THE KIMBELL ART MUSEUM BUILDING
FROM CONCEPT TO COMPLETION

THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS

By

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Denton, Texas
December, 1977
The problem of this thesis is to determine the evolution of the architectural design of the Kimbell Art Museum building from its origin as a concept to its realization in the completed structure. This study has two objectives. The first is to discover the process by which the physical museum building came into being. The second is to trace the conceptual evolution of the Kimbell Art Museum building.

This problem has three parts, each of which has been made the subject of a chapter. The first, "Concept Development," sets forth the pre-design concepts of the founder, the director, and the architect. The second, "Design Development," establishes a chronological sequence of architectural design presentations. The third, the "Conclusion," compares the pre-design concepts to the finished building.
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INTRODUCTION

On October 4, 1972, the formal opening of the Kimbell Art Museum was celebrated. Eight years had passed since the death of Kay Kimbell, whose Last Will and Testament had set into motion a remarkable process which culminated in an award-winning building designed by an internationally famous architect, the late Louis I. Kahn.

The founder of the Kimbell Art Museum, Kay Kimbell, had amassed a great fortune during his lifetime despite his modest beginnings. Born in Oakwood, Texas, in 1886, Kimbell left school at the age of thirteen to work for his father who employed himself variously as a farmer, cotton dealer, and merchant. Kay Kimbell shunned publicity about how he managed to begin with a small flour milling plant in Sherman, Texas, and expanded his business to eventually include seventy corporations in wholesale foods, petroleum processing, insurance, and real estate.¹

Kay Kimbell and his wife, Velma, began collecting art during the 1930's after attending an exhibition held by the Fort Worth Art Association. Enchanted by the British eighteenth century works in the show, Kimbell purchased a painting from New York gallery owner, Bertram Newhouse. During

the years that followed, Kimbell's love of art grew and his collection was expanded. In addition to new acquisitions of British eighteenth century painting, Kay and Velma Kimbell bought many fine examples of late Renaissance, French nineteenth century, and American art.

In 1936, the Kimbell Art Foundation was established by Kay and Velma Kimbell and Coleman Carter and his wife. The legal document which brought the foundation into existence is entitled the "Articles of Incorporation of the Kimbell Art Foundation." The foundation served as an owner for the art and wealth that would be bestowed upon it by Kay Kimbell during his life as tax-deductible gifts and after his death as his estate. The purpose of the Kimbell Art Foundation was "to establish and maintain in the City of Fort Worth an art institute." This institution was to be operated without fees as a non-profit organization, and if, in the future, its corporate existence were terminated, it would become the property of the City of Fort Worth.

In the years that followed the establishment of the foundation, the Kimbell collection grew to contain a great many works of art including examples by Gainsborough, Reynolds, Romney, Lawrence, Leighton, Greuze, Van Dyck, Hals, El Greco, Canaletto, and Corot. Paintings owned by the

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2Fort Worth Star-Telegram, November 9, 1964.
3Ibid.
4Ibid.
foundation were placed in public institutions including Texas Christian University, Texas Women's University, Arlington State College, and the Fort Worth Public Library. Kimbell's desire to share his art with the public led him to provide the financial resources and legal mandate for the institution that was to bear his name, the Kimbell Art Museum.

The problem with which this thesis is concerned is determining the evolution of the architectural design of the Kimbell Art Museum building from its origin as a concept in the minds of the founder, the director, and the architect to its realization in the completed structure. This study has two objectives. The first is to discover the process by which the physical museum building came into being. The second is to trace the conceptual evolution of the Kimbell Art Museum.

Method of Procedure

The design evolution is presented in two chapters. The first, "Concept Development," sets forth the pre-design concepts of the founder, Kay Kimbell; the director, Richard F. Brown; and the architect, Louis I. Kahn. The second chapter, "Design Development," established a chronological sequence of design presentations and accounts for the design changes made at each stage. In the conclusion, a comparison is made of the pre-design concepts and the finished building.
To determine Kimbell's concept of the museum, an examination was made of his Last Will and Testament. Personal interviews with museum staff and board members provided further insight into Kimbell's intentions. To determine Richard Brown's concept of the museum, a study was made of the "Policy Statement" and the "Pre-Architectural Program," two unpublished papers written by Brown in 1966. This investigation was augmented by Brown's statements taken from both personal interviews and periodicals. My findings on Louis Kahn's conception of the museum were based on personal interviews and correspondence with Marshall D. Meyers, the project architect from Kahn's office. A study was made of the architect's design philosophy as recorded in his speeches and writing.

Design development was determined by three methods. First, an examination was made of all available models and drawings which constituted Kahn's design presentations. Second, interviews were held with individuals involved with all stages of design and construction. Third, letters and contract documents written during the design period were correlated with the visual presentation material.

Significance of the Problem

The significance of the Kimbell Art Museum, both as a work of architecture and as an institution, justifies an investigation into the origin and evolution of its architectural design. Recipient of the 1975 Honor Award of the
American Institute of Architects, the museum building is recognized as an important contribution to the history of architecture. This record will be valuable because it not only documents the design methodology of Louis Kahn, but it also records the conceptualization of a major work of twentieth century architecture. It is important that this investigation be made before primary source material becomes unavailable. With the death of Louis Kahn in 1974 there is a need to record accounts of his words and thoughts expressed to his colleagues while the memory of them is still fresh.

Review of the Literature

The design evolution of the Kimbell Art Museum has been treated in part by articles and books published from 1968 to the present. An article by Peter Plagens entitled, "Louis Kahn's New Museum in Fort Worth," describes and illustrates Kahn's second design presentation. It also outlines features of the architect's philosophy and methodology of design.

An analysis of the influence of beaux arts training on Kahn's design procedure appeared in an article by William Jordy entitled "The Span of Kahn." Jordy provides insight into Kahn's method of design and analyzes certain features of both Kahn's and Brown's concept of the museum.

Eighteen Years With Architect Louis I. Kahn, a book

5Peter Plagens, "Louis Khan's New Museum in Fort Worth," Artforum, VI (February, 1968).

written and published by structural engineer August Komendant, discusses the design and engineering of the Kimbell Art Museum. Komendant traces the changes in both plan and structure of the building from 1968 when he was first consulted by Kahn to the completion of the museum in 1972. Although Komendant focuses on engineering, he was intimate enough with Kahn to analyze the changes in the architect's philosophical concept of the museum during these years.

*Light is the Theme* is the only publication which correlates Kahn's design concepts with architectural form. This book was conceived and titled by Kahn himself. The architect's words are juxtaposed with photographs taken during and after construction of the museum.

Articles published in technical journals focus on the unusual construction techniques developed for the Kimbell Art Museum such as the forms for casting the cycloid shells, the laying of the lead roof, and the development of the unique light reflectors. Other periodicals have published photographs, architectural drawings, and statistics. Although many books and articles have dealt with specific aspects of the concept, design, and construction of the Kimbell Art Museum, no publication has addressed the problem of determining the evolution of the architectural design from concept to completion.

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CHAPTER I

CONCEPT DEVELOPMENT

The philosophical foundation for the Kimbell Art Museum is to be found in the initiating concept of the founder, the museum goals of the director, and the design philosophy of the architect. These concepts are worth examining carefully because, first, the ideas in themselves are noteworthy contributions to the general notion of what an art museum should be, and second, these concepts determined to a large extent the final form of an important work of architecture.

Founder Kay Kimbell's initiating concept is most significant for its restraint. In his Last Will and Testament he yielded his power to determine the form and operation of the institution for which he had provided, thereby allowing these basic decisions to be made by a professional museum administrator. Richard F. Brown's goals for the museum are to be found in his "Policy Statement" and "Pre-Architectural Program," a document unique for its thoroughness and client authorship. In writing his own building program, Brown has established an excellent precedent for museum directors. Louis I. Kahn's philosophy of architecture, widely quoted by critics, would have been considered a contribution to twentieth century architecture even if he had never produced
a building. Some of the design concepts Kahn realized in
the Kimbell Art Museum had been in his mind several years
before being commissioned for the project.

The Founder's Concept

Upon the death of Kay Kimbell in April of 1964, his
Last Will and Testament became effective.¹ The Kimbell will
was remarkable in that it provided extensive financial re-
sources for implementing the purpose of the Kimbell Art
Foundation -- "to establish and maintain in the City of Fort
Worth an art institute"² -- but it did not place any restric-
tions on the institution that was to be built. Kimbell's
expression of his intentions can be found in Article One of
the Last Will and Testament.

I have no children, nor have I ever had any. I
have provided amply for all of my relatives. I,
therefore, feel entirely free to attempt to achieve
a long-felt ambition - to encourage art in Fort
Worth and Texas by providing paintings and other
meritorious works of art for public display, study,
and observation in suitable surroundings. The in-
tent of this Will, after providing for my beloved
wife, VELMA KIMBELL, is to further such purpose.³

The phrase "suitable surroundings" is the only reference to
a museum building contained in the will. Thus Kimbell did

¹See Appendix A, p. 124. The Kimbell Last Will and
Testament was contested by six relatives who were represented
by Attorneys Al Winder and Melvin Belli. Belli is the lawyer
from San Francisco who unsuccessfully defended Jack Ruby in
the shooting of Lee Harvey Oswald. Fort Worth Press, Novem-
ber 9, 1964).

²Fort Worth Star-Telegram, p. 3.

³Kay Kimbell, Last Will and Testament, extract, Article
One. See Appendix, p. 124.
not in any way specify the appearance or scope of the art facilities which would bear his name. The frequently quoted statement, "build a museum of the first class,"\(^4\) is not recorded in the actual will, but was frequently repeated to the executors and business associates. Note that Kimbell did not even require that his own paintings be exhibited in this institution.

The will placed the Kimbell estate in a trust fund to be used by the Kimbell Art Foundation for the purpose of building and staffing the Kimbell Art Museum as well as expanding the art collection. Kimbell defined his estate as "my separate properties and the entire community estate of my wife, Velma Kimbell, and me."\(^5\) To administer his estate, Kimbell appointed a board of executors to whom he gave authority "To sell or dispose of, for cash or on credit, exchange, partition with co-owners, liquidate and convert any and all properties of my estate."\(^6\) Thus all of the art owned by Kay Kimbell at the time of his death could have been

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\(^4\)Fort Worth Star-Telegram, p. 2. This article reports that Velma Kimbell said that the building should be in keeping with the other public buildings in the surrounding area.


\(^6\)Ibid., p. 13. The executors of the estate were as follows: Velma Kimbell, Coleman Carter whose late wife was Kay Kimbell's sister, Kay Fortson who was Kay Kimbell's niece, A. L. Scott who is President of Kimbell Milling Co., C. B. Smith who is head of the meat division of Kimbell Milling Co., and Benjamin Bird who is attorney for the Kimbell Art Foundation.
sold and replaced by new acquisitions.

However, the sale of Kimbell properties was not really necessary in order to produce funds for building the Kimbell Art Museum. The income generated by the assets of the estate was intended by Kimbell to be used for this purpose.

All net income received by my estate during administration shall be paid to or permanently set aside for "The Foundation," to be used exclusively for its educational and charitable purposes.7

To augment these funds, Velma Kimbell graciously donated her entire share of community property to the Kimbell Art Foundation.

If Kay Kimbell had a visual image or theoretical concept of the kind of art institution he wanted, he did not specify it in his will. The importance of this fact for the development of the architectural design of the Kimbell Art Museum can scarcely be overstated. Kimbell's restraint in the wording of his Last Will and Testament provided the executors of the estate with almost unlimited options, the director with an open field in the selection of architect and in the planning of the building, and the architect with a great opportunity to realize his creative potential. Thus the Kimbell Art Museum, unlike many institutions, began its development without design restrictions imposed by its founder.

The implementation of the Last Will and Testament of

7Ibid.
Kay Kimbell was the duty of the executors. In addition to the disposition of the Kimbell estate, the executors were responsible for acquiring a site and selecting a director for the future museum.

**Acquiring the Site**

The Kimbell will specified only that the museum be within the City of Fort Worth. The executors were therefore at liberty to make their own decision about the site. The matter was brought before the Fort Worth City Council on November 8, 1964, by Benjamin Bird, attorney for the foundation. The city council voted quickly and unanimously to donate nine-and-one-half acres of park land opposite the Amon Carter Museum of Western Art for the project. To make the site usable, the existing Will Rogers Road East which cut the site in half had to be closed. The cost of the development of the site was to be paid for the Kimbell Art Foundation. This site was bound by Arch Adams on the east, Camp Bowie on the north, West Lancaster on the south, and Will Rogers Road West on the west. The donation of city property for the museum building was formalized in a contract between the Kimbell Art Foundation and the city of Fort Worth. This agreement stated that the museum was to be operated without profit, but that if it became necessary to cover operating expenses, an entrance fee could be charged.

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8*Fort Worth Star-Telegram.*
Selecting the Director

Having had no experience with organizing an art museum, the trustees turned first to successful museum directors to learn how such an institution is established. On a tour of the nation's leading art museums, the executors were advised that their first act should be to hire a highly competent museum administrator as director. Executor Kay Fortson recalled that on more than one occasion they were told that they would be most fortunate if they could persuade Richard F. Brown, then director of the Los Angeles County Museum, to take this post.

Richard F. Brown's education and experience qualified him as an art museum administrator. While working on his doctorate at Harvard University, Brown was invited to be a research scholar and later a lecturer at the Frick Collection in New York City. In 1954 he was asked to be curator of the Los Angeles County Museum of History, Science and Art. Then in 1961 just as a new art center was being planned for this institution, Brown was made director. By the time the

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9 The museums visited were: the Putnam Foundation in San Diego, the Huntington in San Marino, the National Gallery of Art in Washington, D.C., the Boston Museum of Fine Arts, the Philadelphia Museum of Art, the Metropolitan Museum of Art and the Frick Collection in New York, and the Sterling and Francine Clark Museum in Williamstown, Massachusetts.


Kimbell executors approached him in 1965, he had had experience not only in directing but also in building a major art museum. Initially he was asked to come to Fort Worth as an authority on eighteenth century painting to evaluate the Kimbell collection and advise the executors as to whether the paintings were of sufficient quality to exhibit in the planned art institution. A short time later Brown was offered the directorship of the Kimbell Art Museum, and he accepted. It had become apparent to Brown that, unlike the board of trustees of the Los Angeles County Museum, the Kimbell executors planned to give to their director unqualified authority with regard to the building and administration of the museum.

The means employed by the executors of the Kimbell estate in the founding of a great museum reflect the spirit as well as the letter of the Kimbell Last Will and Testament. Following Kay Kimbell's example, the executors did not vest themselves with the authority to define quality in a museum, or even to decide by themselves who should define such quality; rather, they sought advice from a wide range of acknowledged experts in the field, then acted upon that advice.

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13 Shepard, op. cit., p. 22. Fort Worth was not an unfamiliar city to Brown. He had served on the board of the Amon Carter Museum of Western Art.
The Director's Concept

Richard F. Brown's general philosophy of the Kimbell Art Museum can be found in three sources, all of which Brown wrote. In the "Policy Statement," June, 1966, Brown recorded the purpose of the museum as an institution; in the "Pre-Architectural Program," June, 1966, he set forth his architectural concept for the museum building; and in the Introduction to the Kimbell Art Museum Catalogue of the Collection, 1972, Brown reveals his theory of developing the art collection. These three contexts in which Brown articulates his philosophy of the Kimbell Art Museum are by no means mutually exclusive. The design concept is an outgrowth of the purpose of the institution as is the collection of works of art. At the same time, the design affects the installation of the art which in turn affects the visitor's perception of the purpose of the institution. This network of interrelated concepts forms a kind of fabric of ideals upon which the institution as a whole is founded.

Purpose of the Institution

In the "Policy Statement" Brown states that the purpose of the Kimbell Art Museum is to provide "cultural enrichment of the public through the display and interpretation of works of art." "Our knowledge and understanding of the heritage of

civilization is largely dependent upon the continued survival of the kind of art contained in this museum."¹⁵ Further, Brown feels strongly that in an economy based on mass production, "the need for single, unique, handmade, emotionally and intellectually distilled works of art should be self-evident."¹⁶

The "Policy Statement" also includes a statement of the top priority for museum operations: the preservation of works of art. In this document, Brown explains that in order for the purpose of the museum to be fulfilled now and in the future, every precaution must be taken with the works of art entrusted to its care.¹⁷ Making preservation a top priority affected every aspect of the institution, namely, the design of the building, the installation of the works of art, the exhibition program, the security operations, the mechanical equipment, and the facilities for conservation and research. To assure that no future concern might supercede the protection of works of art, Brown made it a museum policy that "every other aspect of the Museum's program pays obeisance to and, where necessary, gives way to this trust."¹⁸

¹⁵Ibid.
¹⁸Ibid.
The director translated this priority into design requirements in the "Pre-Architectural Program." Not only did Brown specify the best security equipment available, but he insured further protection in his suggestions for the organization of the building and by limiting the entrances and accessible glass walls.

**Architectural Concept**

Richard Brown's concept of the Kimbell Art Museum as a work of architecture is to be found in the "Pre-Architectural Program," dated June 1, 1966. An unpublished sixteen-page document written by Brown, the "Pre-Architectural Program" is a prime example of a building program, a statement prepared by an architect or owner before architectural design begins. Usually a program contains general objectives for a building as well as specific requirements such as a list of rooms which are described in terms of approximate size, location, and special facilities. Usually the program is written by the architect in consultation with the client. Richard F. Brown, however, had had sufficient experience with museum architecture to write the Kimbell program before selecting the architect. By mailing copies to the architects under consideration in advance of his interviews, the director gained the advantage of a specific, rather than a general, discussion of the building he had in mind.

The "Pre-Architectural Program" consists of ten sections which provide three kinds of information: the director's
Concept of the architectural design, an analysis of design problems, and the detailed particulars of space use and square foot cost. It is so unusual for a client to provide this kind of information and analysis that the "Pre-Architectural Program" was praised by a major periodical, Progressive Architecture, as

A model of pre-programming for clients and architects alike...If such painstaking and perceptive documents were the rule, museum design would take an immeasurably improved turn.19

Design concept.--The material in the "Pre-Architectural Program" which covers Brown's design concept falls into three categories: the subjective experience of the visitor, the aesthetic features of the building, and the security considerations.

Richard F. Brown wanted the visitor entering the museum to be enriched, educated, and so that he will return, charmed. Ideally he should experience "warmth, mellowness, even elegance."20 Brown hoped that the visitor would find that the architecture, although itself a work of art, does not overwhelm the objects on exhibit.21

The aesthetic features which concerned Brown were scale,


21Ibid.
materials, construction details, lighting, and composition. The program called for the Kimbell Art Museum to be human in scale. It was to be villa-like, not palatial, similar to the Frick Collection in New York where Brown had been curator. The gallery ceilings were to be only twelve feet high. However, the museum was not to have period settings for works of art.

The museum was to have a harmony of textures and forms and a high quality of craftsmanship and materials. Brown believed there should be an honesty in the relationship of visible form and method of construction. The floor plan should be easily grasped so that the visitor feels that he is making his own choices as he walks through the galleries.

Natural light must play an important role in illuminating the interior of the museum. Brown believed that the visitor should be able to catch a glimpse of the natural changes in weather, time of day, and seasons. On the other hand, the director demanded a lighting solution which would avoid glare, diffused skylighting, multiple light sources, fluorescent fixtures, or clerestory windows, yet not deplete the wall space. This was a big order. It exhausted all standard lighting techniques.

Finally, the Kimbell Art Museum building was to be a totally integrated design when finished. The composition was

22 Ibid, p. 140.  
23 Ibid, p. 132.  
24 Ibid, p. 133.  
to have a wholeness that would make additions not only un-
necessary but undesirable. The structure was not to be
built in stages that could grow with the collection, but
was to be complete at the time of opening. 26

Because the preservation of works of art is given top
priority in Kimbell Art Museum operations, 27 all architec-
tural features which could facilitate security were requested
in the program. For example, Brown feels that security is
best served if an art museum has only one public entrance. 28
Likewise, there were to be as few exterior doors as possible.
Another concern was the separation of museum activities. By
dividing all activities into three groups--service, public,
and operations--and by requesting that each group be spa-
tially isolated, 29 Brown was insuring that the architectural
design would result in a secure museum. Thus the shipping,
receiving, crating, examining, and conservation of art could
be done without public awareness; and the observation

26 Ibid., p. 133. In an interview held at the Kimbell Art
Museum December 18, 1975, Richard Brown recalled a discussion
he had with Kahn about plans for future extension of the
museum. Kahn's scheme was as follows: The walls which
surround the parking lots would be continued to the west
end of the site, where they would enclose a structure con-
sisting of two buildings composed of cycloids and joined
to each other by a portico open on all four sides.

27 See page 12 above.

28 Kimbell Art Museum, "Pre-Architectural Program." See
Appendix B., p. 139.

duties of security guards was to be made simpler by the isolation of public activities.

**Design analysis.**—In an unusual feature of the "Pre-Architectural Program," Brown provides analysis of the design problems posed by the constraints of the site: location, surroundings, and height limitation.

The location of the museum in a city in which the primary means of transportation is by automobile, rather than by mass transit, imposed the need for a large parking lot on the museum grounds. Based on an anticipated annual attendance of two hundred thousand visitors, it was estimated that parking for one hundred cars would be required.30

The nature of the developed land surrounding the museum site posed design problems. Only the west boundary had an attractive vista: the tree-lined city park land and Amon Carter Museum of Western Art. On the east were apartment buildings; on the north, small business structures; and on the south, Lancaster field. Brown's suggestions for dealing with the surrounding site were 1) the use of an inward orientation of the building, and 2) an imaginative landscaping scheme.31

A height restriction of forty feet had been agreed upon by the Kimbell executors when the donation of the city park land was accepted as the building site. The purpose of this restriction was to avoid obstructing the view of the surround-

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30 _Ibid_, p. 135.  
31 _Ibid_.
ing area from the terrace of the existing Amon Carter Museum of Western Art. Brown felt that this restriction would entail two important considerations by the architect: 1) the appearance of the roof would take on such importance that careful consideration would have to be given to its treatment and 2) excavation would probably be necessary so that a lower level of the museum could be built below grade.32

**Space use.--**The bulk of the "Pre-Architectural Program" consists of a list of the number of square feet and the projected cost per square feet for each specific building activity. This list was divided into three sections which correspond to Brown's three major divisions of the museum: service, public, and operations.

On the gallery level, Brown asked for an architectural layout in which objects are seen in sequence in a controlled field of vision.33 In a special loan gallery designed for changing exhibitions of differing sizes, the space was to be divisible lengthwise into small units. Means of access to this loan gallery was to be provided at a number of points along its longest wall. This scheme would allow exhibitions of various sizes to be installed without blocking the entrance. The north longitudinal wall of this gallery was to be of glass with sliding opaque walls permitting light modulation according to the requirements of the exhibits.34

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34 *Ibid.,* p. 140.
The operations area of the museum was to have offices and research facilities as required for the function of the administrative, curatorial, and education departments. Included among these were the library and the conservation studio.\textsuperscript{35}

The service area was to have a parking lot placed under the building or on a constructed terrace. The entrance to this parking area was to be mechanized and operable by security staff. This controlled parking entry would have served both service vehicles and private cars. There was to be a stairway and an elevator from the parking lot to the main level of the museum.\textsuperscript{36}

The above description of the adjustable loan gallery and the vehicle parking facility, neither of which appear in any of Kahn's designs, reveal that Brown had a detailed design concept of the museum. The "Pre-Architectural Program" contained both his philosophy of the museum as an institution and his design concept of the building.

Selection of the Architect

As museum director, Richard Brown was responsible for selecting and recommending an architect who could transform the concepts set forth in the "Pre-Architectural Program"

\textsuperscript{35} Ibid, p. 142. Note that in the finished building, the library is in the public level.

\textsuperscript{36} Ibid, p. 137.
into reality. To accomplish this task, Brown submitted the program to fifteen distinguished architects, including Paul Rudolf, Gordon Bunshaft of Skidmore, Owens, and Merril, John Johanson, Edward Larabie Barnes, Mies van der Rohe, I. M. Pei, Marcel Breuer, and Louis Kahn. After six months of visiting these and other architects and discussing the "Pre-Architectural Program" with them, Brown recommended to the Kimbell board of trustees that Louis Kahn be offered the commission of designing the new museum. The trustees voted immediately to approve Brown’s choice, not from familiarity with Kahn as an architect, but from their complete confidence in Brown as a museum administrator.

Brown has stated that his basis for selecting Kahn was the suitability of the architect’s work to the Fort Worth area. Mies van der Rohe, whom Brown had wanted as architect for the Los Angeles County Museum, typically designed sophisticated glass structures more suitable for a metropolitan environment in a cool climate than for the Fort Worth region. Speaking of the younger architects John Johanson and Edward Larabie Barnes, Brown said that after examining their models

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38 The word "trustees" is used from this point on because the disposition of the Kimbell estate had been completed. In addition to the original executors, the trustees include Ben J. Fortson, husband of Kay Fortson.


40 Ibid.
and studying their finished buildings, "I still felt that Lou Kahn was younger than they were and had a fresher attitude about any new problem... I felt Louis Kahn would approach this problem like Adam, for the first time, and indeed that's the way it turned out."  

Further insight into the director's reasons for selecting Kahn may be gained from an unpublished account written by Brown after his first meeting with the architect. Brown's paper records impressions and insights about the architect's character which he considered important (See Appendix C, p. 157).

The opening paragraphs of this unpublished paper describe the informal appearance and casual atmosphere of the Kahn office. Brown felt that the unpretentious nature of the workroom reflected the architect's dedication to his work and his concern for design rather than a preoccupation with image and the display of importance. The work area had the quality more of an artist's atelier than of an influential architect's office. Discussion was always open and varied, involving not just the projects at hand, but also philosophy, books, mathematics, travel, etc. People often stayed at work all night, stopping only in the early morning hours for a snack. Kahn would always arrive the following morning at eight-thirty regardless of how late he had been.

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41 "Kahn's Museum: An Interview with Richard F. Brown," Art in America, LX (September-October, 1972), 44.

at work the night before. The atmosphere of dedicated involvement identified Kahn as an artist-philosopher-architect rather than a businessman-architect: an important decision to Brown.

This distinction was reinforced by the discussion of architecture which took place between Brown and Kahn. Both men had traveled extensively and both had a keen appreciation for architectural history. When Brown explained that he wanted the Kimbell Art Museum to be similar in certain ways to a specific building in Europe, Kahn knew exactly what he meant (See Appendix C, p. 151).43

Brown believed that Louis Kahn would pursue a design solution for the Kimbell Art Museum with relentless originality rather than a reliance on past solutions or preconceived ideas about what a museum building should be.44 Note also that Kahn left Brown with the impression that "economy is an all-pervading attitude of operations, design and building process."45

Finally, and most important, was the quality of light in Kahn's office. Brown had written into the "Pre-Architectural Program" a very complex set of requirements for natural illumination within the museum. Kahn had modulated and controlled the natural light in highly dramatic and inventive ways in his architectural design for the

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Presidential Plaza and for the Outpatient Clinic of the National Hospital, both in Dacca, Bangladesh. So it was with great optimism that Brown approached Kahn. When Brown saw that the architect had chosen an office the only redeeming feature of which was the light, it was the final reassurance that there would be no problem in communicating about this subject.

The light in all these spaces is matchless, and for Lou Kahn light is the great creator of all things, including architecture. With such superb light to work with, why should he move into fancier quarters?46

In selecting Louis Kahn as architect of the Kimbell Art Museum, Brown chose one of the most difficult options open to him. He easily could have selected an architect who would design a building that would have satisfied the requirement in the Kimbell Last Will and Testament for "suitable surroundings."47 Vincent Scully, Kahn's biographer and renowned art historian, warned that Kahn is "not for the faint-hearted" but for "wise and courageous clients who are willing to forego the gloss of superficial perfection in order to take part in a sustained and demanding process."48 Brown's decision to commission Kahn, along with his "Pre-Architectural Program," must be considered major contributions to the creation of the Kimbell Art Museum.

47 Kimbell, op. cit. See Appendix A, p. 124.
The Architect's Design Philosophy

During Louis Kahn's many years of teaching architecture, he developed a highly complex and personal philosophy of design. Although Kahn's philosophy encompassed many aspects of architecture, city planning, and man's general experience of his environment, only those concepts which have the greatest bearing on the design of the Kimbell Art Museum are discussed in this thesis.

One of the problems that must be confronted in the study of Kahn's theories is the architect's use of language. Kahn often invented words or applied to existing words his own, new definitions. In an article in the issue of Architectural Review which is devoted entirely to Kahn's work, William Jordy defended Kahn on this point.

Like so many great teachers, Kahn tended to use words as the veil to a mystery, rather than as a clarification of truth. This is not indeed a criticism of him. It was one of the great errors of the Modern Movement to give it out that architecture was an "easy" subject; and that its problems were to be solved by a simple process of discussion and calculation.49

The problem of Kahn's diction stemmed from the architect's tendency to reject contemporary explanations of cultural institutions and practices. He voiced this rejection, too, in speaking of "volume zero,"50 the unwritten book which

49 Jordy, op. cit., p. 320.
50 Patricia McLaughlin, "How'm I Doing, Corbusier?" The Pennsylvania Gazette, LXXI (December, 1972), 20.
precedes the first volume in a set of encyclopedias covering the history of mankind. Kahn implied that his imaginary "volume zero" would have outlined the origin of man's institutions. Determined to discover for himself the origin and basic essence of man's institutions, Kahn assumed for himself the responsibility of looking at everything around him as if he were the first to perceive it. Because this discipline gave him insights and feelings for which he could not find precise definitions, he made the best use he could of available language. In the discussion below, the presentation of Kahn's concepts and the definition of Kahn's term for these concepts become one and the same. Eight general concepts are discussed in this section. The first three concepts—"the unmeasurable," "reprogramming," and the "natural working order"—are related to Kahn's design methodology. The next four concepts—"served and servant spaces," "the Architecture of Connection," natural light, and natural materials—are features which Kahn sought to incorporate into all of the buildings he designed and, at the same time, are features which Kahn used very successfully in the Kimbell Art Museum. The last concept discussed is Kahn's idea of using the architectural elements of the Kroller Muller Museum in Otterlo, Netherlands.

The Unmeasurable

To Kahn the most important goal of the architect is to produce a building that conveys to the visitor an abstract
message such as silence, light, or celebration. This most important quality is the spiritual essence of that work of architecture. Kahn called this quality "the unmeasurable."

A great building must, in my opinion, begin with the unmeasurable and go through the measurable in the process of design, but must again in the end be unmeasurable.

What is unmeasurable is the psychic spirit.

I sense that the psychic Existence Will calls on Nature to make that which it wants to be.51

Note in the above quotations that Kahn believes that the unmeasurable essence of a work of architecture exists before the structure is built. The architect must discover it. He does not invent such a quality and then endow the building with it. Thus Kahn asks himself the question, "What does this space want to be?"52

Richard Brown said that Kahn found the unmeasurable, or essential nature of a building in the very process of designing it. This process of finding the unmeasurable was what Kahn called "reprogramming."

Reprogramming

The word "reprogramming,"53 coined by Kahn, essentially means redesigning. It is based on the word "program," which


is the name of the written document that describes the criteria a building must meet to satisfy the client's needs. By using the word "reprogramming" rather than "redesigning," Kahn implied that he established new criteria for a new design and not just a new design to satisfy the criteria of the program. Kahn's new criterion was the unmeasurable.

What exactly did the process of reprogramming entail? According to engineer August Komendant, whom Kahn often consulted, the architect went through a question-answer ritual with himself in order to determine the unmeasurable. In the case of the Kimbell Art Museum, Kahn's questions might have been "what is the essential nature of an art museum? What should its spaces evoke?" The concept of "evoke" was central to Kahn's philosophy. He felt that, rather than "form follows function, form evokes function," and "rooms must suggest their use without name."

Complicating matters, Kahn believed that the architect could not completely determine the unmeasurable essence of a building in the design stage, but that he must continue to discover it during construction. Kahn felt that the architect must work as a sculptor works with wood or clay, taking

54 Komendant, op. cit., p. 118.
clues from the object produced as to how it should be shaped. It was this method of design that Kahn was referring to when he said that a building would tell him what it wanted to become.\(^5\) Despite the problems caused by Kahn's reprogramming, Richard Brown wrote about the process with a certain sense of humor:

...his entire approach to finding design solutions lies in what he calls euphemistically "reprogramming." He reprograms the program; then reprograms the schematics; then reprograms the preliminaries; then reprograms the working drawings. Even as concrete and steel and glass go up, reprogramming goes on.\(^8\)

Kahn's use of reprogramming, however, was not sympathetically received by all who were involved with the project. The board of trustees, composed largely of business executives, took a dim view of Kahn's tendency to disregard deadlines and to revise designs. The associate architect, Preston Geren, whose name was associated with many important buildings in Fort Worth and other Texas cities, was accustomed to efficiency in the handling of architectural projects.\(^9\) He expected to develop only one set of architectural

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58. Ibid.

59. Cited for excellence by the American Institute of Architects for Robert E. Lee High School of Midland, the Bank of North Texas in North Richland Hills, the Student Center at Southwestern Baptist Theological Seminary, and the American Airlines Stewardess College at Greater Southwest Airport. Geren was associate architect for the Dallas-Fort Worth Interregional Airport with Helmut, Obata, Kassabaum & Brodsky, Hopf & Adler. (Fort Worth Star-Telegram, April 22, 1973, Sec. E, p. 11, Col. 2-3.)
working drawings following the owner's approval of preliminary architectural design. Geren certainly did not expect to repeat the process of preparing working drawings at his own expense each time a revision was made by Kahn's office. 60

A. T. Seymour, President of Thos. S. Byrne, the firm responsible for the engineering and general contracting of the Amon Carter Museum of Western Art, was accustomed to receiving a thoroughly worked out preliminary design before making a cost estimate. He was also accustomed to obtaining a complete set of architectural working drawings prior to beginning construction. Bowen King, original, former museum business manager, remembers what effect reprogramming had on the building of the museum:

As far as I know, we never got a completed set of plans. Decisions were made with him (Kahn) out there drawing in the sand...until the last nail was driven and for a while after that he was still designing. 61

**Natural Working Order**

Kahn's tendency toward introspection led him to analyze his own creative process. He found that his own mental and intuitive activity could be reduced to what he called a "natural working order." 62 According to this formula, the design of a building was developed in three stages: induction,

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60 Statement by Bowen King, former Business Manager, Kimbell Art Museum, Fort Worth, Texas, August, 1976.
61 Ibid.
62 Plagens, op. cit., p. 20.
deduction, and construction. 63

The induction stage was that phase of design in which Kahn searched for the unmeasurable. The dimensions, materials, and cost of the building were not considered. To begin a design solution, Kahn used a technique learned from his teacher Paul Cret at the University of Pennsylvania. This technique, which originated at the original Ecole des Beaux-Arts in Paris, called for making an esquisse, or quick sketch, with only the building program for reference. In Beaux-Arts training, the student was expected to capture the basic nature of a building in the esquisse. When a project was complete, the student's final drawings were always compared with the esquisse to determine whether the nature of the esquisse had been violated. 64 Experience with actual design commissions had given Kahn a method of developing an esquisse that worked for him.

I use the square to begin my solutions, because the square is a non-choice really. In the course of development, I search for forces which would disprove the square. 65

In summary, the induction stage consisted of Kahn's search for the unmeasurable through the development of an esquisse.

64 Jordy, op. cit., p. 332.
Until he had produced an esquisse which satisfied him, he continued reprogramming.

The deduction stages was that phase of design in which the idea of the building was translated into a particular design. For the first time it became measurable in terms of size, materials, cost, and space use. In Kahn's terminology, he "gets the water out."66

The construction stage was that phase of building development in which the particulars of the design were to be decided. These particulars were the joints between materials, the appearance of the millwork, mullions, electrical equipment and fixtures, and even the treatment of architectural elements such as non-bearing walls. If a client closely followed Kahn's description of the construction phase, he would realize that this architect had no intention of completing his design in great detail before construction began. If he had, he would have violated his own principle of reprogramming.

Served and Servant Spaces

In Kahn's design philosophy, a very important concept was what the architect called "served and servant spaces." These terms were first coined by Kahn to explain the floor plan of the Bath House for the Jewish Community Center,

The served spaces are the areas for which the building exists, while the servant spaces are the areas housing activities or equipment necessary to support the served spaces. Kahn's theory of served and servant spaces called for the grouping, not hiding, of the mechanical equipment in the primary working and living areas of a building. Because Kahn has emphasized the importance of an honest expression of mechanical equipment in his architecture, he has been accused of being "enamored of ducts." But Kahn replied:

I do not like ducts. I do not like pipes. I hate them really thoroughly, but because I hate them so thoroughly, I feel they have to be given their place. If I just hated them and took no care, I think they would invade the building and completely destroy it.

Kahn believed that once the parts of a building were accurately defined, certain "laws" enabled that building to design itself. One of these was the law of "order." By order Kahn meant a natural hierarchy of spaces. The served spaces were at the top of this hierarchy and the servant spaces at the lowest levels, according to their functions. In a museum, Kahn listed the served spaces as the galleries, lecture rooms, classrooms, libraries; and the servant spaces

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69 Wurman, op. cit.
70 Ibid.
as the workshops, laboratories, storage rooms, offices, and mechanical equipment. According to Kahn's theory of served and servant spaces, even though an office and an air-conditioning duct were both servant spaces, the air-conditioning duct would be lower in the hierarchy than would be the office. This law determined the grouping of spaces within the building and prevented, for example, locating a postage desk in a public gallery. Note the similarity between Kahn's concept of served and servant spaces and Richard Brown's division of museum activities into Public Level, Operations Level, and Service Level in the "Pre-Architectural Program."

**The Architecture of Connection**

To Kahn, the spaces in a building which serve as connectors are just as important as the rooms they connect. He called the treatment of such spaces the "Architecture of Connection." The capitalization of the first letters of the words in the coined phrase is used by Kahn to denote architecture as a fine art rather than architecture as a commodity. As he said it, "All buildings do not belong to Architecture." Kahn believed that for a connecting space to be worthy of the name "Architecture of Connection," it

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72 Wurman, *op. cit.*
had to be carefully designed so as to provide the observer with an appropriate experience. Kahn also said that the "Architecture of Connection" could not be programmed by the client, but must be offered by the architect. The quotation below, in which Kahn presented this concept, can easily be read as descriptive of the main lobby of the Kimbell Art Museum, although the statement was first published in 1966.

The place of entrance, the galleries that radiate from them, the intimate entrances to the spaces of the institution form an independent Architecture of Connection.\textsuperscript{74}

\textbf{Natural Light}

Kahn was dedicated to the utilization of natural light as the predominant source of illumination in his last buildings. He believed that sunlight was more than desirable; that, in fact, it was necessary to man's true experience of his environment.

He (a man) cannot even accept a movie house, you might say, which must be in darkness, without sensing that there must be a crack somewhere in the construction which allows enough natural light to come it to tell how dark it is.\textsuperscript{75}

In the years preceding the design of the Kimbell Art Museum, Kahn did a lot of experimenting with the effect of the shape of the interior structure of a building upon the light that enters it. His experiments were based on the assumption that

\textsuperscript{74} Wurman, \textit{op. cit.}

the glare caused by the contrast between a bright window and its own wall made a room seem dark. He knew that glare was reduced and even disappeared if light from a secondary source was thrown against the window wall. The same principle is employed in photography when a flash is used to illuminate a backlit subject. Rather than using artificial light to reduce glare, however, Kahn experimented with bouncing sunlight off an interior wall in order to lighten the window wall. He used this idea in the Bath House of the Jewish Community Center in Trenton, New Jersey. Here he placed cylindrical walls inside open cubicles, creating entrances for light without using windows, skylights, or clerestories. Other examples of Kahn's use of structure to manipulate light may be seen in the Outpatient Clinic for the National Hospital at Dacca, Bangladesh, and the Institute of Management at Ahmedabad, India. In the former, large circular openings in a long masonry wall form a complex arcade. In the latter, intricate geometric shapes are used for openings in brick walls and form a screen in front of the offices. Kahn's own statements concerning this concept are: "Structure is the giver of light,"76 and "The light that enters the room should be the light of the room itself."77

In terms of museum design, Kahn's belief in natural light was reinforced by the knowledge that most paintings are created

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77 Jordy, op. cit., p. 320.
in a setting of natural light. He felt strongly that the artist's intentions could only be fully realized if his paintings were seen under original light conditions.

Natural Materials

Kahn expressed a belief in the use of natural materials for the buildings he designed. However, his definition of "natural" included concrete if it were not painted, and steel if it were not polished. He felt that natural materials blend well together and that there exists a sympathy among them. He liked the natural irregularities inherent in materials such as stone, wood, and marble. He considered the irregularities which occur during the pouring and setting of concrete to be an important part of Concrete's aesthetic appeal. He always specified that the irregularities occurring in concrete surfaces not be eradicated by sanding and filling. Kahn was very much opposed to the use of paint on architectural surfaces because its effect, like that of artificial light, was static and lifeless. He was also opposed to polishing stainless steel because "in nature there are no polished materials." Kahn, "The Wonder of the Natural Thing," op. cit. See Appendix D, p. 160.

Kahn also believed that a building should be put to-


gether in such a way as to reveal its structure to the observer. Turning again to nature for justification, he said, "How we were made is recorded in us." Not a new idea to the history of architecture, it was nevertheless Kahn's criterion for the choice of materials for structural and non-structural portions of a building. This principle would be violated, for example, if a concrete pier were covered with a facing material such as marble, because the pier would appear to the observer not to be structural.

**Concept of Architectural Elements**

**For Kimbell Art Museum**

While traveling in Europe in 1959, Kahn saw a building that greatly inspired him - the Kröller-Müller Museum by architect Henri Van de Velde in Otterlo, the Netherlands. According to Marshall Meyers, the member of Kahn's office who served as Project Architect for the Kimbell Art Museum, there were certain architectural elements in this museum that Kahn wanted to use in the Kimbell Art Museum. The Kröller-Müller is a one-story structure set in a large, tree-filled park. The Kröller-Müller Museum has an inward orientation, that is, very few exterior windows. Finally, and most important to Kahn, a great deal of natural light is let into the galleries by means of skylights and open courts. The courts are filled with foliage and running water. Wurman, op. cit.

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80 Wurman, op. cit.

Striking similarities between the Kimbell Art Museum and other works of architecture have been noted. For example, William Jordy, knowing Kahn to be an admirer of Le Corbusier, saw an influence in the Villa Sarabhai, in Ahmedabad, India. Others have pointed out similarities between the Kimbell Art Museum and the Forum at Pompeii with its arched bays. Meyers, however, feels that if these influences existed, they were very general and not intentional, as was the incorporation of design elements of the Kröller-Muller.

82 Jordy, op. cit., p. 332.
CHAPTER II

EVOLUTION OF THE ARCHITECTURAL DESIGN

The architectural design of the Kimbell Art Museum evolved slowly over a period of six years, beginning in 1966 with the signing of the architectural contract and ending in 1972 with the completion of the building. In contrast to standard architectural practice, the building design was incomplete at groundbreaking in June, 1969, and continued to be revised throughout the construction period.

During these years Kahn produced four models and a wealth of drawings in his search for a design which satisfied him. The purpose of this chapter is to establish and characterize this sequence of design development in four stages: First Design Presentation, Second Design Presentation, Final Preliminary Design Presentation, and Design Revision During Construction. The discussion of these four stages of design development is primarily derived from the four architectural models produced by Kahn and owned by the Kimbell Art Museum. Additional information was provided by architectural drawings and personal interviews. To discover the relationship between designs and to make comparisons simpler, each design composition is discussed in terms of site plan, orientation, floor plan, and structure. In response to each design pre-
sented by the architect, the client submitted a list of requested revisions. Tracing this sequence of design presentations and revision requests from the first design presentation through each design phase to the final revised design indicates most clearly how the ultimate design evolved.

Architectural Contract

The architectural contract, called the design agreement, October 5, 1966, formalized the relationship between the owner, the Kimbell Art Foundation, the architect, Louis I. Kahn, and the associate, Preston M. Geren and Associates.¹ This contract established a sequence of design presentations which the architects would be expected to produce.

Under Article II, "The Architect's and Associate's Services," section two, the architect was "to prepare schematic design presentation drawings, including site development plan, floor plan, elevations, schematic renderings and model."² The term schematic when used in architectural writing refers to a rough, unmeasured sketch made without drawing instruments. The purpose of a schematic presentation is to provide a design for the client either to accept or reject without entailing the expense of measured drawings.

Upon approval of the schematic design, the architect was to prepare "preliminary working drawings and outline specifi-

² Ibid, p. 4.
Preliminary working drawings differ from schematic drawings in that they are measured and drawn to scale with architectural instruments. Typically they include a number of cross-sections and details, as well as plans, elevations, and a model. The purpose of this presentation is to provide the owner with accurate information about the building. Once the design has been found to be acceptable, the preliminary working drawings then are used by the associate to prepare working drawings, which are a set of large scale, detailed drawings to be used by the workmen on the construction site.

Other services required of the architect include the "selection of materials, textures, and lighting effects," consultation with the associate, review of the working drawings, and visits to the construction site.

In Article V, a time schedule established the number of days allotted for the preparation of each design presentation. The schematic design was to be presented 120 days after the design agreement was signed; the preliminary design, 120 days after approval by the owner of the schematic presentation; the working drawings, 180 days after approval of the preliminary design.

First Design Presentation

Plan

True to his statement that he began his design solutions

with a square, a "non-choice" shape, Kahn produced a model that was square in ground plan for his first design presentation in April of 1967 (See Figure 1, p. 46). The layout of the building on the site was determined largely by the location of existing trees. Note that the two large courts are placed so as to contain most of the trees which had lined Will Rogers East, the street closed by the city in establishing the site (See Figure 2, p. 47).

The museum represented by this model would have been enormous, approximately six hundred feet on a side and covering nearly the entire nine-and-a-half acre site. The building would have been a one-story structure composed of fourteen bays running north-south from Camp Bowie Boulevard to Lancaster Boulevard. The roof would have been composed of tilted plates, forming in cross-section a sequence of truncated pyramids. A close examination of the model reveals that the roof becomes a portico on all four sides. Project Architect Marshall Meyers said that even at the time of the first design presentation, Kahn was considering using an arched roof, for he made many supplemental drawings, among them studies of a series of semi-circular barrel vaults.

Along the boundaries of the north and south porticoes

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6 See p. 33 above.


Fig. 1--Site mode for first design presentation
Fig. 2--Model for first design presentation, plan view
Fig. 3--Model for first design presentation, oblique view
Kahn placed an unusual feature, a screen composed of fourteen semi-circular arches overlapping the edge of the tilted plate roof. The idea of overlapping two different geometric shapes is a recurring theme in Kahn's architecture. For example, he used giant circular screens in the Exeter Library at Exeter, New Hampshire, and arcades composed of half and full circles in the Outpatient Clinic of the National Hospital at Dacca, Bangladesh (See Figure 3, p. 48).

The plans drawn by Kahn to accompany this model show that the museum would have been visually divided into two nearly equal parts by an east-west corridor which Kahn called a "spine." He believed that the spine would serve as a point of reference for ease of orientation. As the spine passed between two extremely large courtyards, it formed what Kahn called a "connector," the kind of space Kahn referred to as the "Architecture of Connection."  

Included in the first presentation was a set of schematic drawings made with colored pencil on translucent sketch paper. Kahn intended for these drawings to show how the bay, a basic architectural unit, could be varied in use for the Kimbell Art Museum. Thus he showed the closed bay, the open bay, the bay interrupted by a light court, and the portico,  

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10 Wurman, op. cit.
consisting of the bay open on all sides.  

**Structure**

The structure intended by Kahn for the museum building at this stage consisted of a great many columns supporting the tilted plate roof. The question arises: Why did Kahn use such a simple structure on his first model and such a daring, innovative structure on his final design? The reason given by Marshall Meyers, Project Architect, is that Kahn himself did not have a sophisticated knowledge of engineering. He would not produce a design requiring a type of construction he did not know how to build. Later, through consultation and study, Kahn became familiar with the structural system that he used in the finished building.  

It is evident in the first model that the concept of lighting the galleries through a light slit in the roof was central in Kahn's mind from the beginning. Note that even the porticoes had skylights. The schematic drawings indicate that Kahn was toying with the idea of using some sort of fixture to manipulate the light coming through the slit, although at this stage, he apparently had no shape in mind. The section he drew for the museum interior simply shows a rough scribble beneath the opening in the ceiling.  

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11 Statement by Meyers, February 10, 1975. These sketches, never published, are part of Kahn's estate. Slides of them are owned by Marshall Meyers.

12 Ibid.

13 See drawings, p. 59.
model has several of the features which Kahn said he admired in the Kroller-Muller Museum in Otterlo, the Netherlands. It is a one-story building in a park setting. It has an inward orientation. A great deal of natural light would have entered through skylights and courts.

The first presentation was called by Kahn the induction stage of the design formula. In fact, this first design provides an excellent example of what Kahn meant by induction stage. The basic architectural elements that he was to retain in the final design were present. However, the specific and measurable factors such as size, scale, materials, and details had not been formulated.

Revisions Requested by the Client

Size.--The Kimbell Board of Trustees and the Director, Richard Brown, were quite alarmed at the size of the building on the site model. At six hundred feet on a side, the museum would have covered nearly three hundred sixty thousand square feet, an area three times the size prescribed by the "Pre-Architectural Program."

Cost.--Further, it was immediately apparent that if the high standard of workmanship and materials were used as required by the program, the enormous size of the proposed museum would have pushed the cost far beyond the budget.

Scale.--Richard Brown wanted the museum to have a villa-like rather than a palatial scale. He objected to the

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height of the ceiling shown in the drawings to measure thirty feet at the crown. The "Pre-Architectural Program" had required that the ceiling be no higher than twelve feet.

Skylights.—Although Brown had ruled out skylights as an acceptable light source in the "Pre-Architectural Program," there were approximately six thousand, six hundred linear feet of skylights in the first model. Brown's statement had been unequivocal:

Skylights are not the answer; the visitor cannot look out them, the changing natural effects do not come through them effectively; they cause insufferable design problems; require huge wasteful attic and clerestory spaces; and they always leak no matter what is spent on their maintenance. 15

Clearly the skylights proposed by Kahn for the Kimbell Art Museum were not the kind described above in the program. However, with this kind of predisposition against the device, it was not likely that Brown would immediately embrace this lighting solution. 16

Kahn's concerns in the early design stage of the Kimbell Art Museum were different from those of his client. Kahn's interest was in the quality, not the quantity of museum spaces. He did not want to hear that the building was too large or too expensive because to him it did not have

15Ibid.
16Statement by Bowen King. King, who was present at this meeting, remembers Brown's resistance to the skylights. In his words, "Brown said there was not way we were going to have skylights."
dimensions or cost; it was "unmeasurable." 17

The Second Design Presentation

On November 30, 1967, the second design for the Kimbell Art Museum was presented to the Board of Trustees, the museum director, Richard Brown, the museum business manager, Bowen King, the Associate Architect, Preston Geren, and the President of Thos. S. Byrne & Co., general contractors, A. T. Seymour. 18 Following the first design presentation, Kahn had made a number of important design revisions. Below is a discussion of these developments with respect to plan, structure, lighting, and materials.

Plan

In explaining his design procedure, Kahn had said, "I search for forces which would disprove the square." 19 The forces which changed the Kimbell square plan into the H-shaped plan were 1) the client's objection to the overall size of the building, and 2) the location of trees on the site. Kahn recomposed the design by removing the three bays on both the north and south facades of the building which had served as walls enclosing the two extremely large courts

17 See Kahn's design philosophy, p. 22 above.


19 See p. 30 above.
flanking the connector. Now the space which had been contained within the museum in the form of open courts flowed into the surrounding park grounds. The revised plan, now in the shape of an H, was called the "dumbell plan" by Kahn's office staff.20 This new plan was composed of three parts: 1) a rectangular, two-story section which was to house the permanent collection above and the museum staff offices below; 2) a narrow two-story connector which was to have a book store above and an open pavilion below; and 3) a smaller one-story rectangular section which was to house both an auditorium and a temporary exhibition space.21

The amount of space devoted to light courts was greatly reduced. In addition to deleting the large open courts which had flanked the connector, Kahn reduced the number of small courts, ten of which had been variously arranged in the remaining museum spaces. In the new plan, the wing containing the auditorium and temporary exhibition area was to have no courts, while the wing housing the permanent collection was to have eight light courts, or "light wells," as Kahn called them,22 of varying dimensions, shapes, and depths.

20 Meyers, Letter to Becky Connally.
21 Plagens, op. cit., p. 20.
Fig. 4--Model for second design presentation, plan view
At the same time that Kahn recomposed the plan of the museum, he reduced the size further by shortening the bays so that the building represented by the second design presentation model only covered a little over half the site. Kahn’s landscaping scheme at this stage included only pools and terraces. There is no indication of planted shrubs and trees. Particularly noticeable is the enormous reflecting pool at the southwest corner of the building. This feature would have given the west entrance a dramatic, asymmetrical approach (See Figure 5, p. 57).

It is interesting to note what features of site development are missing from this model. The building is entirely isolated. No indication has been made of pedestrian walks, driveways, truck delivery entrance, or parking lots.

Richard Brown’s objection to the scale of the first presentation led to a number of changes in the roof design. The ceiling height indicated by Kahn on some of the accompanying drawings for the first design presentation had been twenty-four feet. Brown wanted the ceiling lower. To comply with this request, Kahn investigated kinds of curves which, while suitable for a vaulted roof, were shallow enough to produce a lower ceiling. It was the search for such a curve that led to a change in the structural system.

Fig. 5--Model for second design presentation, oblique view
Assisting Kahn in this research was Marshall Meyers, project architect. Meyers showed Kahn a book entitled *Surface Structures in Building* by Fred Angerer. The surface structures of interest to them were barrel shells. A barrel shell is a concrete structure which is posttensioned and poured in place, that is, not precast. Unlike a vault, which functions as a series of arches, a shell functions as a beam and as such is capable of spanning great distances. The curved section of a barrel shell may be made of several shapes, among them a semi-circle, a sector of a circle, an ellipse, and a cycloid (See Figure 6, p. 59).

Kahn found what he wanted and more. While the shallow shape of a cycloid curve effectively lowered the ceiling, the barrel shell type of construction drastically reduced the number of columns needed for support. Problems were anticipated in trying to substitute the cycloid barrel shell into the building design. To provide the skylighting, the shell would have to be pierced at its apex, the point where it needed the most strength. To complicate matters further, a low, flat ceiling eight feet wide was to be used between the shells to provide a place for ducts and wiring, a servant space in Kahn's terminology. Because a flat ceiling does not have the structural strength to span long distances, it would have to be held up by the cycloid shell.

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Fig. 6--Model and cross-section of cycloid for second design presentation.
Unsure of whether the cycloid shell could be engineered to meet these constraints, Kahn called as a consultant his friend, August Komendant, a renowned expert on concrete construction. Komendant, who had been the engineer for a number of Kahn's other buildings, was busy with the construction of Habitat, the innovative Canadian apartment complex. Upon receiving Komendant's assurance that he could engineer the cycloid shell with a few structural changes, Kahn proceeded to incorporate this dramatic structural form into the design of the museum (See Figure 7, p. 61).

The decision to use the cycloid shell not only produced a lower ceiling with minimal support, but additional benefits which were perhaps more subtle. The cycloid shell supported by four columns forms an architectural unit or module which not only allowed, through repetition, the creation of the museum building, but also serves as a visual explanation of the building's structure. The portico reveals in its purest state the principle embodied by the cycloid shell. Thus Kahn's statement: "A module is not the repetition of a motif, but the expression of an architectural principle.\(^{26}\)

Kahn foresaw another opportunity inherent in the use of shell. He could emphasize the fact that it was not supported along its edges. By placing glass strips between the unsupported edges of the shell and the infill walls below, Kahn

\(^{26}\) Kahn, *Light is the Theme*, p. 70.
Fig. 7—Mathematical generation of cycloid curve and cross-section of cycloid barrell shell.
enhanced the dramatic impact of the architectural principle upon which the structure of the building depended.

**Lighting**

By the time of the second design presentation, Kahn had well-developed objectives for the use of light in the Kimbell Art Museum. Accordingly, he designed the architectural features which he believed would materialize his objectives. The following is a discussion of these architectural features.

**Light Courts.**—Kahn knew that all light coming from the courts would be reflected light because each court was to be of such size and shape in relation to the angle of the sun at all times of the day that no direct light rays could enter the museum. He believed that the courts would create islands of soft green light as a welcome rest to the eyes of the visitor. Kahn planned to add further interest to the design of the courts by varying the use of solid and glass enclosing walls, but did not make specific decisions about interior walls of the museum until the construction phase.

**Light Reflector-Diffuser.**—For the first design presentation, Kahn had given only a scribbled indication of some kind of device to be hung underneath the light slit in the roof. Before the second presentation was produced, Kahn and Meyers drew several possible shapes for the fixture. The study chosen for the actual presentation was one suggested

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27 An examination of the floor plans of the final preliminary design verifies this point.
by Meyers (See Figure 8, p. 64). The two-foot-wide slit in the roof would have been covered with a type of transparent plastic that screens out ultraviolet rays, the portion of the light spectrum most harmful to paintings. Beneath the plastic filter would have been a fixture composed of convex one-way glass mirrored on its top surface. The observer would have seen a silvery band which was transparent enough to allow a glimpse of passing clouds. The light entering through the slit would have reflected off the surface of the shell and diffused down the walls. Suspended from the fixture would have been an artificial lighting device equipped with a photosensitive mechanism to add illumination on cloudy days and to light the museum for night activities.

Summary

A visitor approaching the museum from the west would have passed by an extremely large reflecting pool on his right and a small rectangular one on his left as he entered a portico stretching the entire width of the building. Once inside the museum, the visitor would have seen the auditorium on his left and the temporary exhibition area on his right. Ahead of him would have been the spine leading to the connector. Inside the connector, on gallery level would have been a bookstore; on the level below, an open pavillion leading

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29 Plagens, op. cit., p. 23.
Fig. 8--Cross-section studies for light reflector-diffuser
to the sculpture gardens flanking the connector.

Continuing through the connector, the visitor would have entered the two-story part of the museum. On his own level, he would have seen the main gallery, the exhibition area for the permanent collection. Below him would have been the staff offices, research facilities, laboratories, shipping dock, storage areas, and mechanical equipment. This arrangement of the floor plan complied with Richard Brown's desire for a distinct separation of public, service, and operations activities.

Revisions Requested by the Client

The second design presentation was reviewed by Director Richard Brown, Associate Architect Preston Geren, Contractor A. T. Seymour, Business Manager Bowen King, and the Board of Trustees. The proposed building, still larger than the "Pre-Architectural Program" called for, was met with new criticisms.

Composition.--The dumbell composition of the new plan was viewed with apprehension. Especially troublesome was the connector, which was seen as "being like a street that led nowhere." In addition, Brown felt that the connector was too narrow to house an adequate bookstore.

Chauffeured Entrance.--Brown had requested a protected

30 A. T. Seymour, "K.A.M. Early Correspondence.
entrance to the building for visiting dignitaries (See Appendix B). Such a feature had not been provided. The director was especially concerned about the arrival of visitors during poor weather conditions. By Meyers' account, Kahn hated cars and "wanted to keep them as far away from his buildings as possible." Kahn strongly opposed modifying or "sacrificing his design to accommodate any sort of vehicle. The solution Kahn favored to what became known as the "car problem" was the use of a series of canopies to the garden entrance on the west side of the museum for special occasions. 32

**Truck Entrance.**--For security reasons, protected access to the museum by delivery trucks was a real necessity. The kind of facility Brown wanted for this purpose had been detailed in the "Pre-Architectural Program" (See Appendix B). However, with porticoes running the entire length of both the front and back of the proposed building, there seemed to be no immediate means of incorporating these important features into the design.

**Reflecting Pool.**--The enormous pool, equal to nearly one-fourth the area of the museum, was a feature which was not well accepted by those who reviewed the design. The size and shape of this pool was criticized as being unrelated

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to the composition of the proposed building.\textsuperscript{33}

All of the objections taken together, the size, the composition, the connector, the oversize pool, and the car problem, caused Kahn to go through a major re-evaluation of the museum design. This period was a retreat to the induction stage in which he again asked himself the question, "What is the basic in museum design?" Komendant said that the answer Kahn found was "silence and the quality of light."\textsuperscript{34}

The Final Preliminary Design Presentation

By the time Kahn had developed a new design for another presentation, a total of two and a half years had lapsed since the architectural contract was signed. The time allotments in this contract had clearly not been met. The Board of Trustees were preparing to sue the architects because, during the delay, prices of materials and labor had increased twelve per cent.\textsuperscript{35} To avoid suit, the architects and the contractor, Thos. S. Byrne & Co., agreed to begin construction with only preliminary drawings and a working model.\textsuperscript{36} Working drawings would have to be produced a step ahead of construction.

\textsuperscript{33}Statement by Meyers, February 10, 1975.

\textsuperscript{34}Komendant, op. cit., p. 118.

\textsuperscript{35}Ibid.

\textsuperscript{36}Ibid.
Plan

In early 1969, Richard Brown went to Philadelphia to discuss with Kahn more problems he saw with the floor plan. He was dissatisfied with the location of the auditorium and the temporary exhibition gallery. The connector and the car problem still worried him. During this meeting, the plan was reorganized into a U-shaped composition, essentially the plan of the finished building.\(^{37}\) The new design was translated into the construction model and final preliminary drawings, dated June, 1969.

The construction model looks deceptively like the finished museum (See Figure 9, p. 69). On closer examination, however, there are a number of differences worth noting.

Reversal.--The auditorium and the largest court were in the south wing of the museum, just the reverse of the final design (See Figure 10, p. 70).

Size.--The north and south wings were each composed of seven cycloids, including the porticoes, as opposed to six in the completed museum. The length of the shells represented would have been one hundred fifty feet rather than one hundred, making the total length one hundred fifty feet greater than the existing museum.\(^{38}\) The auditorium and the main

\(^{37}\)Meyers, Lecture.

Fig. 10—Model for final preliminary design presentation, oblique view
light court were so large that each occupied two shells rather than one (See section of north elevation, Figure 11, p. 72). Four light courts rather than two pierced the opposite wing.

Stairs.--Public access to the lower east entrance from the main lobby was by means of a single stairway on the north side of the lobby. Where a large double stair is in the present lobby would have been a raised platform of irregular shape.

Lower Level.--Space use on the lower floor was still uncommitted at the time of groundbreaking. All that was known was that one wing would house shops, the other offices. The preliminary plans of this floor bear no relationship to the final design, and no basement level was planned at the time. Had the museum been built by these plans, ductwork and mechanical equipment would have been buried underground. Servicing these facilities would have been prohibitive.

Access.--Kahn's solution to the car problem does appear on the construction model. An east entrance adjacent to public parking and covered by the second floor was provided for the unloading of arriving passengers. Still notably missing from the final model, however, was a security-tight service entrance for delivery trucks.

Site Plan.--Placing the museum building on the far east end of the site saved more existing trees than had any previous model. Especially satisfying is the preservation of

39 Statement by King.
the spacious meadow and the entire double row of live oaks which had lined Will Rogers Road East, the street that was closed by the city when the site was established.

New planting would have been formal, even geometric in layout. A maze-like arrangement of shrubbery was proposed for the west boundary. Terracing at the west entrance would have been interrupted by three rectangular pools, two reflecting the porticoes and one dominating the central court. A planned acquisition, the sculpture of \textit{L'Air} by Aristide Maillol was represented on the model as the focal point of the entrance court. The remaining three sides of the museum were to be enclosed by parking area, no distinction having been made between public and staff lots.

\textbf{Summary}.--The visitor arriving at the museum by car could park either on the west or southeast side of the building. If he entered the protected east entrance, he would have access to the gallery floor by a single flight of stairs on his left. On the other hand, if the visitor chose to walk to the main west entrance, he would find himself on a symmetrical terraced forecourt flanked by the portico pools. Ahead of him would have been the central court with \textit{L'Air} by Maillol. Upon entering through the main doors into the lobby, he would have seen an extremely large light court on his right in the South Galleries and four small courts on his left in the North Galleries.

The final preliminary design presentation was in Kahn's
terminology in the deduction stage of design. The architect had eliminated such distracting elements as the connector and the large pool and had revised the composition of the plan. In Kahn's terms, he "got the water out;" that is, the design had been refined to its essential elements.

Materials

Following standard procedure, Kahn wrote a set of outline specifications to accompany the final preliminary model and plans. Kahn's use of materials is a basic part of his architectural philosophy. Several points should be made about his choice and handling of materials.

Kahn used very few materials in the Kimbell Art Museum. This fact is more significant than it may seem. The harmony and serenity, the lack of confusion, the peacefulness, the wholeness of the museum can be partially attributed to this limitation. Only four major materials are seen on the exterior: concrete, travertine, glass, and lead; only five on the interior: concrete, travertine, glass, wood, and steel.

All of the materials specified by Kahn are linked by common aesthetic characteristics. All are nearly neutral in hue and in intensity; they share a medium value range, are matte in finish, and smooth in texture. Concrete, travertine, wood, and mill-finish stainless steel each have subtle surface variations. Because the material share so many

Meyers, Lecture.
characteristics, they blend harmoniously with one another to produce a quiet, yet gracious environment.

Kahn considered the materials he used in the museum to be natural in spite of the fact that concrete, steel, and glass are obviously manufactured. His primary concern was apparently not the source of a material but its treatment. For example, he said that he used mill-finish stainless steel because "in nature there are no polished materials."\(^1\) By the same rationale, Kahn spoke of concrete as a natural material because he used it as poured without sanding or painting.

Kahn believed that a building should be put together in such a way as to reveal its structure to the observer. One of the techniques he used to accomplish this goal was to correlate appropriate materials with discrete architectural functions. Specifically, in the Kimbell Art Museum, concrete is used only for structural members; glass and travertine for enclosure; steel for mechanical equipment and fixtures. The finished building can be read by the observer in terms of structural and non-structural elements (See Figure 12, p. 76).

Concrete.--Because the structural nature of the cycloid barrel shell requires that it be cast in a form, the only material of which it could be made is concrete. This type of concrete structure can not be precast and lifted into

\(^1\) Kahn, "The Wonder of the Natural Thing," See Appendix D, p. 16C.
Fig. 12--South Facade, detail: end of cycloid
position, but must be cast in place. It should be noted that cast-in-place concrete is generally considered to be inferior to precast concrete in appearance.

Exposed cast-in-place concrete, unless strictly specified as architectural concrete and constantly supervised during casting, usually results in ordinary concrete, and is definitely not recommended if first-class surfaces are desired.42

The difficulty with cast-in-place concrete is that the operation of mixing, pouring, and curing cannot be carefully controlled because it must be done out-of-doors. Furthermore, mistakes and defects cannot easily be discarded since the piece is cast as part of the finished structure. All the imperfections show. However, it is precisely the quality of cast-in-place concrete with all its roughness that Kahn wanted for the Kimbell Art Museum. He believed that it was the chance variations that occur in casting that gives concrete the character of a natural material.

Where travertine and concrete belong beautifully together because concrete must be taken for whatever irregularities or accidents in the pouring that reveals itself.43

The aesthetic of form imprinted concrete was not Kahn's idea. He had been deeply impressed by the use of this technique in the Marsailles Bock, the apartment building in Marsailles, France, by Charles Edouard Jeanneret, known as

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42"Concrete: Where do we go from here? Cast-in-Place vs Precast," Progressive Architecture, XLVII (October, 1966), 186. The authority quoted is Raymond Epstein.

43Kahn, "The Wonder of the Natural Thing." See Appendix D, p. 162.
Le Corbusier (1887-1965). This Swiss-born architect had pioneered the use of unsanded concrete and had exploited the design texture of wood form. Whereas architects had previously specified that concrete be sanded and filled to remove evidence of the wood form, Le Corbusier had chosen to design forms composed of boards arranged in a pattern that was emphasized rather than eradicated by the finishing process. This treatment of concrete used by Kahn and Le Corbusier contrasted sharply with the smoothly sanded, plastered and painted surfaces of the Solomon R. Guggenheim Museum in New York, 1946-59, designed by American architect Frank Lloyd Wright (1869-1959).

The treatment of the concrete at the Kimbell Art Museum is Kahn's refinement of Le Corbusier's technique. The effect Kahn achieved was honest, but it should not be considered effortless or without manipulation. The architect chose precisely the features he wanted to appear on the surface of the concrete, then proceeded to design the kind of formwork that would produce this effect. Because he want a generally smooth surface, he specified plywood rather than boards for the form. Because he wanted a crisp, linear motif of rectangles, he had the edges of the plywood sheets beveled to produce the fins which outline each rectangle. For further pattern, he made use of the form ties. "Form ties are to be recessed cone type snap or screw ties regularly spaced, left
partially filled." Nor was the color of the concrete a chance feature. It was selected from a great number of samples which were mixed and cured on the site. Thus, the highly articulate effect of the finished concrete surface of the Kimbell Art Museum was achieved by very careful planning.

Similar, but not identical concrete surfaces were designed by Kahn for Salk Research Institute, Las Jolla, California; the Exeter Library, Exeter, New Hampshire; and the Erdman Domitory Complex at Bryn Mawr College, Bryn Mawr, Pennsylvania.

Travertine.—Travertine from Bagni di Tivoli, Italy, was specified for the infill areas of the museum; that is, the non-loadbearing walls which were not to be glass. Kahn chose this material for its natural irregularities, its quiet color, and its harmony with concrete. Kahn had previously used travertine with concrete at the Salk Center at La Jolla, California. He had developed a preference for

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45 In "The Wonder of the Natural Thing," a recorded interview of Kahn by Marshall Meyers, Kahn explained how his original decision to combine concrete with travertine was made. The architect had first specified slate for the Salk Research Institute because he thought a strong contrast "would make things brilliant." However, due to unexpected changes in shipping arrangements, travertine arrived at La Jolla from Italy at a much cheaper price than slate. After considering the effect on his design produced by a low contrast combination of materials, Kahn decided to accept the travertine. When the Salk Institute was finished, Kahn was quite pleased with the results. He noted that "as a new building, it already had the harmony of something that was aged."
subtle combinations of materials during his travels in Europe, where he had been deeply impressed by the quality of the architectural ruins. To him, the blending of visually sympathetic materials gives a building the same sense of quietness and harmony that centuries of weathering has bestowed upon ancient architecture.

For the interior of the Kimbell Art Museum, travertine was specified as a facing material on the stairs and their enclosing walls as well as on the sections of the floor that were like to receive heavy traffic. Kahn's reasons for using travertine on the interior of the museum included further considerations. As a flooring material, travertine was non-slippery as well as extremely durable. As a wall surface, it was of just the right value for the lighting effect the architect was trying to achieve. A darker material would have reflected too little light for adequate illumination of the galleries; a lighter materials would have created a background which would have been too bright a surface against which to exhibit paintings.

Lead.—Like Kahn, Richard Brown had seen features in European architecture with which he felt very sympathetic. Lead as a roofing material was one of these. Used on the domes of many churches, it had the virtue of lying smoothly on a curved surface. The dark, matte finish was another

point in its favor, since the extreme glare of Texas sunlight had to be considered. Kahn, too, was enthusiastic about the use of lead for the museum roof as he had seen it in cities on the east coast. His preliminary specifications called for lead-coated copper, as this was the most frequently used form of lead for roofing.  

Lead was also specified for plugging the form tie holes in the concrete walls. If left unfilled, the tie metal would tend to rust and streak the concrete surface.

**Oak.**--Oil-finished, quarter-sawn, clear select white oak was specified for the cabinet work, millwork, and panelwork. Oak is the only exposed wood in the museum. Similar in value to travertine, white oak is also highly durable, low-key, and beautifully grained. Kahn said that sunlight reflected off the oak would be honey-colored in contrast to the silver light from the light reflector-diffuser and the green light from the courts.

**Steel.**--Mill-finish, or unpolished, stainless steel was to be used for the soffits of the low ceilings in the galleries, for doors, mullions, elevators, for the stair rail, and for air intake and outlet devices. Considerably darker and

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48Ibid, p. 3.
49Meyers, Lecture.
50Kahn, "Outline Specifications," p. 3.
duller than polished stainless steel, the mill-finish surface was chosen for its low-key presence. Kahn explained:

Why do we want stainless steel not to be polished? We don't like it polished because you don't want to see yourself in the material...and it simply isolates and becomes ostentatious in itself. And, therefore, the sense of its unity, the sense of the blending, so that you can read the walls for their length and their height and their thickness is all gone because there's one (material) that the eye is attracted to more and you do not feel the unity of materials.51

Transparent Materials.--In the final preliminary design, the light reflector-diffuser was to be made of acrylic plastic, mirrored on one side. The roof slits were to be covered with sheets of acrylic containing a filter to screen out the ultraviolet rays of the sun. Glass doors and walls were to be glazed with two layers of glass separated by an air space.52

Though not a part of the specifications, water is an important material on the west entrance facade. Seen over the dark brown marble aggregate that lines the portico pools, the effect of the water as a design element is that of a curving form which repeats the color value of the roof. Its shimmering surface provides a textural contrast to the surrounding pavement.

Other Materials.--The lower-level office area, unlike the galleries, was ordinary in both design concept and


52 Kahn, "Outline Specifications," p. 4.
materials. This area was to have plaster and lath wall parti-
tions and carpeted floors. Other materials included in the
preliminary specifications were ceramic tiles in the bath-
rooms, granite on the curbs, gravel paving for the entrance
walks.

Summary.--All materials specified by Kahn for the Kim-
bell Art Museum were linked by common characteristics: nearly
neutral in hue and intensity, within a medium value range,
matté in finish, and smooth in texture. There are signifi-
antly few in number and each is used over large enough areas
to create a serene environment. The relationship between
material and architectural function is kept consistent,
allowing the observer to be able to read the building's
structure.

Last Design Revision Before Construction

On June 25, 1969, three days before groundbreaking,
Kahn sent to Velma Kimbell a letter describing his land-
scaping ideas (See Appendix E ). The sketch accompanying
this letter shows the building much as it is today, the
length of each cycloid shortened to one hundred feet, the
number of cycloids reduced by one each wing, the north park-
ing lot and truck entrance established, and the terracing
planned for the south garden (See Figure 13, p. 84).

Shielded from view from bordering streets by new plant-

Mrs. Kimbell - I hope this sketch will keep you visualizing at least the main elements of the garden setting.

K.A.M.

Fig. 13--Sketch of site plan from Kahn's letter to Mrs. Kimbell
ing, the public and staff parking lots were to be on separate levels. A service entrance for trucks was at last provided from the lower staff parking area into the north wing of the museum. Unlike the final scheme, both parking lots were to be entered from Camp Bowie Boulevard.

The south garden as sketched was a natural grass theatre bordered by planted terracing. Kahn imagined this space being used for musical and theatrical performances, and, when not in use for these purposes, as a sculpture garden. It was the kind of area he often referred to as an unprogrammed space that is, it was flexible and available.

The concept of the west entrance differs from that of the final design. As Kahn explained in his letter to Velma Kimbell, there was to be a central court with a fountain which would serve as the source for the portico pools.

This sketch and dated letter give a clear indication of the incomplete state of the architectural design at the time construction began. It was not just a question of there not being detailed working drawings for the contractor, but of basic elements on the lower floor plans being in a state of flux.

Design Révisions During Construction

To make it possible for the design of the Kimbell Art Museum to be completed while the building was under construction, certain arrangements had to be made. First, a re-structuring of contractual relationships had to be
formulated. Second, the contractor, A. T. Seymour had to improvise means of beginning construction without completed plans.

Legal Arrangements

Because the Board of Trustees of the Kimbell Art Foundation were pressing suit against the architects, the partnership between Kahn as Architect and Geren as Associate was dissolved. New and separate contracts were written to establish a separate responsibility of each architect to the owner.\(^{54}\)

The original "Agreement," the architectural contract, had provided that Geren be the engineer for the entire project. However, with the introduction of the cycloid shell, it had become apparent that the expertise of August Komendant, with whom Kahn had consulted on his own, would be required to complete the project. In fact, Kahn had given Komendant the impression that he would be the engineer for the museum. To resolve the misunderstanding that ensued, a new contract was written on July 29, 1969, after construction began. It provided that Komendant would engineer the gallery level floor and the cycloid shell system while Geren would be responsible for the foundations and the basement floor.\(^{55}\) These new

\(^{54}\) Statement by King.

\(^{55}\) Komendant, op. cit., pp. 120-22.
contracts lessened the strain on the individuals involved and made further progress possible.

The construction contract was let on May 4, 1969, to Thos, S. Byrne, Inc., a firm of engineers and general contractors of excellent reputation. Previous to this date, a significant amount of preparatory work had been done by A. T. Seymour, President of Thos. S. Byrne, Inc. On February 7, 1968, Seymour had attended an informal meeting of the Board of Trustees to participate in a review of the preliminary design. Present also at this meeting were Richard Brown and Bowen King. The materials of which the building was to be made were discussed. Following this meeting, A. T. Seymour investigated the supply and prices of these materials. He prepared an analysis of the anticipated shortage of labor and materials caused by the concurrent construction of the Dallas/Fort Worth Airport. On April 7, 1969, Seymour submitted to the Kimbell Art Foundation a proposal for a guaranteed maximum cost of $6,055,500 with an estimation of twenty-one months construction time.

Procedures Developed by the Contractor

A. T. Seymour, President of Thos. S. Byrne, Inc., made

56 A. T. Seymour, "K.A.M. Early Correspondence."


58Ibid.
significant contributions to the success of the construction phase of the Kimbell Art Museum by planning the schedule of excavation and construction so as to accomplish the extraordinary feat at the beginning construction without final working drawings. He also was responsible for developing new construction techniques which made possible the innovative architectural forms designed by Kahn and engineered by Komendant.

During the summer of 1969, the contractor excavated only that section of the site where the building foundations were to be poured. The higher, unexcavated portions of the site provided access to the roof for both men and machinery. Then in 1971 the part of the site devoted to parking areas and landscaping was excavated.

Seymour used a similar phased program of purchasing materials. Because he had a guaranteed maximum cost contract, he was able to buy materials without taking bids, thus allowing him to phase purchases to correlate with each design component as drawings were completed.

The development and fabrication of special construction equipment was an important contribution of Thos. S. Byrne, Inc. Project superintendent Virgil Earp and cycloid superintendent L. G. Shaw of the Byrne construction company developed the unique wood forms that were used for making the cycloid.

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barrel shells. Because the structural nature of the cycloid shells made it necessary for them to be cast in place, the wood forms were made in such a way that they could be jacked down and rolled to another position after each operation of pouring and setting the concrete shell.

Before constructing a full-length cycloid as an integral part of the museum, the contractor had his crew build a twelve-foot-long full scale mock-up of a cycloid shell as a test for the materials and techniques planned.

Features of Design

Velma Kimbell turned the first spade of earth on the site of the Kimbell Art Museum at the groundbreaking ceremony held on June 27, 1969. The remarkable process by which the museum came into being is captured in Richard Brown's statement about how Kahn operated during construction, "Even as concrete and steel and stone and glass go up, reprogramming goes on." and Bowen King's comment: "Decisions were made with him out there drawing in the sand. . ."

The following discussion of the design revisions made during the construction period covers the plan, the structure,

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60 Ibid.  
62 See page 31 above.  
63 Statement by King.
the architectural details, the light reflector-diffuser, the fixtures, the materials and the landscape design.

Plan, Gallery Level.--Most of the designing of the interior floor plan took place during the construction phase. At Richard Brown's suggestion, the preliminary plan was flipped over so that the auditorium and the large court occupied the north rather than the south wing. The number of courts in the north, now south wing was reduced from four to two, although only one court is visible in the south gallery since the two-story conservation court is surrounded by solid walls at this level. The auditorium and the large light court each of which had occupied two cycloids in the final preliminary design were revised to fill only one cycloid bay (See Figure 14, p. 90).

For the interior of the galleries, Kahn designed moveable partitions which could be installed by means of specially designed connector buttons. These partitions could be fastened either parallel or perpendicular to the cycloid shell in a variety of locations. The size and proportions of the panels were made optional by the use of modular parts which could be assembled in the carpentry shop and covered with either fabric or wood (See Figure 19). Kahn said of the partitioned spaces, "there'll be houses within the house."66


Like the final preliminary design, the final revised design featured two entrances to the galleries, the main entrance on the west and the protected drive-up entrance on the east. However, rather than a single off-center stair connecting the east door to the gallery level, the new plan was given symmetry with a dramatic double stairway placed so that its axis lay exactly beneath the soffit between the two cycloids of the lobby. Opposite the west entrance was placed the bookshop area against the background of storage closets which enclose the library.

The "Pre-Architectural Program" called for the location of the library in the operations division of the museum, that is, near the curatorial offices; but space in this area was simply not available. The library was therefore placed in the east central cycloid. The library plan underwent careful scrutiny by librarian Ilse Rothrock, who was hired early by Richard Brown so that she could assist the architects in the design of the floor plan and the selection of library furnishings. Kahn's original plan for the library was symmetrical with a central door leading to a reading area flanked by stacks and offices on both sides.

The mezzanine would have been split into two sections each accessible by iron spiral stairs. Ilse Rothrock opposed this scheme because a split mezzanine would have made it

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67 Statement by Ilse Rothrock, Librarian, Kimbell Art Museum, Fort Worth, May 14, 1975. All the material presented about the library was learned during this interview.
difficult to locate books while the spiral stair would have made the mezzanine inaccessible to elderly visiting scholars. Furthermore, carrying heavy books up the iron stairs for shelving would have been difficult.

The librarian recommended instead a continuous mezzanine accessible by a centrally located stair which is augmented by a booklift. Further suggestions included the allocation of space to a slide room, the location of glass doors and walls for surveillance, and the specifications of furnishings, built-ins and shelving. These recommendations were accepted by Kahn and used in the final design.

If the museum were empty there would be no way to know that the cycloid adjacent to the auditorium was a cafe. A good example of one of Kahn's unprogrammed spaces, it could be readily made into an exhibition area. For catered activities, the kitchen, at the far north end, is well located next to the service elevator which originates from the truck entry dock to the floor below.

Plan, Operations Level.--The interior spaces on the operations level were not allocated to specific functions when construction began. All that was known, according to business manager Bowen King, was that the shops would be in one wing and the offices in another. However, once it was established that the truck entry and loading dock were to be in the north wing, it was inevitable that such activities as shipping and receiving, security, the preparations labora-
Fig. 15--Plan, Operations Level

shipping and receiving, shops

east entrance lobby, mechanical

offices, laboratories
tory, and the carpentry shop would be clustered as they are around the dock area (See Figure 15, p. 94).

The remaining non-public activities to be on the operations level were related to the curatorial, educational, and administrative functions of the museum. The facilities for these activities were allocated to the south wing. This area was conceived as a central core of offices ringed by a perimeter of offices and laboratories. The laboratory facilities for conservation and photography were conveniently placed near the storage vault. The allotment of only one cycloid to storage reflects a general policy established by the director that the Kimbell Art Museum would not indulge in the practice of accepting large bequests of mediocre art in order to attain one or two fine pieces of a quality suitable for display in the galleries. Therefore, minimal vault storage was needed as most of the art owned by the museum would be on exhibit in the galleries.

Suitably located adjacent to the storage vault is the conservation laboratory for which Kahn designed a two-story light well to provide natural light for the examination and in-painting of works of art. The lobby at the east entrance functions variously as a gallery, a security checkpoint, information area, and entrance to the main stairs. Behind the stairs and beneath the library and bookstore is a mechanical plant.

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68 Shepard, *op. cit.*, p. 27.
Plan, Service Level.--At the time construction began, there was to be no basement; mechanical equipment would be buried. However, these plans were changed at the suggestions of E. B. Brown, who was hired as building manager of the Kimbell Art Museum during the planning phase so that the museum could benefit from his experience in a similar position at the Amon Carter Museum of Western Art. E. B. Brown recommended that the excavation provide enough space for a true basement with standing room in most areas. The significance of this change for the museum as a whole was that spaces otherwise allotted to mechanical equipment were freed on the gallery and operations level for other uses more appropriate to their location.

Structure, Gallery Level.--Because new contracts had been written before construction began, August Komendant was legally responsible for the engineering design of the cycloid system and the gallery floor while Preston Geren was to work out the structure of the operations and basement levels. Komendant's revision of Kahn's design of the cycloid shell system amounted to structural corrections, not engineering design. Kahn had produced a preliminary design which contained all of the basic elements of the cycloid shell system.

69 Statement by E. B. Brown.
70 Ibid.
Komendant's contributions were primarily the posttensioning of the shells and adjusting of dimensions of the shells and soffits and the structural calculations for the gallery and mezzanine floors.

Komendant produced drawings which specified the size and placement of the steel posttensioning tendons in the concrete shell cycloid roof. Slack tendons were to be placed in the hollow formwork before pouring the concrete. When the concrete was dry, the tendons could be tightened to counteract certain stresses that the shell could not withstand without them.71

To provide the required structural integrity, Komendant varied the crosssection of the curved beam under each end of the cycloid. Because the thickness of the curved beam varies, its lower edge no longer forms a perfect cycloid curve. However, the top edge of the travertine wall under this curved beam was by Kahn's design a perfect cycloid curve. Therefore, the lunette-shaped gap formed between the wall and the curved beam varies in width. This lunette, filled with glass, varies from nine inches to four inches.72 This engineering revision by Komendant produced an important design detail, a feature of subtle elegance.

The concrete slabs forming the floors of the mezzanine and galleries were designed by Kahn and engineered by

72 Ibid, p. 122.
Komendant to have a totally new type of construction: styrofoam blocks imbedded in the slab to displace 724.5 tons of concrete. Kahn's purpose was aesthetic. He wanted to see a smooth, unbroken ceiling from the floor below. To Kahn this smooth ceiling was an important design feature which would contribute to the serenity of the museum.

Ordinarily, if an architect wanted a smooth ceiling he would specify a waffle slab from which would be suspended a smooth, non-structural ceiling such as acoustical tile. Kahn, feeling that this type of construction is dishonest, designed a ceiling that might be called a hidden waffle slab. It was smooth on the top and bottom with large styrofoam blocks imbedded within it. Thus, it was not a dishonest structure, but it was contrived (See Figure 16, p. 99).

There were several advantages, other than aesthetic, to the use of styrofoam blocks in the concrete floor's slab. A lighter-weight floor relieved the areas below it of many columns. Thus, there was increased floor space, less visual clutter, and reduced cost in both the library and the entire operations level. Furthermore, the styrofoam served as a baffle for sound transmission between floors.


74 Definition of waffle slab: a concrete slab supported by a crisscrossing grid of interconnected concrete grids.
Fig. 16—Construction of Library mezzanine floor
Structure, Operations Level.--Kahn did not design for the operations level an exciting structural system equivalent to that of the gallery level. Instead, he specified a rather ordinary type of construction similar to that found in the average office building. Note in the background of Figure 17, p. 101, the flat ceiling from which are suspended fluorescent lighting fixtures. The two-story conservation court is the one inspired space in this area.

Architectural Details.--The term detail when used in a discussion of architecture refers to the treatment of the meeting of two different materials or two different surfaces. If designed well, the treatment of the joint can be visually quite pleasing. Thus, Kahn’s statements:

The joint is the beginning of ornament

It’s [a building] like a human body—like your hand. The way the knuckles and joints come together makes each hand interesting and beautiful. In a building these details should not be put in a mitten and hidden. You should make the most of them.  

Considered by some architects to be the most significant feature of the museum, the architectural details designed by Kahn have several common characteristics.

First, the number of joints was intentionally minimized by the use of very few materials and the continuation of materials over large areas. By this means, Kahn produced a serene and uncluttered effect.

75 McLaughlin, op. cit., p. 19.
Fig. 17--Conservation Laboratory, detail: light court
Second, the treatment of the joints was consistent throughout the interior and exterior of the building. For example, wood never visually contacts another material. A deep groove, called a reveal, occurs between each wood surface and the adjacent material. Because the reveal is very deep and narrow, it is dark enough to conceal the actual meeting of materials. Specifically, travertine meets concrete with a V-groove which is incised, the exact reverse of the raised V-groove which was intentionally created on the surface of the concrete by the design of the formwork. Consistent also is the treatment of glass, which never touches any material but mill-finish steel.

Third, there are no visible hinges, bolts, nails, thermostats, fire hydrants, or other such items which customarily add visual clutter to the interior of buildings. Some of the metal hardware was custom designed by Kahn for the Kimbell Art Museum, the finest example being the stair rail of the double stair in the lobby.

Fourth, the craftsmanship employed in the fabricating of the details is superb. Reveals are consistently the same width; parallel edges are always truly parallel; corners are always perfectly square. Richard Brown explained that much of the designing of the details took place on the site.

But time after time, on his visits to the site, Lou found solutions to seemingly insurmountable design and technical problems by talking to the men who must physically make the building out of intractable materials with their own hands. In
these confrontations the master architect understood the problems from the physical workman's point of view and was willing to alter the way to achieve his goal ("reprogramming").

Light Reflector-Diffuser.--The final preliminary presentation had featured studies of a light reflector which was concave acrylic, mirrored on one side. During the years 1969-72, the design of this important fixture was revised considerably and refined through many stages of trial and error (See Figure 8, p. 64).

Lighting consultant Richard Kelly was called upon to assist in determining the correct shape of the reflecting device. He recommended that perforated aluminum be used and that the shape be changed. Kelly drew an intuitive curve which was refined with the aid of a computer. Twelve different trial reflectors were made by the Kimbell staff and hoisted into position under the light slit.

The objective sought in the making of the trial reflectors was to find the shape, angle, and position of the holes drilled into the aluminum which would most effectively diffuse the light entering the museum at all times of the day and year. The problem was that at some times of the day a few escaped sunrays would pierce straight through the reflector and create bright spots of light on the walls or floor of the museum. Testing was continued until the escaped light

Fig. 18—Entrance Lobby, detail: light reflector-diffuser
rays were almost entirely eliminated. The actual light slit in the cycloid shell which had been fitted with glass in the preliminary design was covered by a transparent acrylic plastic dome in the final design (See Figure 18, p. 104).

It is interesting to think of the light reflector-diffuser as the culmination of Kahn's experiments with light (See Kahn's design philosophy, p. 36). His approach to the problem of glare had been to light a backlit wall by reflecting onto it incoming light rays which had been bounced off of an interior architectural feature, usually a wall. In the Kimbell Art Museum building the cycloid vault is a backlit surface, because the light slit lets in direct sunlight as does a window. What the light reflector-diffuser does is create a series of tiny surfaces which deflect light rays so that they enter the building quietly. It is composed of two closely spaced sheets of aluminum with tiny offsetting holes. Most of the light coming through the inside holes has been deflected at least once. Light rays which do not enter the holes are reflected by the curved surface of the cycloid. This intricate fixture is therefore based on the same theory of manipulating sunlight as the buildings discussed in chapter one, i.e., the only light entering the galleries is reflected light from one or more intervening surfaces.

77 Occasionally these escaped light rays may still be seen.

Materials.--The materials specified by Kahn for the preliminary design were not changed with the exception of one: the type of lead to be used in the roof. The specifications had called for lead-coated copper, but several problems were found in this material. An examination of such roofs in the Fort Worth area proved that this climate produced a white patina on the surface rather than the pewter gray common in cities on the east coast. For this reason a calcium lead alloy was substituted for pure lead.\textsuperscript{79}

Landscape and Site Development.--The final design of the gardens and terracing was essentially the plan drawn by Kahn and sent to Velma Kimbell in his letter of June, 1969 (See Appendix E, p. 170). The most noticeable design revision is to be seen at the west entrance, where the central fountain was replaced with a tree-filled entry court lined with marble chips. The site development was also revised in terms of circulation and access. Both public and staff automobile entrances were shifted from Camp Bowie Boulevard to Arch Adams. A comparison of the last model, p. 69, with the aerial photo of the finished building, p. 107, shows how stairs and walks were redesigned.

The amount of design production during the construction period was extensive, but it did not involve a change in the

\textsuperscript{79}"Lead Covers Roof with Eye Appeal," Building Design & Construction Magazine, LXVII (July, 1972), 21. The lead was supplied by the Murdock Lead Company of Dallas. According to Richard Brown, this company obtains lead from old car batteries which they buy and melt down. (Sheppard, \textit{op. cit.}, p. 28)
Fig 18 -- Aerial view of completed museum
basic concept of the museum. The new designing consisted of: 1) structural corrections, 2) refinements, and 3) design development of the operations and basement levels.

Conclusion

The design evolution of the Kimbell Art Museum can be characterized as having progress from: 1) a rather loosely strung together array of architectural elements to a tight, focused well-integrated design; 2) large to small in both scale and overall size; and 3) having features designed by Kahn to having many of the features requested in the "Pre-Architectural Program" by Richard Brown.

The reasons for these directions in design development can be attributed to Kahn's method of working and the unusual amount of client input. Characteristic 1, above, is Kahn's general method of finding a design solution. Using his design formula, he began his projects with a loose "unmeasurable" first scheme and gradually "got the water out"80 in the final, tight, finished design. The other two characteristics, 2 and 3 above, can be attributed to the unusually active role which Richard Brown, as client representative, played in the design development process. Brown's "Pre-Architectural Program" was just the beginning. Throughout the design and construction period, he worked with Kahn on the plans, often bringing in his own drawings.

80Meyers, Lecture.
Finally, the design development of the Kimbell Art Museum is characterized by Kahn's relentless search for perfection. He was obsessed with architectural details to the point of working with the craftsmen himself. He was obsessed with the "unmeasurable" or spiritual quality of the museum to the point that he made design revisions throughout the construction period as the building told him "what it wants to become." 81

81 "Kahn's Museum: An Interview with Richard F. Brown," Art in America, LX (September-October, 1972)
CHAPTER III

CONCLUSION

A Comparison of the Pre-Design Concepts
To the Finished Museum

The purpose of this chapter is to determine whether the original concepts of the founder, the director, and the architect were realized in the final design. To accomplish this purpose, a comparison is made of the pre-design concepts to the finished building, and an accounting is made of those ideas which were abandoned.

The Founder's Concept

Kay Kimbell's concept of the institution that was to bear his name is not recorded as a visual image, but as an ideal of excellence. The art collector may have had a private notion of the building in the style of classical architecture as has been suggested. But, whether or not he envisioned a museum of an historical style, what he wanted most was a building that would be considered beautiful by those who are authorities in such matters. He wanted his name to be associated with an institution that is admired by individuals with discriminating taste. If he had felt qualified to provide a visual description of such a building, he

1 Interviewee wishes to remain anonymous.
most certainly would have done so.\textsuperscript{2} 

The Board of Trustees, composed of those individuals who knew Kimbell best, may be considered reliable representatives of his wishes. The members of the board, at first alarmed by the unusual design of the building,\textsuperscript{3} were ready at one point to fire the architect and the director.\textsuperscript{4} Fortunately, Richard Brown convinced the board members that if they would see the project to completion, they would be satisfied. Even during construction, he recalled, the reaction was dismay. When the museum was completed and the opening ceremonies held, both public criticism and board pessimism subsided.\textsuperscript{5} The building was celebrated as a beautiful architectural experience. Kay Kimbell's reactions could scarcely have been other than jubilant to this kind of response to his museum. He would have also undoubtedly received great gratification from the awards which have been bestowed upon the Kimbell Art Museum building.

The Director's Concept

The general qualities of the museum certainly fulfilled Brown's expectations. In fact, some of the statements in the

\textsuperscript{2}Statement by Frances Robb.
\textsuperscript{3}Statement by Richard F. Brown, July 23, 1975.
\textsuperscript{4}Ibid.
\textsuperscript{5}Ibid.
program could be used as a description of the finished building. For example, the visitor experiences "warmth, mellowness, even elegance" upon entering the museum. There is an "honesty between visible form and method of construction" and a "clarity of layout" on the gallery level.⁶

While Brown wanted a building that is significant as a work of architecture, he did not want the museum to overwhelm the art. Some feel that it does. Whether the building seems to dominate the art or not depends upon the interests and background of the observer. In any case, Brown is by no means dissatisfied on this point.

Richard Brown believed that the Kimbell Art Museum building should have an organic integrity. Certainly, on the gallery level, it does. However, the museum as a whole must be considered. Although certain architectural features such as the woodwork, cabinetwork, glazing, and metal fixtures are treated uniformly throughout the building, a considerable sacrifice of the quality of non-public spaces was made. Thus, in contrast to the galleries, the areas used for service and operational activities are quite ordinary in terms of type of construction, use of materials, lighting, and spatial quality. For this reason, it would be incorrect to say that the museum as a whole has a totally integrated design.

Concept of the Plan

In the "Policy Statement" Brown established preservation as a top priority for museum operations. In the "Pre-Architectural Program" he set forth requirements for the architectural features which he felt were necessary to achieve this priority.

First, Brown wanted one public entrance. He got two. Why? Two other factors had to be considered: the site has only one pleasing vista, the west; and the program called for a protected, drive-up entrance. These two facts worked together to create a very difficult design problem. Because the only pleasing vista is toward the west, the only suitable orientation for the museum is west. Bringing cars to this side of the museum in order to create a drive-up entrance would mean compromising the one good vista. The only apparent solution was to make a second public entrance. Unfortunately, because of its greater accessibility by car, the east entrance is used most, and for this reason functions as the real main entrance. Thus, the Kimbell Art Museum has two main entrances - the real main entrance and the intended main entrance.

To compound this problem the east entrance had to be one floor lower than the west entrance because the site slopes. The result? The public areas of the museum are now on two levels, a violation of one of the main precepts of the "Pre-Architectural Program" that every space which will ever be
used by the public should be kept on one level. Furthermore, Brown's three basic divisions of the museum - service, public, and operations - which were to have the "clearest possible spatial separation,"\(^7\) are now intermingled.

By contrast, the layout of the galleries is very much in accord with the concepts set forth in the program. The gallery spaces are "flexible."\(^8\) Movable panels may be arranged in such a way as to allow each piece to be seen in its own selected environment, yet in sequence with other works of art. Although the ceilings do not have "a maximum height of twelve feet,"\(^9\) there is definitely a human scale throughout the building. While the cycloids reach twenty-two feet at the crown, the soffits between them serve as lower ceilings.

**Concept of Lighting**

Brown's emphatic demand that there be no skylights was ignored by Kahn, who continued to experiment until he arrived at a unique skylight/fixture combination. This device, the light reflector-diffuser, satisfied Brown's criteria for lighting the museum: that natural light should play the major role in illuminating the galleries; that the visitor should be able to glimpse momentary changes in weather, seasons, and time of day; that glare should be avoided; and that the wall space should not be depleted. One requirement was not satisfied, however. Brown had asked that only the "side-

\(^7\)Ibid, See Appendix B, p. 136. \(^8\)Ibid, See Appendix B, p. 132. \(^9\)Ibid, See Appendix B, p. 140.
directed parallel rays of daylight" be brought into the galleries. The reflector-diffuser does diffuse light such that the overhead light in the galleries could not be called side-directed, but the light brought into the museum through the courts is reflected at an angle by the courtyard walls.

Richard Brown is very proud of the lighting in the Kimbell Art Museum and always ready with statistics about the effectiveness of Kahn's system. For example, Brown has evidence that the Kimbell galleries have the lowest light level of any museum in the country, yet many people ask whether the illumination is too bright for the good of the paintings. Why would a dark museum seem light? It is Kahn's solution to the problem of glare. By eliminating the backlit wall, the architect created the illusion of ample light.

The Architect's Concept

The question of whether Louis Kahn realized his design concepts - the unmeasurable, served and servant spaces, the architecture of connection, the use of natural light and natural materials, the architectural features of the Kroller-Muller Museum - can be justifiably asked of the museum as a whole, but is most fairly asked of the public spaces.

Basically, the quality of the service and operational spaces had to be sacrificed during the design period in order

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10 Ibid, See Appendix B, p. 145.
to meet financial and program needs of the client. It seems unfair not to recognize the architectural triumph of the galleries by basing an analysis on the whole museum. Therefore, the following assessment of Kahn's realization of his design concepts is based on the galleries, the west entrance, and the development of the site.

**Plan Concept**

Kahn's intention to use the architectural elements which pleased him in the Kröller-Muller Museum was realized with one exception. He had successfully incorporated into the Kimbell design skylights, long bays, an inward orientation, and light courts filled with water and foliage. However, the idea of a one-story structure which was present in the first design was abandoned. For the second presentation, Kahn made one wing of the museum model two-story, probably in an attempt to make the building look smaller to satisfy the client.

It is interesting to analyze the consequences of this change. If the museum had been built as a one-story structure composed of repeated bays as in Kahn's first presentation, there would not be the tremendous difference in the quality of the public and operations areas. There would have been no reason for the mixing of public, service, and operations activities that exists in the present building. Finally, skylighting could have served the whole museum, not just the galleries. However, even at the present size of
120,000 square feet, a one-story structure composed of cycloid vaults would have most certainly been too expensive. On this point, Marshall Meyers noted that the finished museum gives the appearance from the west entrance of being a one-story structure.11

The Architecture of Connection

Several excellent examples of Kahn's concept of the architecture of connection can be seen in the Kimbell Art Museum. On the interior, the west lobby is itself a dynamic connecting space which links the north gallery, the south gallery, and the entrance portico. Within the lobby is contained another kind of connecting space, the double stairs. Ascending these stairs is one of the great architectural experiences of the building. One moves from a tomb-like enclosure into the vast light-filled spaces of the galleries.

It is the porticoes, however, which are the most important connecting spaces of the building. In addition to the function of the porticoes as a visual explanation of the museum's structure and their potential as an unprogrammed space, the porticoes form the perfect transition between the building and the terraces. Composed of equal parts open space and architectural module, the porticoes accomplish the most important function of a connecting space — they prepare

the visitor visually and intellectually for the connected area.

**Natural Light**

The one area of design in which Kahn's concepts totally prevailed was the lighting of the galleries. Brown's anxieties about the use of skylights were diminished with the successful design of the reflector-diffuser. In fact, Brown himself became quite involved in working out the details of this device. Thus, Kahn's original concept of using a combination of light courts and skylights to illuminate the galleries was realized.

**Served and Servant Spaces**

Kahn always gave a great deal of attention to the housing of such necessities as electrical wiring, air-conditioning ducts, pipes, and vents. The servant spaces he created for this equipment in the Kimbell galleries, the served spaces, camouflages them so well that few people realize what they are seeing. It is important to note that these servant spaces are not hidden from view, but are planned so carefully that they are design elements. For example, the steel soffit between each pair of cycloids contains three ducts which carry conditioned air and electric wires. Between the ducts are slits through which the air enters the galleries. From a design point of view, this apparatus creates horizontal bands running the length of each cycloid.
These bands become perspective lines which dramatize the length of the span. Another carefully designed servant space is the air intake grid which forms a narrow slit between the parquet wood floor and the travertine wall at the end of each cycloid. Note that this feature is not interrupted or stopped short of the wall, but forms a continuous horizontal reveal under the travertine wall. Not only was this servant space made unobtrusive, but it was used by Kahn to separate dissimilar materials, his preferred treatment of joints (See Figure 19, p. 119).

Although visibly evident, the provision of servant spaces was consistent with Kahn's design philosophy of minimal materials, surfaces and joints. This achievement is extraordinary. The stringent requirements for air handling in an art museum have been fulfilled without intruding upon the clarity of the structural system, yet are consistent with Kahn's architectural philosophy, the servant spaces are readily visible and honestly expressed.

The most beautiful servant space in the galleries is the storage wall behind the bookstore. Having the appearance of oak paneling, it actually stores the books, cards, and slides which are sold in the shop and it conceals the door to the library. Architectural features such as these are largely responsible for the sense of serenity Kahn achieved in the Kimbell galleries. Consider the same space interrupted by occasional protrusions and indentions, occasional changes
Fig. 20.-Entrance Lobby, detail: storage wall behind bookstore.
of material or color. The continuity of form would be violated, and violated too would be the sense of the unmeasurable (See Figure 20, p. 121).

**The Unmeasurable**

Kahn defined the unmeasurable as the essential nature of a work of architecture. In an art museum, Kahn believed that the essential nature was "silence and the quality of light." By 1968, Kahn felt that he knew what architectural features were necessary to achieve this silence and quality of light.

Kahn created silence in two ways: the blending of harmonious design elements and the elimination of interruptions. The quality of light he exploited for its color, for its momentary variations, and for the rest it gives to the eye.

The blending of harmonious design elements was achieved through the use of materials which were similar in hue, intensity, value, finish, and subtlety of surface variations. Blending was also accomplished by making servant spaces into design elements which harmonized with surrounding forms.

Another design element which contributes to the serenity of the galleries is the simplicity of the floor plan. Easily grasping the nearly symmetrical layout, the visitor remains composed and is not distracted by the confusion of not

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12 Komendant, op. cit., p. 118.
knowing where he is.

As important as the above elements are, they alone would not suffice to define the essential nature of the museum. The essential nature was stated as a bold, clean, uplifting architectural form, the cycloid shell. Did Kahn feel that the cycloid shell gave to the museum the unmeasurable quality he had searched for? The answer to this question comes from Richard Brown.

Brown remembers Kahn's tenseness upon arrival in Fort Worth to see the cycloids for the first time. The architect said nothing during dinner and the drive to the site. After walking around in the partially finished building for some time, he finally broke into a smile and said, "It works." ¹³

The cycloid shells are of paramount importance in creating the unmeasurable in the Kimbell Art Museum. This soaring, yet human scale form, reaching toward sunlight at its apex communicates both serenity and aspiration, both peace and celebration. It is the spiritual and the architectural essence of the Kimbell Art Museum.

APPENDIX A

STATE OF TEXAS
COUNTY OF TARRANT

KNOW ALL MEN BY THESE PRESENTS:

That I, KAY KIMBELL, of Fort Worth, Tarrant County, Texas, do hereby make, publish and declare this to be my Last Will and Testament," hereby expressly revoking all other Will and Codicils by me at any time heretofore made:

ARTICLE ONE

General

A. I have no children, nor have I ever had any. I have provided amply for all of my relatives. I, therefore, feel entirely free to attempt to achieve a long-felt ambition -- to encourage art in Fort Worth and Texas by providing paintings and other meritorious works of art for public display, study, and observation in suitable surroundings. The intent of this Will, after providing for my beloved wife, VELMA KIMBELL, is to further such purpose. My wife, Velma Kimbell, shares such ambition; and it is my hope and my request that if she survives me as indicated herein, she make the necessary elections to authorize the dispositions of community property hereinafter detailed.

B. If my wife, Velma Kimbell, survives me and makes
the necessary election, the term "my estate" as herein, shall be construed to consist of my separate properties and the entire community estate of my wife, Velma Kimbell, and me; if my said wife does not survive me or, having survived me, does not make the necessary election, "my estate" as used herein, shall consist of all properties and property interests owned by me at my death. In the event my wife and I die in a common disaster or under the trust, the affirmative vote of a majority of the executors or trustees cast at a meeting at which two-thirds (2/3) of the executors or trustees are present, shall be required. Each executor or trustee shall have one vote on each and every matter. None of the executors or trustees herein designated by name shall be required to give bond or other security, but any other successor trustee may be required by the remaining trustees to give such bond as may be determined by such trustees. I expressly direct that no action be had with respect to my estate in the appropriate Probate Court other than to prove, probate, and record this will and to file an inventory and appraisement and a list of claims due to or by my estate; it is my intention that the administration of my estate shall be independent. All net income received by my estate during administration shall be paid to, or permanently set aside for "The Foundation," to be used exclusively for its educational and charitable purposes.

B. Powers of Executors. I give and grant to my Inde-
dependent Executor full power and authority to administer upon my Estate and to carry out all of the instructions herein contained, and during the administration of my estate to conserve and protect the properties and values thereof. Without in anywise limiting the generality of the foregoing grant of power and authority, I expressly empower my Executors—

1. To sell or dispose of, for cash or on credit, exchange, partition with co-owners, liquidate and convert any and all properties of my estate;

2. To borrow money (from the Fort Worth National Bank or otherwise) and to secure the repayment of the same by pledge, mortgage or otherwise, or to renew any indebtedness due to or by my estate,

(Signed) Kay Kimbell
I. General Aims.

A. Purpose.

The Kimbell Art Museum is dedicated to the education, increased enjoyment and cultural enrichment of the public through the display and interpretation of works of art. Our knowledge and understanding of the heritage of civilization is largely dependent upon the continued survival of the kinds of art objects contained in this museum.

It follows that the paramount duty of the Kimbell Art Museum is to display and interpret to present generations and preserve for future generations, the highest aspirations of past generations as represented in the works of art entrusted to its care.

B. Scope.

The Museum aims to form collections of the highest possible aesthetic quality, derived from any and all periods in man's history, and in any medium or style. The entire province of art is considered appropriate as the source of material for the collections.

C. Program.

Consistent with the educational, interpretive and recreational purposes of the Kimbell Art Museum, the constant display and interpretation of its permanent art collection, plus programs of changing exhibitions, scholarly lectures and symposia, conferences of visiting scholars, continuing research in art, publications, and the encouragement of the general public's understanding and interest in art shall be undertaken. The Museum, through its staff, shall participate in all activities considered to be in furtherance of the encouragement of art.

II. Acquisitions.

A. Principles of Acquisitions.

The dominating principle involved in the acquisition process is that the stature of the Museum depends more upon the quality of the definitive objects it contains than on the historical completeness of its collections. A prospective addition to the collections, therefore, is to be judged from the standpoint of aesthetic quality and typicality, and whether it defines a master, period, school, style or area. The goal shall be definitive excellence, not historical range or size of collection.
B. Staff Function.

(1) Since the primary function of the Museum is the acquisition, preservation, display and interpretation of art at the highest level of aesthetic quality, the principal efforts and time of the professional staff are to be applied toward this end. No matter how qualified the staff, the Museum is not effectively working toward its goals if this is not the case.

(2) The specialized training, experience, knowledge, research activities and travel of the professional staff is focussed mainly on two corollary aspects of the Museum problem: a. an alert and up-to-date knowledge of the history of art and of the art market; b. an unceasing and intimate survey of the Museum's own collections to determine needs versus strengths.

(3) When recommending objects for acquisition, the staff members rely, not only upon their own research, but upon the advice, opinion and aid of the best available authorities in the specialized field concerned with the object.

C. Acquisition Procedure.

(1) Based on their findings, the staff, through the Director, recommends purchases to the Acquisitions Committee of the Board of Trustees for its approval.

(2) Since successful negotiation for the best in art often requires commitment and on-the-spot decisions that preclude time-consuming referral back to committees, the Trustees, upon special occasion (such as auctions), and after approved outline request from the Director, provides individual staff members from time to time with authority to spend acquisition funds up to specified limits, depending upon the occasion.

(3) There is no way of predicting when the most desirable objects will be discovered or made available. The most successful collecting is always to a large degree opportunistic. It follows that the Museum can have a successful acquisitions program only if there is a considerable capital fund available for this purpose. The maintenance of such a fund is an essential concomitant of this policy statement.

(4) In the absence of emergencies, the Acquisition Committee will not approve specific acquisitions until...

a. There is furnished to it such documentation as may be available relating to the artist, the origin of the object of art, the reasons for its value; and an evaluation by the staff, including available proof of authenticity;

b. There is presented to it by the Director or his staff, the reasons for the acquisition recommendation by the staff, including why the object is definitive of the period, master, school, style or
area it will define, why objects of art already owned by the Museum do not provide such definition and why, considering the acquisition budget, the specific object is superior to other possible or probable acquisitions.

In the event of on-the-spot acquisitions, the foregoing documentation and supporting reasons shall be furnished and presented to the Acquisition Committee by the Director or the staff at the first meeting of the Committee following the acquisition.

D. Gifts, Bequests, Loans and Advice.

(1) The acceptance of gifts or bequests of objects is governed by the same high standards as those outlined for acquisition by purchase.

(2) Gifts and bequests are accepted only if the Museum is left completely free, by acceptance, from any guarantees in perpetuity concerning the attribution, display, exchange or sale of such donations.

(3) The staff shall supply individual consultations and advice to members of the public, only in situations where it is ascertained and agreed that such action will result in specific benefits to the Museum. For example, the staff may advise concerning the acquisition of a work of art by an individual who represents that he plans to present the object to the Museum at an agreed time and in an agreed way, but the staff shall not assist in the building of a collection merely in hopes that the collection, or a part of it, will be willed or given to the Museum. The staff shall not make professional monetary appraisals of works of art in any case.

(4) Long term loans (those not included in temporary special exhibitions) may be entertained, but with comparable standards to those which apply to donations and purchases.

III. Facilities for Implementation.

A. The Museum building is a work of art itself, and it is designed, constructed and maintained according to those same concepts of high aesthetic standards that govern the collections which it houses. It is a creative contribution to the evolving history of the art of architecture, as well as being a functional instrument for the care, study and exhibition of the other arts.

B. Since our knowledge and understanding of the heritage of civilization is largely dependent upon the continued survival of the kinds of art object collected by this Museum, it follows that the paramount duty of the Museum is to preserve for future generations what has been entrusted to its care. Every other aspect of the Museum's program pays obeisance to and, where necessary, gives way to this trust. A continuing security and conservation program, and the funds, space, facilities, staff and technical equipment to maintain it are provided.
C. The Museum maintains a reference library. It is primarily a staff library so that the total program of the Museum may be carried out with economy and efficiency. It is not a lending library, and it is not for the general public's use, although qualified scholars, teachers, curators and students are welcome to use it at the discretion of the librarian and the director. The constant growth and increased efficiency of the library is a major concern of the Museum.

D. In addition to the public galleries, the conservation facilities and the library, the following facilities are provided and maintained to implement the museum's total program: a special exhibition gallery, an auditorium, bookshop, administrative and curatorial offices, Trustees' board room and office, adequate storage facilities, maintenance and preparatorial shops, study areas, photographic studio, automobile parking space for visitors, and adequate dining and catering facilities for special occasions.

E. Since a limited special exhibition program for public benefit, which entails borrowing by the Kimbell Art Museum, is a part of the museum's function, it is recognized that reciprocity in lending to other institutions is a necessity. Loans are stringently controlled, however, in view of the primary policy (I. C.) which states that the constant display of the permanent art collection takes precedence over other aspects of public program.
1. General Philosophy and approach to the building problem:

A. The Policy Statement, attached, sets forth the purposes, goals, scope, program and general method of operations for the museum. It should be referred to constantly, and it should provide determining criteria for constructing the physical facility, as well as for future management.

B. The building will exist to: 1. preserve and exhibit objects called works of art; and 2. enable as many people as possible to experience those objects as effectively and as pleasantly as possible: the "confrontation of object and observer".

C. Even though, hopefully, the building will be a creative contribution to the history of the art of architecture, the building itself should play a supporting role to the reasons for its existence (B., above), not a dominating role. Architectural "gymnastics" for their own sake work against these reasons. As in verbal expression, when an alternative is presented between the use of a long complicated word and a short simple one, the latter is invariably the better choice. The overwhelming percentage of people whom this building is intended to serve will not be art historians, other architects, or progressive artists with a sophisticated background in architectural form. Their total experience of a visit to the museum should be one of warmth, mellowness and even elegance. Among other experiences educational and personally enriching, a visitor to an art museum ought to be charmed; otherwise, why should we expect him to come? The spaces, forms and textures should maintain a harmonious simplicity and human proportion between the visitor and the building and the art objects observed.

That the above may be accused of "catering" to "popular" taste (or lack of it) is nothing to the point. In the past this catering was achieved by making the museum a monumentally awesome repository of "priceless" art housed in "period" settings against a background of massive and/or complicated, irrelevant decor. The answer to this ultimate alienation between art object and human being lies in the acceptance of the principle that, in a museum today, the art object is not a decorative part of a given setting (even if it was when produced centuries ago). Each individual art object is now a whole world unto itself, and architectural conditions should be so disposed as to encourage the visitor's complete absorption in contemplation of that world. Spaces, forms, textures, colors should avoid distracting that attention. As much as possible, the architecture should be flexible enough so that, upon installation (and future changes of installations), the objects of art may themselves help create the architecture and prescribe spatial quantity and surface qualities.

The creative strength of such a building lies in simplicity and directness of approach to the uses of the building, clarity of the disposition of parts, honesty in the relationship
between visible form and means of construction, taste in the proportions of those forms, quality of materials, and exquisite craftsmanship in putting the materials together. Such a building is not only strong in design, it has the desirable effect of strength upon the average visitor. And, the desired elegance and charm are achieved with restraint and grace. If, in addition, the average visitor can easily find his way through well lit spaces in which, because of clarity of layout, he feels that he is making the choices about where to go to see what, then the message we believe to lie latent in art will be imparted more effectively to more people sooner. (Even symmetry has the virtue, at least, of making it easier for people to figure out where they are and how to get to something else, thereby cutting down museum fatigue.)

No matter how effectively the expressive content of objects in the collection is conveyed to the public, the art museum today must be far more than a treasure house. The facilities, space and equipment for the care and interpretation of the treasures constitute a complex organism involved in a multitude of activities. The specialized facilities for these supportive activities must be included and equipped for their particular demands with as much consideration and care as the space for an artistic masterpiece.

A building with such an organic integrity cannot be built in stages, with allowances and adjustments being made for future wings, extensions or added floor levels. The form of the building should be so complete in its beauty that additions would spoil that form; and all of the requisite functional facilities should be articulated as components of that form so that, from the outset, the museum will be able to operate as a complete and vital institution.

II. Environment:

A. City of Fort Worth:

1. Population: city 400,000; metropolitan area 600,000; projected 1970 for city, approximately 500,000. Proximity of Dallas (less than 30 miles), plus urban area between two cities, must be considered in audience potential; i.e., an additional 1,000,000 population.

2. Cultural Institutions:

   a. General: public schools (87 elementary, 20 junior high, 12 senior high); one large private university in vicinity (T.C.U.) with art programs; four colleges; Arlington State College at Arlington (15 miles east of Fort Worth on road to Dallas), new, growing rapidly, will soon have over 10,000 students, with emphasis on humanities and important art history program, including library, research, etc.; three municipal junior colleges, all with art programs, now building.

   b. In immediate vicinity of site: Carter Museum of Western Art (annual attendance
over 100,000). Children's Museum (annual attendance approximately 350,000). Fort Worth Art Center (annual attendance about 50,000).

c. Theaters in immediate vicinity of site: Scott Theater (legit. stage, etc.), approx. 500 seats. Children's museum (lecture hall), 300 seats. Casa Mañana (theater in round), 1,800 seats. Will Rogers Auditorium, 3,000 seats. Will Rogers Coliseum, over 9,000 seats.

d. Climate:

1. Average annual rainfall, 31.51 inches.

2. Annual average temperature 65.8°. Effects of typical mid-continent climate produces extremes of weather conditions, often in sudden change to extremes. Lower temperature never too extreme or lasting; N.B.: higher temperatures are a definite problem to cope with architecturally six months of year, often over 90°, sometimes over 100°.

3. High winds frequent, sometimes carrying considerable earth dust content (factor to consider in: fenestration, water pools, fountains, climate control filter systems, etc.).

4. N.B.: Sunlight intensity frequently very extreme. This is a major factor to cope with, not only because of heat production, but in relation to visual effect on exterior design, psychological effect looking out from building interior, difficulties of potentially high surface reflectance of natural light off art objects, glare effect when looking at art against natural light source, intensity of light upon art objects in which light causes fading.

III. Site:

A. See topographical detailed map of area, attached to this program. (designated site in red.)

1. Size, approx. 9 1/2 acres. (413,820 sq. ft.)

2. Dimensions of sides (approx.): North, 800 ft.; East, 900 ft.; South, 650 ft.; West, 455 ft.

3. Contour line interval = 10 ft.

4. North-south roadway running through center of site being eliminated.

B. Geographically, the site is ideal. It lies at the heart of the population area defined in II. A.1. above. It lies about one mile west of the central downtown business district; and immediately to the west of the site the major suburban residential area begins, from which the highest density of audience potential will be drawn. The site lies directly between two
of the major traffic arteries connecting downtown and the residential area (Camp Bowie Blvd. on the north, Lancaster Blvd. on the south). Access will be almost entirely by automobile.

C. The park, of which the site occupies the east end, slopes gently downward from west to east (approx. 50 ft. drop total). It is covered with rich grass turf and hardwood trees, the largest being about 50 ft. tall. The trees, for the most part, parallel in straight lines the existing roadways. The only existing building in the park proper is the Carter Museum of Western Art, indicated on the map in the apex of the triangle at the west end. The open spaces, with some trees, and the large edifices of Will Rogers Coliseum and Theater lie across Lancaster Blvd. to the south; rather ordinary apartment structures (2 to 4 stories) begin across the street bounding the east end of the site; decidedly unattractive (1 and 2 story) small business and shop buildings lie across Camp Bowie Blvd. on the north. This surround, combined with the low-lying nature of the site, poses a design problem; there is no outward vista, and the elements of lowness and flatness will have to be utilized for positive effect. Inward orientation and an imaginative garden treatment in relation to terraces and/or building platform will be important.

D. Height restriction: the drop-off in grade from the main floor and terrace level of the Carter Museum of Western Art to the grade at center of the Kimbell Art Museum site is about 40 ft. In accepting the park land from the city, the Kimbell Trustees agreed to adhere to a height restriction of 40 feet so as to avoid impeding the view from the Carter Museum. This may mean that the first level of the KAM will have to go partially below grade (parking space, service areas). Roof treatment will have to be carefully considered in this regard as well.

E. Parking: nearly all visitors will reach the museum by private car (some in taxis or buses). The park should be preserved as much as possible, and the garden setting for the museum should be an important part of the museum visitor's enjoyable experience, with sculpture in the garden. A parking area capable of accommodating about 100 cars should handle the daily routine attendance; (two passengers per car, averaging two hour visits, over a 7 hour day, 350 open days in the year, with total attendance around 200,000). A parking area filling this need can be placed partially below grade, under the building itself and terrace and/or building platform. Overflow parking (scheduled properly) for large special events can go to vast parking areas for the coliseum across Lancaster Blvd. to the south.

F. Footing: loose gravel in soft clay, resting upon a limestone stratum 20 to 40 feet below grade. No unusual drainage problems.

IV. General Requirements of the Building:

A. The permanent collection may very well number something under 100 objects (1. paintings, 2. sculpture, 3. drawings and watercolors, 4. objects of the so-called minor arts) when the museum opens to the public. However, since the prime function of management (see Policy Statement) will be the continued acquisition of objects of the highest possible
aesthetic quality, the collection will continue to grow steadily. The rate of growth, barring certain foreseeable possibilities of the sudden acquisition of a whole group or collection, will probably be at the rate of a dozen or so objects a year. In any case, a basic design problem, therefore, is to build for a new, small, choice collection, but an expanding one. All the space cannot be filled at first, but the unused portion should not yawn openly at visitors.

B. Attendance for a few months after the museum opens will probably be much higher than that to be expected after the novelty of a new institution and its attendant fanfare dies down. Routine attendance, based upon the current audience potential and local statistics of record will probably be about 200,000 annually, which means roughly an average of upwards of 100 persons in the museum at a time, with week-day mornings, of course, being much lower and Sunday afternoons or holidays infinitely higher. The range can run from next to zero attendance at 10 A.M. Monday morning, to 1,000 or more at 3 P.M. Sunday. During the period shortly after the museum opens these figures will be doubled at least. Based upon burgeoning interest in art in the nation, the projected population growth in the Fort Worth-Dallas area, and the accelerating effect the KAM, its collection, outstanding shows and general program will have upon stimulating an art conscious public, annual attendance in less than five years will probably be over 500,000, and in less than a decade it will reach nearly 1,000,000. (Over 200,000,000 persons visited museums in the U.S.A. last year.)

C. There are three basic divisions into which any art museum is logically disposed because of the different nature of activities, personnel, equipment and type of space required within each division:

1. Service division (shipping and receiving, mechanical, maintenance, storage, preparatorial, etc.): all those activities, behind the scenes, that make the physical operation of the institution possible.

2. Public division (permanent collection display, special exhibitions, lectures, films, music, social events, etc.): all those activities that the institution produces for public benefit and in which the public participates or attends.

3. Operations division (administration, office work, files, financial control, scholarly research, etc.): all those activities, behind the scenes, which manage the physical plant and the total public program.

The clearest possible spatial separation between these divisions or areas, and the most carefully integrated relationship or unity of parts within each division, is the most conducive to economy and efficiency of operation, safety, maximum security and enjoyment by the public. For example, a whole host of headaches involving everything from fire exits to public circulation to guard salary costs are avoided if every space that will ever by used by the general public can be kept to one level—the level of easiest access and pleasantest prospects. Besides which, this simplifies and clarifies the visitor's task of finding his way, thereby increasing his enjoyment and the chances that he will "get the message" intended by the art and the institution.
For the sake of organization in this program, these divisions have been placed on separate levels, or floors, of the hypothetical building. This is not a mandate but a way of ordering the complex problem. Actual architectural design may produce a better solution.

V. Service Level

<table>
<thead>
<tr>
<th>Service Level</th>
<th>Sq. Ft.</th>
<th>Cost per Sq. Ft.</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Parking area under bldg. and/or constructed terrace, garden or bldg. platform:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. 100 cars @350 sq. ft. per car; incl. access aisles and inter-spaces.</td>
<td>35,000</td>
<td>7.00</td>
<td>245,000</td>
</tr>
<tr>
<td>a. Entry and exit portals for vehicles must be equipped with mechanized gates, doors or overhead doors so that area may be closed for complete security.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Lintel minimum height must be 13'6&quot; for trucks (cf. I.C.C. Regs.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Vehicle unloading magazine, along one edge of parking space, for deposit of visitors from taxi, buses, or private cars which will then immediately exit; (cf. openings, receptions, large social events, etc.) (During large special events parking will be attendant parking, with overflow across Lancaster Blvd. in the Coliseum parking area.)</td>
<td>2,000</td>
<td>7.00</td>
<td>14,000</td>
</tr>
<tr>
<td>3. Congregating or waiting area for visitors, at foot of stairs and entrance to elevator to main public level.</td>
<td>300</td>
<td>7.00</td>
<td>2,100</td>
</tr>
<tr>
<td>4. Stairway to main level (well to continue to operations level).</td>
<td>200</td>
<td>11.00</td>
<td>2,200</td>
</tr>
<tr>
<td>5. Elevator to main level (continue to operations level).</td>
<td>100</td>
<td>9.00</td>
<td>900</td>
</tr>
<tr>
<td>B. Aisle adjacent to parking area, for truck deliveries and pick-up (opposite side of bldg. from passenger-visitor arrival area).</td>
<td>3,000</td>
<td>7.00</td>
<td>21,000</td>
</tr>
<tr>
<td>C. Delivery and loading dock, along one side of area (opposite visitors entrance from this area).</td>
<td>1,000</td>
<td>9.00</td>
<td>9,000</td>
</tr>
</tbody>
</table>

1. Long, narrow dock could be used as access "corridor" connecting a number of the facilities itemized immediately below.
D. Office for: control center, check-point, surveillance of this entire level during day (glass wall), receiving visitors during hours when museum is closed, station center for night guard

E. Receiving area for deliveries (mail, packages, large objects, whole exhibitions)
   1. Overhead mechanized door, min. 10 ft. width

F. Shipping office: uncrating, inspection, wrapping, packing, etc.

G. Temporary storage (quick accessible)

H. Permanent storage (bulk objects: sculpture, furniture, etc.) clear space, plus bins

I. Permanent storage (paintings); screen room

J. Crate, box and packing material storage

K. Raw material storage (lumber, glass, wall-board, piping, etc.) for constr. of special exhibitions, cases, pedestals, etc

L. Mechanical shop

M. Paint shop

N. Preparation area (assembly of shows, their supports, cases, pedestals, art objects, frames, etc.)

O. Permanent storage area: pedestals, bases, build-ups, vitrines, frames, wall brackets, etc

P. Photographic studio, work-room and darkroom

Q. Storage for half-tone and color plates, plus files

R. Head Maintenance office

S. Office space for other service personnel

T. Service staff locker room, relief room, wash-room, toilet

U. Janitorial facilities (equip. storage, water, etc.)

<table>
<thead>
<tr>
<th>Sq. Ft.</th>
<th>Cost per Sq. Ft.</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>14.00</td>
<td>2,800</td>
</tr>
<tr>
<td>500</td>
<td>9.00</td>
<td>4,500</td>
</tr>
<tr>
<td>500</td>
<td>9.00</td>
<td>4,500</td>
</tr>
<tr>
<td>500</td>
<td>9.00</td>
<td>4,500</td>
</tr>
<tr>
<td>500</td>
<td>9.00</td>
<td>4,500</td>
</tr>
<tr>
<td>1,200</td>
<td>10.00</td>
<td>12,000</td>
</tr>
<tr>
<td>1,200</td>
<td>10.00</td>
<td>12,000</td>
</tr>
<tr>
<td>900</td>
<td>14.00</td>
<td>12,600</td>
</tr>
<tr>
<td>150</td>
<td>9.00</td>
<td>1,350</td>
</tr>
<tr>
<td>200</td>
<td>14.00</td>
<td>2,800</td>
</tr>
<tr>
<td>750</td>
<td>14.00</td>
<td>10,500</td>
</tr>
<tr>
<td>150</td>
<td>10.00</td>
<td>1,500</td>
</tr>
</tbody>
</table>
V. Small passenger elevator space (to all levels) .................................. 50 9.00 450 (plus mech'l.)

W. Freight elevator space (to all levels) .................................................. 200 9.00 1,800

X. Stairwell (to all levels) ................................................................. 200 11.00 2,200

Y. Building mechanical equipment (possibly in a sub-basement):
   1. heating-air-conditioning
   2. electrical equipment
   3. transformer vault
   4. generator plant
   5. fan room
   6. telephone relay panels
   7. pump room
   8. utility stairs (freight elevator to this area?) .................................. 2,500 10.00 25,000

<table>
<thead>
<tr>
<th>Gross Square Footage</th>
<th>Cost per Sq. Ft.</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>56,500</td>
<td>8.00</td>
<td>$446,000 (gross)</td>
</tr>
<tr>
<td>minus parking area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35,000</td>
<td>7.00</td>
<td>$201,000 (net)</td>
</tr>
<tr>
<td>Net Allocatable Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21,500</td>
<td>9.35</td>
<td></td>
</tr>
</tbody>
</table>

VI. Public Level

A. Entry foyer. ................................................................. 1,500 60.00 90,000

(Ideally, peace be to city code engineers and fire marshalls, an art museum should have but one public point of ingress and egress: security control)

B. Book shop and sales ............................................................. 1,000 14.00 14,000 (plus built-ins)

   1. Should be walk-in, browsable, self-service to increase sales maximum.
   2. Elongated sales desk to prevent congestion of purchasers.
   3. Tight entry-exit way for control of shoplifting.

C. Book Shop stock storage & packaging area ................................ 250 11.00 2,750 (plus built-ins)

D. Sales Office ................................................................. 200 14.00 2,800
<table>
<thead>
<tr>
<th>Sq. Ft.</th>
<th>Cost per Sq. Ft.</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check-desk space (checking counter, info. desk, security center when museum open to public).</td>
<td>200</td>
<td>14.00</td>
</tr>
<tr>
<td>F.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total gallery area for permanent collection.</td>
<td>40,000</td>
<td>40.00</td>
</tr>
<tr>
<td>-1. Ceiling height: 12 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Layout so that objects are apprehended visually by:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. being placed in a controlled field of vision,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. seen in sequence. (This does not mean historically chronological or stylistic, but simply one at a time against the controlled field.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. Area for temporary special loan exhibitions</td>
<td>7,200</td>
<td>30.00</td>
</tr>
<tr>
<td>1. Twelve ft. ceiling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Extended elongated shape, divisible transversely to create spaces to fit varying show sizes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. A number of access points along one longitudinal side, to permit entry according to particular sized space for diff. shows, with some space closed off.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. North longitudinal side glazed, with sliding opaque panels, to adjust to shows of different media (Large sculpture show could have all glass wall; chinese painting show must have minimum light).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Sales storage area, to service roll-away sales counter, and to store counter when not in use.</td>
<td>200</td>
<td>11.00</td>
</tr>
<tr>
<td>H. Auditorium area, incl. seating area, foyer, small stage, musical instrument storage room offstage, backstage access to stage, fire exit areas</td>
<td>6,000</td>
<td>30.00</td>
</tr>
<tr>
<td>1. 300 seating capacity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Continental seating.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Foyer area providing light and sound lock from everything outside auditorium.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Acoustics for music.</td>
<td></td>
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</tr>
<tr>
<td>I. Projection room (perhaps part of 3rd level).</td>
<td>250</td>
<td>11.00</td>
</tr>
<tr>
<td>1. Equipped for 16 and 35 mm. movie film projection, double slide projection in 2&quot;x2&quot; and 3 1/4&quot;x4&quot;, T.V. camera pick-up for cable or beamed program to local T.V. tower, complete voice communication and signal communication between projection room and stage.</td>
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<tr>
<td>J. Two respite areas/smoking rooms/lounges, strategically placed in relation to gallery areas to help relieve museum fatigue (each approx. 250 sq. ft.).</td>
<td>500</td>
<td>30.00</td>
</tr>
</tbody>
</table>
K. Reception hall, for refreshment serving at special exhibit openings, receptions, social functions, civic functions, entertainment of special groups such as foreign groups, Int'l Council, Assoc. of Directors, etc.; social gatherings after lectures.

1. Strategic placing in rel. to auditorium and special exhibition galleries important.
2. Use by any future members or "friends" of KAM.

L. Catering service area for reception hall

M. Toilet facilities:

1. Ladies powder room (150 sq. ft.), and toilet (150 sq. ft.) near entry and permanent galleries.
   - 300 sq. ft.
   - 14.00 Cost per sq. ft.
   - 4,200 Cost

2. Men's toilet rel. to entry and perm. galleries.
   - 200 sq. ft.
   - 14.00 Cost per sq. ft.
   - 2,800 Cost

3. Ladies powder room (150 sq. ft.), and toilet (150 sq. ft.) rel. to auditorium and special exhibit galleries.
   - 300 sq. ft.
   - 14.00 Cost per sq. ft.
   - 4,200 Cost

4. Men's toilet rel. to aud. and spec. exhib. area.
   - 200 sq. ft.
   - 14.00 Cost per sq. ft.
   - 2,800 Cost

N. Janitorial service closets (water & equip.):

1. Two rel. to perm. gall. area (100 sq. ft. each).
   - 200 sq. ft.
   - 11.00 Cost per sq. ft.
   - 2,200 Cost

2. One rel. to spec. exhib. area.
   - 100 sq. ft.
   - 11.00 Cost per sq. ft.
   - 1,100 Cost

3. One rel. to entry area.
   - 100 sq. ft.
   - 11.00 Cost per sq. ft.
   - 1,100 Cost

4. One rel. to auditorium area.
   - 100 sq. ft.
   - 11.00 Cost per sq. ft.
   - 1,100 Cost

O. Main level continuation of:

1. Stairwells (V. A. 4 and V. X.).
   - 400 sq. ft.
   - 11.00 Cost per sq. ft.
   - 4,400 Cost

2. Passenger elevators (V. A. 5 and V. V).
   - 150 sq. ft.
   - 9.00 Cost per sq. ft.
   - 1,350 Cost

3. Freight elevator (V. W.).
   - 200 sq. ft.
   - 9.00 Cost per sq. ft.
   - 1,800 Cost

Total:
- 60,950 sq. ft.
- $36.00 Cost per sq. ft.
- $2,185,950 Total Cost

Approximate average cost per sq. ft.:
- $36.00

Cost per sq. ft.
### Operations Level

#### A. Continuation of:

1. Stairwell space from V. & VI. .......... 400 Sq. Ft. 11.00 Cost per Sq. Ft. 4,400
2. Passenger elevators space ............. 150 Sq. Ft. 9.00 1,350
3. Freight elevators space ............... 200 Sq. Ft. 9.00 1,800

#### B. Reception area (receiving professional and official visitors, telephone switchboard, work desk for one person) .......... 300 Sq. Ft. 14.00 4,200

#### C. Clerical pool, central files, gen'l office work area .......... 800 Sq. Ft. 14.00 11,200

#### D. Board room .................. 400 Sq. Ft. 20.00 8,000

#### E. Trustees' office .................. 200 Sq. Ft. 20.00 4,000

#### F. Administrative secretarial area (3 desks, plus files, to service director, Asst. director, Trustees) .......... 500 Sq. Ft. 16.00 8,000

#### G. Director's office .................. 400 Sq. Ft. 20.00 8,000

1. Small screen room for paintings
2. One wall for installation and lengthy study of objects
3. Vault

#### H. Assistant director's office .................. 300 Sq. Ft. 16.00 4,800

#### I. Office for Head of Museum Programs ............... 300 Sq. Ft. 16.00 4,800

#### J. Business Manager's office ............... 300 Sq. Ft. 16.00 4,800

#### K. Secretarial area for H., I., J. ............... 500 Sq. Ft. 14.00 7,000

#### L. Office for Head of Research ............... 300 Sq. Ft. 16.00 4,800

#### M. Curatorial research office area (divisible into small units), for future curators, visiting scholars, specialists working on KAM publications or projects, etc.) .......... 2,000 Sq. Ft. 15.00 30,000

#### N. Registrar's office and key file on accessions, loans, etc ............... 400 Sq. Ft. 15.00 6,000

#### O. Bookkeeping, accounting, payroll, personnel files, etc. (proximity to Business Mgr's. office desirable) ............... 500 Sq. Ft. 14.00 7,000

#### P. Library:

1. Stack and reading area .......... 3,000 Sq. Ft. 14.00 42,000
2. Work room ............... 400 Sq. Ft. 14.00 5,600
3. Librarian's office (with window wall for surveillance of reading area) .......... 300 Sq. Ft. 14.00 4,200
Q. Conservation studio.
1. Open studio work area (for easels, work tables, hot vacuum table, etc.); N.B.: must face north, with entire wall glazed; it is impossible to get enough light in this room.]
2. Sinks and wet-drain counter area
3. Volatiles storage vault
4. Darkroom for ultra-violet, infra-red, X-Ray, etc. examination
5. Varnishing and drying room
6. Conservation office and files (1., 2., 3., & 5. must be force ventilation with blower fan exhaust)

R. Research and conservation temporary storage reserve (partly clear floor space for large objects & furniture, three painting screens, partly shelf and bin storage)

S. Greenhouse

T. Toilet facilities:
1. Administrative
2. Ladies staff powder room & toilet
3. Men's staff toilet

<table>
<thead>
<tr>
<th>Sq. Ft.</th>
<th>Cost per Sq. Ft.</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>500</td>
<td>14.00</td>
<td>7,000</td>
</tr>
<tr>
<td>200</td>
<td>14.00</td>
<td>2,800</td>
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<tr>
<td>100</td>
<td>14.00</td>
<td>1,400</td>
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<tr>
<td>300</td>
<td>14.00</td>
<td>4,200</td>
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<td>2,800</td>
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<td>14.00</td>
<td>5,600</td>
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<tr>
<td>300</td>
<td>14.00</td>
<td>4,200</td>
</tr>
<tr>
<td>200</td>
<td>14.00</td>
<td>2,800</td>
</tr>
</tbody>
</table>

14,950 $14.44 $215,750 approx.

VIII. Terraces, plaza, approach walks, ramps, and surrounding sculpture garden (prior to design layout, these figures are, of necessity, the most rough & arbitrary)

A. Terrace, plaza, plinth, or bldg. platform (Whatever shape(s) the bldg. itself ultimately takes, the minimum square footage of this element, extending beyond the peripheral walls of the bldg. itself, must maintain
proportion with the mass of the bldg.)..........................

B. Landscaping garden area immediately surrounding structure (and/or interior courts).......................... 30,000 10.00 300,000

C. Entrance and exit drives for vehicles........................... 10,000 3.50 35,000

D. Walkway approaches.................................................. 4,000 3.00 12,000

E. Decorative water (reflecting pools, fountains, etc.).......................... - - 100,000

$517,000

XI. Statistical Recapitulation:

A. Allocatable interior space; basic bldg.:

1. Operations level.................................................. 14,950 14.44 215,750

2. Public level..................................................... 60,950 36.00 2,185,950

3. Service level (not counting parking area)................ 21,500 9.35 201,000

4. Net interior allocatable space................................. 97,400 $26.72 $2,602,700

B. Plus underneath parking area; service level.............. 35,000 7.00 245,000

C. Bldg. mechanical (plumbing, heating, wiring, air-conditioning).......................... 132,400 7.00 926,800

D. Special equipment, mechanical (elevators, shop eqip., screen rooms, conservation eqip., fork lift, movable scaffold, etc.).......................... 230,000

E. Exterior vertical wall surfacing (30,000 sq. ft. of maximum surface: 30'x300x2: 30'x200x2: 1/2, 15,000 sq. ft., treated with granite @ $30.00 per sq. ft.)........ 450,000

F. Exterior horizontal surfacing (terraces, water, drives, walkways, landscaping) see section VIII.......................... 517,000

G. Interior furnishings and office equip.......................... 800,000

H. Pumps, piping, controls, drains, filters, etc. for handling decorative water.......................... 30,000

I. Special gallery lighting:

1. Permanent collection areas (30 gallery spaces, with 20 light sources per space = 600 x less than $100 per source).......................... 60,000
2. Special exhibition area (200 movable, visible, clip-on-power-source grid type fixtures @ $50 maximum) .......................................................... 10,000

J. Total cost for facility .............................................................. $5,871,500

K. Architectural and design fees .................................................. 600,000

L. Grand Total Cost of Museum .................................................. 32,400

X. Notes on features of particular importance to museums:

A. Lighting:

1. Natural light should play a vital part in illumination, consistent with the problems of maintaining maximum lineal feet of wall for hanging pictures and avoiding those glare and heat effects already discussed in section II., page 3. Since there are so many times when natural light is insufficient (museum open at night, late winter afternoons, very cloudy day, etc., etc.), artificial light must be sufficient to do the whole job of making complete visual appreciation of a great variety of art objects a pleasure. However, if natural light were excluded completely, the art, and eventually the museum visitor, seem vacuum packed in a can. The visitor must be able to relate to nature momentarily from time to time -- to actually see at least a small slice of foliage, sky, sun, water. And the effects of changes in weather, position of the sun, seasons, must penetrate the building and participate in illuminating both the art and the observer. The creation of the ideal total visual situation, of course, involves the physics, physiology and psychology of it: i.e., all levels of perception. But, we are not after a measurable physical quantity, or a physiological reaction; we are after a psychological effect through which the museum visitor feels that both he and the art he came to see are still a part of the real, rotating, changeable world.

2. Skylights are not the answer: the visitor cannot look out of them; the changing natural effects don't come through them effectively; they cause insufferable design problems; require huge wasteful attic and clerestory spaces; and they always leak no matter what is spent on their maintenance. A clerestory natural light source is unsatisfactory for a number of the same reasons.

3. The side-directed parallel rays of daylight are required (as with artificial, as much as possible). The true quality of the surface of a small panel painting with even very low impasto can be negated for a connoisseur by vast windows, diffused overall skylighting, or multiple light sources.

4. In artificial illumination, fluorescent lighting is anathema. It does to art that which was just mentioned in paragraph 3. above. It does not relate in quality to natural light as well as some incandescent (commercial labels notwithstanding). And it limits the greatest quantity of those very rays that are the most injurious physically to works of art.
5. Lighting should be incandescent; the latest quartz lamps seem to provide sufficient brightness, with the smallest available unit to replace, handle and store (thus also cutting down the size requirement of the fixture); their K rating seems to relate best to most art objects visually.

6. The fixtures in the permanent collection galleries should be set into the ceiling so that the aperture and face of fixture is flush with ceiling. Above the ceiling the power source should be on a grid system (6 foot intervals) so that wiring can be pulled to a fixture placed in any ceiling panel (on 2 foot squares, approx.).

Fixtures in the special exhibition area should be suspended from an open power source "grid" (actually transverse parallel tracks at about 6 foot intervals).

7. If the walls upon which objects are installed, plus free standing objects in center of floor, plus glass cases, are illuminated adequately, there should be no need for general space illumination as such (down-lighting, etc.). This is distracting.

B. Collection installation:

1. Floor bases, pedestals, glass display cases, table cases, wall brackets, etc. should be designed by the architect and produced to order by local craftsmen for specific works of art. They should not be bought by stock items from a manufacturer's selection of module samples.

2. Walls of the permanent collection gallery area will be of excellent quality material and should not be violated by the installation process. Changes of installation will be relatively infrequent. Hanging pictures, therefore, should be effected from a channel, or strip, or other device located up near the ceiling on the face of the wall. This device should be designed by the architect, be part of the working drawings; and produced especially to specifications. The hanging wire (or other material) will be colored (painted) to blend imperceptibly with the color and texture of the wall.

3. Walls of the special exhibition area must be subject to frequent changes of installation, and often these are unavoidably quick changes. They usually involve shifting wall arrangement in plan, plus change in color. Heretofore, the best solution to this has been a tough, coarse fabric surface, backed by 3/4 inch fir, horizontal tongue and groove wood; the fabric removed every few years after successive nailings and coats of paint have disintegrated it. Hopefully, a fresh solution is to be found here.

C. Security:

1. Design layout should keep maximum surveillance of art by security force constantly in mind.

2. There should be the absolute minimum of doors leading from the building to the outside. The ideal museum has only one spot where the general public enters or leaves the building: control.
3. Live, roving human beings as guards are the irreplaceable basis for security (comparable to the infantry in war), but certain electronic security devices can augment the guard staff, and even cut the salary budget for it:
   a. All exterior doors on electronic alarm
   b. Fire detection
   c. Limited closed circuit T.V. surveillance
   d. A.D.T.

D. Internal Communication:

1. Any given floor level of the building should maintain an absolutely uniform and continuous level surface on that given floor, with no thresholds or divider strips at doors (ease, economy and safety in moving objects).

2. An ample number of two-digit internal telephone stations should be installed so that rapid communication between staff, when not in their offices, can be achieved. (e.g., between a guard on duty to central security office; between a curator working in a gallery and his office; or, director should be able to receive a long distance call while in conservation laboratory without going all the way back to his office.)

3. A comprehensive system of signs and labels should be worked out as part of the architectural design problem, be designed under supervision of the architect, and have type, face and scale carefully adjusted to purpose, place and background. (Announcements of shows, lectures, new acquisitions, etc.; directional signs, designation of doors to specific facilities, labels for art objects.) Continuity of design.

E. Climate Control:

The principle goals are:

1. Stability (continuity, sameness) of total climate conditions maintained steadily.

2. Clean atmosphere.

3. Relative humidity steady at 55%.
APPENDIX C

Statement: Louis I. Kahn

by Richard F. Brown

Clutching a copy of a rather detailed "Pre-Architectural Program" which we at the Kimbell Art Foundation had sent out to about fifteen architects all over the world, the appointed time arrived one morning in April, 1966, when I was to have my first discussion about the program with Mr. Louis I. Kahn in his Philadelphia office. Having gone through this procedure already with many of the other architects under consideration, I anticipated with relish a normally expected couple of hours, probably including a pleasant luncheon at a quiet and excellent restaurant, during which each of us would politely explore what made the other tick, and whether entertaining the idea of a client-architect relationship should be pursued any further.

In contrast to most of the red carpet treatments thus far, it was mildly surprising to find Mr. Kahn and his associates beavering away in a kind of garret space on the top, or fifth, floor of a relatively flimsy "taxpayer"-type structure with a drugstore at the street level. I was also somewhat chagrined to find the single small elevator out of order because, while skiing in Colorado that winter, I had
unwisely argued with a mountain, and the mountain won, putting me on crutches while lugging a huge cast from hips to instep. Having achieved the top of the stairs in spite of that, I realized the entire establishment consisted basically of three spaces only.

An approximately fifteen-foot-square room with a bare wood floor, bare windows, and bare walls (except for various drawings, postcards and other ephemera pinned or pasted on them) served the reception, filing, secretarial and main access function. An extremely charming and intelligent secretary who called Mr. Kahn "Lou" presided here; but she had four people delivering or picking up various rolls of drawings to cope with, and all the light buttons on her telephone were twinkling. An affable young man who also called Mr. Kahn "Lou" stepped in from the large doorless space at the left and took me back in there with him. The drafting room had fifty feet of the same bare windows and floor, and all the pipes, ducts and conduits were bare on the ceiling. But the activity reminded one of a beehive, with the bees crawling around from table to table, clustering at moments, busy singly at other times. After appreciating a couple of extensive models being worked on by a group of Mr. Kahn's students from the University of Pennsylvania, we crossed back through the reception office and approached the wide-open door of Mr. Kahn's absurdly miniscule office. Most of the space is occupied by a huge wooden plank of a door set on top
of two sawhorses, and this serves as his work table. In addition, the clutter is considerable; sketches on drafting paper precariously festoon the walls, piles of odd old books with unexpected titles that he loves to snoop for during his many travels occupy whatever horizontal surface Kahn can find, and chunks of gutty Mexican lava stone lean from the bare floor up against the wall.

Since a group of men were already in his office, evidently trying to conclude a conference about cost estimates for some project or other, and since we went right in anyway, a sense of bedlam suddenly developed; and there weren't enough places for everyone to sit. Claustrophobia was impossible, however, because the little office is at the southwest corner of the building, and two whole walls are made entirely of the same big bare windows that light the reception office and drafting room. The light in all these spaces is matchless, and for Lou Kahn light is the great creator of all things, including architecture. With such superb light to work with, why should he move into fancier quarters?

Because the flow of ideas and their infinite refinement never stops with Lou Kahn, the concluding phase of a conference often takes as long as a whole conference. But eventually the cost estimate gentlemen were gone, and Lou and I were alone. I was made tremendously welcome, but obviously nothing had been specially "arranged." Business went on as usual, with numerous trips to different tables in the
drafting room, specifications brought in to be checked, and changed, decisions to be made about how he was to get from Italy to India in connection with his overseas commissions. I was simply permitted to rattle along in neutral observance of all these vital activities that ultimately result in the most pertinent building being done in the world today. I shortly came to realize that there could be no better technique devised to instruct a potential client about what he would be getting into if he decided to produce a building with this madcap outfit, although there was not technique being applied at all. As the hours passed, one could not avoid being reminded of that old admonition not to make sweeping statements when important interruptions were in progress.

In between the interruptions, however, discussion did take place. It was about proportion in the Ducal Palace at Urbino, the character of the towers of San Gimignano, the structure of the Romanesque church in Tournus, and many other subject unavoidably germane to living architecture in the latter half of the twentieth century. With full acceptance of the modern artist's irrevocable historical self-consciousness, such subjects become, not stylistic influences, but the means through which philosophical principles can be communicated. Soon we began to extend the communicability of abstract language with drawing upon bits and pieces of drafting paper laid out on top of the big wood
door slab. Assistants from the drafting room came in from time to time, following the general drift of the discussion. If they tore off a fresh piece of paper larger than Lou deemed necessary to express their idea, they were relieved of the prodigal piece and handed a partially used one, a portion of which they were invited to use as adequate. Economy is an all-pervading attitude of operations, design and building process.

There were innumerable positive proofs that Lou had read and even thought about the zealously produce "Pre-Architectural Program," and he seemed so kind about what it had to say. What we could not know at that early stage of our association is that his entire approach to finding design solutions lies in what he calls euphemistically "reprogramming." He reprograms the program; then reprograms the schematics; then reprograms the preliminaries; then reprograms the working drawings to the point where you never really have working drawings. Even as concrete and steel and stone and glass go up, reprogramming goes on. He finds the essential nature of his building in the process of producing it. "What does this building want to become?" This, of course, is in accord with the very nature of the creative process at this point in history, when there is no such thing as form known beforehand and as given by a tradition, a faith or imitative revival. To insist upon knowing beforehand is to negate creation, since each building is made at a new
moment in time, in a different place, with its own individual uses that are different from any others. Thus each building, if it is a building that creates form, is unique; and thus Lou Kahn is indeed a "form giver," as he has been called so often.

But pushing forward into this unknown that cannot really be known until it is done is risky business in a rapidly inflating economy, under current union conditions, and using all manner of people whose attitude has increasingly dictated less risk and more easy routine for more money. Great credit is due on this count to the Trustees of the Kimbell Art Foundation who, as to be expected, are industrial executives not accustomed to bearing with this kind of risk. They had the courage and the faith to give us the chance to take the risks, both aesthetic and economic.

Self-doubt, of course, is the great spectre that stalks anyone whose philosophical premises commit them this far beyond the already tested, and for a long time during design and construction it was pretty lonely out there. It would be difficult to find anyone with more professional conviction than Lou Kahn, or with more stubborn patience to wait for the building to tell him what it wanted to become. For this reason many of his critics see him as the old philosopher-architect, dictating godlike for a Parnassian summit. This simply is not so. Even after construction had been under way for some time, contractors, sub-contractors and workmen
doubted the functional logic, aesthetic sense and structural and economic feasibility of what they were being told to build. But time after time after time, on his visits to the site, Lou found solutions to seemingly insurmountable design and technical problems by talking to the men who must physically make the building out of intractable materials with their own hands. In these confrontations the master architect understood the problems from the physical workman's point of view and was willing to alter the way to achieve his goal ("reprogramming"). The workman began to see and understand that goal and, because he suddenly realized his own vital part in the creative process, he was willing to try harder. His ideas and experience and the knowledge of the hand became just as important as anything else. The lovely tradition of craftsmanship flowered; look at the detailing on the quarter-sawn white oak doors, the quality of the concrete form work, the welding and joining of the mill-finish stainless steel mullions, the laying of the pure lead roofing sheath! God bless the craftsman who cares; and Lou Kahn can eventually make them care because of his own patient dedication and incredibly high standards.

The most dramatic illustration of how an evolving form instructs everyone concerned with a building has to do with the cycloid vaults that are the most salient feature of the Kimbell structure. This soaring space creator was invoked by Kahn for a multitude of reasons. Reinforced and
post-tensioned with six tendons, each of the sixteen, four-to-six-inch-thick shells spans more than a hundred feet from north to south. They are, because of shape in relation to compression, plus post-tensioning, their own support, and they finally bear only on the two-feet-square piers at the four corners. The flat soffits between each curved vault actually hang from them and are there only as lateral thrust stiffeners. With this system an absolutely free space more than a hundred feet wide and stretching all the way from Texas to Malibu beach could be built—no columns or supporting walls to get in the way of a museum man’s flexibility of installation. And the natural light, coming through a three-feet-wide slit running the full length at the apex of each vault, is diffused by an inverted reflector hung beneath each slit. The result is a miraculous bathing of the interior surface of the vaults, and gentle domestication of Texas’ sometimes brutal sunlight without losing its natural qualities.

The scale of the spatial units was modified to accommodate the client’s imagined use. The profile of the arches, and thickness and graded shape of the shells, were modified by the structural engineer, Dr. August Commendant, who determined exactly how these structures could stand. Still there were many Cassandras who said they would not; and even if they would, there was not way to form them up there in liquid concrete. The supervisors, foremen and workmen on
the job literally invented an ingenious but simple set of forms that were foldable and movable. The shortest span in the building, bridging only thirty-five feet because of a light court that intersects one of the vaults, was chosen for the initial pour. With double crews it took longer than a full work day. You see, said Cassandra, more than a hundred feet will be impossible; setting up, post-tensioning, and curing must result from a contiguous pour for these things to have structural integrity. Creation is risky, but by now the men relished the challenge. They found the ways and means, and the four for each succeeding vault became easier, better in quality, and took less time. The last one, one of the three open-front porticos, 104 feet long, started at 8:30 a.m., and the men were calmly at lunch by noon! It was like winning the Super Bowl by a good score.

Concrete, in Lou Kahn's philosophy, is a noble material if used nobly. The reflected Texas light, bathing the bare concrete interior surface of the vaults, endows that surface with a subtle richness comparable to a "silvery powdered moth's wing." Although that effect may be considered decorative, there is a severe logic to exactly when and where concrete is used. In the Kimbell building whenever you see concrete, without exception, that wall, pier, vault, or whatever, is a supporting, sheer, structural member. Whenever you see travertine, wood, or, of course, glass, that member is simply a diaphragm to enclose space and proper climate. This
structural logic is so rigorously consistent that it becomes a major aesthetic ordering of the building.

For Lou, architectural design is not one thing and engineering and mechanics another; the two must become one in the process of building. You find the most direct, frank, economical way to support your floor slab or roof, or achieve the space or light, and if you have achieved it rightly that is your design. But, you may say, employing such elements as post-tensioned cycloidal vaults does not seem so direct, simple or economical; they are if you want that kind of space and light. Largely because of this directness of approach, the Kimbell Art Museum grosses approximately 120,000 square feet of space at about $53.00 per square foot, based on the construction contract. It is not an exorbitant cost for space that is so monumentally exhilarating while, at the same time, always warm, friendly and in human scale. It is exciting but quiet, a perfect place in which to contemplate individual works of art.

About all of this we could not even guess during that first visit of April, 1966. But it was easy to perceive quickly that here was a great passion for design, integrity, quality and ruthless honesty. As the sun through the big bare windows of the miniscule office moved farther westward and downward, Lou's hair became haloed by it, so his mop looked wispier and whiter all the time. He kept talking and drawing, holding the charcoal willow stick so lightly that
sometimes you could barely see the lines that someday might be a huge wall. The movement of the stick over the paper was not controlled only by the fingers, but by the whole hand and arm, much in the manner of a Chinese calligrapher or Zen sumi-e painter. Absorption was so great that nobody even thought of lunch until late in the afternoon. It was too late to go out, and besides, there was too much to do and talk about. So cold sandwiches and milk were brought in, and mustard and ketchup got mixed in with the charcoal dust.

Darkness had settled by the time I could tear myself away to catch the train back to New York. All day I had noticed Lou glancing repeatedly down at my leg cast and the big woolly shoe mitten I had to cover the discolored, frayed end of the cast and the now blue and scabrous toes that projected from it. He finally reached down and pulled the mitten off, while asking me why I wore it. I explained that I was afraid of spoiling people's appetites if I ever happened to go into a fancy restaurant with all that showing. But he objected that it would be much better not to cover up anything and show the full nature and relationship of the cast to leg, including their present condition which was a record of how they got that way. His buildings are like that, too.
APPENDIX D

Marshall D. Meyers interview with Louis I. Kahn
11 August 1972
"The Wonder of the Natural Thing"

LIK:

I'll tell you what I feel. I feel that natural materials have a way of blending together. There's something about nature's making of the material—somehow there's more sympathy amongst materials, a cross-sympathy of materials in nature, whereas if we paint, any variety of paint (and it surprises you almost every time when you see one paint against another how they don't work together) where if you took a collection of natural materials (which have a great variety of color) and you put them on a table they all blend together. So the first sort of instinctive reverence one has about the importance of decision is that the natural materials when they do come together—there is—there could be a greater immediacy of the sympathy between materials.

And it's always the same—whereas one says that you will have a matte finish which is manufactured by one person as being matte in one way different from another. So in the matching of materials with all the great number of materials that are on the market there is always great apprehension, you see, that either the color will be discontinued so you
can't renew it or it will prove to be that the gray of one manufacturer is not the same gray, even with the same name, as that of another manufacturer. Now of course that's not a very deep reason, it's just simply one of the running reasons why you instinctively go to natural materials.

Also let us say you're attracted to natural materials because you're almost looking forward to the natural variations that the material has. As material that's manufactured you're always in a state of apprehension as to the variations that occur by the "artistic," let's say, whims of the manufacturer. You see it's kind of a— that the whole idea, Marshall is to say that we're going away from the wonder of the natural thing. And if we imitate it you really sell yourself short. You're attracted to the material because it's very---it's closely---somehow you almost inherit naturally sort of an instinct for the use of nature's availabilities because you actually in the course of your own making, you made choices which had to do with what was available that way.

I think to answer properly, but it's just the idea, it's a reverence problem---you see what I mean really.

Now in nature there are no polished materials so why do we want stainless steel not to be polished? We don't like it polished because you don't want to see yourself in the material, for one to see your image in the material. And in stainless steel particularly the flash of stainless
steel tends to highlight, give a multiplicity of highlights which you admire at a certain point and it tells you much about the shape. But the polish of a stainless steel member has a tendency to be entirely highlight and it sets all the other values, it recedes all other values, and it simply isolates and becomes ostentatious in itself. And therefore the sense of its unity, the sense of the blending, so that you can read the walls for their length and their height and their thickness is all gone because there's one that the eye is attracted to more and you do not feel the unity of the materials. So you see it becomes a staccato note, a constantly staccato note which takes away all the other blendings. It's like a constant lightning, you know. You admire it but you really expect the serene, the repose---and also a building must be really in repose and sort of take its place in the way it makes a mountain noble like a temple does. But if the temple were of stainless steel it would ruin the mountain. It just would be so glaring that the mountain would look muddy, where the mountain is actually very beautifully bright.

The use of travertine in the walking areas of the museum is a very excellent material because it is naturally not a slippery material. Marble is certainly very nice in a museum but it is slippery and besides anything glaringly white, let's say, or very polished against concrete has too much contrast - while that which has a similar tone to concrete,
---let us say for instance travertine is very much like concrete---it almost has the character at times that concrete and travertine look like the same material. That makes the whole building again monolithic and it doesn't separate things. If you had a contrasting material the concrete would look dirty, muddy---whereas---white would make concrete look very bad because concrete would look really dirty and white would be very white and the contrast between the materials would make both materials rather not belong to each other. Where travertine and concrete belong beautifully together because concrete must be taken for whatever irregularities or accidents in the pouring that reveals itself. One must in every way avoid any kind of irregularities in a purposeful, artistic kind of way. Artistic being put in quotation marks as being rather a fault than a virtue.

In my own experience, you know, in Salk, where I ordered the concrete to be contrasted with slate and it happened, just as a matter of market balance, that slate proved to be more expensive coming from Italy than travertine. They were getting material which comes as ballast. And because they had some arrangements, boat arrangement, in La Jolla, I was asked whether I would not accept travertine instead of slate and for the moment I thought, gee, I'll lose my contrast. But then I said, gee, it's a great material, so let it come. And I couldn't have made a better
decision at that moment. Thinking that the contrast would make both things brilliant but actually the travertine and the concrete are so much together that it now looks to people as though that building were there thousands of years ago, because the decision of its harmony, which takes many years to attain, was there already, right?---as a new building it already had the harmony of something which was aged. So even a material like stainless steel and other materials which at first seem clashing would eventually, after many years, become rather unified, the weather would unify them in some way or other. And this was an immediate kind of unification. So the contrasting material is also eliminated here as a blending then of wood and travertine and concrete which are so subtle that each material never ruins the other, never really takes over and ruins the other material. And that's why the choice.

MDM:

How does this relate to the idea of the way light changes its mood--as you've talked about before. Is there anything about the variety and the character that materials have that also--I see a connection, I'm trying to say, between the variety in the natural materials and the changing (dynamic) variety of the moods of light throughout the day, as opposed to paint which is static and the electric light which is static.
I noticed when I was at a house I built many years ago and I had specified sand-finished plaster and I looked at the walls and I wondered why—"it's a lovely color," I said to the client, "this lavender you put on the way, but I remember I specified sand-finished plaster." He said, "we didn't touch it, we love everything you do you see, we didn't touch it." And I look around and I said, by gum, this wall is lavender. And it is actually the natural, sand-finish white plaster. The little granules of sand that were on the surface of the plaster cast numerous, numerous minute shadows and because the light was of that kind of yellow which projected, which gave you a purplish shadow and the whole wall became purple, not purple, lavender, subtle, a very subtle lavender and it was so delightful. Now on the wall where the shadow was not, the color was different. Just see what a variety you get merely by the entrance of natural light into a building which allows the shadow caused by the natural light to be an added color—so I'd say the sun is after all possibly the greatest painter. And the time of the day and the season of the year, which by the way is completely different from the year before and the day before throughout all of nature's course—you can be sure there isn't one day like the other or one moment like the other in light. So natural light is just an endless display of mood. Electric light is static and when it
burns out you get another bulb and it becomes a little brighter at that moment but the same feeling is there. Electric light will never take the place of natural light.

And in the gallery paintings were painted in natural light in countries which probably are different from the ones in which now these paintings are exhibited. Because there is a great traffic between countries and countries as far as works of art go, there is still the acceptance of the artist himself, though he may be long gone, that the painting sits in its natural light and he expected it to look different someday even surprising him, because he remembered having painted it in a certain light, that he sees it now as being more beautiful than he thought it was (or has some surprising aspects to it) that he never could have anticipated. So the natural light is just full of moxie and it's unpredictable and it's like man's nature too which is unpredictable.

It is for this reason that it can be brought out the importance of your intuitive feelings about things because in the intuitive feeling lies a more comprehensive record of the nature of man than does any kind of group of information or discoveries from time to time. And I believe that man inherits, in his intuitive, a sense of beginning which answers to all the laws of nature and to the nature of man in general, as you might say in the qualities of commonality.

So in the intuitive sense there are the qualities of
commonality, there is also the qualities which have to do with all the laws of the universe which is in it.

So man has this feeling that this somehow has the unity—and I sense it though I can't prove it. The dogged determination to believe in this intuitive sense and find the means even if maybe it is sometimes very devious, will give the best, best possible results—so when a man says that he believes that natural light is something we are born out of, he cannot accept a school which has no natural light, he cannot even accept a movie house, you might say, which must be in darkness, if he's really passionately engaged in this without sensing that there must be a crack somewhere in the construction which allows enough natural light to come in to tell you how dark it is. It's that sense. Now he may not demand it actually but he demands it in his mind to be that important.

Therefore our insistence with the greatest amount of difficulty—and even it was marvelous that we found the man who thought that he was equally interested in making the calculations because his belief was the same. But his belief was not something that was immediately translated into shape. His belief called on the laws of nature to prove it to him and so the combination of one who is a scientist and can't tolerate statements that cannot be substantiated—-(but he must also have a belief that it is good to do this) and so he finds in a way an inspired technology, and where it
wouldn't be without the stimulation of another person. I believe so much in the wonder of natural light that it resulted in an invention of a shape which one could never get to by just playing around with shapes that you like. It is something that grew out of a real belief in the wonder of natural light with the deepest respect for the injurious effects of natural light that brought a scientific-minded mind together with an art-minded mind, together to make something which has great validity. This "natural lighting fixture" which is rather a new way of calling something, it is rather a new word, entirely. It is actually a modifier of the light, sufficiently so that the injurious effects of the light are controlled to whatever degree of control is now possible. And when I look at, Marshall, I really feel it is a tremendous thing--don't you think so?

MDM:

When we first thought of this idea of having--we didn't know how to make it...

LIK:

Well you have such an affinity for it yourself--this is something I noticed in you--how really interested you were in that.
MDM:

Well when the idea came that there would be a possibility of making a reflector that you saw through, that also put the light on the shell—-I didn't know a curve, I didn't know the technology, I only had a sense of it. From that point, once we worked with Kelly and then he had to get someone also to actually put it through a computer and so forth, and we went from glass (which is still a way, but it is too expensive) to another way which was perforations which is the same idea...

LIK:

I think you ought to talk about that because you ought to add it to show what the path is to get something. You see it really is a very difficult one—-but don't neglect our Director who at the same time believed in it in his way.

MDM:

It's all there in his program.

LIK:

I think that's as good a story as anything you want to know because that darn thing looking up there is the best proof. It's the result of something.
MDM:

An it starts with a belief in the natural light being there to begin with which starts with Ric Brown and that's why he found you, I'm sure--one of the reasons--because there's a sympathy, he saw a sympathy. And that's fantastic.

LIK:

It is fantastic yes.
Dear Mrs. Kinkaid:

Wednesday June 25, 1969

I plan to come to see you soon to show and explain the garden ideas I have surrounding The Kinkaid Art Museum. I hope you will find my work beautiful and meaningful.

The entrance of the trees is the entrance by foot which links Camp Bowie Boulevard and West Lancaster Ave. Two open porches frame the entrance court of terraces. In front of each porch is a reflecting pool which draws its water in a continuous sheet about 70 feet long in a basin two feet below the ground surface. The sound heard was gentle. The stepped entrance court passes between the porches and their porches with a fountain, around which one into, one axis designed to be the source of the porches pool. The west lawn gives the building perspective.

The south garden is at a level 10 feet below the garden entrance approached by gradual stepped lawns sloped to be a place to sit to watch the performances after play music or choose the building with its arched silhouette acting as the back drop for stage. When not so used it will seem only as a garden with sculpture acquired from time to time owned by.

The North Garden Through mostly utilitarian is designed with ample trees to shield and balance the south and north sides of the building.
The car entrance and parking is also at the lower level running
parallel to Arch Adams Street. This road too is lined with trees
designed to assistance as shelter. For this we need closer
the right tree whose habit are respectful to the car tops.

When I see you I expect to bring a model whichahad gay more
than my little words.

By now you know that I cannot be present at the ground
breaking ceremony. Unfortunately I have emergency
liaisons in India at the same time. In my absence I wish everything
well.

I am confident that the work will progress more from now
on. I believe every one believes in the building and its good
purposes.

I expect to return from India by the 12th of July. I wish need
a few weeks to plan up and meetings I hope to present to you.

In discussion,

Sincerely yours,

Linn
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