NPS Form 10-900 OMB No. 1024-0018

United States Department of the Interior
National Park Service

430

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being nominated, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property Catalina American Baptist Church

historic name

other name/site number **Catalina Baptist Church**

2. Location

street & number: **1900 North Country Club Road** _____not for publication
city/town: **Tucson** ___ vicinity
state: **Arizona** code: **AZ** county: **Pima** code: **019** zip code: **85716**

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☒ locally. (☐ See continuation sheet for additional comments).

James Garrison 8 APRIL 2008
Signature of certifying official Date

ARIZONA STATE PARKS
State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments).

Signature of commenting or other official Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that this property is:

☒ entered in the National Register
☐ See continuation sheet.

Signature of the Keeper: Linda McClelland — Date of Action: 5/23/08

☐ determined eligible for the National Register
☐ See continuation sheet.

☐ determined not eligible for the National Register.

☐ removed from the National Register.

☐ other (explain):_____

5. Classification

Ownership of Property
(Check as many boxes as apply)
- ☒ private
- ☐ public-local
- ☐ public-State
- ☐ public-Federal

Category of Property
(Check only one box)
- ☒ building (s)
- ☐ district
- ☐ site
- ☐ structure
- ☐ object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
One		buildings
		sites
		structures
		objects
One		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing).

N/A

Number of contributing resources previously listed in the National Register

N/A

6. Function or Use

Historic Functions
(Enter categories from instructions)
RELIGION/religious facility

Current Functions
(Enter categories from instructions)
RELIGION/religious facility

7. Description

Architectural Classification

MODERN MOVEMENT: Other (Sculptural Expressionist)

Materials
(Enter categories from instructions)
foundation concrete
walls concrete, glass, aggregate concrete
roof concrete
other steel columns, steel window mullions

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing)

- ☐ **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.
- ☐ **B** Property is associated with the lives of persons significant in our past.
- ☒ **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- ☐ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:
- ☒ **A** owned by a religious institution or used for religious purposes.
- ☐ **B** removed from its original location.
- ☐ **C** a birthplace or a grave.
- ☐ **D** a cemetery.
- ☐ **E** a reconstructed building, object, or structure.
- ☐ **F** a commemorative property.
- ☒ **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)
ARCHITECTURE

Period of Significance
1960-61

Significant Dates

Significant Person
(Complete if Criterion B is marked above)
N/A

Cultural Affiliation
N/A

Architect/Builder
Charles Cox

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):
- ☐ preliminary determination of individual listing (36 CFR 67) has been requested.
- ☐ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Buildings Survey # _____
- ☐ recorded by Historic American Engineering Record # _____

- ☒ Other state agency
- ☐ Federal agency
- ☒ Local government
- ☒ University
- ☒ Other

Name of Repository:
University of Arizona Architectural Archives

Primary Location of Additional Data:
- ☐ State historic preservation office

10. Geographical Data

Acreage of Property Less than one acre

UTM References

(Place additional UTM references on a continuation sheet)

	Zone	Easting	Northing		Zone	Easting	Northing
1	12	506929	3567629	3			
2				4			

☐ See continuation sheet

Verbal Boundary Description

(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification

(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title: Chris Evans with assistance from R. Brooks Jeffery, Sarah Tomme and Matan Mayer

organization: Chris Evans, Architect date: 25 April 2007

street & number: 3220 E. Terra Alta Blvd. #9 telephone: (520) 319-8835

city or town: Tucson state: AZ zip code: 85716

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps

A **USGS map** (7.5 or 15 minute series) indicating the property's location.

A **sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **Black and White photographs** of the property.

Additional items (Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of the SHPO or FPO)

name: Catalina American Baptist Church

street & number: 1900 North Country Club Road telephone: (520) 327-6655

city or town: Tucson state: AZ zip code: 85716

NARRATIVE DESCRIPTION

Summary

The Catalina American Baptist Church is located in north central Tucson, Arizona. The original sanctuary, the subject of this nomination, is a Modern building and was built in 1960-61. The primary character-defining feature of the Catalina American Baptist Church sanctuary is a thin-shell concrete hyperbolic paraboloid roof. Floor-to-ceiling glass window walls enclose the space on four sides, along with exposed aggregate concrete walls. In 2005, a new multi-purpose church complex was built on the property, east of the original sanctuary. The original sanctuary is in excellent condition and has had very little alteration since its construction. Although slight modifications have been made to the windows and some interior finishes, the building retains and expresses its original character.

Narrative

The Catalina American Baptist Church is located in north central Tucson, Arizona at 1900 N. Country Club Blvd. Tucson is located in the southern portion of the state, approximately 60 miles north of the Mexican border, and is surrounded by the Sonoran Desert. The Church is located adjacent to urban residential neighborhoods that were developed in the 1950s, and have remained intact since they were originally constructed. The original sanctuary, the subject of this nomination, is a Modern building and was built in 1960-61. The west elevation of the sanctuary fronts on Country Club Blvd. (a major north-south thoroughfare) and is the primary image for the Church from the street. The sanctuary is the oldest building on the property. Other buildings on the property, built both before and after the sanctuary, were demolished in 2005, when a new multi-purpose church complex was built to the east of the original sanctuary. These new buildings provide a backdrop for the original sanctuary, and surround a sunken courtyard that was built as part of the 2005 complex. Modifications to the church property have occurred over the years, but the general character of the site has remained the same: a complex of buildings with the sanctuary building adjacent to the street as the primary image of the facility.


Figure 1: west elevation

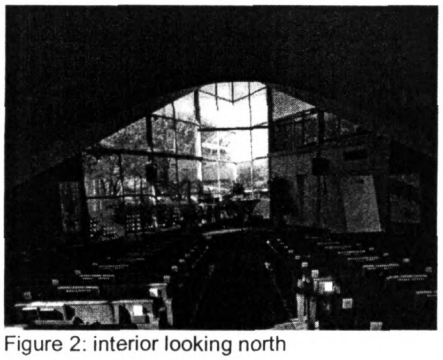
Figure 2: interior looking north

The primary character-defining feature of the Catalina American Baptist Church sanctuary is a thin-shell concrete hyperbolic paraboloid roof that spans the entire sanctuary. The sculpted, upward-thrusting roof form extends from floor level at the center of the building to more than 30 feet in height at each end. The roof is supported by four exposed aggregate concrete side walls near the center of the structure and 5 steel columns at each end. Steel-framed glass window walls infill between the floor and roof on four sides, resulting in a brightly lit interior space.

The diamond-shaped plan of the sanctuary is 108 ft. in length along the primary north-south axis, and 54 ft. wide at the center. On the interior, an entry foyer is located at the south end of the sanctuary, with a cast-in-place concrete stair that ascends to a choir loft above. The primary space in the building, the sanctuary seating area, is divided by a single center aisle, and served additionally by two small side aisles along the exterior walls. The elevated pulpit is located at the north end of the sanctuary. A sunken baptismal is located on the pulpit, accessed from a small adjacent dressing room.

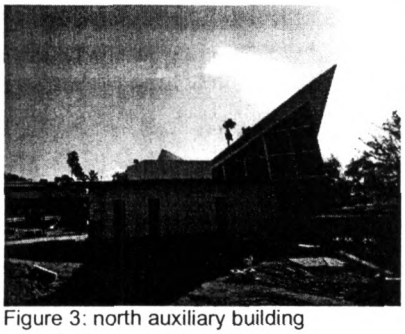
Figure 3: north auxiliary building

The sanctuary building has two small auxiliary buildings attached to the east side of the sanctuary building. The southern auxiliary building houses men's and women's restrooms and shelters the sanctuary entrance. The north building contains offices, the dressing area and a hallway. Both auxiliary buildings are trapezoidal in plan with flat roofs. Mechanical equipment has been placed on the roof of the north building. These small, attached structures are not on the original concept rendering, but they can be found on at least one version of the original construction drawings. There is anecdotal evidence from the congregation that the auxiliary buildings were not originally intended in the early planning of the building. The disjointed relationship between these buildings and the primary building suggests this may be true. These auxiliary buildings do not contribute to the historic character of the sanctuary.

Secondary to the overall power of the roof form is a subtle angular design motif that is found on the sanctuary pew ends and incised in the concrete side walls. This angular motif is reminiscent of Frank Lloyd Wright's many geometric design motifs used in everything from floor plans and window designs to furniture and carpets.

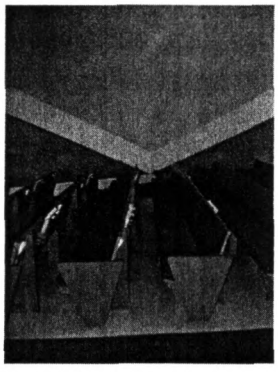
Figure 4: interior pews

Alterations

To limit solar heat gain, solar screens and tinted film were installed over the glass in the years after construction was completed. As glass panes were replaced, intermediate mullions were installed to divide the large panes of glass into smaller sections to reduce the cost and frequency of glass replacement.

Since the original construction, a decorative concrete masonry landscape wall was added around the north side of the building to screen the view of traffic on the adjacent street from the interior. In addition, several mechanical units have been re-located at the southwest corner of the site. These are screened by wooden lattice fencing. On the interior, some of the wood panels sheathing the mechanical rooms have been removed or painted.

In 2005, a new multi-purpose church complex was constructed to the east (behind) the existing sanctuary. The existing sanctuary continues to be used for traditional services and events; this new construction has no adverse affect on the integrity of the main sanctuary.

STATEMENT OF SIGNIFICANCE

SUMMARY

The Catalina American Baptist Church is eligible for listing in the National Register of Historic Places under Criterion C at the local level of significance as a rare surviving example of thin-shell concrete hyperbolic paraboloid construction in Tucson, Arizona. The roof form is unique in Tucson but is associated with national and international trends of the period. The building is also an exceptional example of the Sculptural Expressionist sub-type of the Architecture of the Modern Movement in Tucson 1945-1975. The period of significance relates directly with the date of the building's design and construction, 1960-61.

Criterion Consideration A is applied to the Catalina American Baptist Church as a building that continues to function as an active house of worship. Due to its age, Criterion Consideration G is applied to the Catalina Baptist Church, as a building that has achieved significance within the past 50 years.

NARRATIVE

In 1958, the pastor of the Catalina American Baptist Church, Reverend Rodger D. Harrison, toured Europe. While in Berlin he discovered the Kongresshalle (Congress Hall), which was designed by American architect Hugh Stubbins and built in 1957. Harrison was so inspired by the Congress Hall's hyperbolic paraboloid construction that he sought to achieve something similarly dramatic for his congregation's new sanctuary. When he returned to Tucson he hired local architect Charles E. Cox to design a new sanctuary in the Berlin Congress Hall's image. The structural engineer of record was Rod Gomez of the firm of Boduroff, Meheen and Gomez.

Charles E Cox (1921-1996) was born in Missouri and moved to Arizona in 1940. He began his career in the construction industry working for his father, who was a general contractor. He served in the US Coast Guard in the South Pacific during World War II. During the war he took advantage of the Armed Forces Institute, a self-education program offered by the US Military that allowed him to expand his education in architecture and construction. He provided design and drafting services to both military and civilian clients during the war. After the war he worked for several architectural and construction firms in various capacities as a draftsman and construction manager. He worked for the Standard Fruit Co. in Honduras in 1949-50, and then worked for several architects in New Orleans and Nevada before he opened his own office in Las Vegas in 1954. Buildings he designed in Las Vegas include: the Hotel Mardi Gras, the Bonanza Club Casino, and a shopping center in North Las Vegas. None of these buildings are known to be of any significance. He was President of the local AIA chapter in 1955.

Cox moved to Tucson around 1958. It is believed (but not confirmed) that he was a student of Frank Lloyd Wright at Taliesin West at some point during this period. He began design work on the Catalina American Baptist Church in 1959 or 1960. He also designed two additional churches during the early 1960's; these were the Church of Christ (2848 N. Mountain, 1961) and the Pantano Baptist Church (615 S. Pantano, 1962; now BPO Elks Lodge). Like Catalina American Baptist Church, both buildings utilized Wrightian geometry. Pantano Baptist has since

been significantly modified. Cox also designed Golden Pin Lanes (1010 W. Miracle Mile). He does not have any other known significant commercial work, though the Cox Residence (1963) that he built for his own family is perhaps the best example of Wrightian residential design in Tucson. In the mid-60s he was employed by the Planning and Facilities offices of the University of Arizona, where he worked until he retired in the 1980's. At the University he played a significant role in campus development. Anecdotal evidence suggests he may have had a hand in the designs for the University of Arizona's Law School and Main Library, both of which are significant structures.

Anecdotal evidence suggests that structural engineer Rod Gomez (1924-1996) consulted with Howard Herenstein, a faculty member of the University of Arizona's Department of Architecture, on the structural design for Catalina American Baptist Church. Gomez was involved in the design of a number of other thin shell concrete structures, including a medical office building at the northwest corner of 5th St. and Wilmot (Sholer and Fuller, Architects; now demolished) and the gymnasium for the Christopher City housing complex (demolished). Gomez continued to practice into the 1980s as RGA (Rod Gomez Associates) Consulting Engineers. RGA was the premier civil engineering firm in Tucson in the 1970s and 1980s, and was responsible for many high-profile projects including the McKale Center, the US Federal Building and the Westin La Paloma. The office had a staff of over 100 at its peak, including 25 in a Phoenix branch office.

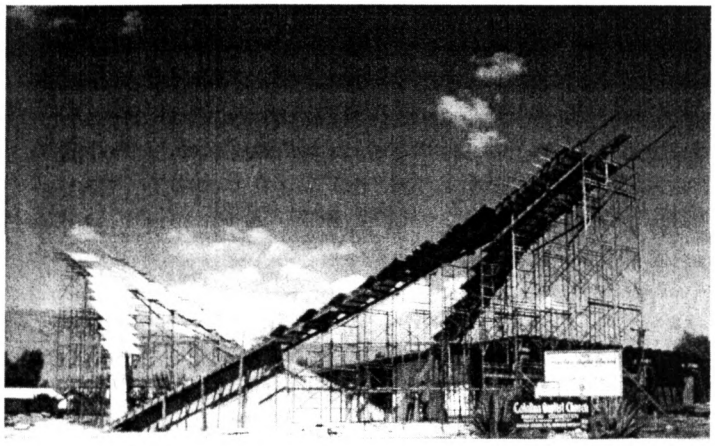

Figure 5: Catalina Baptist Formwork, ca. 1960 (image courtesy of Catalina American Baptist Church Archives)

Construction of the Catalina American Baptist Church was accomplished by M.J. Lang Company, headed by Matthew Joseph Lang (1913-2007). Lang's company was responsible for the construction of hundreds of buildings in Southern Arizona from the early 1950s until he retired in 1987. He built at least 7 other churches; several of these required significant expertise and innovative construction techniques. Construction photos show the complex formwork that was required for the construction of the Catalina Baptist Church's roof.

The Catalina American Baptist Church was a significant departure from anything that had previously been built in Tucson. It was one of the earliest thin-shell concrete structures in Tucson, and was one of the first modern buildings to integrate a sculptural character into its essential design. The Church is one of just a handful of thin-shell concrete structures remaining from the period, and the only concrete hyperbolic paraboloid still standing and uncompromised. The only other known examples of thin-shell concrete hyperbolic paraboloids built during this

period were the Bill Breck Dodge Automotive Showroom at Country Club and Speedway Blvd., which was demolished in the 1980s, and an addition to the former Saddle and Sirloin on North Oracle, which has been badly compromised by structural failure and inappropriate modifications.

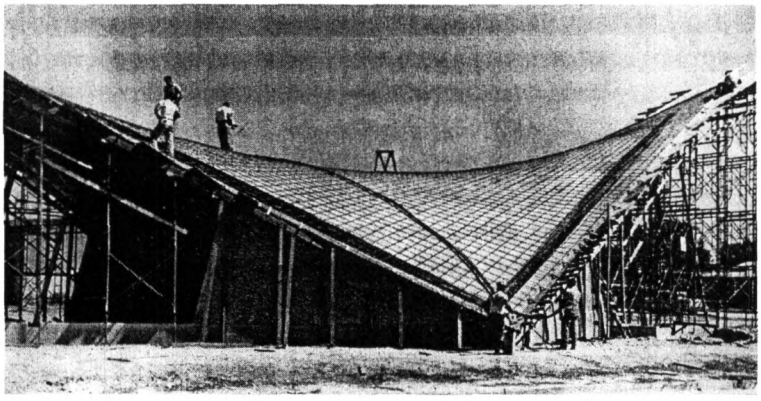

Figure 6: Catalina Baptist Formwork, ca. 1960 (image courtesy of Catalina American Baptist Church Archives)

HISTORIC CONTEXT

Architecture of the Modern Movement in Tucson 1945-1975

According to the organization DOCOMOMO (Documentation and Conservation of the Modern Movement), the Modern Movement was an artistic and architectural movement that embodied the unique early 20th century notion that artistic works must look forward to the future without overt references to historical precedents. Modern design emphasized expression of functional, technical or spatial properties rather than reliance on decoration. Modern design was conscious of being modern: it purposefully expressed the principles of modern design.

The Modern Movement finds its roots in the Industrial Revolution of the late 19th and early 20th centuries, when tremendous advancements in engineering, materials, and construction techniques had a significant impact on design. New products, including steel, sheet glass, aluminum, and reinforced concrete allowed architects to envision the world in a whole new way.

In addition to changing technologies, new democratic institutions led to revolutionary ideas on how architecture should respond to the needs of the working class. Architectural problems were to be solved by rational thought rather than through pre-determined models; historical precedents were rejected as being associated with the tyrannies and aristocracies of the past. Neo-classical and other highly decorated styles were replaced with a reductive, utilitarian aesthetic where “form follows function” (Louis Sullivan) and “ornament is a crime” (Adolf Loos).

In Europe, population growth and a construction moratorium during World War I led to a tremendous post-war demand for low-cost housing. This provided the early modern architects an opportunity to implement their

vision. Common architectural characteristics of the early European modernists were: simple, clean designs, the use of modern materials & technologies, an emphasis on geometric forms, asymmetrical compositions, functional planning, large expanses of windows, and an absence of ornamentation.

In Germany, architect Walter Gropius founded the Bauhaus in 1925, a school dedicated to modern design and the democratic collectivity of teamwork. The school became a training ground for young European architects and greatly influenced the shape of modern architecture worldwide. Another German architect, Ludwig Mies van der Rohe, developed an architectural vocabulary based on open planning, functional design, expression of structural materials and highly crafted details. Coining the expression, "less is more", Mies van der Rohe's work epitomized the "steel and glass" aesthetic most commonly associated with the Modern Movement.

In France, architect and artist Le Corbusier developed a philosophical and architectural vocabulary for his modern designs based on five points: piloti (a term coined by Le Corbusier to denote slender supports seen in a building where the principal floor is above an open ground level), a free plan, a free façade, a roof garden, and ribbon windows. His philosophy was less motivated by political or social issues and more by aesthetic possibilities. He envisioned buildings to be well-crafted "machines for living" reflecting the new machine age.

In the United States, Frank Lloyd Wright led an American version of the Modern Movement by using complex geometries, stark forms and asymmetrical compositions. In contrast to the Europeans, Wright used more traditional materials, was less controlled by function, and integrated more ornamentation into his work.

In the 1930s, political turmoil in Europe and the rise of Fascism led many of Europe's modernists to emigrate to the United States. The 1932 Museum of Modern Art's exhibition of "The International Style", curated by a young Phillip Johnson, had a significant role in disseminating the work of the European modernists to the United States. Gropius and Mies van der Rohe both became educators in American schools (Harvard and Illinois Institute of Technology, respectively) spawning a new generation of modernists in the US.

By the 1950s and 1960s, in an era of greater affluence, the Modern Movement shifted away from its early roots of "less is more" towards a broader exploration of form and structure. Greater experimentation and a more personal expression ensued. In this 'Expressionist' phase of the Modern Movement, "reduction and restraint were replaced by articulation and exuberance. Ornamentation began to gain acceptance if it was abstract and integral to the building. The result was greater variation and an expanded range of architectural aesthetic. Form was now less determined by function and utility, and more by aesthetic intention." (Evans and Jeffery, p.17)

Modern Architecture in Tucson, Arizona

Prior to World War II, Tucson's architectural expression was defined by the revival of historical styles, and particularly those associated with a romantic image of the Southwest, (e.g. Spanish Colonial, Mission, and Pueblo). Although Modernist tendencies were introduced prior to World War II by architects such as Henry Trost, Arthur Brown, and Richard Morse, it wasn't completely adopted in a town that embraced its image as

"The Old Pueblo".

Tucson, like many cities in the Southwest, grew exponentially after World War II from a population of 35,000 in 1940 to 212,000 in 1960. Moreover, World War II created a local housing shortage and Tucson had few architects to satisfy the demands of its expansive growth. The arrival of modern architecture in Tucson during this post war boom can be attributed to three prolific architects: Arthur Brown, William Wilde, and Nicholas Sakellar. Their award-winning and nationally published works were responsible for attracting young graduates and professionals to the desert, creating subsequent generations of architects steeped in the principles of the Modern Movement.

Sub-Types of the Modern Movement in Tucson, Arizona

Within the Modern Movement, there were a number of different architectural expressions that reflected chronological phases of the movement. These variations were the result of experimentation with forms, materials and construction technologies as well as the concurrent social and cultural changes of the time. These expressions can be grouped to create sub-types within the Modern Movement.

Situated Modernism
Based on the integration of modern principles with specific contextual qualities, including local materials and vernacular traditions. This expression formed the roots for the later development of critical regionalism that is distinguished by a more mature blending of modern principles with regional characteristics of climate and site. In Tucson, this sub-type can most clearly be seen in the work of Henry Trost (Second Owl's Club - 1902), Josias Joesler (Joesler-Loerpabel House – 1936), and Arthur Brown (Rosenberg Residence – 1947; Rose Elementary School – 1948; Tucson General Hospital – 1965, demolished 2004)

Utilitarian
Based in the reductionist principles of Austrian architect Adolf Loos, this sub-type stripped architecture of any unnecessary adornment or materiality; utility and cost efficiency were the guiding principles for design. In Tucson, this sub-type can most clearly be seen in the work of Arthur Brown (Cloverleaf House – 1942; University of Arizona Graham-Greenlee Residence Hall – 1954).

Planar
Based on Mies van der Rohe's Barcelona Pavilion (1929) and Wright's Fallingwater (1937), the intent was to define architectural form and space through the composition of roof and wall planes. In Tucson, this sub-type can most clearly be seen in the work of Nicholas Sakellar (Wilmot Public Library – 1965) and William Wilde (College Shop – 1956, demolished 2001).

Structural Expressionist
Based on Mies van der Rohe's Seagram Building (1957) and IIT's Crown Hall (1955), this sub-type used the building's expressed structure as an abstract form creating patterns that were integral to the building's overall

aesthetic. In Tucson, this sub-type can most clearly be seen in the work of Nicholas Sakellar (Broadway Kelly Building – 1964), and William Wilde (Supreme Cleaners – 1964).

Pattern Expressionist
Based on Mies van der Rohe's Seagram Building (1957) and LeCorbusier's Unite' d'Habitation (1952), this sub-type emphasized the patterns that resulted from the repetitive use of building elements, at various scales. In Tucson, this sub-type can most clearly be seen in the work of Thomas Stanley (Transamerica Tower – 1961), Nicholas Sakellar (Broadway Kelly Building – 1964) and Art Brown (AAA Offices, 1960; Tucson General Hospital 1965, demolished 2004).

Critical Regionalism
A later version of situated modernism based on a blending of modern principles with an appropriate application to the region, this sub-type was based on projects such as Frank Lloyd Wright's Taliesin West (1939) and Charles Moore's Sea Ranch (1965). This sub-style may incorporate historical precedent (e.g. courtyard forms), but is more oriented toward climatic appropriateness and site integration. In Tucson, this sub-type can most clearly be seen in the work of Judith Chafee (Johnson House – 1974, now demolished; Ramada House – 1975, listed in the National Register of Historic Places 2006).

Sculptural Expressionist
Based on Wright's Guggehneim Museum (1959), Le Corbusier's Ronchamp Chapel (1955) and Saarinen's TWA Terminal (1962), this sub-type celebrated the liberation of architectural form from the constraints of box-like rectilinear forms by embracing curvilinear surfaces. In Tucson, this sub-type can most clearly be seen in the work of Scholer Sakellar and Fuller (Catalina High School – 1955), Arthur Brown (Hyperbolic Parabaloid Carport – 1958; McInnis House – 1959), and Charles Cox (Catalina American Baptist Church – 1960).

The Catalina American Baptist Church is an exceptional example of the Sculptural Expressionist sub-type of the Modern Movement, and the only remaining example of a thin-shell concrete hyperbolic paraboloid still standing and uncompromised in Tucson. Although the dynamically curved surface of the hyperbolic roof form was a significant departure from the utilitarian tenets of the early Modern Movement, the large windows, clean lines and lack of ornamentation clearly demonstrate that the building is an extension of Modern architecture.

Thin-Shell Concrete Hyperbolic Paraboloid Construction

According to Boothby and Rosson (1998), "thin-shell concrete structures were developed...in response to the need for economy in large span structures and in response to the design and aesthetic program of the modern movement in architecture." This move toward thin-shell buildings in the construction industry required three fundamental engineering developments: steel reinforcing for concrete, thin-shell technologies, and innovative geometric forms.

Reinforced Concrete

Although the use of concrete in construction dates back to the Roman Empire, significant innovation in the use of concrete did not begin to take place until after the advent of steel-reinforcement in the mid-19th century.

In the early twentieth century, there was dramatic experimentation with concrete in Europe. Structural engineers like Max Berg, Eugene Freyssinet and Robert Malliart were pushing the limits of concrete design, particularly for large civil and industrial projects. Berg's 1913 Centennial Hall used giant ribs to create a clear span of 213 feet and was the first concrete structure to exceed the span of the Roman Pantheon. Malliart's bridge designs and Freyssinet's vaulted structures like the airship hangars at Orly (1916-24) were structurally and aesthetically innovative and demonstrated the sculptural potential for reinforced concrete.

French architect Auguste Perret helped to bring concrete into more mainstream use. In projects such as the Church of Notre Dame at Le Raincy (1922-24) Perret integrated the new material into a conventional building type as a replacement for more traditional materials like brick and stone. The slender columns and vaulted ceilings demonstrated the beauty, flexibility and potential of concrete.

Hyperbolic Geometry

Hyperbolic forms are three-dimensional geometric constructions generated by mathematical equations that take one of two forms: hyperboloids and hyperbolic paraboloids. A wide range of architectural shapes can be derived by taking sections of varying sizes and in various locations of the overall geometry. The primary strength of the hyperbolic form for construction lies in the double curvature and the ability of the form to transfer or resist loads in two directions. This allows for vaulting while reducing the need for buttressing. Another advantage is that the curved surfaces of hyperbolic structures can be generated and constructed using straight lines.

Two designers began independent investigations into this form in the late nineteenth century, each using a distinct material to achieve structural innovation. In Russia, engineer Vladimir Shukov utilized steel skeletons in his designs for water towers. The strength of the hyperbolic paraboloid form allowed him to reduce the size of the steel members. In Spain, Antonio Gaudi began experimenting with the geometry using masonry. The first of these was the Palau Guell porch ceiling, but he also used hyperboloid forms in his masterwork, the Sagrada Familia Church. For Gaudi, the geometry allowed him to build bold and innovative forms.

Thin-Shell Concrete

The use of reinforced concrete allowed architects and engineers to create larger and more sophisticated structures. In the early twentieth century, the bulk of this reinforced concrete construction consisted of three types: post-and-beam construction, traditional arch and vault construction, and ribbed structures. Ribbed structures typically utilized heavy beams or 'ribs' as the primary load-bearing system, and then utilized thinner concrete sections to fill between the ribs.

In the 1920s the German engineering firm Dyckerhoff and Widman collaborated with Walter Bauerfeld to create the first thin-shell reinforced concrete structure, a dome for the Zeiss Planetarium in Jena, Germany.

The thin-shell did not require ribs, but rather transferred all loads through the shape of the form. There were several innovations associated with this project: 1) the steel reinforcing grid resembled a geodesic dome, and the individual elements were reduced in scale; 2) the smaller steel elements allowed the concrete to be reduced in thickness as well; and 3) the concrete was spray-applied. The result was a much lighter dome that was economical to produce. The structure was completed in 1926.

While Dyckerhoff and Widman continued their experimentation in Germany, engineer Eduardo Torroja of Spain was also beginning to explore the potential of thin-shell concrete. In 1930, Torroja designed the Algeciras Market using a 3.5" thick dome to span 150 feet. In 1935 Torroja fully realized the dramatic aesthetic potential of thin-shell concrete in his design of the Madrid Hippodrome. The elegant cantilever of the roof canopy was a significant advance in the application of a new technology beyond its structural capacity. The structure was probably the first use of a hyperbolic form in thin-shell concrete construction.

Thin-Shell Construction in the United States

In 1932, Dyckerhoff and Widman sent one of their engineers, Anton Tedesko, to the United States to try and introduce their thin-shell patents into the American construction industry. Tedesko associated with the engineering firm Roberts and Schaeffer, and although initial interest was limited, he designed a small dome for the Hayden Planetarium in New York in 1934. In 1936, Tedesko designed the first long span thin-shell structure in the United States for the Hershey Arena in Hershey, Pennsylvania.

During World War II, thin-shell domes and vaults were utilized extensively for industrial and military facilities because they were efficient to produce and required very little steel. Engineers like Tedesko were primarily responsible for these utilitarian structures, and the engineering strategies evolved and matured as the technology became more prevalent.

There were several prominent international architects that began to engage architecture as sculpture in the 1940s and 50s, including LeCorbusier (Ronchamp Chapel 1955), Oscar Niemeyer (St. Francis of Assis Church 1943) Pier Luigi Nervi (Turin Exhibition Hall 1950) and Frank Lloyd Wright (Marin County Civic Center 1957, Guggenheim Museum 1943-59). This directional shift among the modern masters toward curvilinear forms contributed to the rise of thin-shell structures. In the 1950's this technology was adopted and exploited by architects for its inherent sculptural and aesthetic possibilities. The curved surfaces were employed in part to broaden the vocabulary of modern architecture beyond the utilitarian and rectilinear norms of the Modern Movement and were about art and appearance first, function second.

Figure 7: Madrid Hippodrome

Eero Saarinen was the most prominent and prolific designer of sculptural architecture in the United States. To achieve this new sculptural quality, Saarinen often used thin-shell concrete structures. Saarinen's Kresge Auditorium at MIT (1955) utilized a thin-shell concrete dome that had been sliced vertically to create what was essentially a three-point vault. With Kresge, Saarinen brought this construction technique into mainstream modern architecture. Saarinen's greatest achievement in using thin-shell concrete was the TWA Terminal at JFK International Airport. Completed in 1962, TWA incorporated a complex, free-form doubly-curved structure to achieve the flight imagery Saarinen sought.

In 1956, Minoru Yamasaki (with Tedesko) designed the Lambert Field Airport Terminal in St. Louis, successfully transitioning his use of thin-shell concrete from the purely utilitarian (airplane hangars) to the sculptural.

The Marriage of Thin-Shell Concrete and Hyperbolic Geometry

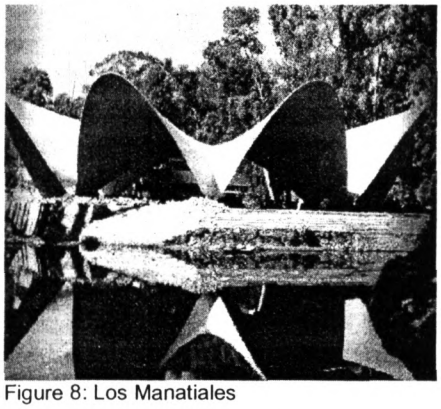
Figure 8: Los Manatiales

Torroja's Madrid Hippodrome was likely the first thin-shell concrete structure to integrate hyperbolic forms, but it was not until after World War II that the form was more widely used. The Spanish tradition of structural innovation that had begun with Gaudi and Torroja continued with Felix Candela. The Spanish-born and educated Candela moved to Mexico in the late 1930s. In the late 1940s and early 1950s, Candela began experimenting with thin-shell concrete hyperbolic paraboloids. He created some of the most innovative and technically daring structures of the period. He designed thinner and thinner shells, while at the same time creating exquisite and unique forms. Perhaps the most dramatic of these is the hyperbolic paraboloid groin vault at the Restaurant Los Manantiales in Xochimilco (1958). Candela's work was widely publicized at the time.

In the United States, hyperbolic forms received notable attention in two works by architecture faculty at North Carolina State University in Raleigh. The North Carolina State Fair's Dorton Arena (1952, Nowicki, Deitrick) incorporated steel cables and parabolic tensile technologies to provide a long span for a large public facility. The wood-framed Catalano House (1954) by Argentine architect Eduardo Catalano received considerable attention, thrusting Catalano and hyperbolic paraboloid forms into the national spotlight. But neither of these works were built using concrete.

The increasing use of thin-shell technology and hyperbolic forms in the 1950s led to the eventual marriage of the two technologies. One of the first American architects to integrate the two was Hugh Stubbins who, along with engineer F. N. Severud, designed the Berlin Congress Hall in 1957. A cultural center and political statement in the midst of the Cold War, the building's dramatic saddle-shaped cantilevered roof was intended to demonstrate the pinnacle of American design innovation.

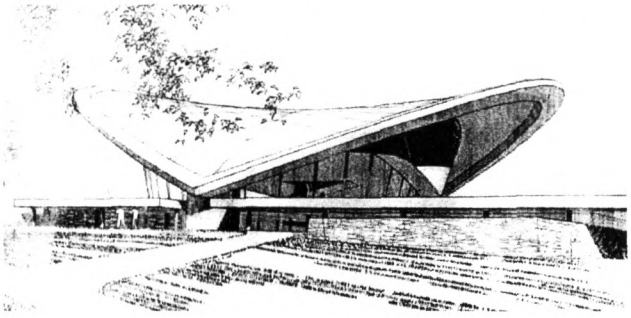

Figure 9: Berlin Congress Hall

There were 4 basic types of hyperbolic paraboloid forms used in construction: the double cantilever, inverted umbrella, gabled vault and groin vault. The double cantilever usually consisted of a single hyperbolic form (such as the saddle shape of the Berlin Congress Hall), while the other three types were almost always deployed repetitively. Early designs used engineering techniques that approximated and simplified the structural analysis; only with the advent of computer analysis was it determined that each of the 4 types behaved differently and transferred loads in unexpected ways. The Catalina American Baptist Church is an example of the double cantilever form.

Thin-shell concrete hyperbolic paraboloids became a popular construction form for a wide range of building types over the next decade, most notably for spaces that required visually-arresting forms and/or necessitated minimal interior structural intrusion. These included religious institutions, cultural facilities, shopping malls, and restaurants. Other notable examples include the McDonnell Planetarium in St. Louis (1963, hyperboloid; HOK), the Edens Theatre in Northbrook, Illinois (1963, double cantilever; Perkins and Will), the Paraboloid in Denver (1969, gabled vault; I. M. Pei) and the Apache Plaza shopping mall in St. Anthony, Minnesota (1961, inverted umbrella; W. L. Thorsen). The latter three projects have since been demolished.

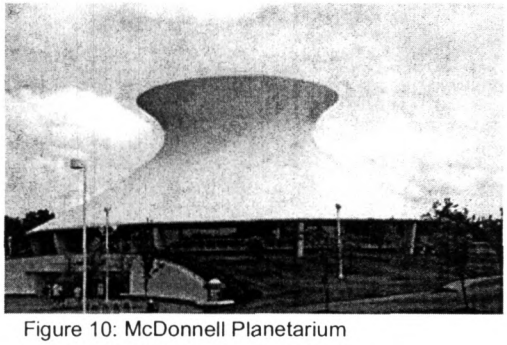

Figure 10: McDonnell Planetarium

Thin-shell construction fell out of favor by the early 1970s, largely as a result of increased construction costs. The use of pneumatic formwork was introduced to reduce the cost of construction, but this technique resulted in a limited range of forms and allowed for little sculptural innovation; within a few years, thin-shell construction was used for little else other than industrial engineering projects. Thin-shell structures have also been particularly vulnerable to demolition over the past 30 years, for two reasons. First, the concrete structures are unforgiving

and often difficult to modify or expand. Second, the structures were often difficult to waterproof, making them susceptible to structural decay.

Hyperbolic Paraboloid Construction in Tucson

There were few thin-shell concrete structures built in Tucson during this period, and only a handful of these were in the form of hyperbolic paraboloids. In 1958, Nicholas Sakellar designed an addition to the Saddle and Sirloin Restaurant using a small hyperbolic paraboloid. Anecdotal evidence suggests the structure failed to support itself adequately, and required additional columns to support the roof almost immediately after the formwork was removed. Subsequent inappropriate modifications to the building have left the roof virtually unrecognizable today. In the early 1960s, John Beck designed the Bill Breck Dodge Automotive Showroom on the southwest corner of Speedway Blvd. and Country Club Dr. The showroom's roof was comprised of a series of umbrella-type hyperbolic forms. The creative use of structure eliminated the need for columns along the perimeter of the building; instead the exterior walls were comprised of floor to ceiling glass. The building was demolished in the 1980s.

Other thin-shell concrete structures that have survived include: Walter Douglas Elementary School (1962, Shaver Co.) and the Cole Office Building (1961, Ellery Green).

Arthur Brown also designed several structures using the hyperbolic paraboloid form, but his projects did not use concrete. Instead, his designs all incorporated steel panels. These included two structures in Tucson: a carport structure at his architectural office at 726 N. Country Club (1958) and the McInnes Residence (1959). The shallow nature of these forms suggests that Brown used the hyperbolic forms more for their structural efficiency than for their sculptural quality.

It was into this context that architect Charles Cox designed a hyperbolic paraboloid for the sanctuary of Tucson's Catalina American Baptist Church in 1960. The church's pastor had seen the hyperbolic structure of Hugh Stubbins' Berlin Congress Hall on a trip to Germany, and sought to achieve something similarly dramatic for his congregation's new sanctuary. The result was an upward thrusting concrete shell, balanced on two small sidewalls. Glass infill between the floor and shell resulted in a dramatic and brightly-lit space. The building was a significant departure from anything that had been previously built in Tucson. The structure is the largest thin-shell concrete form in Tucson, and the only remaining thin-shell concrete hyperbolic paraboloid in Tucson. It is unknown whether there are other thin-shell double cantilever hyperbolic paraboloids in the state of Arizona.

The Catalina American Baptist Church is eligible under Criterion C as a rare surviving example of a thin-shell concrete hyperbolic paraboloid. It is also an exceptional example of the Sculptural Expressionist sub-type of the Modern Movement.

INTEGRITY

design

The Catalina American Baptist Church, and its character-defining features, demonstrate exceptional integrity, although a few modifications have been made to the original design. The most significant modifications have been made to the windows. To limit solar heat gain, solar screens and tinted film were installed over the glass. As glass panes were replaced, intermediate mullions were installed to divide the large panes of glass into smaller sections, thereby reducing the cost of glass replacement. Also, there is anecdotal evidence from the congregation that the auxiliary structures were not originally intended in the early planning of the building. The disjointed relationship between these buildings and the primary building suggests this may be true, although one version of the construction drawings clearly show their existence.

setting

The sanctuary building's west elevation faces Country Club Blvd., a major north-south thoroughfare. The building is located adjacent to urban residential neighborhoods that were developed in the 1950s, and have remained intact since the building's construction. Modifications to the church property have occurred over the years, but the general character of the site has remained the same: a complex of buildings with the sanctuary building adjacent to the street as the primary image of the facility. In 2005, a new independent sanctuary and multi-purpose church complex was constructed to the east (behind) the existing sanctuary. The existing sanctuary continues to be used for traditional services and events; this new construction has had no adverse affect on the integrity of the main sanctuary.

Since the original construction, a decorative concrete masonry landscape wall was added around the north side of the building to screen the view of traffic on the adjacent street. In addition, several mechanical units have been re-located at the southwest corner of the site and are screened by wooden lattice fencing.

Two tall palm trees planted at the time of construction provide a vertical counterpoint to the lines of the roof form. This was a common landscape practice for Modern buildings at the time. There are additional trees located around the building that were planted after construction to shade the windows, but these do not contribute to the significance of the property.

materials

The primary exterior materials—glass, concrete, steel—have not been modified except for the glazing as described above. Some of the wood panels sheathing the mechanical rooms and auxiliary spaces on the interior have been removed or painted.

workmanship

What is particularly apparent is the lack of workmanship evident in the building. This reflects the mass production and clean lines of the Modern period, and is a character-defining feature.

feeling
The building feels "dated" or wedded to its time period, in part because its roof form is so unique and unrelated to more contemporary construction and because the interior wood motif is rare in more contemporary buildings.

None of the modifications described above constitutes a compromise to the overall integrity of the building's character-defining features.

CRITERIA CONSIDERATIONS

CRITERIA CONSIDERATION A
Catalina Baptist Church is a building currently and historically used for religious purposes. However, the building's historic significance derives from its distinctive architectural style and method of construction (Criterion C).

CRITERIA CONSIDERATION G
Due to its date of construction (1960-61), Criterion Consideration G is applied to the Catalina American Baptist Church as a building that has achieved significance within the past 50 years. As such, the measure of "exceptional importance" is applied. The Catalina American Baptist Church is considered to be exceptionally important at the local level, as it is a rare surviving example of thin-shell concrete hyperbolic paraboloid construction, of which there are no extant examples remaining in Tucson. Although this nomination does not evaluate the building in a statewide or regional context, the Catalina American Baptist Church may also represent one of the best preserved examples of this construction type in the country, as Tucson's unusually arid climate is well suited to the preservation of thin-shell concrete construction, a construction method considered highly susceptible to moisture damage.

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GEOGRAPHICAL DATA

VERBAL BOUNDARY DESCRIPTION

The Catalina American Baptist Church is located within a portion of Pima County Tax Assessor's parcel number 122-15-312A. The nominated property is located on the *Tucson* USGS 7.5 minute Quadrangle Map in Section 4, Township 14S, Range 14E of the Gila and Salt River Meridian, Pima County Arizona. The boundary of the nomination is shown on the attached site map (Additional Documentation #1). It includes the sanctuary building and the landscaped area between the building and Country Club Blvd.

BOUNDARY JUSTIFICATION

The boundary of the nominated property forms a polygon around the sanctuary building designed by Charles E. Cox and the adjacent landscaping along Country Club Blvd., including two palm trees that were part of the original design. As other buildings on the site were not part of the Cox's original design and are not part of the National Register nomination, they have been excluded from the boundaries.

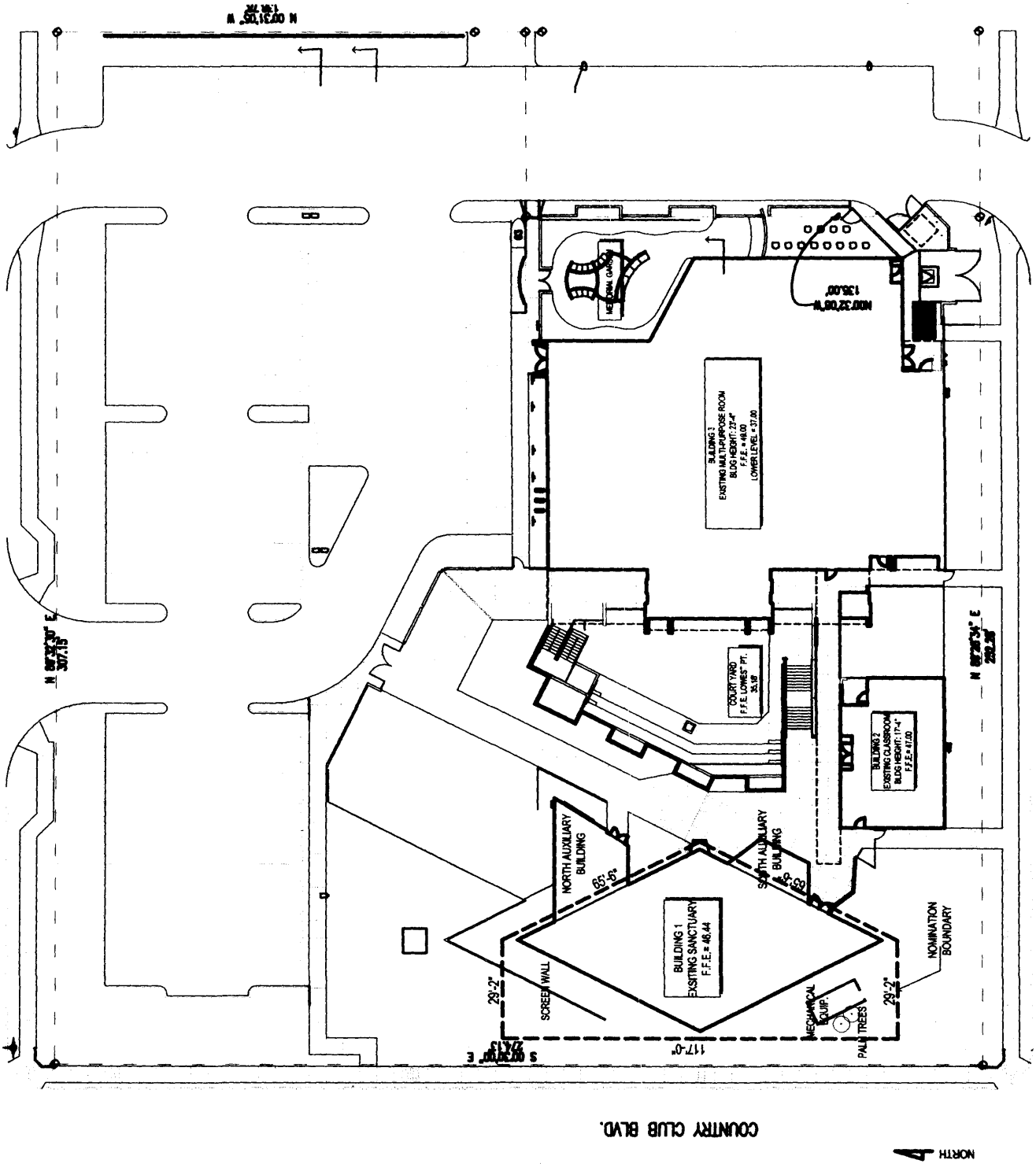
United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

PHOTOS

Catalina American Baptist Church
Pima County, Arizona
Photographer: Matan Mayer
Date of Photographs: September 13th, 2005
Digital Photographs (no negatives)

Photo #	Description of View
1	Exterior view of sanctuary looking northeast from across Country Club Blvd.
2	Exterior view of sanctuary looking southeast from across Country Club Blvd.
3	Exterior view of south end of sanctuary building; camera facing northeast
4	Exterior view looking south showing north end of sanctuary and north auxiliary building
5	Interior view looking north along central aisle of sanctuary seating area towards pulpit
6	Interior view looking southwest towards pews in seating area
7	Interior close-up view of pews, looking east from central aisle
8	Interior close-up view showing exposed aggregate concrete wall, looking west-northwest
9	Interior view of entry foyer from sanctuary seating area's central aisle, looking south



Additional Documentation #1
Site Plan Showing National Register Boundary