1900 Storm events concerning three of the study churches. Storm damage photos of St. Patrick’s and Sacred Heart-I (links cited previously) illustrate strikingly similar degrees of substantial destruction to both churches. Interestingly, St. Patrick’s was rebuilt, with some minor modification, to its original Gothic Revival motif and ecclesiastical heritage; even though the popularity of this style in Galveston’s architectural fashion had ebbed 10 years previously. This can be explained in part as the need of the parish to build a memorial to the original church (Foote, 1997). By contrast, Sacred Heart-I was not rebuilt to its original style. Its characteristic Moorish replacement, Sacred Heart-II, represented an anachronism to both the American and Galveston architectural landscape (Barnstone, 2001). This style was neither consistent with the built environment nor contemporary thought of the era regarding ecclesiastical architecture. Rather, the Moorish design selected was influenced by the Spanish tradition reflected in the 13C Puerto Santa Maria, Toledo, Spain, and by familiarity with Immaculate Conception, New Orleans, Louisiana; built in 1857 with Brother Jimenez participating in its construction. Furthermore, it is suggested that perhaps the Jesuits of Galveston selected this Iberian style to pay tribute to Ignatius of Loyola, a Spanish nobleman and founder of their order in 1540 (Spielvogel, 2005). Additionally, it is

conceivable the parishioners and/or the clergy wished to distance themselves from the horrific events and painful memories of September 8, 1900 that rebuilding may have engendered. As Foote (1997) describes the phenomenon of starting afresh to provide distance from the catastrophe, they chose to build *de novo*, creating a new beginning with a totally different style.

Due to the qualitative nature of the data represented in this *matrix* segment (figure 18, p. 167), quantification within this variable is more problematic, i.e. no shaded dots or $\{Y\}/\{N\}$ responses. However, in analyzing the built environment variable as a whole, it is assigned a value of 0.50. Cited previously, three of the churches in their Gothic Revival rendering followed the built environment and contemporary thought regarding the form of a church. It therefore, can be reasoned they were equally influential, i.e. 50-50. Sacred Heart-I seems to have been influenced more by the built environment than contemporary thought, while Sacred Heart-II was not likely influenced by the built environment or contemporary thought regarding how a church should look. In fact a solid argument has been made for the strong cultural influence on Sacred Heart-II's built form. Furthermore, St. Patrick's reconstruction tends to indicate its Gothic Revival style was influenced more by contemporary thought than the built environment.

Therefore, based on this reasoned perspective of the variable a quantitative value of 0.50 is assigned. Thus, a claim can be made that the built environment's influence was modified by contemporary thought regarding church design and the recurring cultural themes of memory, tradition, familiarity, and heritage; which reinforce further

the claim by Geva, Rapoport, and others for the significant impact of culture on the built form.

Building Technology

Comparative Analysis Matrix Building Technology						
Criteria		Study Churches				
IV. Variable: Building Technology		St. Mary's 1847-48	St. Joseph's 1859-60	St. Patrick's 1872-77	Sacred Heart I 1889-92	Sacred Heart II 1901-04
Time line	1600-----1840	1850	1860	1870	1880	1890
American Building Technology	[timber & masonry][-milled lumber-][masonry & cast iron][steel skeleton]					1900
Galveston Building Technology	[milled lumber, masonry][masonry & cast iron][steel skeleton]					
City founded 1836						
Architectural Details		St. Mary's	St. Joseph's	St. Patrick's	Sacred Heart I	Sacred Heart II
A. Scale: General Building Dimensions:	Length	126'- 0"	70'- 6"	140'- 0"	150'- 0"	158'- 0"
	Width	64'- 0"	35'- 10"	50'- 0"	65'- 0"	53'- 0"
	Height	43'- 0"	36'- 8"	58'- 0"	96'- 0"	41'- 0"
B. Building Materials		Masonry Timber	Wood Frame	Masonry Lumber Concrete	Masonry Lumber Concrete	Masonry Cast Iron Concrete
C. Structural Systems		////////////////////////////////////				
1. Foundations		CS, MP	CS, MP	CS, MP	CS, MP	CS, C, MP
2. Floors		GDR, FJ, WP	GDR, FJ, WP	GDR, FJ WP	GDR, FJ WP	GDR, FJ WP
3. Walls		BM, MA	WF	BM, MA	BM, MA	BM, MA
4. Roof		WTp	RFp	RFp	RFp	F
D. Finishes: material, color, texture		P, S/P, LW	P, WSd	EM, S/P	EM, S/P	S/P

BM = Bearing Masonry LW = Lime Wash RFp = Rafter Frame pitched
 C = Concrete MA = Masonry Arches S/P = Stucco/Plaster
 CS = Crawl Space MP = Masonry Piers WSd = Wood Siding
 EM = Exposed Masonry MTL = Metal WF = Wood Frame
 F = Flat MF = Masonry Footing WP = Wood Plank
 FJ = Floor Joists P = Paint WTp= Wood Truss pitched
 GDR = Girder

Figure 19: Comparative analysis matrix segment—building technology variable.
Source: Created by the Author.

This disquisition concerns building technology and directs its attention on building materials, systems, and finishes available and used during the last half of the 19C in the construction of the study churches. Similar to the discussion of the built environment, this analysis incorporates a time line into the *comparative analysis matrix*

(figure 14, p. 154) against which contrasts are drawn. In this instance however, the time line (in years) documents building technology available and in use in America and Galveston during this era.

Figure 19 (p. 171) represents the matrix segment assigned to building technology. Across the top are the names of the churches and the associated dates of their construction. The time line appears below the church names. The extension from 1600 to 1900 represents the continuum of building technology in America from its first colonies to the beginning of the 20C, inclusive of the last half of the 19C.

Beneath the time line the matrix segment is organized into two subsets. One represents building technology available and in use in America, the other representing that available and employed in Galveston. To the right of these subsets are the primary building materials/building systems. The brackets delineate the approximate range in years that these materials/systems were primarily implemented, noting that the transition often resulted in technologies overlapping. For example, within the American subset of building technology, the use of masonry and/or heavy timber either separately or together as a building system was the primary building technology used in America from 1600 until the 1840s, when milled lumber began to replace it.

Below the building technology subsets the architectural details of the individual churches are presented. These details are categorized into general building dimensions (scale), building materials, structural systems, and finishes that constituted the churches' built form. A legend of abbreviations used in this matrix segment is provided.

Regarding scale there is an assortment and inconstancy of building dimensions. All of the churches vary in length, width, and height. Interestingly, Sacred Heart-II, the longest, was not the widest or the tallest church, yet was built at a time when advancing technology's use of ferrous metals (cast iron, wrought iron, steel) would have permitted it. By contrast, St. Mary's built 50 years prior when ferrous metal technology had not availed itself in Galveston, exceeded Sacred Heart-II in those dimensions. This finding can be interpreted by the fact that St. Mary's was built as a cathedral (seat of the bishop) and as such was built larger.

The churches' use of building materials faintly shadows the trend in America and Galveston during this era. St. Mary's masonry and timber, and St. Joseph's wood frame construction are consistent with materials available and utilized on the national and local scene, even though St. Mary's masonry was in contrast to Galveston's backdrop of wood frame construction (Scardino & Turner, 2000). It can be argued that Bishop Odin wanted the diocese's mother church to be substantial and familiar (see St. Mary's analysis). The limited use of concrete and cast iron, primarily for columnar structural support, in St. Patrick's, Sacred Heart-I and II, respectively, indicate at least, awareness by designer/builders of these emerging technologies.

The structural systems engaged, however, do not reflect in any substantial way beyond interior columns (and the foundation walls for Sacred Heart-II) the incorporation or adaptation of emerging technologies into the built form of the churches. The matrix segment (figure 19, p. 171) reveals that during this 50 year period the building technology applied (load bearing masonry) was consistent and virtually unchanging

across all the churches. Again, using the aftermath of the 1900 Storm as an example, the data shows that architect Clayton's reconstruction of St. Patrick's did not venture beyond the technologies used to construct it originally. Furthermore, Sacred Heart-II proclaimed by its pastor Father Murphy (*To build...*, 1903) and erroneously documented by Beasley and Fox (1996) to be fabricated of concrete block and reinforced concrete was in fact a load bearing masonry construction (see reference on Jesuit archive photographs).

The foundations made consistent use of bearing masonry footings and/or piers that created a crawl space beneath an elevated first floor (cited previously as practical considerations regarding flooding and ventilation). The church floor systems uniformly adapted a network of wood girders and floor joists that supported wood plank flooring. Extending upward from the foundation, structural support for the churches was provided though the use of load bearing masonry walls, buttresses, and arches supported by columns of wood, masonry, concrete, or cast iron. Interestingly, Sacred Hear-I, the tallest church, shunned the use of ferrous metal for structural support. This, at a time when secular construction embraced this technology in response to the pecuniary need to build higher that load bearing masonry could not economically fulfill (Freidman, 1995).

The roofing systems with the exception of Sacred Heart-II's flat roof were steeply pitched, using wood trusses or wood rafter framing for structural support. The available data did not provide definitive information regarding Sacred Heart-II's flat roof design or the materials used.

The general uniformity among the churches regarding materials and structural systems continued with the finishes adopted. Exteriorly, with the exception of St.

Joseph's white painted wood siding the churches stayed within a narrow range of either exposed masonry, or masonry parged with stucco/plaster or lime wash—a primitive form of stucco. The church interiors followed suit, with walls exposed, painted or plastered white in color. Ceilings of exposed wood and wood columns were painted/stained dark and grained. The exception was St. Joseph's, the interior walls of which were finished with painted bead board and molded ceilings to accent Gothic elements.

The data clearly reveals that while the materials used (masonry and lumber) in and of themselves were prevalent during this era, the churches generally ignored the evolving building technology of the era. In contrast, the load bearing masonry walls, arches, buttresses, and vaulted wood frame roofs were not only consistent with the building technology used by the early settlers to America, but was the same technology used to craft the Romanesque and Gothic churches of Europe in the Middle Ages. Emerging technologies were available in Galveston and the designers/builders had the knowledge of their application (see literature review). Yet, the materials and structural systems engaged in the building of the study churches were born of tradition and familiarity—it is what was known and deemed appropriate for church construction as part of the parish's and builder's culture. Thus it can be argued again, that culture played a significant role in the built form of these churches.

The nature of the data does not fit the shaded circles or $\{Y\}/\{N\}$ convention. In applying a collective perspective however, it appears that building technology had a temperate effect on the churches' built form. While the building materials used in the

study churches' construction and the time line match to a certain degree, the revealing observation is that the churches did not in any substantial way embrace new technologies of the period. Thus a score of 0.50 is reasoned as appropriate.

Summary

Figure 20 (p. 177) presents the quantification analysis for each variable as determined by its respective discussion and provides for a collective comparison, which was the primary focus of this inquiry. The numerical value represented is the cumulative (collective) result from the analyses of multiple cases (five churches). Across the top are listed the variables analyzed for this study. Down the left hand margin are listed the study churches. In the intersecting cells are the scores that illustrate the level of compliance for each church with each variable. At the bottom of this table the total value of each variable examined is presented and can be used for comparisons. As indicated previously the nature of the data regarding the variables *built environment* and *building technology* does not fit the shaded circle or {Y}/{N} convention. Therefore, an NA is placed in the cell for each church. For an explanation of their scoring the reader is directed to the text of the discussion section of these variables. Also, heretofore documented, these numbers represent no significance beyond a means to convert qualitative data for the purpose of making contrasts and comparisons between the variables.

Variable Quantification Analysis					
Church	Variable				
	Culture	Faith	Physical Environment	Built Environment	Building Technology
St. Mary's	0.67	0.65	0.63	NA	NA
St. Joseph's	0.83	0.54	0.75	NA	NA
St. Patrick's	1.00	0.77	0.38	NA	NA
Sacred Heart-I	0.50	0.58	0.38	NA	NA
Sacred Heart-II	0.50	0.77	0.75	NA	NA
Total Score	0.70	0.67	0.58	0.50*	0.50*

* see text of the individual variable discussion for an explanation of scoring.

Figure 20: Variable quantification analysis.
Source: Created by Author.

Clearly noticeable is the variable of *culture's* high score, 0.70, followed by *faith* at 0.67. The values of the other three variables—*physical environment* 0.58, *built environment* 0.50, and *building technology* 0.50—are significantly less than the other two variables. It could be argued that the difference between culture and faith is too small to be important. This narrow range is not entirely unexpected given that *faith* is in fact a subset of man's *culture*. Closer examination of faith, however, indicates that it was perhaps not as influential as the pure number reflects. First, the strength of the *faith* variable is found in church compliance with the sacred path, and it could be speculated that this resulted from the designers relying on the tradition of church building as much as specific mandates from the Bishop that the design follow dictates of the faith. Second, the criterion of verticality shows finish floor height was fully complied with by four churches. It is advanced however, that floor elevation was due to practical considerations regarding flooding rather than for the purpose of establishing prominence, which can be

accomplished by tall steeples/spires. This is rendered a reasonable assumption by the fact that many secular constructions in Galveston also employed designs that elevated first floors above grade. Therefore, if one accepts this premise, and thus reduces the compliance value (for finish floor height) from a fully shaded circle to a non shaded circle, while not altering the values for sacred path, the score for the *faith* variable becomes 0.61 accompanied by the obvious implication attached by this diminished influence of the *faith* variable. In the case of Sacred Heart-II the rebuilt and replaced church post-1900 Storm demonstrates the importance of cultural elements over faith in the built form. In viewing the results quantitatively faith appears to be more influential. The qualitative perspective argues that in the rebuilt church the parish returned to its roots. It honored the faith, but did so with building technology and a building style that returned the church to its medieval roots while simultaneously paying homage to its Spanish heritage.

The score for *physical environment* shows that thermal comfort was not an overriding concern in the design and construction of these churches. This finding is noteworthy, given the hot and humid semi-tropical climate of Galveston. Furthermore, it is evident that neither the *built environment* nor *building technology* had a major impact on these churches built form and construction.

The end result illustrates definitively a strong argument for the influence of culture on the built form. This argument is further strengthened by the fact that *culture* supersedes *faith* in faith's domain, the church.

CONCLUSION

Initiating this dissertation was the question; why do churches of the same faith, in the same location, built in the same era vary in their built form and construction? Within this question is a primary point of architectural theory and study—the ever changing built form. Endeavoring to answer that interrogative, this inquiry identified four variables—*culture*, *faith*, *environment*, and *building technology*—and then examined their impact on the built form of five 19C Catholic churches in Galveston, Texas. The framework for this analysis is a conceptual model (figure 1, p. 32) constructed around theoretical assumptions regarding the impact of culture on the built form. From this theory three hypotheses were derived (figures 2 and 3, p. 35). To test these hypotheses, the study variables were contrasted against each other and the study churches through a comparative case methodology utilizing a *comparative analysis matrix* (figure 14, p. 154).

The first hypothesis, *churches of the same religion built in the same environment and approximately during the same era vary in their built form and construction* is supported by this study's findings. The photographs and detailed analysis of the study churches (figure 21, p. 180; analysis section, p. 54) clearly show variety in the built form among all of them. Furthermore, these churches are of the same faith (Catholicism), subject to the same environment (Galveston, Texas), and built during the same approximate era (the last half of the 19C).

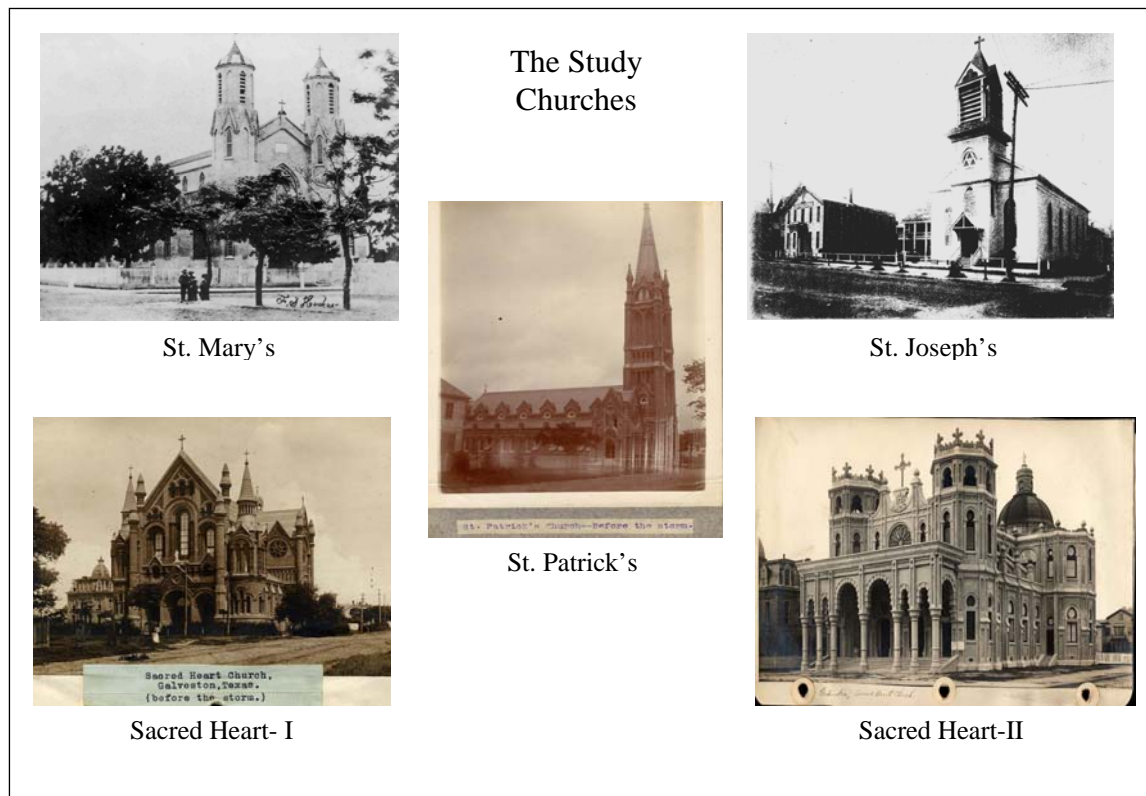


Figure 21: The study churches grouped.

Source: Created by author using the individual photographs in the analysis section.

The second hypothesis, *if religion, physical environment, and building technology are held constant then the variety in church form and construction is a function of culture* is also supported by the findings of this inquiry. It could be argued that differences in church built form are attributed to teachings and rituals of different religions. This contention is negated however, when religion is held constant by churches of the same faith, and particularly in the instance of Catholicism—meaning universal. Also it can be claimed that differences in church form and construction are the result of differing physical environments. This argument is likewise diminished by the fact that this study focused on churches built in the same geographic location, thus

subjecting them to the same physical and built environment. Furthermore, the analysis of the physical environment through Galveston's climatic conditions revealed that the churches had a 0.58 compliance with design strategies devised to promote thermal comfort; reinforcing Geva's claim (cited previously) that people (culture) will sacrifice thermal comfort in their places of worship. Another assertion is that changing building technology could explain differences among the churches. However, in the analysis of building technology—materials and systems—it was found that while building technology did advance throughout the last half of the 19C in American and Galveston, the building technology employed in the construction of the study churches remained constant. It should be acknowledged that the non-substantial changes in the churches' building technology (such as wood in the instance of St. Joseph's) was a function of culture—the influence of ethnic German rural churches. This argument is supported by the fact (see St. Joseph's historical and parish discussion in the analysis section, p. 81) that the Germans were the largest immigrant population living in Galveston at the time. Furthermore, they were not the poorest. Most of the parishioners were working class, holding occupations as clerks, printers and carpenters. Therefore, it is reasonable to assume that they had as a group the resources necessary to build a larger and more substantial structure, but chose instead to build from their tradition.

The study churches were of the same religion, they were subjected to the same physical environment, and the building technology used to fabricate them did not significantly change. Therefore, it is concluded that the variety of form manifested in the study churches is a function of culture's impact.

The third hypothesis, *if form and construction of the churches do not reflect the variety of the built environment and evolving building technology then the variety in church form and construction is a function of culture*, is likewise supported by this study. It can be reasoned that over time the changing architectural styles and changing building technologies can influence the built form. It has been chronicled that while *building technology* evolved during this era, to include new materials and construction methods such as cast iron, reinforced concrete and steel skeleton framing, the study churches did not embrace in any substantial way these emerging technologies over the last half of the 19C. The literature review documents the changing architectural fashions in America and Galveston during the era of study. Furthermore, the *built environment* analysis corroborates the presence of these changing architectural styles in Galveston. The analysis, however, brings into question the strength of these changing architectural styles on the built form of the study churches. Their Gothic Revival design could have been equally influenced by contemporary architectural thought of the era regarding church design and construction. In addition, the built environment's impact on the study churches is diminished further by the post-1900 Storm events regarding St. Patrick's and Sacred Heart-I and Sacred Heart-II. Though building technology and the built environment in Galveston did change during the last half of the 19C; the study churches did not reflect these trends, even when the destruction caused by 1900 Storm presented the occasion to do so. Thus, it is determined that the hypothesis is affirmed.

In summary, the findings of this study support the conceptual model and the research hypotheses issued from it. There was found to be variety in the built form of

churches of the same faith, built in the same location and during the same era. The variety persisted when *faith*, *physical environment*, and *building technology* remained constant. This variety in built form was not significantly impacted by evolving architectural styles or building technology. Therefore, it is concluded that the variety in the churches' built form was a function of *culture*⁴.

Concurrent with these findings is the attention it fosters for the importance of culture regarding preservation efforts. Maintaining links to the past requires more than just preserving the physical structures and its architectural style. It insists on securing and perpetuating the cultural elements as well. When St. Joseph's was vacated by the Dioceses in 1968 and its content auctioned off, its status was relegated to that of an old building built before the Civil War. It was not until these lost items were reclaimed that it returned to its original significance and proper place in the history of Texas and Galveston as a German Catholic church built by its German immigrant parishioners; who linked to their homeland through their culture, faith, ideas, traditions and skills.

Moreover, this inquiry holds promise for further investigation. This research model could be applied to a variety of different conditions or settings and invites inquiry from a range of academic disciplines such as historic preservation, cultural geography, architectural history, and construction science. One such setting would be to investigate Catholic churches in other geographic locations where the physical environment of terrain and climate are in contrast to that of Galveston. Another may be to focus inquiry on churches of a different faith; such as Protestantism. Additional research opportunities may be found in applying this model to civic buildings such as schools or court houses.

Was there cross over between different building type? To what degree did culture influence their built form and construction? In the context of construction science, this model holds promise for investigating building systems, materials, construction methods and craftsmanship.

In closing, this dissertation builds on the body of knowledge regarding the built form and how it may be shaped by culture. Its importance extends beyond that suggested by its findings and substantiation of the research hypotheses. It presents a larger canvas, a cultural and historical tapestry woven from the threads of man's religion, culture, ethnicity, and ancestral roots. It examines man's faith through *Domus Dei* and the impact to these forms by his cultural ethnicity and heritage. Sacred houses of worship are at the core of man's cultural existence. His churches are deliberately created and his culture is introduced through their design (Barrie, 1996). Sacred architecture is an agora and a gateway; it is man's physical expression of and assimilation into the transcendental. It pushes the limits—from symbol to unreal—that Hegel describes (Whiteman, 1987).

This phenomenon is punctuated when immigrants come to a new land, bringing with them the symbols of their culture and a legacy of traditions rooted in their ancestral pedigree. Through the alembic of time and place a significant chapter in the immigrant history of Texas, Galveston, and the Catholic Church is written. It provides, as Geva (1995) states “a link between the current, rapidly changing world and the cultural roots from the past.”

NOTES

1. For example, when outdoors and looking heavenward one knows the distance is beyond imagination, yet there is no sensation of height.
2. These five churches were the only Catholic churches built in Galveston in the 2nd half of the 19C by European Immigrants.
3. Pieper, R. (n.d.). Francois Coignet was a pioneer of concrete construction in France. He received United States patents in 1869 and 1870 for his system of pre-cast concrete construction, which consisted of Portland cement, hydraulic lime, and sand. (National Park Service preservation brief #42). Washington D.C: United States Department of the Interior. Available on-line at <http://www.cr.nps.gov/hps/tps/briefs/presbhom.htm>
4. Although funding can play a role in the built form and construction of buildings, this study could not find sufficient data/documentation to support this premise beyond speculation.

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APPENDIX

GRADE-RAISING FIGURES.

The following interesting table, showing the amount of filling required to bring the grade up to the standard as prescribed by the plans for raising Galveston, is compiled by City Engineer Clinton G. Wells from levels run before the storm of September 8, 1900. The figures show the amount of filling required at the intersection of every street within the territory bounded by avenue A and the Gulf beach and Seventh and Thirty-fifth streets.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
7	8.0	8.2	8.5	8.7	8.9	9.1	9.4	9.6	9.8	10.0	10.3	10.6	10.9	11.2	11.5	11.8	12.1	12.4	12.7	13.0	13.3	13.6
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Galveston Daily News
Mon. 23 Mar. 1903 P.

Figure A-1: Galveston grade raising figures.
Source: Galveston Daily News, 1903, March 23

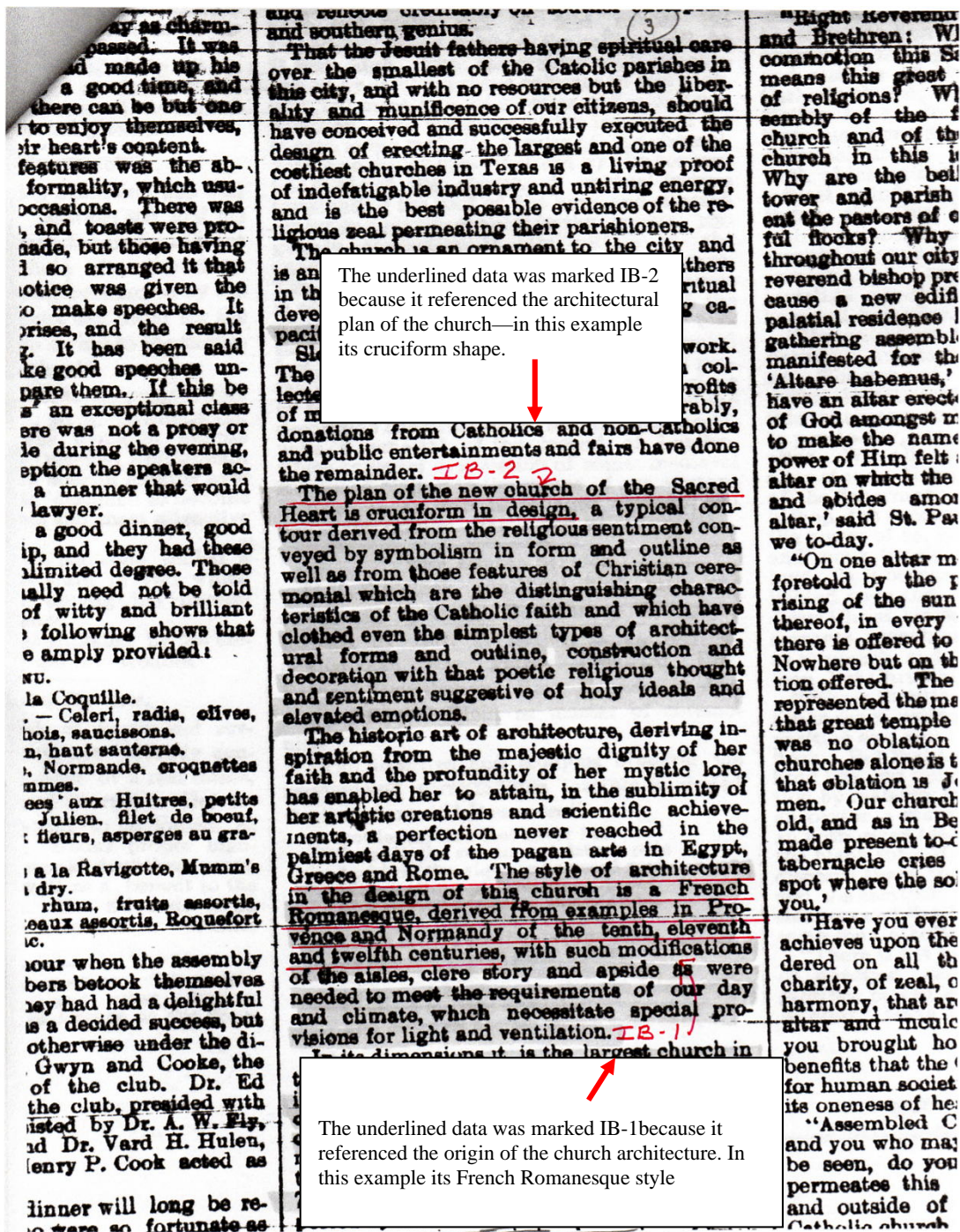


Figure A-2: Audit trail example.
Source: Created by Author

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